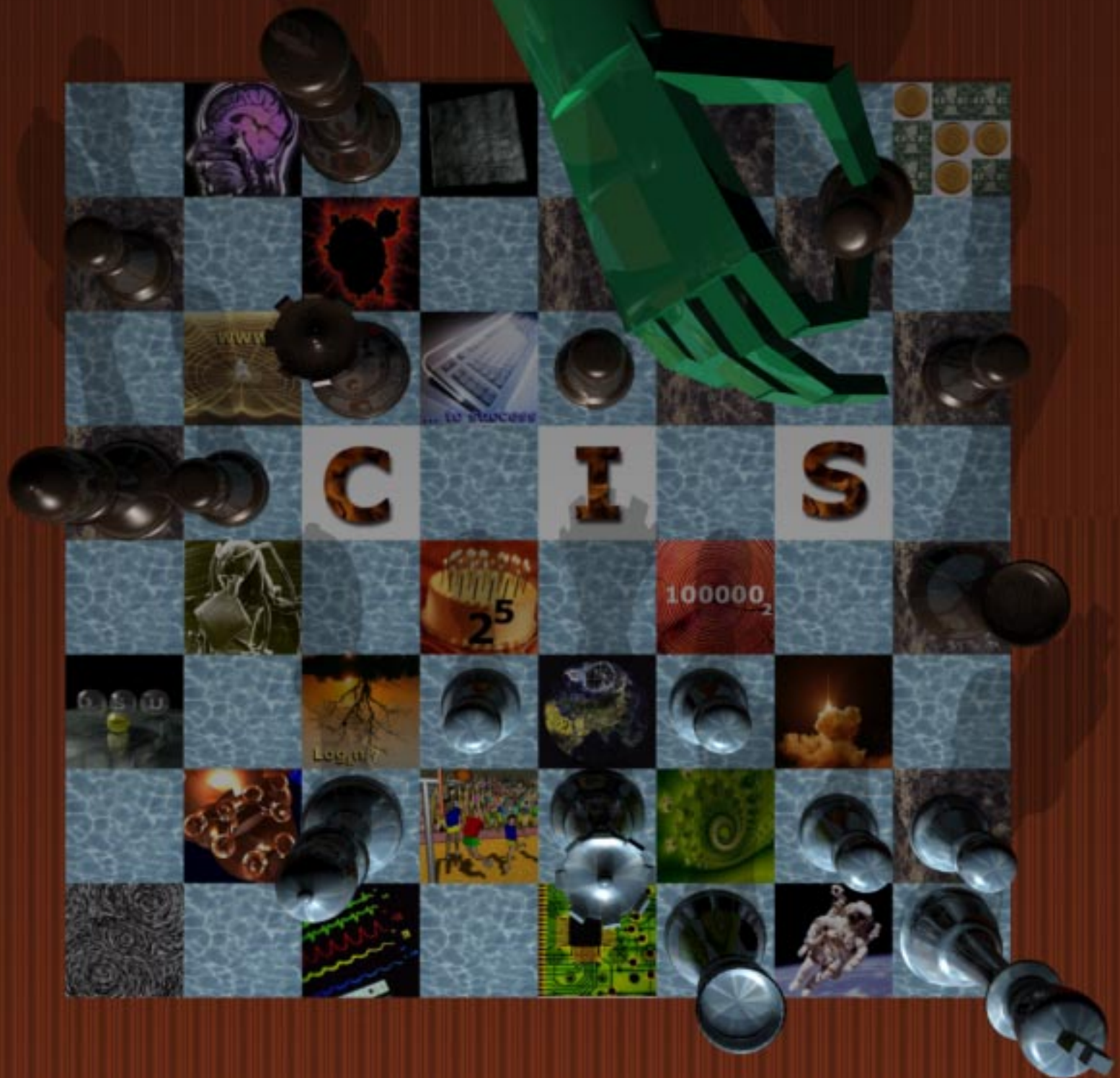


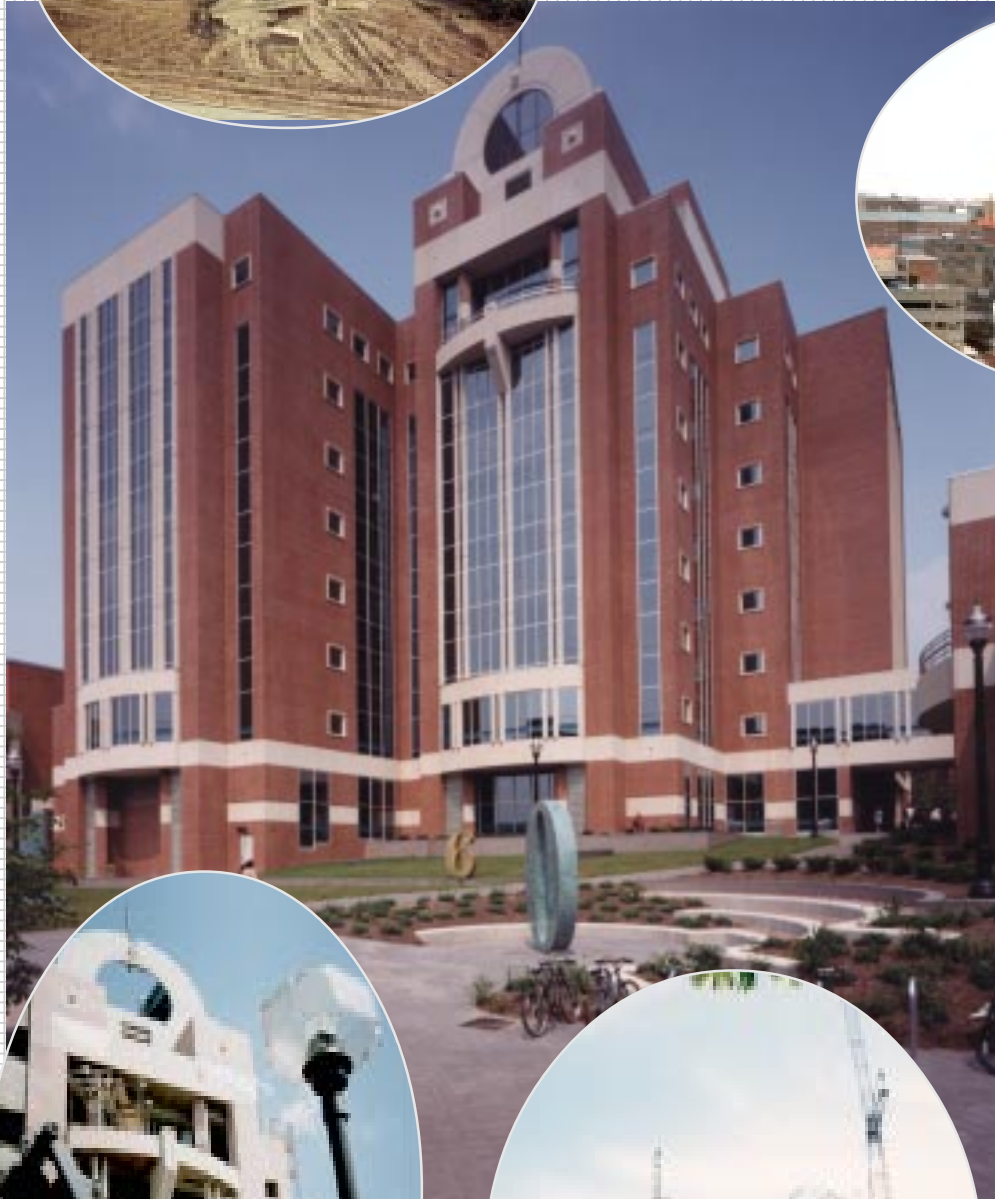
**Computer & Information Science
University
2000~2001**



Celebrating our 25th Anniversary

*Cover created by
Arunachalam Somasundaram*

OUR HOME = DREESE LABS



CONTRIBUTORS & THANKS

SPECIAL THANKS

This edition of the CIS Annual Report features photos from the past 32 years of development. Some of the photographers are not known with some of the older pictures. On others the "blame" is in dispute. However we would like to acknowledge as many as possible if not with their individual pictures.

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Song Chun Zhu*

TABLE OF CONTENTS

This is a special edition of the OSU Computer & Information Science Annual Report. It contains not just the highlights of this past year, but also many great moments from out previous thirty-two years. Enjoy with us this trip down Memory Lane!

DEPARTMENT HIGHLIGHTS & PASSAGES	1
Awards & Recognitions	5
Fifth Annual Awards Banquet	11
Student Diversity Program	12
Memorial to a Colleague	13
Special Thanks & Financial Giving Information	14
RESEARCH	17
Artificial Intelligence Area Highlights	19
Graphics Area Highlights	21
Networking	24
Systems Research Group	28
Software Engineering Area Highlights	36
Motion Capture: Collaborative Work with the ACCAD	37
Information Systems Area Highlighted Projects	37
Grants & Awards	38
ADVISING & ADMINISTRATION	83
Undergraduate Office for Academic Advising	85
CIS Computing Services	86
CIS Administrative Staff	87
External Advisory Board	88
FACT & REPORTS	91
The Binary Statistical History	93
Distinguished Guest Lecturers & Guest	94
Publications	97
Invited Talks & Presentations	106
Technical Reports	110
Equipment	111
Faculty Search Report	111
Course Listing	112

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FROM THE CHAIR'S CHAIR:

Fiscal year 2001 was special for the department in more than one way. Obviously, it marked the entrance of CIS into the 21st century, a century that many believe will be remembered as the global information age. But it also marked the department's 32nd anniversary. Now, as you know, 32 is a special number to computing folks. So we marked the occasion with a celebration, bringing back several alums who have helped shape the field in both education and industry. Read more about our "binary birthday" elsewhere in this report.

We had another good year in recruiting new faculty, once again despite the very stiff competition for high quality persons in our discipline. This year, we welcome four new persons to our ranks. Joel Saltz joined OSU from his dual appointments at the University of Maryland and Johns Hopkins. Joel, a CS Ph.D. and also an M.D., will head OSU's new program in biomedical informatics, and will have a joint appointment as a full professor in the CIS Department (not just a courtesy appointment, by the way). He will work in our systems group, and we expect there to be considerable collaboration between CIS and biomedical informatics in terms of joint research projects, joint faculty hires, and educational programs serving the interests of both units. Gagan Agrawal also joins our systems group as a new tenured Associate Professor. Gagan comes to us from the University of Delaware, where he had a faculty appointment and won an NSF Career Award. Gagan will have a joint appointment with the biomedical informatics program. Hakan Ferhatosmanoglu is a new Assistant Professor in the (database) systems area, and joins us from UCSB, where he just received his Ph.D. Dong Xuan also is a new Ph.D., from Texas A&M, and joins our networking group as an Assistant Professor.

The addition of three of our new faculty considerably strengthens our already excellent systems group. In the past two and a half years, we have five new hires into this group. You may recall that, a couple of years ago, we had a cluster of hires in the graphics area. It should be clear that we are building excellence on many fronts.

Faculty and staff continue to be recognized for their accomplishments, both within and outside of the university. Song-Chun Zhu received three honors (an "academic hat trick" according to OSU President Brit Kirwan). Song-Chun won an NSF Career Award, ONR Young Investigator Award, and Sloan Fellowship within the same year! Mukesh Singhal became a Fellow of the IEEE. Bruce Weide and Tim Long won the IEEE-CS Award for Undergraduate Teaching, recognizing their innovative work in developing our introductory computer science courses. Leon Wang and D. Panda won College of Engineering Lumley Research Awards, recognizing their excellent research accomplishments over the past four-year period. Peg Steele of our staff won an Ohio Academic Advising Association award.

External research expenditures were up only slightly this year, but new awards went up over 10%. Recent new awards include a major DARPA grant and two awards in the NSF Information Technology Research (ITR) program.

For the second year in a row, we had an undergraduate student winner of an NSF Graduate Fellowship. This year's winner was Susan Hohenberger. We also had an honorable mention in this year's NSF Graduate Fellowship competition. We know we are producing high quality graduates from our programs, and it's great to see some of them receive this prestigious national recognition.

Students continue to have very strong interest in our major programs, and in courses we teach even when they are not majoring in computing. This is a very important part of our mission at OSU, and we continue to seek resources from the administration to help meet this demand. Right now, the GPA required for entrance into our undergraduate program in Engineering, and our program in Arts and Sciences, is 3.0. It will rise to 3.2 in 2002. While we are extremely selective and are getting the best students into our programs, I personally feel we should be serving more of this demand. Not only are we shutting out very well qualified people from our major programs, but we also are making it very difficult for students from other programs, who recognize the importance of computing to their own disciplines, to get the courses they need. This affects a much broader segment of OSU's research and educational missions. The recent economic downturn nationwide, and the associated resource situation in the State of Ohio, will make it very challenging to make progress on this front.

The resource issue also is tied to faculty recruiting. We will be recruiting for several faculty again this year. Hopefully, we will continue to be successful here and the university will support our continued efforts to hire more strong faculty. In addition to existing openings, the department, in partnership with our EE Department, is a finalist in the statewide competition for a new endowed faculty position. This Ohio Eminent Scholar position would be in the networking area. The awardees will be announced in summer 2001.

Funding from outside sources can, of course leverage the support we receive from the university. This year, I am pleased that we created three new endowed funds. One was in tribute to Elley Quinlan, a former graduate student and long-time staff member who passed away this year after a bout with cancer. Many of Elley's friends and colleagues in the department, past and present, contributed to make this endowment possible. The other two funds were due to the generosity of Con and Chris O'Connell, former grad student and staff member, respectively. We also thank the Leggett family for their continued contributions this year to the Leggett Family endowment fund. Funds of this kind can support student scholarships, and the development of students, faculty and staff. Those in a position to do likewise are urged to contact me for more information about these opportunities. But even more modest contributions help us with our wide-ranging departmental development needs.

I hope you enjoy the report. I welcome your feedback and hope you will continue to help us improve.

Stuart Zweben



The five chairpersons: (l-r) Lee White, Stuart Zweben, Mervin Muller, Anthony Petrarca & Marvin Yovits.

MISSION STATEMENT

The mission of the Department of Computer and Information Science is:

- ◆ *to educate undergraduate and graduate majors in computer science and engineering, as well as the broader campus community, in the fundamentals of the computing discipline;*
- ◆ *the create and disseminate computing knowledge and technology;*

and

- ◆ *to use our expertise in computing to help our society solve problems.*

VISION STATEMENT

- ◆ *Our students and graduates will be aggressively recruited for their valuable educations.*
- ◆ *High ability persons from diverse backgrounds will seek admission to our programs for the superior value of an OSU/CIS education.*
- ◆ *Our alumni will become recognized for their accomplishments.*
- ◆ *The knowledge and technology created within the Department will be acclaimed and disseminated worldwide. A significant amount of this knowledge will become the basis for new and improved concepts, processes, systems and products.*
- ◆ *Persons outside the Department will appreciate the role of the Department in addressing major societal problems in whose solutions computing technology play a significant role.*

DEPARTMENT HIGHLIGHTS & PASSAGES



Autumn 1986
Rear Admiral (ret.) Grace Hopper speaking
to the Department.

Autumn 1974
The CIS faculty.

Spring 1988
The College of Engineering
Senior Research Awards.
(l-r)
Prof. Ken Waldron
(Mechanical Engineering),
Balakrishnan
Chandrasekaran (CIS) , *Dean*
Donald Glower, Prof. Keith
Bedford (Civil Engineering),
and Prof. James Lee
(Chemical Engineering).

The Binary Birthday **100000***in* **2000** *Dept. of Computer & Information Science*

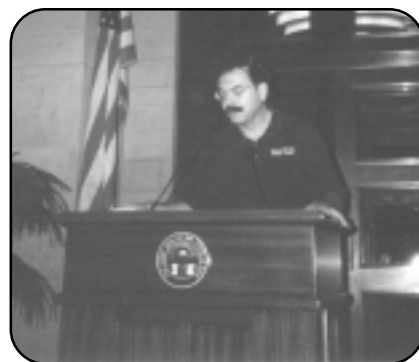
With the arrival of the year 2000 and the beginning of a new millennium, the Department of Computer & Information Science decided a celebration was necessary. It occurred to our Chairperson, Stuart Zweben, that this was the

Department's 2⁵th Anniversary and that when written in the language of computers, binary we became 100000₂ in Y2k! This was most definitely a cause for celebration!

On Friday, October 27th, 2000, we began the event with alumni presentations to our current students and guests. Our research labs held an Open House through the afternoon on Saturday. Many of our grad students appreciated the opportunity to see their colleagues' work. We were pleased to see a variety of alumni. Some local high schoolers came by looking for information to drive their futures.

The weekend ended with a gala event. The Department hosted a banquet in the Ohio Statehouse Atrium. It was a grand affair. Dr. Stuart Zweben, Chairperson, presented an historical timeline of the Department. The keynote speaker of the evening was Dr. John Levine.

John R. Levine writes, lectures, and consults on UNIX and compiler topics. He moderates the on-line comp. compilers discussion group at Usenet. He worked on UNIX versions Lotus 1-2-3 and the Norton Utilities and was one of the architects of AIX for the IBM RT PC. He received a Ph.D in computer science from Yale in 1984. His talk, titled *Will Computing Ever Advance Again?*, was a review of the computer science field's history. He spoke of how he perceived there was a burst of creative energy in the 1940s, 50s, and 60s, but since 1968 it's been working out the details of earlier ideas.



Alumnae Patti DeRuyter Millage chatting with Advisory Board member/alum, Bruce Flinchbaugh



Alum Larry Sampson and faculty member Doug Kerr compare notes about the early days.



Current Graduate Students

(l-r): Ramki, Vijay Kota, Prakash Krishnamurthy, Sanjay, Arun, Madanraj Selvaraj



Wayne Carlson and his wife Pam.

Wayne is a CIS alum ('83) and Director of the Advanced Center for Computing Art & Design.

Our alumni presenters were: (left to right)

Mary Jane Lee (Ph.D., Dec., '78);

Paul Amer (Ph.D., Mar., '79);

Mike Fortin (Ph.D. Aug. '91);

Conleth O'Connell (Ph.D., June '90) .

Dr. O'Connell has worked with two technology start-ups. Currently he is the Chief Technologist: Architecture, Technology Group, Vignette Corporation. He discussed the various aspects of working for start-ups in his talk *Surviving the Start-Up Life*. In his talk, he included: the ups and downs, the necessary skills, the attitude needs, what education will carry over, and what education won't help.



Dr. Lee has stayed within the academic world and is the Associate Dean College of Engineering & Computer Science, California State University at Sacramento. Her presentation, titled *U. S. Information Technology Workforce Needs: Issues and Impact on CS Programs* focused on the current crisis between Industry and Academia. Dr. Lee related how U.S. information technology (IT) companies argue that the universities are not producing adequate numbers of IT graduates (about 35,000/year in 1997 and 1998) to fill the 100,000 + new IT positions opening each year and that IT industries have supported legislation to increase the number of H-1B visas from 107,000 to 195,000 for the 1999 - 2000 fiscal year. She analyzed how the opponents argue the IT industry is too selective, wants to keep salaries low, and practice age discrimination. She emphasized how this issue affects CS departments in terms of, among other things, faculty recruitment, academic programs, and industry relationships.

Running with the Big Dogs was the title of *Dr. Mike Fortin's* talk. A member of the Development Lead Windows Performance team at Microsoft Corporation, Dr. Fortin was a qualified speaker to tell students how working in large corporations such as IBM and Microsoft requires a different skill set than other career paths. It requires a different mind set as well. He discussed what he has found is necessary to survive and thrive in this realm.

Dr. Paul Amer's talk was one of the most well attended because a large number of the audience were faculty and staff. Dr. Amer used his unique humor and wit to share his insights garnered from the worlds of Academia and Industry. His talk, *Computer Science: Then and Now or Ramblings by an Old Man*, included many anecdotes and tales of the early days of OSU-CIS as well as pictures many long time faculty would have preferred forgetting. Dr. Amer is currently a Professor with the Computer & Information Science Department at the University of Delaware.

AWARDS & RECOGNITIONS

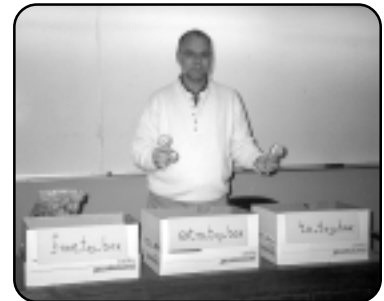
It's been a terrific thirty-two years -- and we are just getting started!! The Birnary Birthday was one that shone not only with our 100000₂ birthday cake candles, but with awards and special recognitions!

FACULTY



Professors Tim Long & Bruce Weide received the IEEE Computer Society's Computer Science & Engineering Undergraduate Teaching Award. This award is given in recognition of outstanding contributions to undergraduate

education through both teaching and service and for helping to maintain interest, increase the visibility of the Computer Society, and make a statement about the importance with which the society views undergraduate education. The award consists of a plaque and \$2000 honorarium. Tim and Bruce had previously received teaching awards from both the OSU College of Engineering and our department.



Tim Long demonstrating one of the methods he and Bruce Weide use for which earned them the title "Teacher of the Year."



Dr. Song Chun Zhu works with Adrian Baubu, GRA and Ph.D. candidate

Dr. Song Chun Zhu performed a computer science equivalent of a hockey hat trick. He was the recipient of three recent national awards for his work in image analysis.

- National Science Foundation Career award.
- 2001 Sloan Research Fellowship from the Alfred P. Sloan Foundation.
- Young Investigator Award from the U.S. Office of Naval Research. He is one of four math and computer science recipients of this award nationwide.

Dr. Mukesh Singhal was named a named a Fellow of the Institute of Electrical and Electronics Engineers (IEEE). Dr. Singhal was elected for contributions to algorithms for distributed systems.

Three other OSU College of Engineering faculty were also so named: Bharat Bhushan, Ohio Eminent Scholar and professor of Mechanical Engineering; Roberto G. Rojas, Associate Professor of Electrical Engineering; and Stephen Yurkovich, Professor of Electrical Engineering.

David Ashley, Dean of the College of Engineering, said that the new IEEE fellows "exemplify our commitment to excellence and demonstrate the wide range of engineering research underway at Ohio State."



Ohio State University's pioneer in computer animation has received the state of Ohio's highest recognition for an individual artist. Gov. Robert Taft Wednesday presented *Charles Csuri*, professor emeritus of art at Ohio State, with the 2000 Governor's Award for the Arts for the best individual artist. In November 2000, the OSU Board of Trustees presented Charles A. Csuri, professor emeritus of art education and computer and information science, with the Joseph Sullivant Medal, one of Ohio State's highest honors. Csuri, considered to be the "father of computer art," was approved for the award at the trustees' meeting in July. The \$10,000 prize is awarded at five-year intervals to recognize notable achievements by alumni or faculty members.

Dr. DeLiang Wang was elevated to the grade of Senior Member within The Institute of Electrical and Electronics Engineers, Inc.

STUDENTS

Athletes may sometimes call Computer Science students "nerds," but last year the nerds did something the athletes didn't do ~ OSU BEAT MICHIGAN!!

At the 2000 ACM programming tournament, the OSU-CIS Scarlet team came in eighth beating out Michigan, whose teams followed at ninth and tenth. The competition is an annual event sponsored by the Association for Computing Machinery (ACM) and is an international tournament pitting the best student computer programmers against one another. OSU was part of the East Central North American Region which included over 50 universities from western Pennsylvania, Ohio, Michigan, eastern Ontario and Indiana. Most schools enter two teams each. It is for that reason that OSU's eighth place is misleading. Only four schools beat out Ohio State: the University of Toronto took first and fourth places; the University of Waterloo, second and sixth; Carnegie-Mellon, third and seventh; and Case Western Reserve rounded out the field with a fifth place team. This regional tournament was held simultaneously at the University of Cincinnati and Case Western Reserve. OSU was part of the Cincinnati site. The Scarlet team placed first within that location's participants, which included Notre Dame, University of Cincinnati, University of Dayton, Wright State University and Ohio Northern.

The Scarlet team consisted of: *Tyler Neylon, Sandy Barnabas, and Matt Gates*. OSU's second entry, Gray, placed 17th out of the 101 teams and the members were *Vinod Tipparaju, Dana Vantrease, and Ryan Schuerger*. The group's advisor was Dr. Wuchi Feng. The teams members were both graduate and undergraduate students. It is a very challenging exercise for the students. Each team must write programs that will solve a problem. They choose from eight problems. The team scores are based on how many problems they solve and the quickness and accuracy of the answers.

Susan Hohenberger (BSCSE, August 2000) received a National Science Foundation Graduate Fellowship, our second recipient in a row. This year, additionally, *Florence Neymotin* was named honorable mention in the same competition.

Ms. Hohenberger also won a National Defense Science and Engineering Graduate Fellowship. Susan will be using this and the above mentioned fellowships at MIT.

Spring 2001 graduate *Tyler Neylon* won first place for Engineering at the 2001 Denman Undergraduate Research as well as a fellowship to study mathematics at New York University.

Four CIS graduate students joined two MBA students in the Fisher College of Business and placed second in the Fisher/Andersen Business Plan Competition. The CIS student were: *Santosh Kumar*, Founder, CEO *Nikhil Chandhok*, *Vinod Krishnan Kulathumani* and *Prasanna Jagannathan*. The MBA students were Garrett Hunt and Rakesh Damani. Eight teams, which had been selected from a field of 17 business plans, competed in the finals. This is the first business plan competition at OSU and with a purse totalling \$100,000 this has the highest prize money in the country as compared to the similar competitions hosted by Harvard University, Stanford and UC at Berkeley. The second place prize was \$15,000 in cash and services.



(L-R) *Rakesh Damani, Vinod Krishnan K, Nikhil Chandhok, Garrett Hunt, Santosh Kumar*

The company formed by the six is called OConnect. The company's purpose is based on the findings of a paper written by Santosh Kumar and Dr. Arjun Duresi. The proposes that all-optical switching equipment, in combination with their innovative software, will dramatically increase the speed and capacity for data traffic on the Internet. This switching equipment will also cost significantly less than competing all-optical switches because it will require significantly less hardware. As of June 2001, the students were in the process of commercializing the technology by establishing a start-up.

Every year, CIS is especially proud of our students who participate in the Minority Engineering Program. This year several of our students received recognition for their efforts. *Lubin-Chami Townsend* was recognized with the MEP Humanitarian Award for her outstanding service to the Minority Engineering Program and the University community. Receiving the Academic Status Award (certificate for maintaining a cumulative grade point average of 3.0 or higher) were *Robert Alonso, Joi Crayton, Peter Gephardt, Terrence Moore, William Ross IV and Herve Thomas. Emory Harris, William Lee and Lubin-Chamie Townsend* were awarded the Academic Year Award. Because he maintained a 3.0 gpa each quarter of enrollment at OSU, Robert Paloma received the Academic Distinction Award.



Lubin-Chamie Townsend and her very proud parents.

Women in Engineering Top Academic Award Recipients Jennifer Butler and Marianne Poch pose with CIS Chairperson Stu Zweben and Microsoft recruiters



Lindsay Roitman and Scott Evans (who is a 1999 Electrical Engineering graduate). Microsoft funded the scholarships Ms. Butler and Ms. Poch received.



Donny Lippard of Allstate Insurance Company presents Lanny Hudionno her Academic Award certificate.

Every year more and more women join the College of Engineering. This year the women of Computer & Information Science shone at the 21st Annual Women in Engineering Banquet. *Jennifer Butler and Marianne Poch* received Top Academic Awards while *Lanny Hudiono, Megan McCabe, Nicole Perdue, Elizabeth Rosselot, Debra Steinkirchner, Mary Tanner and Dana Vantrease* were all recognized for with Academic Awards.

Two CIS seniors were inducted into The Senior Honorary, SPHINX. They were *Corey Bishop and Daniel Kiracofe*. Membership in SPHINX is one of the highest honors that can be accorded a student at The Ohio State University.

Several of our undergraduates were honored by the College of Mathematical and Physical Sciences. *Jason Burnsides, Aledsandr Dubinskiy, Jennifer Kannen, William Lutmer, Rupal Mehta, Tyler Neylon and Brad Umbaugh* all followed a curriculum of highest challenge and maintained a 3.8+ gpa while doing so thus earning them the Excellence in Scholarship Award recognition.



Corey Bishop (above) and Daniel Kiracofe (left) are led through the Sphinx initiation ceremony.



STAFF

He has only been in the Department a short time, but already *Quincy Howard* is making an impact within the University and our community. The Office of Minority Affairs recognized his mentoring efforts with the Distinguished Professional Mentor Award and appointed him to their Advisory Board.

Department Fiscal Officer *Sandy Hill* received a Recognition of Service Certificate from the College of Engineering. Sandy has been with the University for nearly thirty years.



ALUMNI AND ALUMNAE



The nonprofit San Francisco Women on the Web chose *Dr. Ruann Ernst* as one of their high-profile Top 25 Women on the Web. Dr. Ernst graduated with a Ph.D. in 1977, is currently the President and CEO with Digital Island a San Francisco global e-business delivery network that provides content hosting and delivery and application and network services. She has been directing technology companies for more than 20 years. Before joining Digital Island, she worked at Hewlett-Packard for 10 years, most recently as general manager for the company's financial services business unit. She has also worked for General Electric Information Services as vice president and general manager.

Ernst serves on the boards of the Institute for the Future, Phoenix International and Advanced Fiber Communications.

The Minority Engineering Program honored our alumni and External Advisory Board Member, *James Cates*, with the Outstanding Alumnus Award. Mr. Cates has remained exceptionally active with this program his lasting commitment is a source of pride for CIS. You may read more about this exceptional person on page 85.

Wangmao (Bill) Ge, MS in CIS Au 99, was one of 278 authors of "The Sequence of the Human Genome" paper in the Feb. 16 issue of Science. He earned a PhD in Animal Genetics in June 2000 and then went to Celera Genomics. Mr. Ge credits some of his OSU-CIS education saying, *"My formal, intensive training in CIS really help my success now and will help a lot in my future career. I really appreciate your advice and CIS department as a whole for giving that training."*



Jim Cates and Stu Zweben.

Summer 2000 ~ A visit from an alum and his family. Hari Narayanan ('92), his wife, Nancy and their two daughters.



BANQUET AWARD RECOGNITIONS

Winners of the Boeing Commercial Airplanes scholarships are: (l-r) Jian Wu, Timothy Daoust, and Patrick Coleman.



IBM funded recipient Dilpreet Sethi poses with IBM representatives, Richard Baum and Larry Dunn and Department Chairperson, Stu Zweben.



Stu Zweben presents the Dell Corporation scholarship certificate to Marianne Poch.

Chemical Abstracts representatives, Heather Marriott and Ernie Larger with their scholarship winner, Talib Sharif.



Eric Shaw, (right) recipient of the Lucent Technologies scholarship.



The Leggett Family Fund award was given to Igor Grobman (left).



The design winner of this year's annual report cover contest was Arunachalam Somasundaram.



The Lockheed Martin Scholarships will be used by Jennifer Butler and Michael Billman (two on left). They are congratulated by representatives of Lockheed Martin, Jim McCann and Clark Reed.



The Department recognized the Service of Shaun Rowland seen here with Stu Zweben.



Tony Petrarca is always in attendance when the CIS Department Scholarship awards are given. This award was founded by Dr. Petrarca who is a Assistant Professor Emeritus and a former acting-chairperson. The winners for this past year were (l-r): Alex Cowan, Emily Howe and Keith Marsolo.

FIFTH ANNUAL AWARDS BANQUET

TEACHING & SERVICE AWARDS

Outstanding Teaching Awards

Paolo Bucci

Eleanor Quinlan Memorial Award

Manoj Pillai

Outstanding Service Awards

Marty Marlatt

Shaun Rowland

ENDOWED SCHOLARSHIP AWARDS

The Leggett Family Fund

Igor Grobman

The O'Connell Family Fund

Ellen Yang

CIS Undergraduate Scholarship

Alex Cowan

Emily Howe

Keith Marsolo

ANNUAL REPORT COVER WINNER

Arunachalam Somasundaram

CORPORATE SCHOLARSHIP AWARDS

Boeing Commercial Airplanes

Patrick Coleman

Timothy Daoust

Jian Wu

COC-ACM Scholarship

Tobin Juday

Chemical Abstracts

Talib Sharif

Crowe Chizek

Diane Drozd

George Locktish

Dell Corporation

Marianne Poch

EDS

Elizabeth Rosselot

IBM

Dilpreet Sethi

Lockheed Martin

Michael Billman

Jennifer Butler

Lucent Technologies

David Timmerman

Motorola

Eric Shaw



When you've worked together for over 25 years, a common hand shake will not do! Stu Zweben congratulates Marty Marlatt, his Administrator, for her Service Award.

STUDENT DIVERSITY PROGRAM

The Department of Computer and Information Science is committed to making our student environment open and accessible to women and minority students. The department sponsors several programs designed to serve the needs of our minority student population. The programs include: faculty sponsored undergraduate research opportunities; graduate fellowships for women and minorities; forgivable loans for women and minority graduate students interested in academic careers; and mentoring programs. During the 2000-2001 academic year, for example, Bill Leal, a member of a minority group, was supported while completing his doctoral dissertation. These programs are supported by a grant from the GE Foundation's Faculty for the Future program and are administered locally with the assistance of Lisa Didier, an undergraduate student in Computer and Information Science.

If we are to achieve a richer culture, rich in contrasting values, we must recognize the whole gamut of human potentialities, and so weave a less arbitrary social fabric, one in which each diverse human gift will find a fitting place.

- Margaret Mead; 1901-1978



Participants in our annual Graduate & Professional Student Visitation Day. This campus-wide recruitment fair brings in minority students from schools through out the U.S. On the far right is Armel Peel, who will join the Department in Autumn 2001.

MEMORIAL TO A COLLEAGUE



Some People

by Flavia Weedn

Some people come into our lives and quickly go.

Some people move our souls to dance.

*They awaken us to new understanding
with the passing whisper of their wisdom.*

Some people make the sky more beautiful to gaze upon.

They stay in our lives for awhile and leave footprints on our hearts.

And we are never, ever the same.

One can hardly say the loss of a colleague is a highlight, however this particular change has been deeply felt within our Department and has irreparably changed many of us. On January 8, 2001, Eleanor "Elley" Quinlan, Academic Program Assistant, succumbed to the cancer she had been battling for the previous two years.

Elley initially came to the CIS Department as a Masters student in 1983. She worked as a TA during her graduate studies. After she received her degree in 1985, she stayed as an instructor teaching and coordinating various undergraduate courses. In 1990, she accepted the Academic Program Assistant position. The new position increased her duties to include new graduate student orientation and the supervision of the Graduate Teaching Associates and graders.

She was born in New York City on August 2nd, 1934 to Mr. & Mrs. Walter Schwick. She attended Bethany College in Bethany, WV., graduating cum laude with a Bachelor of Arts degree in Mathematics. She then went on to work for Bell Telephone Laboratories in New Jersey where she was a computer programmer using FORTRAN.

Elley, with her husband of forty years, Robert Quinlan, had three children: David, who lives in Sweden; Karen Cutler, living in Colorado; and Susan Kruse, who is nearby in Hilliard.

To honor this exemplary woman, the Department has created The Eleanor Quinlan Memorial Fund. The proceeds from this fund will be used for the development and recognition of graduate teaching associates in the CIS Department. The first of these awards was given to Manoj Pillai at our Department Banquet in May 2001. Thanks to many generous contributions from alumni, faculty, staff and friends (including Elley's golf league, The Blacklick Ladies Golf League) this fund is now the first endowed fund of our department. {For details on how to contribute to this or any of our funds, please see our development page on page 14 of this publication.}

Eleanor was: warm, gracious, funny, intelligent, giving, a golfer, a quilter, a bird-watcher, and, above all else, a lady. While packing Elley's office, several quotes were discovered scribbled on a piece of paper tucked in a drawer. One of them read, "When life gives you scraps, make a quilt." Thank you, Elley, for picking the paisley patterned cloth that is this department and working it into the pattern of your life.

Elley & Bob Quinlan in October 1995. Our thoughts go out to the Quinlan family. They've suffered a double loss. Bob passed away in June 2001.



SPECIAL THANKS & FINANCIAL GIVING INFORMATION

Thank you!

The relatively young Department of Computer and Information Science is working hard to develop the sustained donor base enjoyed by Ohio State's older departments. We are grateful to the alumni, parents, students, faculty and corporate benefactors who invested in the Department during 2000-01. Philanthropy does provide a meaningful difference. Discretionary gifts improve labs, support professional travel by the faculty and help recruit talented faculty. Scholarship support enabled more students to receive merit and need-based assistance.

Listed below are our industry partners who funded \$1,000 scholarships given for CIS undergraduates. Each of these companies and their Scholars were recognized at the Department's annual Awards Dinner last spring.

Boeing Commercial Airplanes*	IBM
Chemical Abstracts	Lockheed Martin*
Crowe Chizek*	Lucent Technologies
Dell Corporation	Motorola
EDS	

*These companies funded more than one scholarship: Boeing Commercial Airplanes supported three and Crowe Chizek and Lockheed Martin each gave two.

Gifts last year also established the permanently endowed Eleanor Quinlan Memorial Award at Ohio State. "Elley" was a lecturer, staff member and graduate of the Department. She graduated with a Masters degree in 1985. From 1990 until her passing in January 2001, she was the Academic Program Assistant. Her family, former advisees, faculty staff responded to this sad news with gifts to her memorial. This fund's annual income will be used for the development and recognition of graduate teaching associates in the CIS Department.

Two new other endowments were added in 2001, raising the Department's total to five permanent funds. Dr. Conleth O'Connell (Ph.D. 1990) and Christina "Curby" (Morgan) O'Connell, his wife and former Department staffer, created these new funds. The O'Connell Family Award will provide the annual O'Donnell Scholarship for a deserving undergraduate and yearly recognition for Outstanding Teaching, Outstanding Research and Outstanding Service by department members.

Conleth and Curby's second endowment, The O'Connell Family Staff Development Award, is designed to assist staff members grow and progress in their Departmental careers. Staff members may use this money to pay for various activities like seminars and conferences.

We remind each of you that you can designate your Ohio State support to CIS and to specific uses within the Department. Questions regarding ways of giving and uses can be directed to the Department (<http://www.cis.ohio-state.edu/>) or to the College's Development staff (http://www.eng.ohio-state.edu/quick_links/alumni_corp/development/development.html)

Donors wishing to mail their gifts should address the envelopes to:

The Ohio State University Foundation

113 Fawcett Center

2400 Olentangy River Road

Columbus, OH 43210

Donations can also be made online at <http://www.giveto.osu.edu/>.



At the Binary Birthday banquet, Dr. Conleth and Christina "Curby" (Morgan) O'Connell pose for the camera.



Manoj Pillai, the first recipient of the Eleanor Quinlan Memorial Award, receives his certificate from Dr. Stuart Zweben.

**THE TWENTY-FOURTH ANNUAL
FACULTY-GRADS-STAFF & FAMILIES PIZZA PARTY!**



Our grad students certainly proved that you never grow too old to enjoy balloons!



Talk about custom bikes! Elizabeth Heym shows off to brother, David.



Dr. Stu Zweben talking with Ryan Feng, son of Dr. Wuchi Feng. It's never too early to start recruitment!



MORE PICTURES FROM THE BINARY BIRTHDAY

Associate Professor Emeritus Clint Foulk (l) and '76 grad, Otto Juelich.



1991 alumnae Julie Barnes with her husband, Roger.



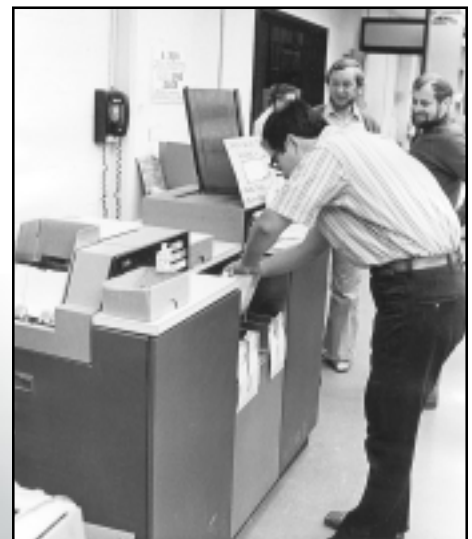
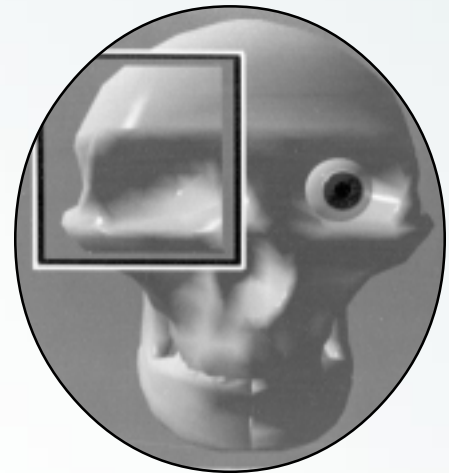
Advisory President and alumni David Cohen shares a laugh with his wife Shifra.



Barbara Muller and Merv Muller (left), former Department chairperson poses with the current chair, Stuart Zweben and his wife Rochelle.

Canine Companion in training, Jake, tries to sneak past his puppy raiser, Marty Marlatt, and make his way to the buffet. Sorry, Pal, she was watching!

RESEARCH



1994. During an open house for our building opening, a graduate student shows his work.

Graphics work from sometime between 1979 and 1982. This is the work of Don Stredney and Rick Parent.

1980's, an early robotic arm.

The closing of the DEC-20 System; December, 21, 1990. From left to right: Jim Newcek; Columbus 'Lum' Johnson; Bob Dixon; Del Waggoner. During its reign, the DEC-20 had been the computer for all department data activity: administration, instruction and research. It was also used by the University Technical staff. Below is the last message it "sent" to all users.

```
From tut.cis.ohio-state.edu:69-26.9CCC.D493-STATE@operator Fri  
Dec 21 08:12:05 EST 1990  
RTTCID: 11434 at CUS.MOFF  
Path: tut.cis.ohio-state.edu:69-26.9CCC.D493-STATE@operator  
From: Operator@69-26.9CCC.D493-STATE@System@pt  
Newsgroups: cis.state  
Subject: Goodbye, all  
Message-ID: <9012261520AA15612@tut.cis.ohio-state.edu>  
Date: 20 Dec 90 15:19:08 GMT  
Sender: dnewcek@tut.cis.ohio-state.edu  
Lines: 11  
  
"There, you saved time!"  
  
"He tired? Rhetorical. Yes, you forget what I am. I'm angry, that's all."  
  
-- Heide and Phil's last conversation  
  
...The Room Is A Harsh Mistress... Robert A. Heinlein  
  
ROCCSYSTEM-26 NOT RUNNING -----
```

*Spring 2001
The Motion Recognition Lab of Dr. James Davis. Grad student Stephanie Taylor walks on the treadmill.*

Oh!, the bad old days! The punch card reader! And to think it was once "cutting edge."

ARTIFICIAL INTELLIGENCE AREA HIGHLIGHTS

KNOWLEDGE SYSTEMS GROUP

<http://www.cis.ohio-state.edu/lair/index.html>

B. Chandrasekaran, John R. Josephson

The Knowledge Systems group at the LAIR is concerned with making computers smart by giving them knowledge about the world and methods of using the knowledge to solve problems. Thus knowledge representation and problem solving are two key themes in the group's work. The strategy adopted by the Knowledge Systems group is to focus on complex real-world tasks, such as engineering or medical problem solving, or visual or speech perception. Of course the programs built are capable of solving complex problems in these domains, but the goal transcends artifact building. It includes understanding cognitive architectures, and abstract principles of knowledge-based reasoning and problem solving. A detailed sampling of works in progress follows.

Causal and Functional Understanding

For more than a decade, the group has investigated how engineers and scientists understand functions of devices, i.e., how they relate functions to the structures and behaviors of devices and scientific knowledge of the relevant domain. Explicitly representing such causal understanding is useful in building systems that can help design artifacts and perform diagnostic reasoning on them. The group has developed a language called Functional Representation that has been used to support reasoning about biological systems, engineering devices and software. Recently, the team formalized the notion of function in such a way that it can be used to build device libraries that can be accessed by designers looking for components that might help them achieve certain functionalities. KSG currently has grants from the Defense Advanced Research Projects Agency and from Army Research Office to conduct research on technologies for device libraries and functional reasoning.

Abductive Reasoning

The Knowledge Systems group at LAIR is a major center of research in abduction. This is a type of inference that is being increasingly recognized as of fundamental importance in intelligence. In this form of inference, a conclusion is made which best explains the evidence available. This is different from what is normally called deduction in which the conclusion made from the data is definitive, or what is called "demonstrative." John Josephson group has long argued that in addition to its importance in helping model problem solving activities such as diagnosis, abduction is also a useful model of speech and visual perception, and natural language understanding. With collaborators, diagnostic reasoning systems in medicine and engineering have built, systems that use abductive problem solving as a component of their activity. There is also a close connection between FR research on causal understanding and abduction. John and Susan Josephson are editors of the book "Abductive Inference: Computation, Philosophy, Technology," (Cambridge University Press), which describes LAIR work on abduction.

Multicriterial Design Space Search

A recent technology developed in our Laboratory enables designers to search very large design spaces. The search architecture consists of three modules, a Seeker, a Filter and a Viewer. The Seeker generates a large number of candidates systematically, and evaluates each of them using a number of different criteria. The Filter retains only those candidates that satisfy the so-called Pareto Optimality criterion. The candidates that survive the Pareto criterion have the property that none of them is clearly superior to another along all the dimensions of evaluation. On realistic problems, this somewhat filtering – locally called dominance filtering – can remove more than 99% of the candidates. The Viewer displays the survivors as several trade-off plots. The designer can identify interesting candidates in one of the plots, and see how the selected candidates fare in the other trade-off plots. The technology is applicable to a wide variety of multi-criterial decision-making problems.

Method Ontologies

More than a decade ago, the Knowledge Systems Group pioneered an approach to building knowledge systems, based on the notion of Generic Tasks. GTs were offered as a set of common building blocks, which could be composed to build complex problem-solving systems. Each GT comes with a unique characterization of the task, methods available for achieving the tasks, and types of knowledge that the methods needed. The ideas helped in the launching of the so-called Second Generation Knowledge Systems technology in which knowledge types and task types played a major role. The ideas are now being extended into the framework of ontologies, formally defined concepts that are being investigated as the basis for knowledge-sharing. The group has been investigating method ontologies as a special type of ontology that focuses on how to use knowledge.

AUTOMATIC PERCEPTION BASED ON NEURAL DYNAMICS

<http://www.cis.ohio-state.edu/~dwang/group.html>

Leon Wang has been investigating biologically plausible neural computations for auditory and visual processing. To achieve this, his research goes along two directions. First, he is searching for appropriate neural architectures and principles for auditory pattern processing. This includes recognition and generation. He builds his models based on psychological data from human auditory perception as well as computational effectiveness. Secondly, he is pursuing neurocomputational principles underlying scene analysis, which is a fundamental aspect of perception. Scene analysis has to do with grouping elements of a perceived scene or sensory field into coherent clusters (objects). The general problem of scene segmentation remains unsolved in computer vision and auditory processing. Inspired by biological oscillations, his approach uses large networks of neural oscillators, whereby each oscillator corresponds to a basic sensory feature (a pixel, for example). He and his collaborators have made significant progress in understanding the dynamics of locally excitatory globally inhibitory oscillator networks (LEGION), which promise to provide an effective computational framework for computing scene segmentation and figure/ground segregation. His group is currently exploring various grouping/segmenting principles. The problems being addressed encompass both real-world applications and explaining neurobiological and psychophysical data.

OSU VISION AND LEARNING

www.cis.ohio-state.edu/oval

Dr. Song Chun Zhu

Dr. Zhu founded the OSU Vision and Learning (OVAL) group in 1998. Research projects are supported by research grants from NSF, ARO, NASA, OBR and industry partners.

The OVAL group is interested in studying the computational mechanisms for visual perception and learning. For example, how does a biologic or a computer system understand semantic contents and reconstruct 3D depth of a scene from a set of or even a single image? What are the mathematical principles that govern the evolution of visual systems for better adaptation to their environments? Studying such problems is crucial for understanding, at a computational level, the functioning of the human visual system, which involves more than 70% of neurons in the central nerve system, and for building intelligent and seamless interfaces for human-computer interaction. Indeed, both are grand challenging problems in the 21st century!

OVAL takes a multi-disciplinary approach with an emphasis on statistical modeling and stochastic computing. As real world images are composed of stochastic patterns, visual perception and learning is naturally posed as a statistical inference problem instead of deterministic logic reasoning. As Maxwell once put: the true logics of the world are in the calculus of probability.

The research is focused on three main aspects:

1. In representational aspect. The team pursues a unified mathematical theory for learning probability models for a variety of stochastic visual patterns, such as texture, texton, line/curve processes, region, shape, and object processes.
2. In computational aspect. OVAL studies stochastic search (computing) algorithms based on Markov chain Monte Carlo for effective inference and sampling.
3. In applicational aspect. The group is interested in problems, such as motion and video analysis, human computer interface, vision and graphics integration, aerial image understanding, and military applications.

MOTION RECOGNITION LABORATORY

<http://www.cis.ohio-state.edu/~jwdavis>

James W. Davis

The research interests for this new computer vision group include the perceptual recognition of human motion from both computational and cognitive viewpoints. In particular, how do we bestow into computers the ability to visually recognize our movements in the world that have meaning, intention, and expression? We approach this problem from a computational standpoint with the belief that there exist structures, regularities, and modes within human movements that offer a reliable means to constructing representations for robust motion categorization. The applied significance for this work relates to automatic visual surveillance and monitoring, video content understanding, perceptual user interfaces, and human-computer interaction.

GRAPHICS AREA HIGHLIGHTS

Computer Graphics is an active area of research in Computer Science as well as a very popular area among both the graduate and undergraduate students. Six faculty are involved in a variety of research projects related to computer graphics such as: image based rendering, computer animation, geometric modeling, scientific visualizations have been taken up by six faculty members. Many students are supported by this research group and a number of publications in premier conferences make graphics one of the most internationally recognized research areas in the department.

In addition to the Department itself, the Advanced Computing Center for Art and Design (ACCAD) provides an environment for advanced research in Computer Graphics as it applies to the arts and industrial design. The Ohio Supercomputer Center (OSC) provides yet another fertile ground for collaboration with researchers from various disciplines.

There are currently six CIS faculty in Computer Graphics: Roger Crawfis, Tamal K. Dey, Raghu Machiraju, Richard Parent, Han-Wei Shen and Rephael Wenger. A brief account of research interest and current projects of each faculty member is listed below.

Dr. Roger Crawfis

Roger Crawfis's primary research interests lie in the areas of computer graphics, scientific visualization, medical imaging, image-based rendering for scientific visualization and volume rendering. His group has been investigating new techniques for representing and rendering three-dimensional scalar and vector data. Jian Huang, a recent Ph.D. graduate, has been investigating a decoupled framework for very large or complex renderings, where a high performance rendering engine is used to compute partial renderings that are then streamed across the network to a local client machine. This local client utilizes a commodity graphics board to interactively walk-thru this complex scene. This allows for the visualization of extremely large data using a high-end and expensive visualization server, that can be remotely accessed across the network. It allows for complex or high-quality renderings that can be manipulated across the

world-wide web. The high-end rendering engine they have currently focused on, is a parallel implementation of a volume renderer on a cluster of work-stations. For time-varying or multi-dimensional data, Dr. Crawfis is also examining new techniques for encoding and representing four-dimensional isosurfaces with Drs. Wenger, Shen and Dey. Application of this research include volume deformation, compression of time-varying data, morphological properties of time-evolving structures and interval volumes or contour threshold sensitivity.

Dr. Tamal Dey

Tamal Dey's research focuses on designing efficient algorithms for geometric problems that arise in geometric modeling. In particular, he is interested in shape modeling that is encountered in the areas of CAD/CAM, computer graphics and visualizations. Currently, he is focusing on shape modeling questions such as how to reconstruct curves and surfaces from their samples, how to simplify these reconstructed models and how to extract features out of these models. This set of questions are generic in that they appear in various forms over a wide range of applications such as medical imaging, solid modeling, CAD/CAM, meshing, scientific visualization and so on.

Current advances in laser technology have made it easier to obtain a large number of samples from the boundary of an object. Approximating the boundary with a piecewise linear model, simplifying and smoothing it effectively form a different paradigm for modeling which he calls Sample Based Modeling (SBM). He believes that SBM provides a platform where a synergy between mathematical disciplines such as differential geometry, differential topology, discrete geometry and computational disciplines such as computational geometry, numerical methods would achieve significant advances. His research pivots around this idea.

Dr. Raghu Machiraju

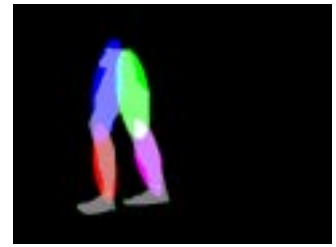
Raghu Machiraju's research interests include graphics, visualization and computational methods. He is interested in applying computational techniques and image analysis methods to problems in graphics and visualization. His current efforts include feature-preserving multiscale representation and compression of very large datasets. Given the proliferation of datasets of extremely large sizes it is imperative that more efforts be expended on their analysis and representation and not just their display. The mainstay of his techniques include the wavelet transforms and filter banks and robust region and set-based feature detection techniques for vector fields. Additionally, he is also interested in the development of metrics to guide image synthesis and visualization. This work has allowed the specification of thresholds to guide the selection of levels-of-details (LoDs), parameters of visualization algorithms, position of light sources and essentially many inverse methods. His work has been funded by the National Science Foundation (including the CAREER award), Department of Defense, and Mitsubishi Electric Research Laboratories.

Dr. Richard Parent

Rick Parent is interested in computer animation, especially as it relates to the human figure. He has recently written a book on the subject, "Computer Animation: Algorithms and Techniques," published by Morgan-Kaufman. His students are working on various projects related to human figure design and motion control. Scott King, a recent Ph.D. graduate, developed a system that takes text as input and automatically generates facial animation. The facial model incorporates an deformable lip model which is grafted onto the facial model to be animated. Matt Lewis is investigating aesthetic control of evolutionary design. Evolutionary design models example designs as genetic features and employs a survival of the fittest paradigm. As the aesthetics of the candidate designs are evaluated by the user, the system quickly evolves new generations of sample designs until the process converges on the final selection. Matt has applied this approach to designing human figures, selecting cartoon faces, and breeding game environments. His dissertation generalizes the concepts and formalizes the principles involved. Ph.D. graduate Lawson Wade developed a system to allow the automatic generation of control skeleton for arbitrary polyhedral objects, optionally incorporating anatomic knowledge. His work computes a discrete approximation to the medial surface and processes it to form a reasonable control skeleton that could be used in forward and



inverse kinematic motion control. Meg Geroch is analyzing human motion in order to characterize differences due to gender and age in order to help animators. Suba Varadarajan is working on extracting human figure motion from markerless video and Manu Varghese is looking at numerical techniques to automatically exaggerate articulated motion.



Dr. Han-Wei Shen

Han-Wei Shen is interested in computer graphics and scientific visualization with a focus on algorithms and software systems for high performance three-dimensional data visualization. Currently the problems he is focusing on are large-scale time-varying data analysis and visualization, adaptive volume visualization framework, fast vector field visualization techniques, and parallel view-dependent isosurface extraction. For the time-varying data visualization project, he and his students are designing system architectures to enable fast data access, pipelining parallel processing, and approximate algorithms for efficient rendering and processing of time-series data. For the adaptive volume rendering project, he and his students are designing novel control frameworks for rendering hierarchical volumes so that an interactive frame rate can be guaranteed. For the vector field visualization research, he and his students are working on interactive 2D and 3D Line Integral Convolution techniques for large-scale vector fields and large format displays. For the parallel view-dependent isosurface extraction project, the focus is on reducing the size of surface patches so that they can be interactively rendered using low-end PC graphics hardware.

Dr. Rephael Wenger

Rephael Wenger works on the design and analysis of geometric algorithms. He attempts to exploit the mathematical and combinatorial structure of geometric objects to design faster, more reliable algorithms, and to design algorithms in non-intuitive spaces such as four dimensions. Together with Drs. Crawfis, Dey and Shen, he is working on visualization of four or more dimensional data. Such data sets are typical in dynamic 3-dimensional systems such as atmospheric or fluid flow models. They also are produced by parametric studies of three dimensional models and simulations where each parameter adds a dimension. This work focuses on reconstructing surfaces, called isosurfaces, from this data.

Researchers from the Department of Medical Microbiology and Immunology are developing a process to detect and diagnose cancer by analyzing changes in DNA. The DNA is spliced into subsequences which is then represented as hundreds or thousands of spots on a two dimensional gel. By comparing images from normal and potentially cancerous tissue, they can identify markers of various types and stages of cancer. Dr. Wenger is supervising the development of software to automate this image analysis.



TRAFFIC MANAGEMENT IN IP NETWORKS

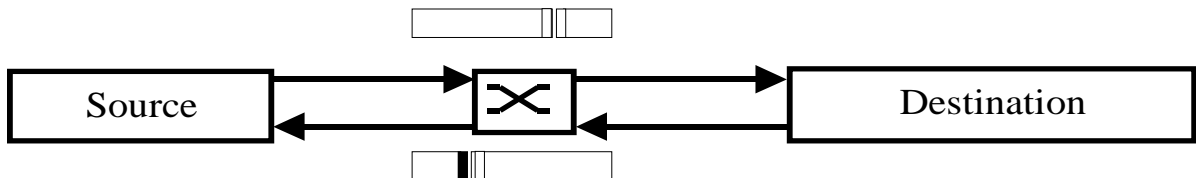
Principal Investigator: Prof. Raj Jain

Personnel: Dr. Arjan Durrezi

Graduate Students: Mukul Goyal, Chunlei Liu, Mukundan Sridharan

Sponsor: National Science Foundation (NSF)

There is an immense demand for quality of service (QoS) in the Internet. One key element of quality of service is traffic management. Since the network traffic is bursty, it is difficult to make any QoS guaran-



tees without proper control of traffic. Currently, Internet Protocol (IP) has only minimal traffic management capabilities. The packets are dropped when the queue exceeds the buffer capacity. The transmission control protocol (TCP) uses the packet drop as a signal of congestion and reduces its load. While in the past, this strategy has worked satisfactorily, we need better strategies for two reasons. First, a large part of the traffic, particularly, voice and video traffic does not use TCP. Continuous media traffic uses User Datagram Protocol (UDP). The proportion of UDP traffic is increasing at a faster pace than TCP traffic. The UDP traffic is congestion insensitive in the sense that UDP sources do not reduce their load in response to congestion. Second, the bandwidth of the networks as well as the distances are increasing. For very high distance-bandwidth product networks, packet drop is not the optimal congestion indication. Several megabytes of data may be lost in the time required to detect and respond to packet losses. Therefore, a better strategy for traffic management in IP networks is required. Recognizing the need for direct feedback of congestion information, the Internet Engineering Task Force (IETF) has come up with an Explicit Congestion Notification (ECN) method for IP routers. A bit in the IP header is set when the routers are congested. ECN is much more powerful than the simple packet drop indication used by existing routers and is more suitable for high distance-bandwidth networks. Unfortunately, to realize the full potential of ECN, several questions need to be answered.

This project is a comprehensive research program on traffic management in IP networks. We are developing a new set of traffic management algorithms for IP networks based on Explicit Congestion Notification mechanism. A total of 18 different issues are being analyzed. We have identified solutions and approaches for each of these issues. Specifically, we are working on a new congestion detection and buffer management scheme for routers, a mechanism for TCP to react to ECN messages from the network and a framework for introducing traffic management to Real-Time UDP traffic using ECN. One of the important goals of this research is to make TCP traffic management algorithm free of any bias based on round trip time and number of congested gateways traveled.

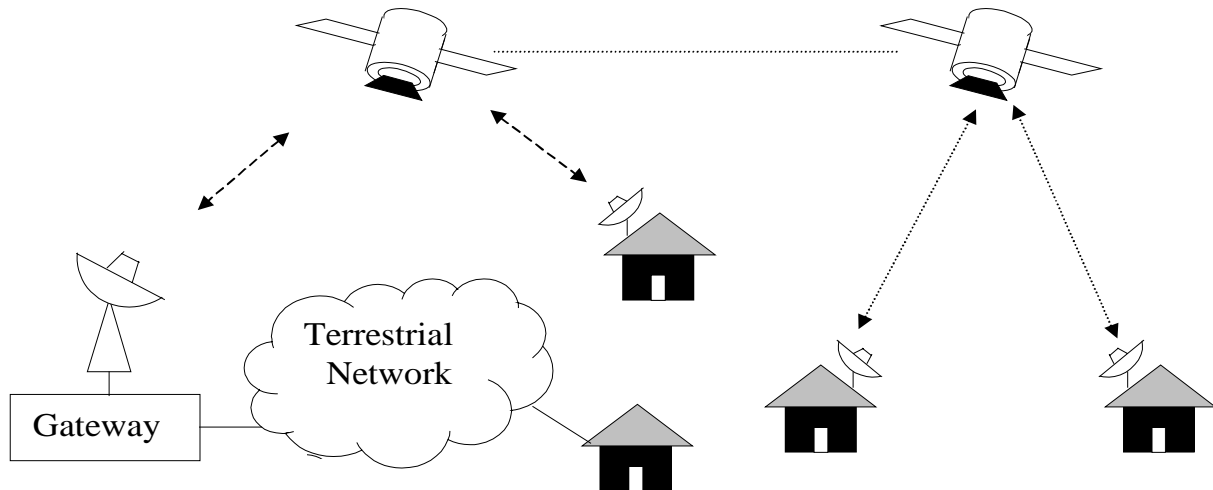
TRAFFIC MANAGEMENT ON NEXT GENERATION SATELLITE NETWORKS

Principal Investigator: Dr. Arjan Durrezi

Graduate Students: Mukundan Sridharan, Mukul Goyal, Chunlei Liu

Sponsor: Ohio Aeronautical Institute, TRW and Honeywell

Next generation of satellite networks will use on-board processing. This processing will be more sophisticated than what is currently done. This will allow these satellites to provide sophisticated traffic management, which is a prerequisite for differentiated quality of services (QoS) at higher speeds of the future. Such satellites will play an indispensable role in providing global Internet access and electronic connectivity.



Providing quality of service (QoS) is the requirement for the next Internet. One key element of quality of service is traffic management. Since the network traffic is bursty, it is difficult to make any QoS guarantees without proper control of traffic. Traffic management becomes a crucial factor in the case of satellite networks because of limited resources and facilities in satellites. Currently, Internet Protocol (IP) not only has minimal traffic management capabilities, but these mechanisms perform poorly in satellite networks.

In this project we are working in two main directions: 1) A new Framework for Congestion Detection based on an improved ECN scheme and 2) Performance Analysis of Differentiated Services over Satellite Networks with on-board processing.

MEASURING QoS PARAMETERS IN IP NETWORKS

Principal Investigators: Dr. Arjan Durresi, Prof. Raj Jain.

Students: Mukundan Sridharan, Aaron Beckstrom

Sponsor: Ohio Department of Development, ITEC-Ohio

Information technology and the Internet are changing the world economy, society and daily life. The change proceeds in waves, originating with the new technologies, growth, and restructuring of the affected industries, than all other industries and ending by conditioning the every day life of all of us. Consequently it is of vital importance to dedicate the necessary research and industry resources to build the best Internet.

It is clear now Internet is becoming the universal platform for communications. In this new scenario providing Quality of Service (QoS) has become the "Holy Grail" for the network community. Immense research resources are dedicated to improve the QoS of IP networks by proposing and developing in new QoS solutions. Definitely one of the most important step in providing the promised QoS, remains the unbiased testing and evaluation of the QoS parameters of these new IP technologies and the network devices, which implement them. This is also a major condition for the commercial success of these technologies. In this project we would like that in collaboration with ITEC-Ohio to provide this service to the community.

Our objectives in this project are to measure without bias and meaningfully the QoS parameters of the three main QoS new solutions proposed on IP, Early Congestion Notification (ECN), Differentiated Services (Diffserv) and Multi Protocol Label Switching Traffic Engineering (MPLS-TE). By accomplishing the objectives this project we will help ITEC-Ohio to achieve its own objectives to become the national evaluation center for technologies, components, and services being considered for Internet2.

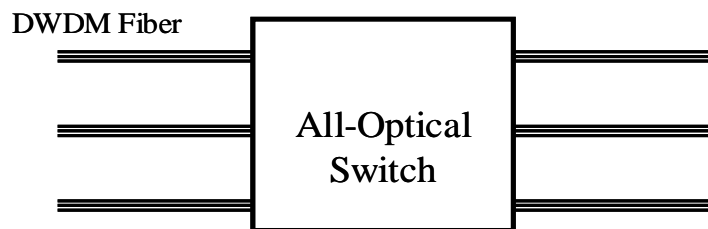
To achieve the objectives, the project is structured in four phases. The first phase of the project is to identify meaningful metrics to evaluate the QoS provided by each new technology under study. The second phase consists of developing a set of networking workloads to be used with the new metrics in network measurements. The third phase consists of developing methodologies measuring the new metrics for various configurations and workloads. And the last phase consists of analyzing the data gathered in the first three phases.

One of our main goals is that jointly with ITEC-Ohio to make important contributions in standardization of new measurement metrics, methodologies and testing, with all the advantages that this important position will bring to Ohio. Standard testing measurement are essential for the commercial success of new network technologies, including the education and government sectors, success that will also sustain US leadership in networking technology. The state of Ohio will benefit in many ways from the successful accomplishment of the objectives of this project and from disseminating our results and experience primarily to Ohio community and industry.

ALL-OPTICAL NETWORKING: IP OVER DWDM

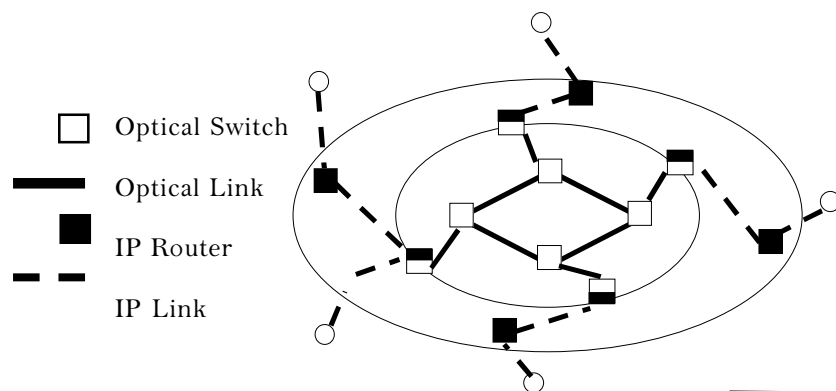
Personnel: Prof. Raj Jain, Dr. Arjan Duresi

Current Graduate Students: Nikhil Chandhok, Srinivasan Seetharaman, Ramesh Jagannathan, Vinodkrishnan Kulathumani, V. R. Sitaraman, Santosh Kumar, Hongwei Zhang, Feras Galala, Misro Kumar



Dense wavelength division multiplexing (DWDM) allows optical fibers to carry hundreds of wavelength each at 2.5Gb/s to 10 Gb/s resulting in several terabits per second capacity per fiber. All-optical switches are required to handle routing at such massive data rates. Using multiprotocol label switching (MPLS), carriers will be able to quickly provision high bandwidth data circuits through optical core networks. We are developing and analyzing algorithms for protection and routing in such networks. In particular, our interest is in providing quality of service such that all connections do not have to have the same level of protection as is the case in current carrier networks. We are working also to design an optimal integration of IP/MPLS with Optical layer and to develop the needed signaling protocols.

Most of the existing fiber is used in ring topologies. We are studying how to integrate the ring and mesh topologies and the implications of using IP/MPLS over such optical networks.



For an optimal integration of IP over optical it is important to take into account the particularities of optical physical layer. In collaboration with Prof. Betty Anderson of EE Department, we are working take advantages of optical layer features in designing IP over Optical networks. In particular we are working to measure and monitor the traffic in optical domain.

RESOURCE ALLOCATION USING DIFFSERV ARCHITECTURE

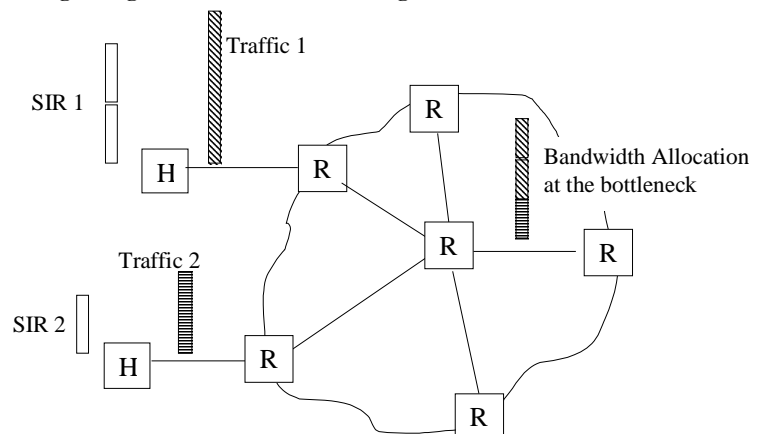
Personnel: Prof. Raj Jain, Dr. Arjan Duresi

Graduated Student: Prasanna Jagannathan

The current Internet provides best effort service. During congestion to determine the packets to be dropped, the max-min fairness principle is used. There exist many mechanisms for achieving max-min fairness using per-flow state information. First, implementing these mechanisms at the routers in the core of the network where there are millions of flows might be difficult. Second, the max-min fairness principle might not be the right fairness principle for many new Internet services.

In this project we have designed a new resource allocation scheme based on Diffserv Architecture. Our scheme assigns the network resources in proportion to the user Subscribed Information Rate (SIR) or to what they are paying for the network service. lower SIR. We defined a new method of bandwidth allocation called Proportional Allocation of Bandwidth – PAB, in which bandwidth is allocated in proportion to the SIR of the competing flows.

In our technique to implement PAB, no information about the state of the flows is stored in the interior of the network. We avoid the storing of per-flow state information by encoding the ratio of a flow's data rate to its SIR in the form of a label on its packets. At the interior of the network, the routers use these labels for differentiating between packets during congestion. All the labeling is done at either the source or the first network element – the ingress router after the source, which has information about the source's SIR. The core router drops packets based on their labels and the current level of threshold in the router. Thus no state information is stored in the center of the network.



The Information Technology era has seen an explosive growth of applications with heavy demands on systems performance. Experimental computing systems is an active, growing and exciting research area within Computer Science, driven by new technologies, novel implementation techniques and the requirements imposed by such end-applications.

The goal of the systems research group at Ohio State University is to take advantage of current trends in computing, networking, and I/O technologies to deliver high performance cost-effective systems infrastructure that can support such techniques and applications. Current research interests in the group span: high performance communication, I/O, networking, and file systems; middleware including programming models and APIs for data and resource management and scheduling; data-intensive computing technologies such as data mining and data servers; and application-specific (e.g. scientific computing, medical informatics, computational biology) systems support. Faculty members associated with this research area are: Mario Lauria, Dhabaleswar K. Panda, Srinivasan Parthasarathy, P. Sadayappan, and Joel Saltz. Research interests of these faculty members and the on-going research activities are mentioned later in this section.

State-of-the-art experimental systems and facilities are key to the research and development in the Computing Systems area. The group has excellent networking and computing facilities as follows: 1) a cluster of 16-node Quad Pentium 733 MHz systems (64 processors) and 16-node Dual Pentium 1GHz systems (32 processors) connected with Myrinet and GigaNet; 2) a cluster of 16-node Dual Pentium 300 MHz systems (32 processors) connected with Myrinet, Gigabit Ethernet, GigaNet, and ATM interconnections; 3) a cluster of 9 dual 1 GHz Pentium systems (18 processors) connected with Myrinet and with multiple disks per node for a total of 1 Terabyte of high access bandwidth storage.

The first cluster is being connected with a video wall to carry out integrated network-based computing systems and applications research. The second cluster supports multiple communication layers (GM and VIA) and multiple programming environment layers (Message Passing Interface (MPI) for distributed memory programming and TreadMarks for distributed shared memory programming). This cluster is also connected with a Beowulf cluster (128 processors) at the Ohio Supercomputer Center (OSC) through two dedicated 155 Mbps ATM links. The third cluster is being used for data mining, data intensive computing and remote data access research. A dedicated 1 Gbps link to the OSC over optical fiber will provide direct connectivity both to OSC clusters and to the Internet II OSU terminal for data transfer experiments over wide area networks.

MARIO LAURIA

Mario Lauria's research interests cover different aspects of PC cluster technology - architecture, system software, applications. Currently he is particularly interested in how to integrate Terabyte-sized disk storage using off-the-shelf components into a parallel machine with supercomputer performance and enhanced I/O capabilities. He is also interested in the system tools required to move large data sets in and out of such a machine, and between machines across geographical networks. On the application side he is studying computationally intensive Computational Biology problems involving large amounts of data such as genome assemblies, whole genome comparisons and cross-species phylogenetic studies. He is also interested in applications involving the handling of distributed data sets such as the integration of remote biological and medical databases. More details can be found at <http://www.cis.ohio-state.edu/~lauria>.

High Performance I/O

Today one Terabyte of disk storage can be easily added to a cluster for less than \$5,000 by installing several IDE disks on each node. Besides the low cost, such a configuration has also other benefits such as a large aggregate disk access bandwidth and the availability of resources for distributed preprocessing and caching of data. At this time however there are not simple means to take advantage of all the potential benefits of this type of distributed storage. We are interested in developing tools and system software to allow parallel applications to efficiently and transparently access cluster disks. We are looking at existing

parallel file systems (PVFS) and parallel I/O libraries (PANDA, MPI-IO) and studying how they can be adapted and optimized to suit the needs of parallel applications accessing a large number of fast disks distributed across the nodes of a cluster. Some of this work is done in collaboration with Dr. Srinivasan Parthasarathy in the context of the InterAct project.

Data intensive computing

The large scale computational biology and biomedical applications that have become one of the frontiers of high end computing are stretching the envelope of current parallel architectures. These applications are characterized by the need to process large data sets (tens of gigabyte, growing exponentially) typically deposited in geographically distributed databases. Providing effective local and remote storage access and adequate transfer throughput to geographically distributed databases brings a new series of issues to the design of parallel machines.

We are experimenting with our own cluster to learn the best way of building and programming clusters specifically to solve such demanding computational biology problems. In one collaboration with Dr. Bo Yuan's Bioinformatic group in the OSU Human Cancer Genetics Program, College of Medicine, we are working on the assembly and annotation of a complete mammalian genome. The development of a parallel version of a popular bioinformatic tool (BLAST) and of our enhanced 1 TB storage system has enabled us to obtain an order of magnitude improvement in the speed of the computation.

In another collaboration with Dr. Joel Saltz's group in the Biomedical Informatics Department we are developing methods for enforcing the consistency of geographically distributed biomedical databases. The outcome of the project will be a set of tools enabling clinical research studies that involve analysis of gene and protein expression data from several separately maintained databases. Dr. Srinivasan Parthasarathy is also collaborating to this work.

Data movement over WANS

The increasing need to access distant large data sets is motivating us to study new techniques to increase the throughput of data transfer between remote sites. One of the tools we are developing is an enhanced version of a remote storage access tool called Storage Resource Broker (SRB) developed at the San Diego Supercomputer Center. The performance enhanced version of SRB employs several strategies to increase the amount of data moved per unit of time between two remote machines. One such strategy is to introduce a notion of pipelining in handling the data and try to overlap different stages of the transfer. In collaborations with researchers at the University of California San Diego we are also experimenting with a different approach in which the data to be sent is striped across several parallel connections opened between the two remote sites.

DR. DHABALESWAR K. PANDA

Prof. Dhableswar K. Panda's research interests are in the area of network-based computing, interprocessor communication, parallel computer architecture, clustered and heterogeneous systems, and high-performance computing. His research group is currently taking an integrated approach in designing high performance network-based computing systems by using modern networking technologies (Gigabit Ethernet, GigaNet, and Myrinet), communication standards (Virtual Interface Architecture (VIA) and InfiniBand Architecture (IBA)) and commodity PCs/workstations. Brief descriptions of some of the on-going projects are as follows. More details on these projects can be obtained from <http://nowlab.cis.ohio-state.edu> and <http://www.cis.ohio-state.edu/~panda/pac.html>. Some of these research projects have been carried out jointly with Prof. P. Sadayappan. Some of these projects are being done in collaboration with IBM T.J. Watson Research Center, Sandia National Laboratory, Pacific Northwest National Laboratory, and Intel.

Low-latency Point-to-Point Communication with User-level Networking Protocols

User-Level Networking Protocols (ULNPs) are being proposed for high performance computing systems to provide low-latency and high-bandwidth communication. Efficient implementation of these protocols requires research along several directions: balanced work distribution between the host processor and the

Network Interface Card (NIC) processor, minimization of copying at sender and receiver side with OS bypassing, flow control, and reliability. The latest industry standard for ULNP are the Virtual Interface Architecture (VIA) and InfiniBand Architecture (IBA). Along this direction, the group has extensively evaluated the impact of different design choices on the performance of VIA. By taking a suitable combination of design choices, we have developed an efficient VIA implementation on the IBM Netfinity cluster. We have also developed a comprehensive benchmark suite to compare different VIA implementations. A new zero copy protocol, called EMP (Ethernet Message Passing), for Gigabit Ethernet systems with Alteon NICs has also been developed. We have developed an emulator for InfiniBand on Myrinet which allows upper layers of the InfiniBand architecture to be developed in the absence of InfiniBand hardware. We are also developing schemes to achieve reliability over Myrinet with low overhead.

NIC-level Support for Collective Communication

Frequently used collective communication operations in high performance computing systems include broadcast, multicast, barrier synchronization, reduction, scatter, gather, all-to-all broadcast, and complete exchange. Traditional implementation of collective communication using a set of point-to-point operations lead to very high latency. Modern computing systems are being built with NICs having programmable processors and a reasonable amount of memory. This helps to implement collective communication operations at the NIC efficiently. Using this framework, we have developed NIC-level support for broadcast and barrier synchronization operations. For a 16-node system, the barrier synchronization implementation reduces the barrier synchronization time by a factor of 1.8, compared to the host-level implementations. Currently, we are developing support for other collective operations and evaluating the impact of these efficient implementations at the application-level.

NIC-level Support for Quality of Services (QoS)

In addition to high performance, modern network-based computing applications require support for QoS. Along this direction, we have developed a NIC-level support for proportional bandwidth allocation in clusters with Myrinet interconnection and MPI/GM messaging layer. This scheme implements a novel packet-scheduling at the NIC and allows applications to reserve and allocate bandwidth for multiple outgoing/incoming flows from/to a node in a given proportion. We are extending this scheme to interface with WAN-level QoS schemes such as RSVP and DiffServ. This integrated framework will allow to achieve end-to-end QoS for clusters (servers) running network-based computing applications and interfacing with clients over the WAN. We are also extending this framework to design next generation Host Channel Adapters (HCAs) and Target Channel Adapters (TCAs) to work with the emerging InfiniBand architecture.

Routing, Flow Control, and Gateway Protocol for Inter-Cluster Communication

Modern network-based computing systems are spanning over multiple clusters. Communication in these systems typically spread over multiple networking technologies (System Area Networks (SAN), Local Area Networks (LAN), and Wide Area Networks and WAN). In order to achieve a seamless and high performance communication environment in these systems, efficient routing, flow control, and gateway protocols are required. Along this direction, we have developed a novel Inter-Cluster GM (ICGM) message passing system which provides efficient communication across multiple Myrinet clusters connected over non-Myrinet technologies (such as Gigabit Ethernet) and running TCP/IP. Currently, we are researching efficient routing and flow control schemes for cluster-based data center environments.

High-Performance Programming Environments for Clusters

With the development of high performance communication subsystems for clusters, a bigger research challenge is how to pass on this performance to the programming environment layer. Along this direction, we are focusing on three commonly used programming environments: distributed memory, software distributed shared memory, and get/put shared memory without coherency. We have developed a thin communication substrate over VIA which allows the popular TreadMarks (a software distributed shared memory environment) to deliver far better performance compared to its UDP implementation. We have also developed a high performance implementation of Global Arrays (a popular model supporting get/put shared memory) on top of Myrinet/GM. We are working on efficient implementation of the Message Passing Interface (MPI) standard (for distributed memory programming) over VIA and InfiniBand architectures.

DR. SRINIVASAN PARTHASARATHY

Spurred by technological advances in data collection techniques, data mining is an interdisciplinary field merging ideas from statistics, machine learning, databases, and high performance computing systems. Dr. Parthasarathy's research in this area has focussed on actively mining dynamic datasets, parallel and distributed data mining, architectural and operating systems support for data mining applications, and applying these techniques on a varied set of domains (biological, web, e-commerce/business and scientific).

Active Data Mining

Most current work in data mining assumes that the data is static and a database update requires re-mining both the old and new data. We have proposed and evaluated several algorithms that maintain valid mined information (mining summary structures) across i) database updates, and ii) user interactions(modifying/constraining the search space) in a client-server setting. The primary challenge is the design of a mining summary structure that satisfies the following two properties: i) the information stored in the structure should be able to address a wide range of user interactions; ii) it should allow for incremental maintenance. In other words, the summary structure from the old data along with the database update should ideally be sufficient to produce the summary structure for the updated data, without having to access the old data. We have successfully implemented and evaluated active mining solutions for association mining, sequence mining, similarity discovery, and discretization. This project is being extended on several fronts. We are evaluating similar strategies for clustering and classification. We are seeking to improve the performance of existing active mining techniques through the use of memory placement and data compression strategies to enhance locality. Simultaneously we are also evaluating the quality vs. efficiency tradeoff in using various data stratification algorithms (such as sampling, discretization and dimensionality reduction) in order to reduce the I/O demands of existing algorithms

Parallel and Distributed Data Mining

We have developed several scalable parallel and distributed algorithms for dataset clustering and association mining. The algorithms proposed are efficient, work out of core, and scale to very large databases. The new algorithms utilize graph-theoretic techniques to decompose the original problem into smaller sub-problems that can be solved independently in main memory while facilitating parallelization. We are extending this work in the following ways: Developing parallel incremental algorithms for mining dynamic datasets; Studying the impact of combining data-shipping and function shipping on parallel data mining applications; Evaluating various reduction operations such as data associations, fast fourier transforms and wavelet transforms to efficiently mine distributed data sets.

Resource-Aware Systems Support for Data Intensive Applications

Modern-day enterprises usually contain a cluster of shared memory workstations connected by some (intra- enterprise) network. Such a cluster of shared-memory symmetric multi-processors (SMPs) can be a cost effective powerful computational resource. The goal of this project is to effectively use such a cluster for data mining applications. Leveraging this enterprise- wide cluster can pose several problems in terms of programmability, the interactive requirements imposed by such applications, the large data sets involved, and the unpredictability involved with sharing cluster resources with other applications. We have developed a prototype object-based system called InterAct which has addressed some of these issues: programmability, interactivity and resource-aware scheduling. Our current focus is on scalable I/O and communication support (with Prof. Lauria), compression and memory placement of InterAct objects to reduce the communication requirements, as well as extending InterAct's current support to address resource aware computing in a shared environment.

Application-Oriented Mining

KDD is ultimately motivated by the need to analyze data from a variety of practical applications. Of particular interest to us is the application of data mining to the domains of electronic commerce, network performance data, the World Wide Web, scientific simulations and biomedical informatics. Within the E-commerce and WWW domain we have been investigating the issue of analyzing web logs and E-commerce data to cluster similar users, transacted items and web pages. In the network security domain we have been working with the enterprise services group at the office of information technology to mine network

performance data for intrusion detection and accounting purposes. In the scientific simulation domain, along with Dr. John Wilkins (Physics), we have been evaluating methods by which one can steer a molecular dynamics simulation through the incremental analysis of simulation data. In conjunction with Mario Lauria we have been evaluating how one can use various mining techniques to examine and analyze gene expression data for drug discovery.

P. SADAYAPPAN

Dr. Sadayappan's research interests pertain broadly to the facilitation of effective use of high-performance computing systems for computationally intensive applications. Currently, his research focus is on the following two projects.

Scheduling and Resource Management for Parallel/Distributed Systems

This project, conducted in collaboration with Professor Panda, investigates a number of issues pertaining to the effective scheduling of parallel jobs on parallel/distributed systems.

Scheduling under a moldable job model

Currently users are required to specify a specific single value for the number of required processors. Many user applications can actually be executed on different numbers of processors. On a very lightly loaded system, the average turnaround time can be maximized by using more processors per job than on a heavily loaded system. It would be desirable to have an intelligent scheduler determine the number of processors to allocate to different jobs, with the user specifying only a range of values for the number of processors required. Initial results of a study into such a moldable model of scheduling have provided promising results.

Scheduling in heterogeneous environments

If jobs are to be transparently scheduled on a collection of several sub-systems of possibly different speeds, new scheduling algorithms are needed and new models of specification of resource requirements are desired. We have previously addressed the issue of scheduling of sequential jobs in heterogeneous environments. Complications arise in extending the approach to the scheduling of parallel jobs on heterogeneous systems. We are now working on developing new strategies for scheduling parallel jobs in the heterogeneous context. Combined use of time sharing and space sharing: Most large parallel systems are space shared. Fine-grained time-sharing at the level of time-sliced multiplexing by the OS creates performance problems, requiring methods for effective co-scheduling of processes of a job. We plan to explore coarse-grained time-sharing, where the granularity of time is in the scale of minutes or hours rather than tens of milliseconds. One way to view coarse-grained time-sharing is through a model of job suspension and restart. Although there are theoretical results about the benefits of job pre-emption, there is a paucity of simulation-based studies that have studied its impact on performance metrics. We are currently evaluating various suspension/restart strategies using actual job traces from supercomputer centers.

Topology-sensitive scheduling

Currently job schedulers do not consider the structure of the parallel system when allocating processors to jobs; thus the nodes allocated to a communication-intensive job may be scattered all over the system, resulting in significant communication overheads. We are currently investigating some inter-related questions involving scheduling and mapping: 1) Development of processor allocation schemes that incorporate topology considerations; 2) Evaluation of the impact of contiguous processor allocation schemes on utilization (utilization can be expected to decrease because of the contiguity constraints - there may be enough free nodes for a queued job, but they may not be contiguous).

Performance Optimization for Scientific Computing

The development of high-performance parallel programs for scientific applications is usually very time consuming. Often, the time to develop an efficient parallel program for a computational model is a primary limiting factor in the rate of progress of the science. Therefore systems support for the development

of high-performance parallel programs is very important. Prof. Sadayappan has been working with Prof. Baumgartner and colleagues in the sciences and engineering, to address various research issues in performance optimization.

Over the last few years, the domain of electronic structure modeling has been an area of special focus for development of optimization techniques. The long-term goal is the development of a program synthesis tool that can be used by computational chemists to generate high-performance parallel programs for computational structures specified in a high-level form. A number of optimization issues are being addressed in this context:

Algebraic Transformations

Many of the core computations in electronic structure modeling can be expressed as sets of tensor contractions, which essentially translate to sum-of-products array expressions. However there are a large number of algebraically equivalent forms for the same computation (assuming that reordering of floating point operations using associative and distributive laws is permissible). These equivalent forms can differ in the number of arithmetic operations by orders of magnitude. Although the problem of finding the operationally minimal form is NP-hard, practically effective search procedures are being developed.

Memory Minimization

The application of algebraic transformations to minimize operations often requires the use of temporary arrays to hold intermediate results that are reused multiple times. Sometimes the sizes of these temporary arrays are so large that they make practical implementation impossible. However, there are significant opportunities for reducing the memory requirements through loop fusion and array contraction. But the optimal choice of loop fusions is not trivially identified. Previous work has developed a systematic framework to address this problem for operator trees, but extension of the methods to more general operator DAGs (DIrected ACyclic Graphs) is a challenging open problem to be addressed.

Space-Time Transformation

Sometimes the reduction in memory through application of loop fusion and array contractions is inadequate and the total memory required exceeds the available disk capacity on the system, making the computation infeasible. In such a situation, it is often possible to seek a trade-off that reduces memory requirements by redundantly recomputing some intermediate results instead of storing and reusing them. We are trying to develop a systematic framework for the modeling of space-time trade-offs and the derivation of program transformations that attempt to reduce memory requirements to within specified limits.

Data Locality Optimization

If the space requirement exceeds physical memory capacity, portions of the arrays must be judiciously moved between disk and main memory as needed, in a way that maximizes reuse of elements in memory. The same considerations are involved in effectively minimizing cache misses - blocks of data must be moved between physical memory and the limited space available in the cache. It turns out that the use of loop fusions and array contractions for memory minimization often have a negative effect on data reuse for the computational structures arising in this domain. So an integrated treatment of the data locality optimization problem with the memory minimization problem is required.

Data Distribution and Partitioning

Finally, we are also studying the problem of how best to partition the arrays among the processors of a parallel system, so as to minimize communication overheads. We assume a data-parallel model, where each operation in the operation sequence is distributed across the entire parallel machine. The arrays are to be disjointly partitioned between the physical memories of the processors. This approach allows us to decouple (or loosely couple) the parallelization considerations from the operation minimization and memory considerations.

DR. JOEL SALTZ

The research interests of Dr. Saltz and his group span techniques, runtime optimizations, and systems software and middleware tools to provide support for storage, data management and manipulation of very large scientific datasets on parallel machines and in distributed environments. The group works on parallel algorithms and domain decomposition methods for scientific computations and application of parallel computing in scientific visualization.

The research group, in conjunction with Dr. Gagan Agrawal, also focuses on development of tools and techniques that aid development of efficient computing and data intensive applications. A particular focus of this research has been applications from medical and biological domains. Dr. Saltz, Dr. Agrawal and their PH.D. student, Renato Ferreira, developed a language and compiler framework that allows data intensive applications to be specified at a very high-level.

Other members of the group also look at query generation, multiple query workloads in data analysis applications and decision tree construction for data mining.

Dr. Saltz and his collaborators, Dr. Kurc and Dr. Catalyurek, developed the Active Data Repository (ADR) and DataCutter software projects to provide the software support needed to manage large scientific datasets.

Active Data Repository

ADR optimizes storage, retrieval and processing of very large multi-dimensional datasets. In ADR, datasets can be described by a multidimensional coordinate system. In some cases datasets may be viewed as structured or unstructured grids, in other cases (e.g. multiscale or multiresolution problems), datasets are hierarchical with varying levels of coarse or fine meshes describing the same spatial region. Processing takes place in one or several steps during which new datasets are created, preexisting datasets are transformed or particular data are output. Each step of processing can be formulated by specifying mappings between dataset coordinate systems. Results are computed by aggregating (with a user defined procedure), all the items mapped to particular sets of coordinates. ADR is designed to make it possible to carry out data aggregation on processors that are tightly coupled to disks. Since the output of a data aggregation is typically much smaller than the input, use of ADR can significantly reduce the overhead associated with obtaining postprocessed results from large datasets.

The Active Data Repository can be categorized as a type of database; correspondingly retrieval and processing operations may be thought of as queries. ADR provides support for common operations including index generation, data retrieval, memory management, scheduling of processing across a parallel machine and user interaction. ADR assumes a distributed memory (or in database terminology, shared-nothing) architecture consisting of one or more I/O devices attached to each of one or more processors. Datasets are partitioned and stored on the disks. An application implemented using ADR consists of one or more clients, front-end processes, and a parallel backend. A client program, implemented for a specific domain, generates requests that are translated into ADR queries by ADR front-end processes. The front-end translates the requests into ADR queries and performs flow control, prioritization and scheduling of ADR queries that resulted from client requests.

DataCutter

DataCutter is a middleware infrastructure that enables processing of scientific datasets stored in archival storage systems across a wide-area network. DataCutter provides support for subsetting of datasets through multi-dimensional range queries, and application specific aggregation on scientific datasets stored in an archival storage system.

DataCutter provides a core set of services, on top of which application developers can implement more application-specific services or combine with existing Grid services such as metadata management, resource management, and authentication services. The main design objective in DataCutter is to extend and apply features of the Active Data Repository (ADR), namely support for accessing subsets of datasets via range queries and user-defined filtering operations, for very large datasets in a shared distributed comput-

ing environment. In ADR, data processing is performed where the data is stored (i.e. at the data server). In a Grid environment, however, it may not always be feasible to perform data processing at the server, for several reasons. First, resources at a server (e.g., memory, disk space, processors) may be shared by many other competing users, thus it may not be efficient and cost-effective to perform all processing at the server. Second, datasets may be stored on distributed collections of storage systems, so that accessing data from a centralized server may be very expensive. Moreover, distributed collections of shared computational and storage systems can provide a more powerful and cost-effective environment than a centralized server, if they can be used effectively. Therefore, to make efficient use of distributed shared resources within the DataCutter framework, the application processing structure is decomposed into a set of processes, called filters. DataCutter uses these distributed processes to carry out a rich set of queries and application specific data transformations. Filters can execute anywhere (e.g., on computational farms), but are intended to run on a machine close (in terms of network connectivity) to the archival storage server or within a proxy server.

Another goal of DataCutter is to provide common support for subsetting very large datasets through multi-dimensional range queries. Very large datasets may result in a large set of large data files, and thus a large space to index. A single index for such a dataset could be very large and expensive to query and manipulate. To ensure scalability, DataCutter uses a multi-level hierarchical indexing scheme.

DataCutter is also being integrated with the Storage Resource Broker (SRB), under development at the San Diego Supercomputing Center through the NPACI consortium. The SRB provides transparent access to distributed storage resources in a Grid environment, and DataCutter will enhance the SRB services to allow for subsetting and filtering of large archival datasets stored through the SRB.

The Active Data Repository and DataCutter research is supported by NSF, the National Partnership for Advanced Computing Infrastructure (NPACI), DARPA, and DOE ASCI. This systems software is also being used to implement data analysis applications in several projects that are funded by NPACI, NSF, and DARPA. Active projects involve development and optimization of data analysis applications that query and manipulate large multi-dimensional datasets. The applications include visualization of digitized microscopy slides, exploration and analysis of data gathered from sensors attached to Landsat satellites, databases for coupled simulation systems, and visualization of biomedical volumetric datasets and output from scientific and engineering simulations. The group is currently working on runtime optimizations and systems software for execution of these classes of applications on disk-based storage clusters and in the Grid environment, and runtime systems for optimizing execution of multiple query workloads on distributed-memory machines and SMP clusters.

Most recently, Dr. Saltz and his group, in collaboration with the Texas Institute for Computational and Applied Mathematics (TICAM) have been funded for an NSF ITR entitled *A Data Intense Challenge: The Instrumented Oilfield of the Future*. The objective of this project is to advance key enabling technologies and to create a new generation of data-driven, interactive and dynamic adaptive strategies for subsurface characterization and reservoir management. The proposed approach will combine multiresolution reservoir models derivable from diverse data types and executing on very large distributed heterogeneous computational environments, with embedded sensors in instrumented reservoir-fields (e.g. permanent downhole sensors and seismic sensors anchored at the seafloor) that dynamically monitor changing fluid and rock properties. Completing this symbiotic feedback loop between measured data and the computational models will enable an "instrumented oilfield", providing more efficient, cost-effective and environmentally safer production of oil reservoirs, and result in enormous strategic and economic benefits.

SOFTWARE ENGINEERING AREA HIGHLIGHTS

Software engineering is the study of designing and building architecturally sound software systems. Highlighted here are advances in component-based software, program analysis, testing and maintenance.

THE REUSABLE SOFTWARE RESEARCH GROUP

<http://www.cis.ohio-state.edu/rsrg>

The Reusable Software Research Group (RSRG) is composed of faculty members Drs. Timothy Long, William F. Ogden, Bruce W. Weide, and Stuart H. Zweben, post-doctoral researcher Dr. Paolo Bucci, senior lecturer Dr. Wayne Heym, and many graduate and undergraduate research students.

A key issue in the design of software is reusability, i.e., developing software from existing software components. All too often software engineers reinvent the wheel when designing software, which results in ineffective, costly software. "The field faces two serious problems that have grown relatively more important as hardware costs have continued to decline while software costs have continued to increase: programmer productivity must be increased, and software quality must be improved. The current research emphasis is on careful engineering of reusable software components, including a formal specification for what a software component is supposed to do and the ability to prove that a particular piece of software really does meet its specification," explains Dr. Zweben.

At the heart of component-based software engineering is the software component engineering problem: the need to design and develop components whose properties (correctness, efficiency, etc.) can be certified locally, or modularly, out of the context of the larger systems into which they might be incorporated. Suppose one has a specification for what a component is supposed to do, i.e., how it is supposed to behave as an abstraction. Suppose one also has an implementation of the component that has been proved correct or that has passed other certification standards such as rigorous testing. Then of course one would like to be able to assume that the component works correctly when it is embedded in a larger system. This is the only hope for certifying important properties such as correctness for large software systems. Unfortunately, with current programming practices there are many subtle ways in which inter-component dependencies can arise that can thwart this kind of modular reasoning about software. RSRG research, supported by the National Science Foundation and Microsoft Research, aims to sort out these problems and codify engineering design principles that will permit local certification of important component properties to become a practical reality.

RSRG members are also engaged in a long-term effort to integrate, into an undergraduate computer science curriculum, component-based software engineering principles including those developed through RSRG research activities. The goal is to create the core of an instructional system capable of producing software professionals with greater awareness and understanding of the technical issues faced by the software industry, and with measurably better software design and development skills. The entire first-year course sequence for CS majors is integrated in this fashion, with funding by the National Science Foundation and the Fund for the Improvement of Post-Secondary Education.

MOTION CAPTURE: COLLABORATIVE WORK WITH THE ADVANCED CENTER FOR COMPUTING ART & DESIGN

The Advanced Center of Arts and Design (ACCAD) has just bought a new Vicon 8 Optical Motion Capture system with fourteen cameras. Meg Geroch and Suba Varadarajan, Rick Parent's doctoral students, were among those to be trained on the system. They were also a part of the motion capture team responsible for capturing Marcel Marceau's performance, headed by Jeff Light and Doug Griffin from Industrial Light Magic.

The lab is to be made available to faculty and industry interested in pursuing research involving motion capture. For more information, take a look at ACCAD's web page at http://www.accad.ohio-state.edu/mocap/mocap_info.htm.

The Vicon 8 optical system. The Vicon 8 optical motion capture system was specifically designed for animation, but it has significant capabilities for many kinds of applications and research initiatives.

The Motion Capture Lab represents a University and College investment. The original funding for the lab is a combination of funds from the Office of Academic Affairs, the Office of Research and the College of the Arts. The College of the Arts is working through its Research Partners Program to collaborate with industry and business to provide on-going support. The lab will serve researchers from a variety of disciplines across campus, and, eventually, from the private sector.

The lab is set up in 251 Mount Hall, a space made available by the Department of Theatre. The College of the Arts is forming partnerships with major multimedia producers who require the use of such an advanced laboratory for their research. Industrial Light and Magic (ILM), through alumni Jeff Light, is providing on-going technical support for the new Motion Capture Lab. It has provided invaluable technical assistance for the motion capture of Marcel Marceau and other projects.



Meg Geroch going through the motions to be captured.



INFORMATION SYSTEMS AREA HIGHLIGHTED PROJECTS

ACUITY

Dr. Sandy Mamrak

The ACUITY project is devoted to innovative information-system technology to support cancer research. In particular we have developed a new technology for automatically generating complex, multi-screen forms for web-based update of relational databases, new metric sets to support decision-making about expanding an application framework, and an object-oriented version of JavaScript, Object JavaScript.

GRANTS & AWARDS

Legend: Title

Sponsor

Amount

Project Start-Project End

Principal Investigator

1999/00 IBM cooperative fellowship

International Business Machines

\$30K

10/1/1999-6/30/2000

Dhabaleswar K. Panda

A Comprehensive Statistical Framework for Image Understanding and ATR

OFC Naval Research

\$300K

4/1/2001-4/1/2004

Song Chun Zhu

A Gigabit/s, VIA-Enabled Cluster Arch. for Res. in High Performance Systems Software, Scalable Knowledge Discovery, Visualization and Parallel Planning under Uncertainty

National Science Foundation

\$133K

1/1/1999-12/1/2001

Raghu K. Machiraju

A prototype system for efficient visualization and interrogation of terascale datasets.

Mississippi State University

\$268K

1/1/2000-12/31/2002

Raghu K. Machiraju

A Video-Based Testbed for Scientific Visualization and Networking Research

National Science Foundation & OSU

\$182K (National Science Foundation), \$91K (OSU)

12/1/1998-12/1/2001

Wu-Chi Feng

Roger A. Crawfis

Raj Jain

A web-based relational database for thermodynamic and structure data on lipids.

National Science Foundation Biological Sciences

\$457K

1/1/2000-12/31/2002

Martin D. Caffrey

Douglas S. Kerr

Acoustic Source Segmentation and Its Applications to Undersea Signals

Naval Undersea Warfare Center Division Newport

\$79K

1999-2000

Deliang Wang

Adaptive Systems

National Science Foundation

\$190K

9/1/2000-7/1/2003

T. Ingraffea, Cornell University

K. Pingali, Cornell University

B. Soni, Mississippi University

Raghu Machiraju

Advanced research trends in computer and information science.

Honda R&D Co. Ltd.

\$173K

1/1/1999-1/31/2002

Stuart H. Zweben

An experimental testbed for research in advanced wireless communications.

National Science Foundation Computer & Information Science & Engineering

\$832K

9/1/1998-8/31/2001

Michael P. Fitz, Dept. of Electrical Engineering

Steven Wellingson, Dept. of Electrical Engineering

Chao-Ju J. Hou, Dept. of Electrical Engineering

Raj Jain

Urbashi Mitra, Dept. of Electrical Engineering

Hitay Ozbay, Dept. of Electrical Engineering

An Image-based Approach to Scientific Visualization

Dept. of Energy ASCI

\$726K

1/1/1999-10/1/2001

Roger Crawfis

Wu-Chi Feng

Roni Yagel

Donald Stredney, Ohio Supercomputer

An image-based approach to scientific visualization.

University of California

\$55K

12/18/1998-12/31/2001

Donald L. Stredney, Ohio Supercomputer Center

Roger A. Crawfis

Analysis of Message Passing Environments on Large Clusters, and Future Directions

Sandia National Laboratories

\$150K

1/1/2001-12/1/2001

Dhbaleswar K. Panda

Pete Wyckoff, Ohio Supercomputer Center

Ponnuswamy Sadayappan

Applied Software Engineering for Engineers and Scientists

Lucent Technologies, Inc.

\$27K

10/1/2000-9/30/2001

Paul A. G. Sivilotti

Assessment of volume rendering algorithms in visual computing

National Science Foundation Computer & Information Science

\$109K

1/1/2000-7/31/2001

Raghu K. Machiraju

Bandwidth Allocation Techniques for Video-on-Demand Systems

National Science Foundation CAREER Award

\$320K

10/1/1999-10/1/2003

Wu-Chi Feng

CAREER: Bandwidth allocation techniques for video-on-demand (REU supplement).

National Science Foundation Computer & Information Science & Engineering

\$5K

9/15/1999-8/31/2003

Wu-Chi Feng

CAREER: Bandwidth allocation techniques for video-on-demand systems.

National Science Foundation Computer & Information Science

\$320K

9/15/1999-8/31/2003

Wu-Chi Feng

Career: Stochastic Modeling of Visual Patterns from Descriptive to Generative Models

National Science Foundation

\$340K

5/1/2001-4/1/2006

Song Chun Zhu

CAREER: Three-dimensional volume visualization of multi-variate data.

National Science Foundation Computer & Information Science

\$166K

1/1/1999-12/31/2001

Roger A. Crawfis

CEWES-CWO: High performance computing - year 5.

Nichols Research Corporation

\$228K

3/27/2000-9/30/2001

Keith W. Bedford

Ponnuswamy Sadayappan

CISE Research Instrumentation: A Video-Based Testbed for Scientific Visualization and Networking Research

National Science Foundation

\$182K

12/1/1998-11/1/2001

Wu-Chi Feng

Roger A. Crawfis

Raj Jain

Clutter modeling and performance analysis in automatic target recognition.

John Hopkins University

\$57K

3/1/1999-8/31/2001

Song Chun Zhu

Computational Auditory Scene Analysis Based on Perceptual and Neural Principles

Air Force Office of Scientific Research

\$486K

1/1/2000-1/1/2003

Deliang Wang

Computational models and coordinated neuroimaging of learning and cognitive function.

University of Pittsburgh

\$155K

10/1/1998-9/30/2001

Richard L. Lewis

Computer Assisted Analysis of DNA Methylation Patterns in Human Cancer

OSU Comprehensive Cancer Center Seed Grant

\$17K

9/1/1999-8/1/2000

Roger Crawfis

C. Plass

F. Wright

Rick Parent

Rafe Wenger

Computing with Shapes: Reconstruction and Decimation

National Science Foundation
\$215K
9/1/2000-8/31/2003
Tamal K. Dey

Congestion Avoidance in High Speed Networks

National Science Foundation
\$375K
9/1/1996-8/1/2000
Raj Jain

*CREST (Florida International University) - ERC (Mississippi State University) Partnership**

National Science Foundation
\$500K
5/1/1998-4/1/2003
Raghu K. Machiraju

Data-centric and image-centric data exploration.

E-Systems Corp.
\$100K
8/10/2000-8/9/2001
Raghu K. Machiraju

Data-centric and Image-centric Explorations of Computational Mechanics Simulation Datasets

DoD Major Shared Resources Center, US Army Research Laboratory
\$100K
8/1/2000-9/1/2001
Raghu K. Machiraju

Dependability components for distributed and network systems.

National Science Foundation Computer Comprehensive Research
\$190K
9/1/1999-8/31/2002
Anish K. Arora

Dependent Types for High-Confidence Distributed Systems

Ohio Board of Regents Doctoral Enhancement Initiative
\$88K
9/1/2000-10/30/2002
Paul A. G. Sivilotti

Design of Adaptable Dynamic Wireless Network Architectures Using Intelligent Agents

National Science Foundation
\$320K
7/1/1998-6/1/2000
Mukesh Singhal
O. Wolfson
C. Yu

Designing Stochastic inference Engine by DDMCMC

Ohio Board of Regents
\$90K
7/1/2000-7/1/2002
Song Chun Zhu

Development of a design simulator for hybrid vehicles.

Army Tank Command
\$60K
10/15/2000-10/14/2001
Giorgio Rizzoni, Center for Automotive
Yann G. Guezennec, Center for Automotive
Ahmed A. Soliman, Center for Automotive
B. Chandrasekaran
John Josephson

Development of Metrics for Image Quality Assessment

Ohio Board of Regents
\$90K
7/1/2000-7/1/2002
Song Chun Zhu

Dynamics-based speech segregation

National Science Foundation
\$150K
9/1/2000-8/31/2001
Deliang Wang

Enhancement of Ph.D. Computer Science Programs in the State of Ohio

Ohio Board of Regents
\$7,000K total, \$1,500K share
1/1/1999-1/1/2001
Stuart Zweben

Event-Based Characterization of Videos for Indexing and Streaming

Ohio Board of Regents Graduate Enhancement Program
\$87K
9/1/2000-9/1/2002
Wu-Chi Feng
A. Goshtasby

EVITA- A Prototype System for Efficient Visualization and Interrogation of Terascale Data
National Science Foundation
\$1,275K
1/1/2000-12/1/2002
Raghu K. Machiraju

Fellow of Alfred P. Sloan Foundation
Alfred P. Sloan Foundation
\$40K
2001-2003
Song Chun Zhu

Geometric Modeling with Simplicial Complexes
DST Project, Government of India
Rs. 11,00,075
1997-2000
Tamal K. Dey

Hierarchical Segmentation and Attribution of High Resolution Aerial Images
NASA
\$200K
5/1/2000-9/1/2001
Song Chun Zhu
Kim L. Boyer, Dept. of Electrical Engineering

Hierarchical segmentation and attribution of high resolution aerial images with a view to change detection and analysis.
NASA
\$63K
5/19/2000-9/30/2001
Song Chun Zhu
Kim L. Boyer, Dept. of Electrical Engineering

Human figure animation
Honda R&D Co. Ltd.
\$88K
4/1/2000-6/30/2001
Richard Parent

Image Metrics for Image Synthesis and Analysis
Ohio Board of Regents
\$200K
9/1/2000-8/1/2002
Raghu K. Machiraju
Song Chun Zhu

*ITR/ACS: A software production platform for computational field simulation.**
Mississippi State University
\$17K
9/1/2000-8/31/2001
Raghu K. Machiraju

ITR/SW: Principles of distributed component-based software.
National Science Foundation Computer Comprehensive Research
\$245K
9/1/2000-8/31/2001
Bruce W. Weide
Paolo Bucci
Timothy J. Long
William Ogden
Paulo A. G. Sivilotti

ITR: Dynamics-based Speech Segregation
National Science Foundation
\$450K
6/1/2000-6/1/2003
Delaing Wang

Learning probability models for surface appearance and shape by minimax entropy principle.
National Science Foundation
\$239K
8/15/1999-7/31/2001
Song Chun Zhu

Low Latency Gigabit Ethernet Message Passing
Sandia National Laboratories
\$117K
9/1/2000-8/1/2001
Dhabaleswar K. Panda
Pete Wyckoff

Lucent Technologies Applied Software Engineering Fellowships
Lucent Technologies, Inc.
\$27K
10/1/2000-9/30/2001
Paul A.G. Sivilotti

Measuring QoS Parameters in Networks
ITEC-OHIO Targeted Research Grant
\$199K
2000-
Arjan Durrresi

Molecular Genetics of Low Grade Gliomas
OSU Interdisciplinary Seed Grant Program
\$1K
3/1/1999-12/1/2001
Sandra Mamrak

Molecular Markers of Glioma Initiation and Progression

Bioinformatics Core

\$500K

4/1/2001-5/1/2005

Sandra Mamrak

Motion-based Grouping and Segmentation of Images Using Synchronized Oscillators

Ohio Board of Regents Computer Science Collaborative Doctoral Enhancement Initiative

\$78K

9/1/1998-9/1/2000

Deliang Wang

National Center for Image Science

Army Research Office

\$3,500K total, \$200K share

9/1/1997-9/1/2001

Song Chun Zhu

Network Computing Testbed for Interactive Visualization, Multimedia, and Metacomputing

National Science Foundation (equip)

\$350K

2/1/2000-2/1/2002

Roger Crawfis

Dhabaleswar K. Panda

Ponnuswamy Sadayappan

Wu-Chi Feng

Network Computing Testbed for Interactive Visualization, Multimedia, and Metacomputing

National Science Foundation

\$173K

1/1/2000-12/1/2002

Dhabaleswar K. Panda

Roger Crawfis

Jose Duato

Wu-Chi Feng

Han Wei Shen

Ponnuswamy Sadayappan

Network Computing Testbed for Interactive Visualization, Multimedia, and Metacomputing

National Science Foundation, State of Ohio, OSU

\$175 (National Science Foundation), \$87.5K (State), \$87.5K (OSU)

5/1/2000-4/1/2003

Dhabaleswar K. Panda

Roger Crawfis

Jose Duato

Wu-Chi Feng

Han Wei Shen

Ponnuswamy Sadayappan

Don Stredney, Ohio Supercomputer Center

Al Stutz, Ohio Supercomputer Center

Network computing testbed for interactive visualization, multimedia, and metacomputing.

National Science Foundation Computer & Information Science

\$175K

5/1/2000-4/30/2003

Dhabaleswar K. Panda

Ponnuswamy Sadayappan

Jose Duato

Roger A. Crawfis

Wu-Chi Feng

OBOR matching funds

Ohio Board of Regents Investing Fund

\$1,493K

4/1/1996-6/30/2000

Raj Jain

OBOR matching funds

Ohio Board of Regents Action Fund

\$87K

5/1/2000-4/30/2001

Dhabaleswar K. Panda

On the Assessment of Volume Rendering Algorithms in Visual Computing

National Science Foundation Early CAREER Award

\$220K

8/1/1998- 7/2002

Raghu K. Machiraju

Parallel programming paradigms for distributed memory and distributed-shared memory parallel computers.

University of Maryland

\$75K

11/1/2000-10/31/2001

Ponnuswamy Sadayappan

Principles of Distributed Component-Based Software

National Science Foundation

\$499K

1/1/2000-1/1/2002

Tim J. Long

Program Directorship of the Operating Systems and Compilers Program.

National Science Foundation Computer Comprehensive Research

\$385K

9/1/1998-8/13/2001

Mukesh Singhal

Providing QoS in Next Generation Satellite Networks

Collaborative Core Research Program 2000
\$100K
2000-
Arjan Durreesi

QoS over Satellite Networks

NASA
\$130K
10/1/1999-9/1/2000
M. Atiquzzaman
Raj Jain

Robust Geometric Computations under Finite Precision for CAD/CAM and Solid Modeling

AICTE, Government of India
Rs. 5,000,00.
1997-2000
Tamal K. Dey

Scalable Communication Support on SMP Clusters for Network-Based Computing

Ohio Board of Regents
\$85K
7/1/2000-6/1/2002
Dhabaleswar K. Panda
P. Farrell

Scalable parallel solution of Navier Stokes equations

Ohio Aerospace Institute
\$48K
1/1/2000-12/31/2000
Ponnuswamy Sadayappan

Stackable Middleware Services for Advanced Multimedia Applications

Department of Energy - Next Generation Internet Program
\$736K
7/1/1999-7/1/2002
Wu-Chi Feng
Roger A. Crawfis
Bruce W. Weide

Stackable middleware services for multimedia applications.

Dept. of Energy
\$245K
7/15/1999-7/14/2001
Wu-Chi Feng
Roger A. Crawfis
Bruce W. Weide

Stochastic modeling of visual patterns: From descriptive to generative methods.

National Science Foundation
\$65K
6/1/2001-5/31/2002
Song Chun Zhu

Subcontract for Computing Research Association distributed mentor project.

Computing Research Association
\$13K
9/1/1998-8/31/2001
Mary J. Harrold

The application of flow analysis to DC3 and coverage compliance.

The Boeing Company
\$200K
3/10/1998-12/31/2001
Stuart H. Zweben

The Ohio State University Partnership: Improving the quality of higher education programs for students with disabilities

Dept. of Education
\$3K
9/13/1999-9/12/2001
Margaretha V. Izzo
Wu-Chi Feng

Three-dimensional volume visualization of multi-variate data

National Science Foundation CAREER Award
\$216K
1/1/1999-1/1/2003
Roger A. Crawfis

Traffic management in IP networks

National Science Foundation Computer & Information Science
\$120K
10/1/2000-9/30/2001
Raj Jain

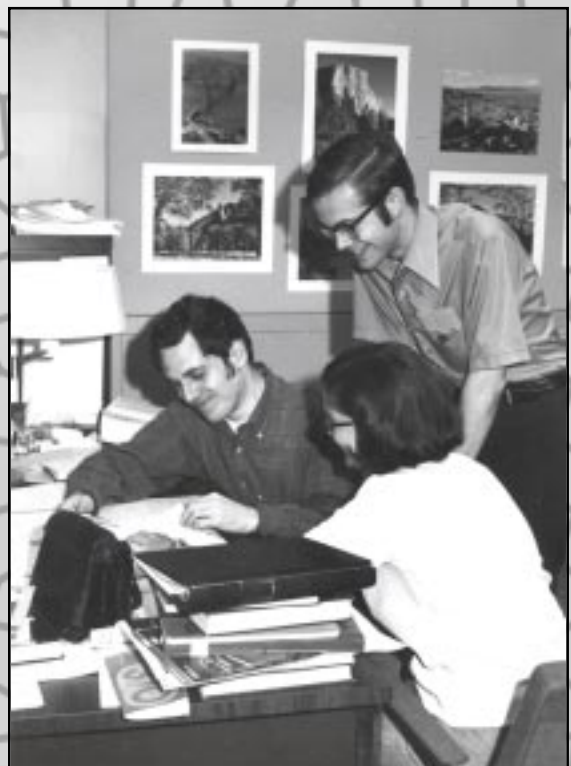
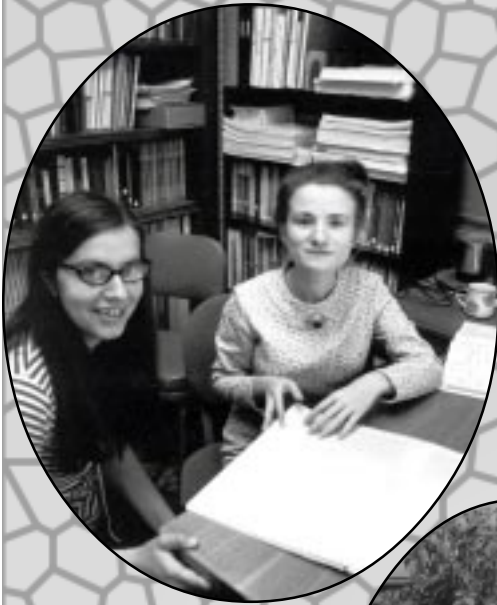
Traffic management on next generation satellite networks with on-board processing.

Ohio Aerospace Institute
\$73K
1/1/2001-6/30/2002
Arjan Durreesi

*U.S. attendance at the International Dagstuhl
Seminar on self-stabilization.*
National Science Foundation Computer Comprehen-
sive Reseach
\$12K
8/1/1998-1/31/2001
Anish K. Arora

*Value of glycolipids for classifying human
gliomas*
National Cancer Institute
\$345K
12/1/1997-9/30/2001
Sandra A. Mamrak
Allan J. Yates, Dept. of Pathology

STUDENTS



*Betty Mathis,
PhD '68, with an
unknown student.*

*Ph.D. graduate, Pete Angeline and his
daughter, Rebecca, at Autumn graduation,
December 1993.*

*Scott King
(Ph.D., Spring 01) with
his son Graham.*

*Doug Roble, Ph.D. 1993, works with a
student on a graphics program.*

*In the hall of Dreese students create
impromptu study groups. Spring 2001*

*In the summer of 1972, Richard Baum,
Ph.D. 1975, reviews work with fellow
students Bill Stalcup and Jo Harbold.*

UNDERGRADUATE & GRADUATE PROGRAMS

The Department offers undergraduate degrees through three colleges: Engineering, Arts and Sciences and Business. Each of these degree programs is carefully tailored to provide the perspective on computing appropriate to the college in which it is offered. Students from any college may also earn a minor in Computer and Information Science (CIS). The CIS Undergraduate Degree Programs brochure describes in detail each of its programs and is available through the Undergraduate Office of Academic Advising in the Department.

Commitment to graduate instruction remains high and the quality of those admitted remains among the best in the country. Master and Doctorate degrees are offered with an emphasis on specialized research areas. Additionally, students may pursue a dual masters degree in CIS and Biomedical Communications.

Additional information describing the Undergraduate, M.S. and Ph.D. programs is available in the Department's main office or at <http://www.cis.ohio-state.edu>.

CURRENT STATUS AND STATISTICS

The number of students taught in all courses during the July 1, 2000 - June 30, 2001 academic year was 14,278.

The Graduate Program was exceptionally busy. We received 857 applications for graduate admissions to the Autumn 2000 quarter. The Department accepted 99 for admission and 50 of those joined the Department; 35 being supported. Graduate student enrollment, new and in process, was 157. Research grants and departmental funds supported 130 of these students. Entering graduate students scores on the quantitative graduate record examination averaged as: verbal = 630; quantitative = 772; analytical = 742. Their mean grade point average was 3.74.

The support of instruction was our greatest challenge. As industry demands employees with technological expertise, more and more of our faculty and advanced students are lured away from the academic community with unprecedented salaries. Teaching these large numbers of students was accomplished with 29 full time faculty members, eight full-time lecturers and sixteen part-time lecturers. The Faculty Search Committee is putting forth a major effort to find qualified professors.

COURSE OFFERINGS

Currently, there are 71 courses offered by the Department with 22 specifically directed toward undergraduates and 20 designated as graduate courses. A list of the current courses offered by the Department can be obtained from the main office in 395 Dreese Labs. A free copy of the *CIS Course Descriptions: Computing Courses* is also available through the Undergraduate Office of Academic Advisement. A general listing of the courses offered may also be found in the Reports section of this volume or at <http://www.ureg.ohio-state.edu/courses>.

Undergraduate Honors Program

The CIS portion of the Honors Program consists of a two-course sequence: CIS H221 Software Development using Components and CIS H222 Development of Software Components.

Undergraduate students with exceptional ability and potential are encouraged to enroll in Honors courses, with the expectation that they will find additional challenges and stimulation to enhance their technical skills and broaden their knowledge of computer science.

STUDENT ORGANIZATIONS

We have several student organizations.

Upsilon Pi Epsilon

ACM

IEEE

The Opensource Club

These are very active organizations and offer students many opportunities for social interaction.



This year UPE held a new event. A trivia quiz game featuring the faculty versus students! Faculty participants were: (l-r) Doug Kerr; Stu Zweben, Wuchi Feng, Paolo Sivilotti. The students were Scott Pike, Patrick Coleman, Matt Gates & Daniel Kiracofe.

As the editor likes her job, the score will not be revealed here. Suffice to say, the students proved that they are studying hard.



DOCTORATES AWARDED

NAME	ADVISOR	HOME
DISSERTATION TITLE		
POST-GRAD LOCATION		

Summer 2000

Cho-Yu (Stephen) Chiang	Dr. Ming Tsan Liu	Taiwan, R.O.C.
"On Building Dynamic WEB Caching Hierarchies"		
- TELCORDIA, Newark, NJ		

Stephen Fridella	Neelam Soundarajan	Chantilly, VA
"Incremental Specification and Verification of Object Systems"		
EMC Corp., Hopkinton, MA		

Jianping Jiang	Huainan, P.R.C.	Ten-Hwang Lai
"Resource Management and Protocol Design in Wireless Mobile Networks"		
Advanced Micro Devices - San Jose, CA		

Jun Xu	Mukesh Singhal	Shanghai, P.R.C.
"Security Mechanisms in High-Speed Networks"		
- Georgia Tech, Atlanta, GA		

Autumn 2000

Mohammad Banikazemi	Dr. Dhabaleswar K. Panda	Tehran, Iran
"Design and Implementation of High Performance Communication Subsystems for Clusters"		
IBM, Yorktown Hts., NY		

Lawson Wade	Dr. Richard E. Parent	Columbus, Ohio
"Automated Generation of Control Skeletons"		
- Ryan Int'l Corp., Columbus, OH		

Spring 2001

Jian Huang	Dr. Roger A. Crawfis	Nanjing, P.R.C.
"A Prototype High-Quality Latency Hiding Remote Volume Visualization System"		
U Tennessee, Knoxville, TN		

Scott Alan King	Dr. Richard E. Parent	Columbus, Ohio
"A Facial Model and Animation Techniques for Animated Speech"		
Ohio State		



*New Doctors of Science.
Left photo, Lawson Wade.
Right photo,
Jian Huang & Scott King*



MASTERS

NAME	UNDERGRADUATE/ OTHER DEGREES	HOME
<i>Summer 2000</i>		
Vijay Chandra Madhavapeddi	B.Engineering Omania University; Hyderabad, India	Hyderabad, India
Yusaku Sako	B.S. The Ohio State University	Kawagoe, Japan
Amit Singhal	B.Tech Indian Institute of Technology; New Delhi, India	Delhi, India
Rong Wang	B.S. & M.S. Lanzhou University, P.R.C.	Qingdao, P.R.C.
Christine Scherer Wolfe	B.S. University of Pittsburgh, Penn., USA	Sugar Grove, OH
Seung Koo Yang	B.Engineering Hong-Ik University, Sough Korea	Seoul, South Korea
<i>Autumn 2000</i>		
Mihail Relu Chirita	Diploma Univeritatea in Bucuresti	Columbus, OH
Barbara L. Olsafsky	B.A. Hiram College	Fairview, OH
Achieng' Alvis Reggy	B.A. Wellesley College	Nairobi, Kenya
Chris Fankhauser	B.S. The Ohio State University	Kent, OH



Masters Graduate Achieng' Reggy and her husband Alan Beane prepare for their rounds of post graduation interviews. Alan was a CIS part-time lecturer and Civil Engineering Masters grad.

Winter 2001

Kiran Annavarapu	B.Engineering Osmania University, Hyderabad	Columbus
Rakesh Arora	B.Engineering University of Allahabad	Karnal, India
Darshan Garimella	B.S. Jadavpur University	Calcutta, India
Thiagaraja Bharathkumar Gopalsamy	B.Engineering Anna University	Kovilpatti, India
Naveen Leekha	B.Tech Indian Institute of Technology - Kharagpur	Bhiwani, India
Qiming Luo	B.S. University of Science and Technology of China	P.R.C.
Arindam Paul	B.Tech Indian Institute of Technology - Kanpur	Calcutta, India
Zhi Yao	B.S. University of Science and Technology of China	P.R.C.

Spring 2001

Jason Allen Bryan	B.S.C.S.E. Ohio State University	Lakewood
Nikhil Vijay Chandhok	B. Engineering University of Pune	Pune, India
Kalin Valentinov Dimitrov	B.S. West Virginia Wesleyan College	Sofia, Bulgaria
Abhishek Gulati	B. Engineering University of Delhi	Guragon, India
Robert Maurice Joseph	B.S.C.S.E. Ohio State University	Fremont
Vijay Vss Kota	B. Tech. Indian Institute of Technology - Madras Diploma Indian Institute of Management	Secunderabad, India
William Milo Leal	B.A. University of California - Berkeley M.S. University of South Alabama	Athens

Spring 2001 Masters List con'td.

Alexander Matey	B.S.	Vel Berezni, Ukraine
	National Tech. University of Kyiv	
Sheetal Bipin Pole	B. Engineering	Pune, India
	Maharashtra Institute of Technology	
Gokul Ramasubramanian	B. Engineering	New Delhi, India
	University of Roorkee	
Srinivasan Seetharaman	B. Engineering	Chennai, India
	Birla Institute of Technology and Science	
Pakaj Sethi	B. Tech	New Agra, Agra, India
	Indian Institute of Technology - Kharagpur	
Hakeem Olaokun Shittu	B.S.	Xenia
	Wilberforce University	
Kulathumani Vinodkrishnan	B. Engineering	Mumbai, India
	University of Mumbai	
Zonghui Xue	B.S.	Columbus
	University of Science and Technology of China	

Masters Spring 2001 graduates. From the top: Vinodkrishan Kulathumani; Alexander Matey; Srinivasan Seetharaman. Bottom picture (l-r) Gokul Ramasubramanian and Sheetal Pole.



Summer 2001

College of Arts & Sciences

Andrew John Baxter
Jong Wuk Choi
Kosha Murji Gada
James Gerung
Shawn Patrick Gilliland
Yunhua Gu
Michael Eric Hagesfeld
Hyun Wook Kim
Sung Jin Kim
Sean E. Lavelle
Jason Allen Lewis
Se-Hee Oh
Hitesh N. Patel
Julie Victoria Shamash
Nathan Robert Smith
Angela Marie Sparrow
Mark Alexander Struble
Jeffrey Richard Wisniewski

College of Business

Ping-Lang Chu
Catherine DeMarco
Gene Ho
Li-Chiung Hsu
Djoko Jaya
Sean Kiner
Vivian Li Syenni Santosa
Anna Sminchak
Frederick Solis
Gregory Stipek
Handoko Tanumihardj
Diana Theresia

College of Engineering

Kiah Seng Chiam
Vincent M. Conaway
Lance E. Earwood
Gregory P. Forret
Ryan A. Fortman
Yee-Hui Hew
Susan R. Hohenberger
Julie Lynn Estepp Krebs
Erik W. Niklas
Yashesh Patel
Kevin J. Riley
Anthony L. Roberts
Sehat Rosny
Rene G. Sandoval
Stephanie A. Smith
Michael Steve
Vishnu Vardhan Reddy Vaka
Chinh Cong Van
Jay S. Young



Autumn 2000

College of Arts & Sciences

Joseph Beckett Atzberger, magna cum laude
Pradeep Kumar Bhandari
Chui Pik Chan
Michael Paul Chizmar
Scott Matthew Coplin, summa cum laude
Steven Francis DeWalt
Arnold M. Fouts II
Ruchita Goble
David Michael Gordon
Todd Jason Griffin
Luk Lau
Chan-Sun Lee
Parisa Massah
James Bannigan McDade
Robert James Nedved
Matthew Ryan Parrish, cum laude
Jeffrey Neil Polak
David Pranata
Yi Qu
Cynthia Colby Rampersaud, magna cum laude
Kevin Wade Richardson, summa cum laude
Michael Arthur Schneider
Barbara Isabella Taylor, magna cum laude
Anthony William Vaughn

College of Business

Ji-Feng (Jeff) Cheng
Manish Shirish Engineer
Jason Mark Fox, summa cum laude
Robert Paul Greathouse
Michael Allen Hagerman
Sangsoo Han
Kyuwoon (Leon) Hwang, cum laude
Yasumichi Iwamoto
Anthony L. Jayme
Chun-Yu (Douglas) Leung
Yu-Heng Liu
Akira Okada, cum laude
Gregory Matthew Petros
Farhan Yusuf Shaikh
Amar A. Zumkhawala

College of Engineering

Thomas Alspach
David Levin
Yinwei Lin
Daniel Loeffler
Johan Lumanto
Melissa Monter
William Pranoto
Florence Pratiwiha
Patrick Rogers
David Shearer
Debby Shen, cum laude
Irina Shmukler
Viseth Singhsac
Julie Stanich, cum laude
Suwandy
Chad Thobe
Susan Tjiptorah
Anton Wijaya
Fitria Wijaya

College of Arts & Sciences

Justin Charles Adams
Brian Jeffrey Bayer
Rumi Sabina Bhuiyan
John Michael Burich
Hsiao-Tung Cheng
Alex Chuan-Lung Chia
Jing Du
Meghan Frazer
Pat R. Gunn
laude
Brian William Hadfield
Do-Hyung Kim
Luk Lau
Sravanthi Mattupalli
Kurt Robert McDowell
Errol Perez Milambiling
Jun Moh
Shaun Monroe Russel
Sonia Rahman Shoma
James Edward Simpson, Jr.
Jonathan Jay Sinsel
Barbara Marie Sliemers
Shanthi Swaminthan
Ying Tao
Christopher E. Vanek
Wayne Arthur Wolfe
Amy Marie Yarges

College of Business

Thomas AnderschatJohn
Jeffrey Carbol
Janie Renee Cummings
John Rex Fagan
Akhil Goel
Sung-il Ha, magna cum laude
Wei Hu
Sarah Hundemer, summa cum laude
Sianny Irawati

Dewan Islam
Gyong-Jang Kim
Suyanto Kim
Shihmei Lin
John William Py, cum laude
Dennis Sarip
Tejal J Shah
Jason Shields, cum laude
Jung-Hyun Son
Joshua Stratton

College of Engineering

Michael Bledsoe, cum laude
Jeremy Daniel Derenberger
Silvia Rossina Gaido
Jason Christopher Gleim
Scott Duston Heltkamp, cum laude
Mayya Malkiman
Reshma J. Radia
Lee Charles Rose
Steven Wayne Schenking magna cum



Now that's an unusual way to spend the processional waiting time ~ signing autographs! Eddy George of the NFL Tennessee Titans graciously signed programs, shook hands and posed for pictures. Admittedly, he isn't a CIS grad, but he is a College of Engineering alum! He received a BS in Landscape Architecture.

Arts & Science

Terry Richard Beall
Defne Berme
John Francis Bialek II
Samuel John Brey
Terry Luke Camerlengo
Shawn Patrick Carr
Brian Douglas Coates
Shawn Christopher Craft
Aleksandr Dubinskiy
Todd M. Duncan
Jianwen Alex Feng
Ryan Bradley Giessl
Nathaniel W. Gorenflo
Jason Robert Hubbell
Ahmar Jamal
Joseph Edward Johnston
John Raymond Justice
Jennifer Molsberry Kannen
Barna Kasa
Rodney Matthew Louk
David Macaulay
Cem Marifet
Rupal Mukul Mehta
John D. Mizanin, Jr.
Samuel Fast Morris
Tyler John Neylon
Sehul N. Patel
Mien Kwa Siao
Zena Yasmin Srivatsa
David Sutedja
Christopher John Vojticek
Thomas Gerald Vu
James Arthur Daniel Watson
William Lee Weddendorf
Lei Zhao

Business

Sheila Sue Armor
Robert Paul Benson
Douglas Thomas Carr
Nicholas B Castelluccio
Lindra Chandra
Michelle Lynn Chau
Alefiya K Chhatriwalla
Hiroshi Chujo
Sean Eric Clark
Maya Purnama Dewi
Chao Tsai Fang
Andrew James Frankart
Tami Marie Goens
Lynda D Harper
Sandy Harrison
Tedy Hartono
Eric S Huebschman
Jay Jeffrey Klauminzer II
Ryan John Kluczynski
Nicholas Stephen Kovalchik
Rudy Kristanto
Amy Lynne Kuck
Kathryn Michelle Lamp
Michael Steven Leininger
Ryan Joseph Leszczynski
Wesley Shawn Lovett
Anup Madampath
Susiwaty Martono
Adam W Marzi
Samir Vasant Parikh
Jana Marie Risley
Andrew Lee Ro
Abhishek Sindhwani
Michael P Tanyusheng
Suzanne Michelle Tate
Teharmin
Li-Chung Tien

Engineering

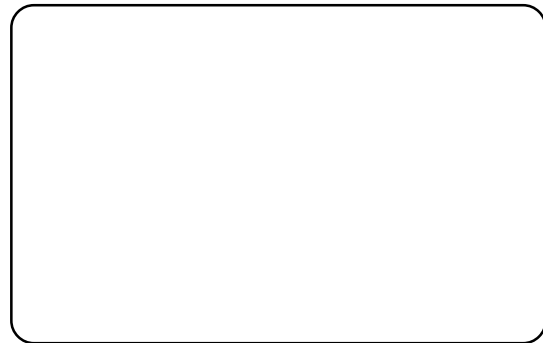
David Benjamin Bonnette
Jeremy Albert Boyer
Theodore Paul Branham Jr.
Ryan Eugene Broyles
Joseph Lorenzo Carter III
Dmitriy B. Chernyak
Jason R. Chester
Michael M. Chou
Yuan Li Fei
Matthew L. Forsythe
Jay Peter Grayson
Nathaniel Lee Hoening
John Eldon Houchard
David Satoru Idemoto
Jeffrey Steven Imes
Jason Kenneth Lambert
Bejanmin Erik Larson
Gary Scott Lerhaupt
Jason Lesh
David Scott Lewis
Gabriel Tomas Luciano
William Lawrence Malee
Gregory Thomas Marcinko
Adam Christian Mattern
Gregory Paul McDonough
Michael Shane McNally
Steven P. Miller
Adam Thomas Moody
Ernest John O'Green
Christopher L. Oklota
Amit Dilip Patel
Woodrum Edward Pattern
Bradley Thomas Penoff
Nicole Christine Perdue
Darunee J. Phensuvabharp
Jason Andrew Pontious
Charles Anthony Retzler
Jerry Edward Rocco
Stephen E. Shanks
Samuel K. Song
Daniel Bozidar Stanojevic
Amy Rachelle Abenoja Teleron
Michael Randolph Videkovich
Jacob Edward Yackenovitch



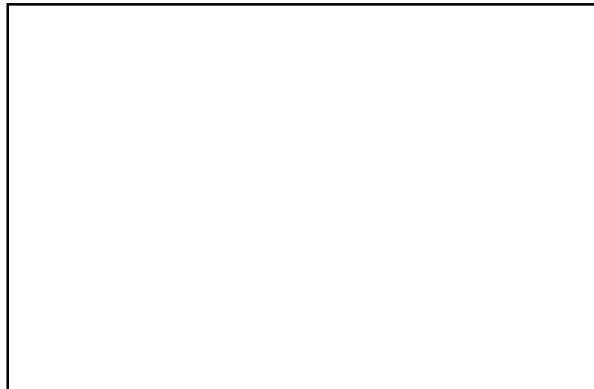


Undergraduate advisors Katherine Titus-Becker and Peg Steele with Spring 2001 Graduate Jeff Imes. Katherine and Peg get to know many of the undergrads and leave lasting impressions.

Paolo Bucci demonstrates basic programming to Archana Pillay. Ms. Pillay was an undecided incoming student interested in Engineering. During the Women in Engineering Exploring Engineering program, young women are given an overview of the different areas within the College.

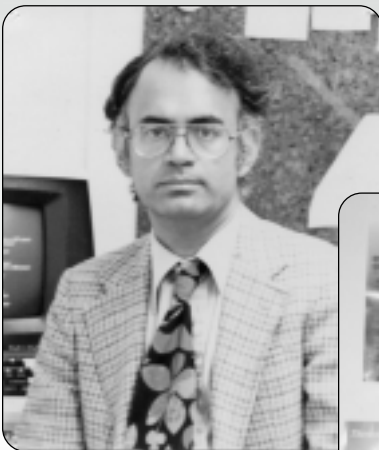


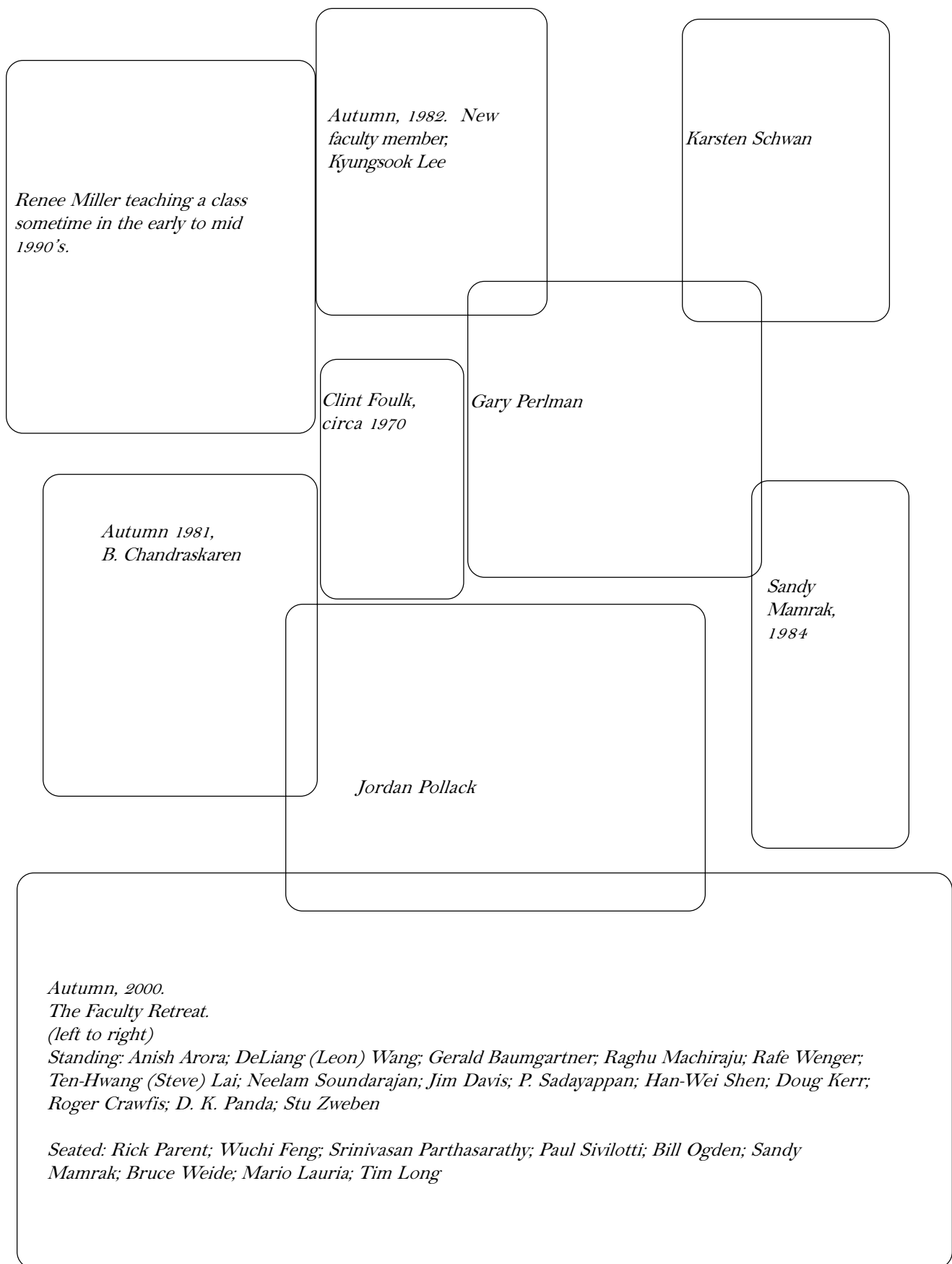
In 1994, Upsilon Pi Epsilon held it's Autumn initiation in the Garden of Constants.



Grad and undergraduate students alike always show and enjoy the camaraderie - and the free food at a UPE pizza party! ~Autumn 2000

FACULTY & RESEARCH PERSONNEL







ANISH ARORA

Associate Professor

B.Tech., Computer Science and Engineering, Indian Institute of Technology, New Delhi, 1986; M.S., Computer Science, University of Texas, Austin, 1988; Ph.D., Computer Science, University of Texas, Austin, 1992.

I lead a research group on Dependable Distributed and Networked Systems. The group works on the foundations of fault-tolerance, security, and timeliness properties, develops design, verification, and implementation methods, and builds prototypes of dependable systems for new application areas.

We are especially interested in discovering new methods for scalable dependability, as well as in characterizing the differences between reasoning about system correctness versus reasoning about systems dependability.

I was on sabbatical leave this past academic year: during Summer 1999, I was at Telcordia and EPFL, Lausanne, and during September 1999-September 2000, I worked in the Systems and Networking Group at Microsoft Research in Redmond, WA.

Selected Publications

S. Kulkarni and A. Arora. "Automating the Addition of Fault-Tolerance. Formal Techniques in Real-time and Fault-Tolerant Systems," *FTRTFTS 2000*, Pune, India, 2000.

A. Arora and S. Kulkarni. "Designing Masking Fault-Tolerance via Nonmasking Fault-Tolerance," *IEEE Transactions on Software Engineering*, Vol. 24, No. 6, 435-450,



**GERALD
BAUMGARTNER**

Assistant Professor

Dipl.-Ing. (equiv. to M.S.), Computer Science, Johannes Kepler University, Linz, Austria, 1988; M.S., Computer Science, Purdue University, 1992; Ph.D., Computer Science, Purdue University, 1996.

The aim of my research is to make programmers' life easier by giving them better languages and better software engineering tools.

For improving object-oriented software development, we are designing the language Brew as a successor language of Java. The goals are to provide support for the implementation of design patterns, for functional programming, and for mobility. We are also investigating techniques for debugging object protocols.

Certain computational chemistry and computational physics applications have a very regular computational structure. We are working on developing a domain-specific language that allows scientists to write their algorithms in their high-level notation. A compiler for this language will then generate efficient C code.

We are also developing a virtual testbed for a digital signal processor (DSP) that allows executing programs on an actual DSP while simulating the electrical and mechanical devices attached to the DSP. This allows debugging of DSP code and teaching embedded systems programming without having peripherals attached to the DSP.

Selected Publications

G. Baumgartner, M. Jansche, K. Läufer, "Support for Functional Programming in Brew." In Proceedings of the ECOOP 2001 Workshop on Multiparadigm Programming in OO Languages," Budapest Hungary, June 2001.

D. Cociorva, J.W. Wilkins, C. Lam, G. Baumgartner, P. Sadayappan, J. Ramanujam, "Loop Optimizations for a Class of Memory-Constrained Computations." In Proc. of the International Conference on Supercomputing '01, Sorrento, Italy, June 2001.

S. Butkevich, M. Renedo, G. Baumgartner, M. Young, "Compiler and Tool Support for Debugging Object Protocols." In Proc. of the 8th International Symposium on the Foundations of Software Engineering San Diego, CA, November 2000.



ROGER CRAWFIS

Assistant Professor

B.S., Computer Science and Applied Mathematics, Purdue University, 1984; M.S., Computer Science, University of California, Davis, 1989; Ph.D., Computer Science, University of California, Davis, 1995.

My primary research interests lie in the areas of computer graphics, scientific visualization, medical imaging, image-based rendering for scientific visualization and volume rendering. We have been investigating new techniques for representing and rendering three-dimensional scalar and vector data. We have been investigating a decoupled framework for very large or complex renderings, where a high performance rendering engine is used to compute partial renderings that are then streamed across the network to a local client machine. This local client utilizes a commodity graphics board to interactively walk-thru this complex scene. The high-end rendering engine has currently focused on a parallel implementation on a cluster of workstations. For time-varying or multi-dimensional data, we are also examining new techniques for encoding and representing four-dimensional iso-surfaces.

Selected Publications:

- Camuto, M., Becker, B. and Crawfis, R. (2000) In *IS&T/SPIE Electronic Imaging 2000*, San Jose, CA.
- Crawfis, R., Max, N. and Becker, B. (1994) *IEEE Computer Graphics & Applications*, , 50-56.
- King, S., Crawfis, R. and Reid, W. (1999) In *Volume Graphics '99*, Vol. 2 Swansea, UK.
- Mueller, K., Huang, J., Shareef, N. and Crawfis, R. (1999) *IEEE Transactions on Visualization and Computer Graphics*, 5, 116-134.
- Rudman, D. T., Stredney, D., Sessanna, D., Yagel, R., Crawfis, R., Heskamp, D., Charles V. Edmond, J. and Gegory J, W. (1998) *The Laryngoscope Journal*, .



JAMES W. DAVIS

Assistant Professor

B.S., Computer Science, University of Central Florida, 1994; M.S., Media Laboratory, Massachusetts Institute of Technology, 1996; Ph.D., Media Laboratory, Massachusetts Institute of Technology, 2000

My current research interests include the perceptual recognition of human motion from both computational and cognitive viewpoints. In particular, how do we bestow into computers the ability to recognize our movements in the world that have meaning, intention, and expression? I approach this problem from a computational standpoint with the belief that there exist structures, regularities, and modes within human movements that offer a reliable means to constructing representations for robust "motion categorization". The applied significance for this work relates to automatic visual surveillance and monitoring, video content understanding, perceptual user interfaces, and human-computer interaction.

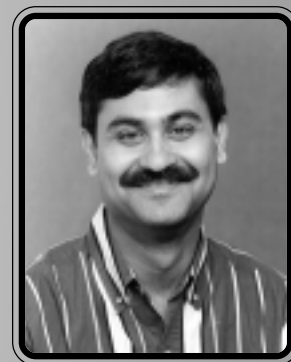
Selected Publications

- J.W. Davis, "Visual categorization of children and adult walking styles," *International Conference on Audio- and Video-based Biometric Person Authentication*, Halmstad, Sweden, June 6-8, 2001.
- A.F. Bobick and J.W. Davis, "The recognition of human movement using temporal templates," *IEEE Trans. on Pattern Analysis and Machine Intelligence*, Vol. 23, No. 3, pp. 257-267, 2001.
- C.S. Pinhanez, J.W. Davis, et al., "Physically interactive story environments," *IBM Systems Journal*, Vol. 39, No. 3/4, pp. 438-455, 2000.

My research focuses on designing efficient algorithms for geometric problems that arise in applications. In particular, I am interested in the geometric problems that are encountered in the areas of computer graphics and geometric modeling. Currently, I am focusing on the shape modeling questions such as how to reconstruct curves and surfaces from their samples, how to simplify these reconstructed models and how to extract features out of these models. This set of questions is generic in that they appear in various forms over a wide range of applications such as medical imaging, solid modeling, CAD/CAM, meshing and so on. I believe that a synergy between mathematical disciplines such as differential geometry, differential topology, discrete geometry and computational disciplines such as computational geometry, numerical methods would achieve significant advances on shape modeling questions. My research pivots around this idea. See <http://www.cis.ohio-state.edu/~tamaldey> for more details.

Selected Publications

- T. K. Dey and J. Giesen. Detecting undersampling in surface reconstruction. Proc. 17th ACM Sympos. Comput. Geom. (2001).
- H.-L. Cheng, T. K. Dey, H. Edelsbrunner and J. Sullivan. Dynamic skin triangulation. Proc. 12th ACM-SIAM Sympos. Discr. Algorithms, (2001). Also to appear in Discr. & Comput. Geometry.
- S. W. Cheng, T. K. Dey, H. Edelsbrunner, S. H. Teng. Sliver exudation. Proc. 15th ACM Sympos. Comput. Geom., (1999), 1-13. To appear in Journal of ACM, 2001.
- T. K. Dey and R. Wenger. Reconstructing curves with sharp corners. 16th Symposium on Computational Geometry, (2000), 233-241. Also to appear in Comput. Geom. Theory and Application.
- T. K. Dey, K. Mehlhorn and E. Ramos. Curve reconstruction: connecting dots with good reason. Computational Geometry: Theory and Applications, Vol. 15, (2000), 229-244.
- N. Amenta, S. Choi, T. K. Dey and N. Leekha. A simple algorithm for homeomorphic surface reconstruction. 16th Symposium on Computational Geometry, (2000), 213-222. Also to appear in Intl. J. Comput. Geom. & Applications.



TAMAL DEY

Associate Professor

B.E., Electronics, Jadavpur University, 1985; M.Tech., Computer Science, Indian Institute of Science-Bangalore, 1987; Ph.D., Computer Science, Purdue University, 1991

My research interests lie broadly in the area of multimedia computing and networking. As multimedia applications that support audio, images, and video such as the world-wide-web and digital libraries continue to become more commonplace (and more complex), their efficient interaction with networks and computing systems will become increasingly important. My research has focused on the efficient network, architectural, and operating systems support for multimedia applications. More specifically, my research has focused on the efficient coding, transmission and decompression of variable-bit-rate video streams including:

- Scalable Multimedia Infrastructures
- Video-on-Demand Services
- Wireless Multimedia Transmission
- Network support for Stored Video Applications
- Video Compression Source Modelling

Please see <http://www.cis.ohio-state.edu/~wuchi> for further information.

Selected Publications

- A. Tosun, W. Feng, "Lightweight Security Mechanisms for Wireless Video Transmission", in Proceedings of the IEEE International Conference on Information Technology: Coding and Computing 2001, Las Vegas, Nevada, April 2001.
- A. Agarwal, W. Feng, C. Wolfe, "A Multi-Differential Video Coding Algorithm for Robust Video Conferencing", in Proceedings of the SPIE Voice, Video, and Data Communications Conference, Boston, Massachusetts, November 2000.
- A. Tosun, W. Feng, "On Improving Quality of Video for H.263 over Wireless CDMA Networks", in Proceedings of the IEEE Wireless Communications and Networking Conference, Chicago, Illinois, September 2000.



WU-CHI FENG

Assistant Professor

B.S., Computer Engineering, Penn State University, 1990; M.S., Computer Science and Engineering, University of Michigan, 1992; Ph.D., Computer Science and Engineering, University of Michigan, 1996.



EITAN M. GURARI

Associate Professor

*B.S., Physics, Technion-Israel
Institute of Technology,
Israel, 1971; M.S., Computer
Science, Technion-Israel
Institute of Technology,
Israel, 1974; Ph.D., Com-
puter Science, University of
Minnesota, 1978.*

My current work is in the area of hypertext authoring. My past research interest has been primarily in the areas of theoretical computer science, literate programs, and programmed figures.

Selected Publications

M. Goosen and S. Rahtz with E. Gurari, R. Moore, and R. Sutor, "The LaTeX Web Companion", Addison-Wesley, 1999.

E. Gurari, "TeX and LaTeX: Drawing and Literate Programming", McGraw-Hill, 1994

E. Gurari, "An Introduction to the Theory of Computation", Computer Science Press – an imprint of E. H. Freeman, 1989.



RAJ JAIN

Full Professor

*B.E., Electrical Engineering;
A.P.S. University, India,
1972; M.E., Computer
Science & Controls, Indian
Institute of Science, 1974;
Ph.D., Computer Science,
Harvard University, June
1978.*

In recent years, demand for computer networking professionals has grown exponentially and so has our research program. We have one of the best research programs in the area of quality of service in computer networks. We work very closely with the industry on practical problems that are important to them and produce solutions that can be implemented. Our traffic management and performance testing research has influenced ATM Forum specifications and has been adopted by many ATM equipment manufacturers.

Our current research projects are in the area of quality of service and traffic engineering in TCP/IP networks, wireless networks, and IP over Optical networks. We are also experimenting with voice and video over the Internet by broadcasting our networking courses via the Internet. Please see <http://www.cis.ohio-state.edu/~jain/> for further information on our research.

Selected Publications

S. Kalyanaraman, R. Jain, S. Fahmy, R. Goyal, and B. Vandalore, "The ERICA Switch Algorithm for ABR Traffic Management in ATM Networks," IEEE/ACM Transactions on Networking, February 2000.

R. Goyal, R. Jain, S. Kota, M. Goyal, S. Fahmy, B. Vandalore, "Traffic Management for TCP/IP over Satellite-ATM Networks," IEEE Communications Magazine, March 1999.

R. Jain, "Congestion Control and Traffic Management in ATM Networks: Recent Advances and A Survey," Computer Networks and ISDN Systems, Vol. 28, No. 13, October 1996, pp. 1723-1738.

Liu, C., Jain, R., "Improving Explicit Congestion Notification with the Mark-Front Strategy," Computer Networks, Vol. 35, No. 2-3, pp. 185-201, Feb. 2001 <http://www.cis.ohio-state.edu/~jain/papers/ecnfront.htm>

My research interests are in the database area, particularly database machines and performance management. I have been involved in the design and implementation of a multicomputer database machine, called the Multi-Backend Database System (MDBS). The goal is to develop an architecture that allows a database to grow without having to obtain larger and larger mainframes, but instead adding more backends.

Recently, I have extended my interests to the problem of file service in a workstation environment such as the one being developed here at OSU. I think this problem is an interesting extension to the one of database machines. In particular, we are looking at performance measurement and benchmarking using our workstations.

My third interest is in the problems of software engineering at the practical level. We have been using several software engineering techniques in the implementation of MDBS and found some to be quite useful.

Selected Publications

M. Fortin and D. Kerr, "A Method to Determine Page Reference Patterns in a Monitored Computer Process," Proceedings of the Pittsburgh Conference on Modeling and Simulation, Pittsburgh, PA, May 1991, pp. 1514-1520.

M. Fortin, S. Kao, and D. Kerr, "Benchmarking Workstations from the User's Perspective: Taking into Account the Environment," Proceedings of the Pittsburgh Conference on Modeling and Simulation, Pittsburgh, PA, May 1989, pp. 861-869.



DOUGLAS S. KERR

Associate Professor

B.A., Mathematics, Yale University, 1962; M.S., Mathematics, Purdue University, 1964; Ph.D., Computer Science, Purdue University, 1967.

My research interests are in

- Wireless networks and mobile computing
- Parallel and distributed computing
- Scheduling and resource allocation

Selected Publications

T. H. Lai and M. J. Sheng, "Triangulations on Reconfigurable Meshes: A Natural Decomposition Approach," *Journal of Parallel and Distributed Computing*, 30, October, 1995, pp 38-51.

Y. C. Tseng, D. K. Panda, and T. H. Lai, "A Trip-Based Multicasting Model in Wormhole-Routed Networks with Virtual Channels," *IEEE Transaction on Parallel and Distributed Systems*, 7, February, 1996, pp. 138-150.

T. H. Lai and M.J. Sheng, "Constructing Euclidean Minimum Spanning Trees and All Nearest Neighbors on Reconfigurable Meshes," *IEEE Transaction on Parallel and Distributed Systems*, 7, August 1996, 806-817.

X. Dong and T. H. Lai, "An Efficient Protocol for Call Setup and Path Migration in IEEE 802.6 Based Personal Communication Networks," *IEEE Transactions on Computers* 46, March 1997, pp. 326-336.



TEN-HWANG LAI

Full Professor

B.S., Mathematics, Fu-Jen University, Taiwan, 1972; M.S., Mathematics, Fordham University, 1976; Ph.D., Computer Science, University of Minnesota, 1982.



MARIO LAURIA

Assistant Professor

Laurea degree, Electrical Engineering, University of Naples, 1992; M.S., University of Illinois-Urbanna-Champaign, 1996; Ph.D., Electrical Engineering and Computer Science, University of Naples, 1997

My research interests cover different aspects of PC cluster technology - architecture, system software, applications. Current PCs have microprocessors that deliver processing rates in excess of 1 billion operations per second. Gigabit/sec speed networks (Myrinet, Giganet, Gigabit Ethernet) deliver low latency, high bandwidth communication and high throughput WAN connectivity. PC disks can be used to build inexpensive multi Terabyte storage facilities. My research focuses on how to integrate such off-the-shelf components into a single machine with supercomputer performance and enhanced I/O capabilities.

On the application side, I am interested to the challenges that novel classes of applications pose to the designer of machines for high end computing. Currently I am studying compute intensive Computational Biology problems involving large amounts of data such as genome assemblies, whole genome comparisons and multi-species phylogenetic studies.

Some of the ongoing or planned projects we are developing on our Myrinet interconnectd cluster cover the following topics: low overhead communication under Windows 2000 and Linux; parallel I/O libraries and file systems for clusters; high throughput access to remote clusters; multiple display for advanced scientific visualization; cluster-enhanced version of popular bioinformatic tools; integration of remote biological and medical databases (gene expression data, clinical/medical data).

Selected Publications

A. Chien, M. Lauria, R. Pennington, M. Showerman, G. Iannello, M. Buchanan, K. Connelly, L. Giannini, G. Koenig, S. Krishnamurthy, Q. Liu, S. Pakin, G. Sampemane "Design and Evaluation of an HPVM-based Windows NT Supercomputer", *The International Journal of High-Performance Computing Applications*, Vol. 13, No. 3, Fall 1999, pp. 201-219

M. Lauria, A. Chien. "MPI-FM: High Performance MPI on Workstation Clusters", *Journal of Parallel and Distributed Computing*, Vol 40, No. 1, January 1997



MING-TSAN (MIKE) LIU

Full Professor

B.S.E.E., Electrical Engineering, National Cheng Kung University, Taiwan, 1957; M.S.E.E., Electrical Engineering, University of Pennsylvania, 1961; Ph.D., Electrical Engineering, University of Pennsylvania, 1964.

My research interests are in the area of distributed computing and computer networking, especially in a new emerging field, called Protocol Engineering.

Research on protocol engineering is concerned with specification, verification, implementation, and testing of computer-communication protocols. At our Protocol Engineering Research Laboratory (PERL), we have applied both software engineering methodologies and formal modeling techniques to protocol design. Currently, we are investigating formal models and algorithms for protocol conversion, ATM switch design, and protocol conformance testing for wireless networks and for multimedia communication.

Our research has been fruitful. In the past 20 years, we have produced 48 doctoral dissertations and published over 170 refereed papers in the literature.

Selected Publications

M. Liu, "Network Interconnection and Protocol Conversion," *Advances in Computers*, ed. M. Zelkowitz, Academic Press, Vol. 42, 123 pages, 1996.

J. Shu and M. Liu, "An Approach to Indirect Protocol Conversion," *Computer Networks and ISDN Systems*, Vol. 21, 1991, pp. 93-108.

M. Liu, "Protocol Engineering," *Advances in Computers*, ed., M. Yovits, Academic Press, Vol. 28, July 1989, pp. 79-195.

Over the last decade, the Reusable Software Research Group at Ohio State has developed RESOLVE: a conceptually robust and sound technology for the design, specification, implementation, verification, testing, and application of reusable software components. My current interests concern intergration of the RESOLVE technology into the undergraduate curriculum through a sequence of courses in software design and development, starting with the first programming course for computer science majors. Research issues concern not only the technical content of this sequence, but also the most pedagogically effective methods for development of student skills and knowledge.

Selected Publications

Long, T.J., Weide, B.W., Bucci, P., Gibson, D.S., Hollingsworth, J.E., Sitaraman, M., and Edwards, S.H.; "Providing intellectual focus to CS1/CS2." In Proceedings 29th ACM SIGCSE Technical Symposium on Computer Science Education, ACM, 1998, 252-256.

Long, T.J., Weide, B.W., Bucci, P., and Sitaraman, M.; "Client view first: an exodus from implementation-biased teaching." In Proceedings 30th SIGCSE Technical Symposium on Computer Science Education, ACM, 1999, 136-140.

Bucci, P., Long, T.J., Weide, B.W., "Do we really teach abstraction?" In Proceedings 32nd SIGCSE Technical Symposium on Computer Science Education, ACM, 2001, pp. 26-30.



TIMOTHY J. LONG

Associate Professor

B.S., Education, University of Cincinnati, 1972; B.A., Mathematics, University of Cincinnati, 1972; M.S., Computer and Information Science, The Ohio State University, 1974; Ph.D., Computer Science, Purdue University, 1978.

My research interests include graphics, visualization and computational methods. I am especially interested in multiscale methods for representation and compression of very datasets. Given the proliferation of datasets of extremely large sizes it is imperative that more efforts be expended on their analysis and representation and not just their display. The efforts of my group will in fact allow for more efficient rendering and visualization through a division of the dataset into ranked regions. The rank of a region measures either an application or user significance. The mainstay of this research is computational mathematics, signal processing, wavelets and compression. Additionally, I am also interested in the development of metrics to guide image synthesis and visualization. This work has allowed the specification of thresholds to guide the selection of levels-of-details (LoDs), parameters of visualization algorithms and essentially many inverse methods. The mainstay of this work includes feature detection, signal processing, geometry and image synthesis. My work has been funded by the National Science Foundation (including the CAREER award), Department of Defense, Mitsubishi Electric Research Laboratories and NASA. More details can be found at <http://www.cis.ohio-state.edu/~raghu>.

Selected Publications

Moeller T., Machiraju R., Muller K., Yagel R., "Evaluation and Design of Optimal Filters Using a Taylor Series Expansion," IEEE Transactions of Visualization and Graphics, Volume 3, Number 2, June, 1997, pp. 184-199.

Gaddipati A., Machiraju R., Yagel R., "Steering Image Generation Using Wavelet Based Perceptual Metric," Computer Graphics Forum, Vol. 16, No. 3, September 1997, pp. 241-251.

Machiraju R., Zhu Z., Fry B., Moorhead R., "Structure Significant Representation of Computational Field Simulation Datasets," IEEE Transactions of Visualization and Graphics, Vol. 4, No 2, June 1998.

Scoggins R., Machiraju R., Moorhead R., "Enabling Level-of-Detail Selection for Exterior Scene Synthesis," Proceedings of Visualization'00 (to appear).



**RAGHU
MACHIRAJU**

Assistant Professor

B.Sc., Electrical Engineering, Delhi University, 1982; M.S., Automation, Indian Institute of Science-Bangalore, 1984; Ph.D., Computer Science, The Ohio State University, 1996



**SANDRA A.
MAMRAK**

Full Professor

B.S., Mathematics, Notre Dame College of Ohio, 1967; M.S., Computer Science, University of Illinois, Urbana-Champaign, 1973; Ph.D., Computer Science, University of Illinois, Urbana-Champaign, 1975.

My current interest is in architectures to support web-based informations systems (WBIS) and object-oriented frameworks. I am cataloguing the myriad software components available for building WBISs and classifying the characteristics of applications that render them suitable for one WBIS architecture or another. Over the past several years we have designed, implemented and are maintaining a WBIS to support brain and oral cancer researchers. The input forms for the WBIS have been implemented using a framework-approach in which patterns of interaction among the objects are coded into the framework. We have been able to completely specify the patterns of interaction in this application, update to web-accessible relational databases, so that we can now automatically generate a new form.

Selected References

'The Object-JavaScript Language,' with D. Hennen and S. Ramachandran, *Software Practice and Experience*, Vol. 30, 2000, pp. 1571-1585.

'A Case Study: Productivity and Quality Gains Using an Object-Oriented Framework Approach,' with S. Sinha, *Software Practice and Experience*, Vol. 29, No. 6, 1999, pp. 501-508.



**WILLIAM F.
OGDEN**

Associate Professor

B.S., Mathematics, University of Arkansas, 1964; M.S., Mathematics, Stanford University, 1966; Ph.D., Mathematics, Stanford University, 1969.

My research is focused on the problem of providing a conceptually robust framework for software engineering. A major goal is increased productivity in software development and maintenance, and this in turn, depends on finding a suitable programming language mechanism to support the widespread reuse of software components. Available mechanisms such as the procedure mechanism in early languages, the class concept in Smalltalk, and the generic packages in Ada, for example, have proved adequate to the task.

If a reusability support mechanism is to be effective, it must make as easy as possible the creation of reusable components, which are fully functionally specified, permit efficient implementations, admit alternative implementations when performance tradeoffs are an issue, and support the verification of the correctness of their implementation. I am currently refining such a mechanism using as a test bed a collection of modules derived from a traditional algorithms and data structures course, and this project has led to a number of surprising insights into what were considered well understood subjects.

For example, it is now clear that for the sake of efficiency, a programming language that supports large, complex user-defined objects should provide swap operators ($:=$) in place of the traditional assignment operator ($:=$). The project has also developed important insights into the module design criteria. One is the modules should provide large operations such as "sort" only as secondary operations while the primary operations should be small ones such as "insert-item" and "remove-a-smallest-item."

Selected Publications

W. Ogden, G. Ernst, R. Hookway, and J. Menegay, "Modular Verification of Ada Generics," *Computer Languages*, Vol. 16, No. 3/4, 1991, pp. 259-280.

B. Weide, W. Ogden, and S. Zweben, "Reusable Software Components," *Advances in Computers*, ed., M. Yovits, Academic Press, 1991, oo, 1-65.

B. Weide, W. Ogden, "Recasting Algorithms to Encourage Reuse," *IEEE Software*, Sept. 94, pp. 80-88.

My primary research interests are in the area of network-based computing, interprocessor communication, parallel computer architecture, clustered and heterogeneous systems, and high-performance computing. My research groups, Network-Based Computing (NBC) and Parallel Architecture and Communication (PAC), are currently taking an integrated approach in designing high performance network-based computing systems by using modern networking technologies (Gigabit Ethernet, GigaNet, and Myrinet), communication standards (Virtual Interface Architecture (VIA) and InfiniBand Architecture (IBA)) and commodity PCs/workstations. Some of our on-going research projects are: scalable architectures for network-based computing, low-latency and high-bandwidth communication layer for network-based computing systems over LAN and WAN with VIA and IBA standards, scalable algorithms for collective communication, high performance and scalable implementation of programming environments (message passing and shared memory), and Quality of Service (QoS) support on modern networks. More details about the research projects can be obtained from <http://nowlab.cis.ohio-state.edu> and <http://www.cis.ohio-state.edu/~panda/pac.html>.

Selected Publications

- M. Banikazemi, B. Abali, L. Herger, and D. K. Panda, "Design Alternatives for Virtual Interface Architecture (VIA) and an Implementation on IBM Netfinity NT Cluster," *Journal of Parallel and Distributed Computing*, special issue on cluster computing, to appear.
- R. Sivaram, R. Kesavan, C. Stunkel, and D. K. Panda, "Architectural Support for Efficient Multicasting in Irregular Networks," *IEEE Transactions on Parallel and Distributed Systems*, Vol. 12, No. 5, May 2001, pp. 489-513.
- R. Sivaram, C. Stunkel, and D. K. Panda, "Implementing Multidestination Worms in Switch-Based Parallel Systems: Architectural Alternatives and their Impact," *IEEE Transactions on Parallel and Distributed Systems*, Vol. 11, No. 8, August 2000, pp. 794-812.



**DHABALESWAR K.
PANDA**

Associate Professor

B.S., Electrical Engineering, Indian Institute of Technology, India, 1984; M.S., Electrical and Communication Engineering, Indian Institute of Science, India, 1986; Ph.D., Computer Engineering, University of Southern California, Los Angeles, 1991.

My general research interests are in computer graphics and computer animation. I am currently writing a book on the subject based on notes from a seminar I teach. My particular interests are concerned with modeling and animating the human figure. The human figure is very complex and very familiar, making its modeling and animation a difficult and challenging task. We are addressing this in a variety of ways: 1) Artistic anatomy is used to more realistically model the human form; 2) motion capture can be used to animate the human figure but requires invasive instrumentation. We are trying to avoid that by recognizing human movement from raw video; 3) nuances in movement have been difficult to model. We would like to model the differences in movement because of age, sex, race, etc. The goal of realistic human figure animation is a very difficult goal to achieve; it also presents many opportunities for research. Some of my research is conducted in conjunction with the Advanced Computing Center for Art and Design (formerly the Computer Graphics Research Group), an interdisciplinary research group located within The Ohio State University with an international reputation in computer animation.

Selected web sites

<http://www.computeranimation.org>
<http://www.cis.ohio-state.edu/~parent/research/research.html>



**RICHARD E.
PARENT**

Associate Professor

B.S., Computer Science, University of Dayton, 1972; M.S., Computer Science, The Ohio State University, 1973; Ph.D., Computer Science, The Ohio State University, 1977.



**SRINIVASAN
PARTHASATHY**

Assistant Professor

*B.E., Electrical Engineering,
University of Roorkee, India,
1992; M.S., Electrical
Engineering, University of
Cincinnati, 1994; M.S.,
Computer Science, University
of Rochester, 1996; Ph.D.,
Computer Science, University
of Rochester, 2000*

My research interests lie broadly in the areas of data mining and parallel and distributed systems. Spurred by technological advances in data collection techniques, data mining is an interdisciplinary field merging ideas from statistics, machine learning, databases, and high performance computing. My research has focussed on developing new techniques for knowledge discovery, improving the performance of existing techniques via various data stratification techniques (such as sampling, discretization and dimensionality reduction), identifying efficient network, architectural and operating systems support for parallel and distributed data mining techniques, and applying these techniques on a varied set of domains (biological, web, e-commerce/business and scientific). Specifically some current issues under investigation in my group include:

- Resource-Aware Active Data Mining
- Data Stratification Techniques for Mining Dynamic Datasets
- Parallel/Distributed Systems Support for Data Intensive Applications
- Mining in E-commerce Systems
- Mining and Visualization of Network Flow Logs
- Gene Expression Analysis through Data Mining

Please see <http://www.cis.ohio-state.edu/~srini> for further information.

Selected Publications:

C. Aggarwal and S. Parthasarathy, "Mining Massively Incomplete Data Sets by Conceptual Reconstruction", to appear in the 7th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, 2001.

S. Parthasarathy and S. Dworkadas, "Shared State for Client-Server Mining", accepted for publication and to appear in the Kluwer International Journal of Distributed and Parallel Databases. An earlier version appeared in the SIAM International Conference on Data Mining, 2001.

S. Parthasarathy, M. Zaki, M. Ogihara, W. Li, "Parallel Data Mining for Association Rules on Shared-memory Systems", in Knowledge and Information Systems, Volume 3, Number 1, pp 1-29, Feb 2001.



**PONNUSWAMY
SADAYAPPAN**

Full Professor

*B.S., Electrical Engineering,
Indian Institute of Technol-
ogy, Madras, India, 1977;
M.S., Electrical Engineering,
State University of New
York at Stony Brook, 1978;
Ph.D., Electrical Engineer-
ing, State University of New
York at Stony Brook, 1983.*

My primary research interests lie in the following areas:

Network-Based Computing: Various issues are being addressed towards the effective use of clusters comprised of commodity computing and networking components for high-performance applications. An area of particular interest in this regard is the development of effective scheduling and resource management strategies for cluster environments. Details about current research projects may be obtained from <http://nowlab.cis.ohio-state.edu>.

High-Performance Scientific Computing: I seek to collaborate with engineers and scientists in developing parallel algorithms. An area of primary interest is the development of performance optimization techniques and a tool for automatic synthesis of high performance parallel programs for electronic structure modeling in computational chemistry.

Selected Publications

N. S. Sundar, D. N. Jayasimha, D. K. Panda and P. Sadayappan, "Hybrid Algorithms for Complete Exchange in 2D Meshes," IEEE Transactions on Parallel and Distributed Systems, To Appear.

D. Cociorva, G. Baumgartner, D. Bernholdt, R. Harrison, M. Nooijen, J. Ramanujam, P. Sadayappan, and J. Wilkins, "Towards Automatic Synthesis of High-Performance Codes for Electronic Structure Calculations: Data Locality Optimization," Proceedings of Eighth Intl. Conf. on High Performance Computing, December 2001, To Appear.

D. Cociorva, C. Lam, G. Baumgartner, J. Ramanujam, P. Sadayappan, and J. Wilkins, "Loop Optimization for a Class of Memory-Constrained Computations," Proc. of ACM Intl. Conf. on Supercomputing, June 2001.

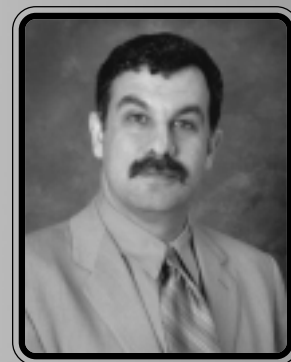
P. Holenarsipur, V. Yarmolenko, J. Duato, D. K. Panda and P. Sadayappan, "Characterization and Enhancement of Static Mapping

Heuristics for Heterogeneous Systems," Proceedings of Seventh Intl. Conf. on High Performance Computing, December 2000.

Increasingly powerful computers have made it possible for computational scientists and engineers to model physical phenomena in great detail. These large scale numerical simulations, imaging and/or sensor data are resulting in detailed, multidimensional, multi-scale, multiresolution datasets. The challenge I see and intend to meet is the management of this information. Efficient storage, retrieval and processing of multiple large scientific datasets on remote archival storage systems needs to be found for efficient exploration and analysis of these datasets. Software support is needed to allow users to obtain necessary subsets of very large, remotely stored datasets. My research works on developing the infrastructure to support data caching, processing and parallel I/O which will fulfill this need.

Joining OSU gives me the opportunity to work with the Ohio SuperComputer Center. We are contributing to the development of a heterogeneous cluster configuration. This system will be fully operational by the end of 2001. This machine configuration is targeted at providing a platform for three key components to address the challenges: (1) efficient storage and preliminary processing of very large datasets (Data Nodes), (2) caching and manipulation of intermediate data structures and results for many simultaneous, related queries (Memory Nodes), and (3) efficient execution of computationally demanding codes (Compute Nodes).

Selected Publications



**JOEL H. SALTZ,
M.D.**

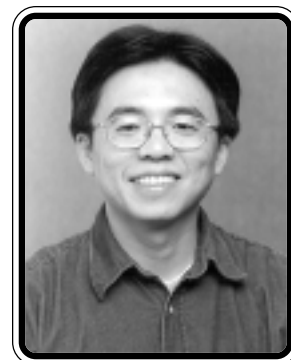
*Joint Appointment with the
OSU Dept. of Anatomy &
Medical Education*

*B.S., Mathematics and
Physics, University of
Michigan, 1977; M.S.,
Mathematics, University of
Michigan, 1978; M.D., Ph.D.,
Computer Science, Duke
University, 1985.*

My research interests lie in the area of computer graphics and scientific visualization, with a special focus on the development of efficient algorithms and software systems to facilitate interactive exploration of three dimensional volumetric datasets. Specifically, my current research projects include the design of hierarchical data structures for processing large scale time-varying data, adaptive control strategies for interactive volume rendering, and the exploitation of high performance workstations and parallel machines for graphics and visualization applications. In addition, I am also interested in the use of distributed system middleware to support large-scale data management and visual computation. The major goal of my research is to provide scientists, engineers, and medical professionals effective visual analysis tools to investigate domain-specific phenomena in an in-depth manner. More details can be found at <http://www.cis.ohio-state.edu/~hwshen>.

Selected Publications

- [1] Xinyue Li and Han-Wei Shen, Adaptive Volume Rendering using Fuzzy Logic Control, Joint Eurographics-IEEE TCVG Symposium on Visualization, May, 2001.
- [2] Jinzhu Gao, Han-Wei Shen, and Tony Garcia, Parallel View-dependent Isosurface Extraction and Rendering, Tenth SIAM Conference on Parallel Processing for Scientific Computing, March, 2001.



HAN-WEI SHEN

Assistant Professor

*B.S., Computer Science,
National Taiwan University,
1988; M.S., Computer
Science, State University of
New York at Stony Brook,
1992; Ph.D., Computer
Science, University of Utah,
1998.*



MUKESH SINGHAL

Associate Professor

*B.S., Electronic and
Communication Engineering;
University of Roorkee,
Roorkee, India, 1980; Ph.D.,
Computer Science, University
of Maryland, College Park,
1986.*

My Research interests include distributed computing systems, mobile computing systems, computer security, and modeling and performance evaluation. My research in distributed computing systems is focused on the development of efficient mechanisms for management of global time and global state, development of tools and techniques to characterize a global state and global time in distributed systems, and application of tools and techniques for state-theoretic characterization to design and verification of distributed algorithms. We have developed an efficient implementation of vector clocks and have introduced the concept of hierarchical clocks to efficiently implement matrix clocks. In addition, I have developed highly efficient algorithms for mutual exclusion, deadlock, load sharing, checkpointing and failure recovery, and casual multicasting.

In the area of mobile computing systems, my efforts have been focused on the following fundamental problems: dynamic channel allocation, location management, global time management, and checkpointing and failure recovery. In computer security, I am developing techniques for security in high-speed networks, ATM firewalls, and secure transaction execution in electronic commerce. In modeling and evaluation, my research is focused on database systems, massively parallel systems, and multiprocessor systems. I am also looking into the problem of real-time delivery of multimedia data in casual order.

Selected Publications

G. Cao and M. Singhal, "Mutable Checkpoints: A New Checkpointing Approach for Mobile Computing Systems", IEEE Transactions on Parallel and Distributed Systems, Vol 12, No. 2, January 2001, pp. 157-172. (Special Issue on "Dependable Network Computing")

G. Cao and M. Singhal, "Distributed fault-tolerant channel allocation for cellular networks", IEEE Journal on Selected Areas in Communications, July 2000, pp. 1326-1337. (Special issue on "Wireless Communications Series")



**PAUL A. G.
SIVILOTTI**

Assistant Professor

*B.Sc.H. Computing Science,
Mathematics, & Biochemistry
Queen's University, Kingston,
Ontario, Canada; M.S.
Computer Science, California
Institute of Technology;
Ph.D. Computer Science,
California Institute of
Technology.*

My research interests lie at the intersection of distributed systems and software engineering. I am investigating tools and techniques for supporting a component-based approach to the development of distributed systems. The underlying theme in these investigations is the practical application of elegant theory to the creation of high-confidence distributed software. Recently, the focus of this research has been on specification methods for distributed components and on tool-based support for testing component implementations against these specifications.

Selected Publications:

"The Specification and Testing of Quantified Progress Properties in Distributed Systems", Prakash Krishnamurthy and Paolo A.G. Sivilotti. Proceedings of ICSE 2001, Toronto, May 16 - 18, 2001.

"A Tool for Testing Liveness in Distributed Object Systems", Charles P. Giles, and Paolo A.G. Sivilotti. Proceedings of TOOLS USA 2000, Santa Barbara, July 31 - Aug 3, 2000.

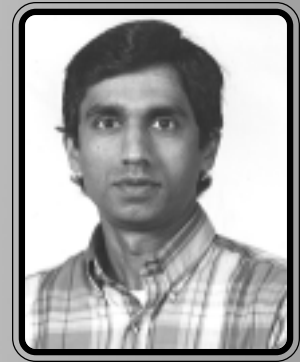
"A Class of Synchronization Systems that Permit the Use of Large Atomic Blocks", Paolo A.G. Sivilotti. Proceedings of CASCON '98, Toronto, Canada, Dec 1, 1998. (won Best Paper Award)

"A World-Wide Distributed System Using Java and the Internet", K. Mani Chandy, Adam Rifkin, Paolo A.G. Sivilotti, et. al. Proceedings of the 5th IEEE International Symposium on High Performance Distributed Computing (HPDC '96), p.11-18, Syracuse, p 9-11, 1996. (won Best Paper Award)

My main research interest is in the area of semantics of distributed and object-oriented programs. I have developed ways to reason about OO programs that are easy to use, and allow the designer to formalize his intuitions about the OO program in question. An earlier contribution was the development of a new and simple approach to understanding distributed programs; the approach can be used informally and elatively easily. I am currently working on trying to modify and extend this approach to apply to Object-Oriented distributed programs.

Selected Publications

- N. Soundarajan, "Documenting framework behavior", Computing Surveys, Vol. 32, 2000, pp. 1-4.
- N. Soundarajan, S. Fridella, "Framework based applications", Proc. of the Sixth Int. Conf. on Software Reuse (ICSR-6), ed. W. B. Frakes, 2000.
- N. Soundarajan, "On the Specification, Inheritance, and Verification of Synchronization Constraints," Second Formal Methods for Open Object-based Distributed Systems, ed. by Bowman and Derrick, Chapman and Hall, pp. 352-367.
- N. Soundarajan, "Communication Traces in the Verification of Distributed Programs," Second Northern Formal Methods Workshop, ed. by Evans and Duke, Springer-Verlag, 1997.
- A. Elmagarmid, N. Soundararajan, and M. Liu, "A Distributed Deadlock Detection Algorithm and its Correctness Proof," IEEE Transactions on Software Engineering, Vol. 14, 1988, pp. 1443-1452.



*NEELAM
SOUNDARAJAN*

Associate Professor

*B.S., Physics, Bombay University, India, 1970;
M.S., Physics, Bombay University, India, 1972;
Ph.D., Computer Science, Bombay University, India, 1978.*

My Research focuses on combinatorial algorithms, mostly for problems involving geometry or graphs. The approach is analytical; that is, I try to prove bounds on the worst case or expected case behavior of the algorithms. I am also studying new algorithms for linear programming.

Selected Publications

- K. Supowit (with M. Golin), "Newton's Method for Quadratics, and Nested Intervals," Journal of Complex Systems, vol. 8, No. 3 (June 1994), pp. 161-180.
- D. Dobkin, S. Friedman, and K. Supowit, "The Delaunay Graph is Almost as Good as the Complete Graph," Discrete and Computer Geometry, Vol. 5, 1990, pp. 399-407.
- C. Gabor, W. -L Hsu, and K. Supowit, "Recognizing Circle Graphs in Polynomial Time," Journal of the ACM, Vol. 36, No. 3, July 1989, pp. 435-473.
- K. Supowit, "The Relative Neighborhood Graph with an Application to Minimum Spanning Trees," Journal of the ACM, Vol. 30, No. 3, July 1983, pp. 428-448.



*KENNETH J.
SUPOWIT*

Associate Professor

A.B., Linguistics, Cornell University, 1978; Ph.D., Computer Science, University of Illinois, 1981.



DELIANG WANG

Associate Professor

*B.S., Computer Science,
Beijing University, 1983;
M.S., Computer Science,
Beijing University, 1986;
Ph.D., Computer Science,
University of Southern
California, Los Angeles,
1991.*

My general area of interest is neural networks. More specifically, I am interested in neural computation for auditory and visual perception. I am searching for appropriate neural architectures and principles for machine perception tasks, including segmentation, recognition and generation. This research is conducted on the integrated basis of neurophysiological data concerning auditory and visual processing, psychological data from human perception, and computational effectiveness for machine perception.

Selected Publications

van der Kouwe A.J.W., Wang D.L., and Brown G.J. (2001), "A comparison of auditory and blind separation techniques for speech segregation," IEEE Transactions on Speech and Audio Processing, vol. 9, pp. 189-195, 2001.

Chen K., Wang D.L., and Liu X., "Weight adaptation and oscillatory correlation for image segmentation," IEEE Transactions on Neural Networks, vol. 11, pp. 1106-1123, 2000.

Wang D.L., "On connectedness: a solution based on oscillatory correlation," Neural Computation, vol. 12, pp. 131-139, 2000



BRUCE W. WEIDE

Full Professor

*B.S.E.E., Electrical
Engineering, University of
Toledo, 1974; Ph.D.,
Computer Science, Carnegie-
Mellon University, 1978.*

The Reusable Software Research Group (RSRG) is exploring software component engineering. We see advances here as being necessary in any successful attack on the problems of programmer productivity and software quality. Our approach involves a broad look at several related subareas: formal specification of functionality, modular verification of correctness and efficiency of implementation, design of programming languages and systems, and adaptation of our RESOLVE technology to practice in C++ and Java.

There are serious technical problems in making such an approach to software construction work in practice. First, a component must have a formal (but still human-comprehensible) specification to say what it does. No one can be expected to use a component without understanding its functionality nor an implementation unless it is known to be correct and efficient. Finally, programming languages and systems must support this approach to software architecture.

Selected Publications

Hollingsworth, J.E., Blankenship, L., Weide, B.W., "Experience Report: Using RESOLVE/C++ for Commercial Software," Proceedings ACM SIGSOFT 8th International Symposium on Foundations of Software Engineering, ACM, 2000.

Sitaraman, M., Atkinson, S., Kulczycki, G., Weide, B.W., Long, T.J., Bucci, P., Pike, S., Heym, W.D., and Hollingsworth, J.E., "Reasoning About Software-Component Behavior," Proceedings Sixth International Conference on Software Reuse, LCNS 1844, 2000, pp. 266-283.

Gibson, D.S., Weide, B.W., Pike, S.M., and Edwards, S.H., "Toward a Normative Theory for Component-Based System Design and Analysis," in Leavens, G., and Sitaraman, M., eds., Foundations of Component-Based Systems, Cambridge University Press, 2000, pp. 211-230.

M. Sitaraman, B. W. Weide, and W. F. Ogden, "On the Practical Need for Abstraction Relations to Verify Abstract Data Type Representations," IEEE Transactions on Software Engineering 23, 3, March 1997, pp. 157-170.

Isosurface reconstruction is the problem of reconstructing surfaces from volumetric data, perhaps a CAT scan or MRI. The marching cubes algorithm is a popular, simple, and efficient algorithm for constructing such isosurfaces in three dimensions. Dr. Roger Crawfis and I developed an algorithm for constructing isosurfaces in four and higher dimensions. Currently, I am working with Drs. Crawfis and Dey on decimation algorithms to reduce the complexity and size of the constructed isosurfaces.

I am also interested in the problem of continuously deforming one shape into another. Given two topologically equivalent shapes, how can one shape be continuously transformed into the other while aligning certain specified features? Problems similar to this one arise in such diverse fields as computer animation, cartography and computational fluid mechanics.

Finally, I am involved in a medical imaging project with the Department of Medical Microbiology and Immunology. DNA can be spliced into genes which can then be represented as hundreds or thousands of spots on a two dimensional gel. Given the images of two such gels, we are developing software to detect added or missing genes. Such differences could be indications of cancer.

Selected Publications

- Bhaniramka, P., Wenger, R., Crawfis, R., "Isosurfacing in Higher Dimensions," Proceedings of the 2000 Symposium on Volume Visualization},(2000), pp. 267-273.
- Dey, T., Wenger, R., "Reconstructing Curves with Sharp Corners," Proceedings of the 16th Annual Symposium on Computational Geometry},(2000), pp. 233-241.
- Gupta, H., Wenger, R., "Constructing piecewise linear homeomorphisms of simple polygons," Journal of Algorithms, vol.22 1997, pp. 142-157.



**REPHAEL
WENGER**

Associate Professor

*B.S.E., Computer Science,
Princeton University, 1984;
Ph.D., Computer Science,
McGill University, 1988.*

My research interests include computer vision, learning, and the integration of vision with graphics and art. The technical emphasis of my research is on statistical modeling and stochastic computing. The general goal of my research group OVAL (OSU Vision And Learning) is to pursue a unified computational theory underlying visual perception and learning, and to build intelligent computer systems that can understand the contents of images and can interact with people and environment. My research projects are categorized into three themes.

- 1) Building probabilistic models for visual patterns, such as texture, color, shapes, and motion etc. and estimate these models from large image set through statistical learning;
- 2) Developing stochastic algorithms (Markov chain Monte Carlo) for effective inference;
- 3) Analyzing the performance of visual systems.

Currently, my group is working on a variety of projects including texture and texture modeling, image segmentation, perceptual organization, motion analysis, performance analysis, partial differential equations, efficient Markov chain Monte Carlo algorithms, facial sketch and caricature, and object recognition.

Select publications

- Y. N. Wu, S. C. Zhu and X. W. Liu, "Equivalence of Julesz Ensemble and FRAME models", Int'l Journal of Computer Vision, 38(3), 247-265, July, 2000.
- S. C. Zhu, "Embedding Gestalt Laws in Markov Random Fields – A theory for shape modeling and perceptual organization", IEEE Trans. on Pattern Analysis and Machine Intelligence, Vol. 21, No.11, Nov, 1999.
- S. C. Zhu, Y. N. Wu and D. B. Mumford, "FRAME: Filters, Random field And Maximum Entropy: – Towards a Unified Theory for Texture Modeling", International Journal of Computer Vision 27(2) 1-20, March/April. 1998.



SONG CHUN ZHU

Assistant Professor

*B.S., Computer Science,
University of Science and
Technology of China, 1991;
M.S., Computer Science,
Harvard University, 1994;
Ph.D., Harvard University,
1996.*



**STUART H.
ZWEBEN**

*Chairperson of Computer
and Information Science*

Full Professor

*B.S., Mathematics, City
College of New York, 1968;
M.S., Statistics and Com-
puter Science, Purdue
University, 1971; Ph.D.,
Computer Science, Purdue
University, 1974.*

My research interests are in the broad area of software engineering. More specifically, I am interested in the subjects of software quality evaluation and software engineering education.

I have done empirical investigations of the impact of software reuse principles on the cost and quality of software, and have helped incorporate some of the principles and components developed by our Reusable Software Research Group into key design classes within our undergraduate curriculum. Also, I am interested in the general subject of computer science education, and have worked with the Computing Sciences Accreditation Board (CSAB), the Association for Computing Machinery (ACM), the Computing Research Association (CRA) and the Columbus Area Chamber of Commerce to evaluate and improve computer science programs in universities and high schools. For the past few years, I have chaired CRA's survey activities.

Selected Publications

Seed Corn at the Millenium: What Can We Learn from the Taulbee Data?" Computing Research News, September 1999, pp. 3-4

NEW FACULTY ARRIVING 2001 - 2002



**GAGAN
AGRAWAL**

Associate Professor

*B.S., Computer Science &
Engineering, Indian
Institute of Technology,
Kanpur, India, 1991; M.S.,
Computer Science,
University of Maryland,
College Park, Maryland,
1994; Ph.D., Computer
Science, University of
Maryland, College Park,
Maryland, 1996.*



**HAKAN
FERHATOSMANAGLU**

Assistant Professor

*Ph.D. Computer Science,
University of California,
Santa Barbara. 2001
B.S. Computer and Informa-
tion Science, Bilkent
University, Ankara, Turkey.
1997.*



DONG XUAN

Assistant Professor

*B.S., Electronic Engineer-
ing, Shanghai Jiao Tong
University, China, 1990;
M.S. Electronic Engineer-
ing, Shanghai Jiao Tong
University, China, 1993;
Ph.D., Computer Engineer-
ing, Texas A & M Univer-
sity, 2001.*



**BALAKRISHNAN
CHANDRASEKARAN**

Senior Research Scientist

*Ph.D., University of
Pennsylvania*

Research Interest: Artificial Intelligence

Selected Publications:

B. Chandrasekaran and S. Mittal, "Deep versus compiled knowledge approaches to diagnostic problem solving," which originally appeared in *International J of Man-Machine Studies*, 19, 425-436, 1983, was selected from among the most heavily cited papers in the 25-year history of the journal, and selected to appear in the Special Issue, 1969-1999, containing a selection of such papers, of *International Journal of Human-Computer Studies*, vol. 51, no.2, pp. 357-368, 1999.

B. Chandrasekaran and John R. Josephson, "Function in Device Representation," to appear in *Journal of Engineering with Computers*, Special Issue on Computer Aided Engineering.

B. Chandrasekaran, J. R. Josephson, and V. R. Benjamins, "What are Ontologies and Why Do We Need Them?," *IEEE Intelligent Systems*, Jan/Feb 1999, 14(1), pp. 20-26.

B. Chandrasekaran, "Multimodal Perceptual Representations and Design Problem Solving, Visual And Spatial Reasoning In Design: Computational And Cognitive Approaches," John Gero, editor, *Key Center for Engineering*, University of Sydney, Australia, 1999.

B. Chandrasekaran and John R. Josephson, "Cognitive Modeling For Simulation Goals: A Research Strategy for Computer-Generated Forces," *Proceedings of 8th Conference on Computer Generated Forces and Behavioral Representation*, Defense Modeling and Simulation Organization, 1999.

Research Interest: Computer and Telecommunication Networking

Selected Publications:

Arjan Durresi, Sastri Kota, Raj Jain, Mukul Goyal, "Achieving QoS for TCP Traffic in Satellite Networks with Differentiated Services", In press in *Space Communications Journal*, 2001.

Kulathumani Vinodkrishnan, Arjan Durresi, Nikhil Chandhok, Ramesh Jagannathan, Srinivasan Seetharaman, Kulathumani Vinodkrishnan, Raj Jain. "Fault Protection in Optical Networks," In press in *Journal of High Speed Networks*.

Arjan Durresi, Mukundan Sridharan, Chunlei Liu, Raj Jain, "Improved Explicit Congestion Notification for Satellite Networks", *Proceedings of the SPIE conference Quality of Service over Next-Generation Data Networks (IT302)*, August 2001.

Arjan Durresi, Mukundan Sridharan, Chunlei Liu, Mukul Goyal, Raj Jain, "Traffic Management using Multilevel Explicit Congestion Notification", *Proceedings of the 5th World Multiconference on Systemics, Cybernetics and Informatics, SCI'2001*, July 2001..

Gojko Babic, Raj Jain, and Arjan Durresi, "ATM Performance Testing and Quality of Service Management," Invited chapter in the book *The IEC ATM Handbook*, F. Golshani Ed., published by International Engineering Consortium, Chicago, IL, 2000.

Arjan Durresi, Raj Jain, Gojko Babic, "Measurement of ATM Frame Latency," *Proceedings of IEEE 25th Local Computer Networks 2000*, p. 614-619, Tampa, Florida, November 8 - 10, 2000.

Arjan Durresi, Raj Jain, Gojko Babic, "Applicability of MIMO as Metric for Frame Latency," *Proceedings of IEEE Ninth International Conference on Computer Communication and Networks 2000 (IEEE ICCCN 2000)*, p.564-568, Las Vegas, Nevada USA, October 16-18, 2000.

Mukul Goyal, Arjan Durresi, Padmini Misra, Raj Jain, "Effect of Number of Drop Precedences in Assured Forwarding," *Proceedings of IEEE Global Telecommunication Conference 1999 (GlobeCom '99)*, p. 188-193, Rio de Janeiro, Brazil, December 5-9, 1999

Arjan Durresi, Raj Jain, Gojko Babic, "Experience with ATM Switch Performance Testing," *Proceedings of IEEE International Conference on Networks 1999 (IEEE ICON '99)*, p.143-150, Brisbane, Australia, September 28-October 1, 1999.

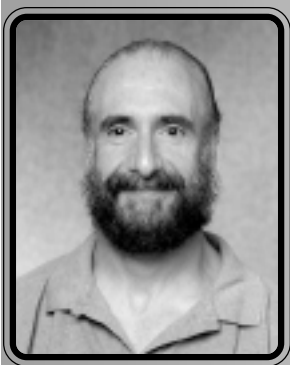
Arjan Durresi, Raj Jain, Gojko Babic, and Bruce Northcote "Methodology for Implementing Scalable Test Configurations in ATM Switches," *Proceedings of IEEE Eighth International Conference on Computer Communication and Networks 1999 (IEEE ICCCN '99)*, p. 628-633, Boston, Massachusetts, October 11-13, 1999



ARJAN DURRESI

Research Scientist

Ph.D., Ohio State University



JOHN JOSEPHSON

Research Scientist

Ph.D., Ohio State University

Research Interest: Artificial Intelligence

Selected Publications:

Josephson, John R. "Smart Inductive Generalizations are Abductions" (2000), *Abduction and Induction*, P. A. Flach and A. C. Kakas (eds.), Kluwer, Netherlands.

Chandrasekaran, B., Josephson, J. R., & Benjamins, V. R. (1999). "What are Ontologies and Why Do We Need Them?" *IEEE Intelligent Systems*, Vol. 14, Number 1, pp. 20-25.

John R. Josephson, B. Chandrasekaran, Mark Carroll, Naresh Iyer, Bryon Wasacz, Giorgio Rizzoni, Qingyuan Li, David A. Erb, "An Architecture for Exploring Large Design Spaces," *Proceedings of the National Conference on AI (AAAI-98)*, AAAI Press/The MIT Press, pp. 143-150.

B. Chandrasekaran, J. R. Josephson, and V. R. Benjamins "Ontology of Tasks and Methods," *Proceedings of Banff Workshop on Knowledge Acquisition*, 18-23 April, 1998, Banff, Alberta, Canada.

D. C. Miller, J. R. Josephson, M.J. Elsass, J.F. Davis, and B. Chandrasekaran, "Sharable Engineering Knowledge Databases for Intelligent Systems Applications," *Computers and Chemical Engineering*, 21, S77-S82, (1997).

Research Interest: Software Engineering, CS Education

Selected Publications:

M. Sitaraman, S. Atkinson, G. Kulczycki, B. Weide, T. Long, P. Bucci, W. Heym, S. Pike, and J. Hollingsworth, "Reasoning About Software-Component Behavior", *Proceedings of the 6th International Conference on Software Reuse*, LNCS 1844, Springer-Verlag, 2000, pp. 266-283.

T. Long, B. Weide, P. Bucci, and M. Sitaraman, "Client View First: An Exodus >From Implementation-Biased Teaching", *Proceedings of the 30th SIGCSE Technical Symposium on Computer Science Education*, ACM Press, 1999, 136-140.

T. Long, B. Weide, P. Bucci, D. Gibson, M. Sitaraman, J. Hollingsworth, and S. Edwards, "Providing Intellectual Focus to CS1/CS2", *Proceedings of the 29th SIGCSE Technical Symposium on Computer Science Education*, ACM Press, 1998, 252-256.



PAOLO BUCCI

Senior Research Associate

Ph.D., The Ohio State University



GOJKO BABIC

B.S., Electrical Engineering, 1972, University of Sarejevo, Sarejevo; M.S., Computer Science, 1975, Florida Institute of Technology, Melbourne, Florida; Ph.D., Computer Science, 1978, The Ohio State University

Until 1993, I was an associate professor at Electrical Engineering Faculty, University of Sarejevo.

My research interest is computer networking. In the period 1982-1991, I was a principal investigator and a team leader of the research program Energonet, the largest project in computer networking in the former Yugoslavia. In the period 1996-1999, I have become involved in performance evaluations of ATM equipment and I coauthored over 20 contributions to ATM Forum Working Groups AF-TEST and AFTM and several conference papers. My most recent interest is in optical networking.

Course Coordinator: CIS675: Introduction to Computer Architecture

CIS777: Telecommunication Networks

Selected Publication: R. Jain and G. Babic: "Performance Testing Effort at the ATM Forum: An Overview," IEEE Communication Magazine, August 1997, Vol. 35, No. 8, pp. 110-116



BETTINA BAIR

Master of Business Administration, University of Denver, 1992.

Bachelor of Science Business Administration, University of Phoenix, 1987.

I was a systems programmer between 1978 and 1989, and a manager in industry from 1987 to 1996..

My interests are in the effects of technological advances on business, culture and individuals.

I am the course coordinator for CIS102, which is an Introduction to the Internet, and also CIS516, which is Systems Analysis.



DEBBY GROSS

S.B., Chemical Engineering, MIT, 1977; MBA University of Chicago Graduate School on Business, 79.

I am a displaced New Yorker who has been in Columbus now for 6 years. I have extensive work experience in the food and chemical industries working in both plants and corporate offices mostly as a cost engineer. Throughout my industry career, I have helped to develop applications on spreadsheets, databases and a variety of corporate purchasing, accounts payable and inventory systems to increase the efficiency and effectiveness of data management.

Currently I teach and coordinate CIS200 and CIS101. These two courses explore the use of these same business tools (spreadsheets and databases) to help solve problems. I am responsible for staffing these large courses (1000 students per quarter), dealing with the associated logistics of lab and lecture sections, and preparing teaching materials for these courses.

My personal interests deal with the interface between "computer programmers" and "business types". Defining the system requirements and understanding the business processes are key to the design of any successful application tool. Over the past three years I have audited many of the core undergraduate computer science courses.

B.Phil., Interdisciplinary Studies (Mathematics Concentration), Miami University, 1978;

M.S., Operations Research, Cornell University, 1980;

M.S., Computer and Information Science, The Ohio State University, 1989;

Ph.D., Computer and Information Science, The Ohio State University, 1995

Rather than teaching how software is currently built, I strive to teach how software should be built if it is to be constructed at lower cost with higher quality and reliability. People need to work hard at moving software construction from the realm of craft to that of an engineering discipline.

Constructing software out of well-designed, well-specified, verified and tested software components is a step in the right direction.



WAYNE HEYM

M.S., Computer and Communication Sciences, The University of Michigan, 1975

B.A., cum laude, Mathematics, The Ohio State University, 1973

Teaching Experience and Interests:

1. Software Engineering: Object-Oriented and Structured Analysis; Object-Oriented and Structured Design; Reusability; C++ Programming.

2. Database Systems: Information Modeling; Data Base Design; Data Base Programming; File Design and Implementation

3. Introductory Architecture: Basic computer organization; Assembly level programming

I am currently course coordinator of 570. In the past I have also coordinated 516 and 321.



MARY BETH LOHSE

D.Sc. (Computer Science) Washington University 1996

M.S. (Computer Science) Washington University 1993

B.S. (Computer Science) University of Delaware 1991

My research has been in the area of computational learning theory. Researchers in this field focuses on algorithms that allow computers to “learn.” More specifically, we study learning problems (“Can a computer learn Boolean formulae?”) and either prove that computers can’t successfully solve the problem (usually involving reduction or an information theoretic argument) or provide an algorithm by which they can. Of course, the answers to such questions are predicated on what it means to learn and what information is available to the computer to accomplish its task.

More recently, my concentration has been on education (of humans, not computers). I enjoy teaching at various levels of our curriculum including our undergraduate analysis of algorithms course (most closely related to my research area). In addition, I am involved in teaching our introductory courses and am the course coordinator for CIS221.



H. DAVID MATHIAS



PETER P. WARE

MS, Ohio State University, 1992

When asked, I usually say I'm from San Diego, CA as that is where I'd previously lived the longest though I grew up in several places. However, I've been in Columbus long enough that I may need to change my story.

My area of interest is distributed file systems particularly with respect to wide scale replication as well as distributed RAID in a cluster environment.

Teaching wise, I concentrate on system level classes: introduction to machine architecture (CIS 360), a large project class in systems software (CIS 560), operating systems (CIS 660, course coordinator), operating systems lab (CIS 662, course coordinator). I'm also involved with programming languages: introduction to C++ (CIS 230, course coordinator), programming in C++ (CIS 459.22, course coordinator). In addition, I'm on the Computer Committee.



MARY ZANDO

M.B.A, The Ohio State University

My interests lie in business systems analysis and development as well as data-mining and data warehousing.

I have been primarily teaching CIS 200 and 570 classes.

OTHER INSTRUCTION POSITIONS

EMERITUS APPOINTMENTS

Professor Emeritus

Balakrishnan Chandrasekaran, Ph.D., (University of Pennsylvania); artificial intelligence, expert systems, knowledge-directed databases, pattern recognition, computer program testing, and interactive graphics.

Charles A. Csurí, M.A., B.F.A., (The Ohio State University); graphic arts, motion capture, tactile kinesthetics

Mervin E. Muller, Ph.D., (University of California, Los Angeles); management systems, statistical computations, distributed data and information systems, simulated designs and analyses, financial systems, quality and productivity concepts, system performance analysis, and software engineering.

Associate Professor Emeritus

Clinton R. Foulk, Ph.D., (University of Illinois); parallel processing and program analysis.

Anthony E. Petrarca, Ph.D., (University of New Hampshire); knowledge representation for information storage and retrieval, automatic indexing and classification, user interface, and biomedical information processing. Joint appointment with the Department of Biomedical Communications.

JOINT APPOINTMENTS

Professor

Greg Baker, Ph.D., (California Institute of Technology); scientific computing, numerical analysis. Department of Mathematics.

Kenneth J. Breeding, Ph.D., (University of Illinois); computer organization and switching theory. Department of Electrical Engineering.

Wayne Carlson, Ph.D., (The Ohio State University); computer graphics, geometric modeling, graphics user interfaces, image data compression, and computer-aided design. Department of Industrial Design. Director of Advanced Computing Center for the Arts and Design (ACCAD).

Patrick Flynn, Ph.D., Computer Vision: 3D object recognition, CAD-based vision, range image processing, image-based biometrics; Geometric Modeling: geometry compression, mesh modeling; Image Processing: Image and video compression, medical ultrasound.

Harvey Friedman, Ph.D., (Mathematics at The Massachusetts Institute of Technology); foundations of Mathematics

PART-TIME LECTURERS

Alan Beane

Moez Chaabouni

Alan Cline

Matt Curtin

Steve Gomori

John Heimaster

Scott King

P. Krishnasamy

Michelle Mallon

Robert Mathis

Doyt Perry

Rajiv Ramnath

Doug Reeder

Kathryn Reeves

Michael Stovsky

Alvin Stutz



This is a group who has seen and participated in a lot of CIS's history! Mary Beth Lohse (left) has been an instructor since 1980. Her husband, John (2nd left) received a BA from Mathematics in 1974 and became a CIS PhD student in 1979. One of our original faculty members and now an Associate Professor Emeritus is Anthony Pretarca, seated with his wife, Betty. - October 2000

A VERY early picture of Dr. Ming-Tsan Liu. ~ circa 1975



1994 - Posing at Merv Muller's retirement dinner are (l-r): D. K. Panda, associate professor; his wife, Debrashree, Ping Bai, alumnae (MA. '98) and wife of, Deliang Wang, associate professor.



Eleanor Quinlan, Academic Program Assistant and lecturer; talks with Clint Foulk, Associate Professor Emeritus ~ circa 1995.



Dr., now chair, Stu Zweben speaking before the faculty circa 1974. Seated l-r: Clint Foulk, Jerry Rothstein (front), Ming-Tsan Liu (back), Larry Rose, Kevin O'Kane, Jim Randles, Howell Mei, Marshall Yovits, and Harvey Koch (far back right).



*Tom Fletcher;
Administrative Staff.
circa 1981*

*Pam Stroud-Hampson &
Marty Marlatt celebrating the birth of a
faculty member's baby in the late 1970's.*

*Grad student
Art Pyster who is
now an Advisory
Board member.*

*Taken in the early 90's, Jim Cates,
alumni and Board member; attends
Minority Affairs Programing banquet.*

*Current Advisory
Board President, David
Cohen. This picture was
during his grad studies
days. Some people never
change!*

*Everyone's favorite grandmother;
Elizabeth O'Neill with Otello Reggy-Bean,
son of Achieng Reggy (grad student) and
Alan Bean (part-time instructor), March
2001.*

*The beard is now
gone and the hair is a little
shorter. Alumni and Advisory
Board member, Bruce Flinchbaugh
in the mid-late 1970's.*

The Undergraduate Office for Academic Advising is responsible for assisting computer science students in the College of Engineering and the Colleges of the Arts and Sciences. Typical advising sessions can include planning of academic course schedules, careers, job search strategies, career exploration information, and referrals to various university resources.



The Undergraduate advisors also assign students to a faculty advisor upon admission to the major. The faculty advisors are then responsible for assisting students in choosing appropriate technical electives in the field, answering questions regarding graduate school and the field of computer science. They will also approve advisee's curriculum for graduation.

PEG STEELE, COORDINATOR OF ACADEMIC ADVISEMENT

Ms. Steele joined the department during winter quarter, 1998. She holds a BA in French from Westminster College in Pennsylvania and an MA in College Student Personnel from Bowling Green State University in Ohio. Peg sits on the executive committee for the Academic Advising Association of Ohio State. She is currently serving as the Ohio liaison to the National Academic Advising Association, and has recently completed a co-chair responsibility for the Regional Conference. She has presented at regional and national conferences that follow:

Selected Publications

P. Steele, P. Gardner: "Enhancing Advisor Retention through Professional Development" National Academic Advising Association, Orlando, October, 2000.

P. Steele, G. Steele, B. Gladman: "Making a Professional Difference on your Campus" National Academic Advising Association, Kalamazoo, April, 2001.

P. Steele, P. Gardner: "Advising Students in OverSubscribed Majors" Ohio Academic Advising Association, Gambier, June, 2001.

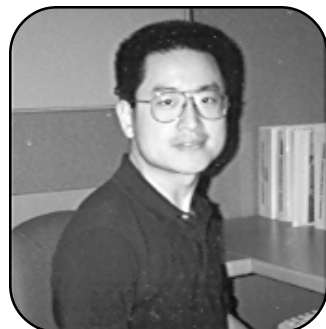
KATHERINE C. TITUS-BECKER, ACADEMIC ADVISOR/STAFF ASSISTANT

Ms. Titus-Becker joined the department in June 2000. She holds a BA in History from the University of North Carolina Greensboro, and an MS in Higher Education from Florida State University. She has worked at several institutions and in various areas of higher education, including Greek life, residence life, orientation, student activities, and judicial affairs. She is a volunteer facilitator for Lambda Chi Alpha International fraternity.

Selected Publications

K. Titus-Becker, S. Bicknel: Impact Leadership III, Lambda Chi Alpha General Assembly, Atlanta, July, 2000.

K. Titus-Becker, A. Carmichael, D. McIntyre: "It's O.K. to be Undecided": Student Alumni Council Leadership Day, Ohio State University, February, 2000.



MING LIU, GRADUATE ADVISING ASSISTANT

Ming Liu received the B.E. in computer science and technology from Tsinghua University, Beijing, China in 1996 and the M.S. in computer and information science from The Ohio State University, Columbus, OH, in Autumn 1997. He is currently a Ph.D. student at The Ohio State University.

While doing his research in wireless communication and multimedia system, he has also been working in the undergraduate advising office since Winter 2000.

CIS COMPUTING SERVICES

The CIS Computing Services staff provides computing support to the Computer and Information Science Department. This consists of the Department's faculty, graduate students, undergraduate majors and non-majors in our service level courses. The staff provide hardware and software support for over 3000 students, faculty, and administrative staff each quarter. They also design and build various software tools and hardware to support a unified computing environment. Their mission at Ohio State is to bridge the gap between the educator and the computer user by providing a user-friendly, stable computing environment.

The CIS computing environment consists of two main operating systems. Sun Solaris is provided to CIS users via nine Ultra 450 quad processor login servers and is primarily used in support of our introductory programming, majors, and graduate courses. Windows NT is provided for our service level courses through 9 Dell 450 Mhz quad processor Intel based servers that allow multiple users to simultaneously use the same server. Each user's desktop, primarily a thin client NCD Explora 450 terminal device, is connected via a high-speed network using ATM and ethernet technology. Connected through this network are approximately six hundred workstations, including a variety of specialty labs and departmental labs.

The departmental labs are in Caldwell Laboratory, Bolz Hall, and Baker Systems. These labs support both majors and service level courses. Caldwell, the largest, consists of a 100 seat open area, a 40 seat instructional room and a 20 seat instructional room.



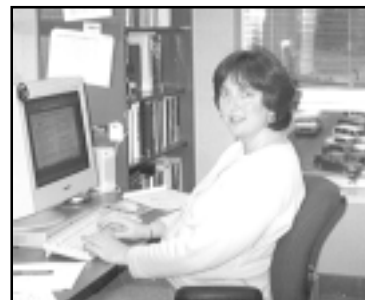
Technical Staff.

Left to right: Rick Wagner; Steve Cardoza; Joshua Gould; Ron Salyers; Tami King; Bob Joseph; Sandy Farrar; David Kneisly. Not pictured: Mike Compton; Jerry Fitzpatrick; Michael Isaac Jones; Shaun Rowland; Ted Welch.

CIS ADMINISTRATIVE STAFF

The office staff members are priceless. The administrative functions of the Department would be come to a standstill without them. They support the faculty, students, and technical staffs. The CIS office staff implement policies set forth by the faculty and university, compile information for reporting purposes and for department publications, and process much of the paperwork for both prospective and enrolled students. CIS office staff are available to answer students' questions concerning University and departmental policy and procedures, graduation requirements, CIS courses, the master schedule, graduate student fellowships, comp/qual exam schedules, and comp/qual study guides.

As with all of the world's environment, the Administrative staff has undergone change this year and this flux will continue through the next. With the loss of Eleanor Quinlan, a new Academic Program Assistant was needed. Kathryn Reeves has ably filled into the breach. Next year we will be undertaking a reorganization as we cope with the retirement of our long-time Fiscal Officer, Sandy Hill. (It should be noted that Sandy is the only staff member looking forward to that day!) There is little doubt, though, that these challenges will be met with efficiency and aplomb.



Administrative Staff

Catrene Collins

Human Resources Assistant & Technical Associate

Tamera Cramer

Public Relations Coordinator

Tom Fletcher

General Services Administrator

Ellen Hammerstein-Woo

Receptionist & Procurement/Key Control Coordinator

Sandy Hill

Fiscal & Human Resources Officer

Quincy Howard

Research Project Coordinator

Marty Marlett

Administrative Assistant to the Chair

Elizabeth O'Neill

Graduate Studies Assistant

Kathryn Reeves

Academic Program Assistant



EXTERNAL ADVISORY BOARD

*During a recent meeting are members:
D. Cohen, B. Pflug, R. Tevonian,
S. Trevor, D. Yun, J. Cates,
B. Flinchbaugh.*



The external Advisory Board was established in 1987. The members are Department Chair appointees and they are leaders from industry and other academic institutions.

While some of the members are alumni, it is not a requirement.

The only prerequisite is a spirit of achievement, a history of accomplishment and a desire to assist the CIS fulfill its mission. The Board's primary purpose is providing the Department with valuable input concerning computing trends and proposing new directions which can enhance the department's growth.

This year the Board composition has undergone its own change. Dr. Richard Baum, a CIS alum, has joined the group. Sadly, due to time constraints, Dr. Nancy Leveson decided to resign her position.

This year's members are:

DR. DAVID COHEN, BOARD PRESIDENT

Dr. David Cohen, alumni ('77), has over 28 years of experience in software development and systems engineering. He is the co-founder and President of sente, Inc. Dr. Cohen also founded IEX a System Integrator start-up that is now a Tekelec division. During the last 10 years he validated the effectiveness of several software development models for improving return on investment (ROI). He has authored several publications in the area of database security, distributed database management for new network services, software reliability, software development and operations center productivity.

DR. RICHARD BAUM

Dr. Baum is Vice President, Server Technology for the IBM Server Group where he leads strategy, architecture and design efforts for future server systems. He was named an IBM Fellow in 1991 and received his Ph.D. from Ohio State in 1975.



*Richard Baum with Stu
Zweben during a recent visit*

MR. JAMES CATES

James E. Cates has been a member of the CIS Advisory Board for over ten years. He is a Masters graduate of the OSU/CIS department and has received the OSU distinguished Alumni Award. Mr. Cates has worked for technological leaders such as IBM, where he spent most of his early career, Silicon Graphics Corporation, Synopsys Corporation and Information Technology Solutions Corporation. His current position is Chief Information Officer and Vice President of Information Systems for Brocade Communications Systems, Incorporated.

DR. BRUCE FLINCHBAUGH

As manager of the Vision Systems branch in the DSP Solutions R&D Center at Texas Instruments, Dr. Flinchbaugh, a Distinguished Member of the Technical Staff, with his team develops DSP systems and software for digital cameras. Dr. Flinchbaugh received his OSU-CIS Ph.D. in 1980.

MR. BRYAN K. PFLUG

Located in Seattle, Mr. Pflug is Director of Embedded Software at Boeing's company offices. He has responsibility for coordinating embedded software activities, business strategies, and improvement investments across the company's five business units (Air Traffic Management, Aircraft and Missiles, Connexion, Commercial Airplanes, and Space and Communications). Within Boeing, embedded software consists of the mission software that is integral to the operation of company products - aircraft, weapons, spacecraft, and related systems.. He is a 1977 Masters graduate.

DR. ARTHUR PYSTER

Dr. Pyster currently is the Deputy Chief Information Officer for the Federal Aviation Administration. His role within the organization is to ensure the FAA's information systems and resources best support the agency's business - to ensure the FAA's information is secure. He received his Ph.D. from OSU in 1975.

MR. RON TEVONIAN

Mr. Tevonian was Director of R&D at Bell Laboratories, in Columbus, OH, when he retired in 1996. His organization developed and supported high availability software for the long distance telephone network. A 40-year career included manufacturing, product development, and manufacturing process development.

MR. ALEXANDER TREVOR

Mr. Trevor is founder and president of Nuvocom, a technology consulting company specializing in prior-art research for fighting questionable Internet patents. He is a Director of Applied Innovation and CMHC Systems, both in Dublin. He was CTO and EVP of CompuServe until 1996, and has been a member of the CIS Advisory Board since 1990.

MR. DENNIS YUN

A Masters Graduate of the Department, Mr. Yun is Information Systems Engineering Vice President with Battelle directing the system integration and consulting activities of over 280+ computer, management, and functional specialists performing integration, planning, analysis, design, programming, and implementation of computer-based information management systems. Dennis is also a member of Battelle's Technical Council responsible for investment decisions to maintain Battelle's long-term technology and competitive edge in the Information Technology field.

Bruce Weide, faculty member, & Doyt Perry, alum and part-time lecturer (Sept. 1995).



Canine Companion Puppy in Training Jake proves that a dog, especially one that's part Lab, can take a snooze anywhere ... until a camera comes out! - Spring 2001



Administrative Staff at Mirror Lake - Summer 1990 (l-r) Ginny Strawser; Marty Marlatt, Jeff Steinbeck, Judy Biller; Tom Fletcher; Elizabeth O'Neill, Deanna Tavener.



Sometime in the mid to late 80's. Administrative Associate and former naval commander, Ernie Stavely. Around the Department, he was aptly called The Grief Chief!



Summer 1986 - Governor's Summer Institute for the Gifted & Talented Walleed Mustafa and another graduate student (standing foreground) lead the Institute's participants. The guest students were chosen from the best and brightest of high school students who had completed the tenth grade.



Don Kalmy some time around 1972. Don was a graduate student and graduate assistant who worked as an undergraduate advisor.

FACT & REPORTS



*Mid 80's: Technical Staff members
Steve Romig (left) and Bob Henckel
(right) show off their new server.*

*Students in a lab in the late 70's or
early 80's.*

*Mid-70's: Loading server
tape.*

*Autumn 2000: Students working in the newly renovated
112 Caldwell Lab.*

THE BINARY STATISTICAL HISTORY

	1 st Year AU 1968	2 Years Later AU 1970	4 Years Later AU 1972	8 Years Later AU 1976	16 Years Later AU 1984	32 Years Later AU 2000
<i>Faculty</i>						
<i>Full Time</i>	11	15	18	22	35	29
<i>Part Time</i>	9	11	14	12	14	9
<i>Graduate Students Enrolled</i>	89	151	209	182	210	157
<i>Undergrad Students Enrolled</i>	143	485	450	470	1,595	1,556
<i>Course Enrollment/ Autumn Quarter</i>	770	1,293	1,728	2,290	4,698	3,977
	68 – 69	70 – 71	72 – 73	76 – 77	84 – 85	00 – 01
<i>Students Taught</i>	2,892	4,703	6,876	7,615	15,715	14,278
<i>B.A., B.S. Degrees Awarded</i>	0	0	118	118	449	297
<i>M.S. Degrees Awarded</i>	17	44	49	70	56	36
<i>Ph.D. Degrees Awarded</i>	0	0	8	5	12	8
<i>Ph.D. Degrees (cumulative)</i>	0	0	12	41	108	314
<i>Graduate Student Applications</i>	190	425	323	333	594	857
<i>Graduate Students Supported</i>	72	87	83	92	94	130

DISTINGUISHED GUEST LECTURERS & GUEST

Guest Name <i>Talk Title</i>	University or Company
Gagan Agarwal <i>Middleware, Language, and Compiler Support for Data Mining & Processing over Data Repositories</i>	University of Delaware
Pankaj K. Agrawal <i>Spatial Data Structures for Moving Objects</i>	Duke University
Mikhail Atallah <i>Secure Multi-Party Protocols for Approximate Searching</i>	Purdue University
Dirk Bartz <i>Efficient Occlusion Culling for Large Polygonal Models and Applications in Virtual Endoscopy</i>	University of Tübingen, Germany
Udeepta Bordenlooi <i>Hierarchical LIC For Vector Field Visualization</i>	The Ohio State University
Gary Bradski <i>A Free, Open Source Optimized Computer Vision Library (OpenCV) Maintained by Intel: Demos of Automatic Calibration, Rectification, Tracking and Object Recognition</i>	Microprocessor Research Labs at Intel
Henri Casanova <i>Application Scheduling on the Computational Grid</i>	University of California at San Diego
Bruce Craig <i>XML Interoperability Solutions</i>	Lucent Technologies
Hakan Ferhatosmanoglu <i>Efficient Searching and Scalable Organization of Multi-Dimensional Data</i>	University of California at Santa Barbara
Bill Freeman <i>Computer Vision for Computer Games & Television Remote Control</i>	Mitsubishi Electric Research Laboratories
Himanshu Gupta <i>Selection and Maintenance of Views in a Data Warehouse</i>	Stanford University
Bernd Hamann <i>Heirarchical Approaches for the Visualization of Massive Scientific Data</i>	University of California at Davis
Charles Hansen <i>Visualization Research at the University of Utah</i>	University of Utah
Ted Herman <i>Available and Stabilizing 2-3 trees</i>	University of Iowa
Julia Hirschberg <i>System Errors and User Correcting in Spoken Dialog Systems</i>	AT&T Labs - Research
Beth Hofer <i>Animation Discussion</i>	PDI/Dreamworks

Y. Charlie Hu	Rice University
<i>Run-Time Support for Distributed Sharing in Type Languages</i>	
David Huron	OSU School of Music
<i>Software-Tools Approach in Music Information Processing</i>	
Ioannis A. Kakadiaris	University of Houston
<i>Physics-based Techniques for Computer Vision and Biomedical Data Analysis</i>	
David Kao	NASA Ames Research Center
<i>On Animating 2D Vector Fields</i>	
Leslie Keedy	University of Ulm, Germany
<i>Attribute Oriented Programming</i>	
Neil Kirby	Lucent Technologies
<i>Concurrency Issues in a Components and Objects World - It Pays to Have a Clue</i>	
Marwan M. Krunz	University of Arizona
<i>Providing Quality-of-Service Guarantees in Wireless Packet Networks</i>	
David Kuck	Kuck and Associates
<i>Parallel Application Development: From SMP to DMP Extensions</i>	
Pete Manalios	University of Texas at Austin
<i>Combining Theorem Proving and Model Checking for the Verification of Reactive Systems</i>	
Atif Memon	University of Pittsburgh
<i>A Comprehensive Framework for Testing Graphical User Interfaces</i>	
J. Strother Moore	The University of Texas at Austin
1.) <i>Machines Reasoning about Machines</i>	
2.) <i>A Flying Demo of ACL2</i>	
Tim Oates	Massachusetts Institute of Technology
<i>Grounding Knowledge in Sensors: Unsupervised Learning for Language and Planning</i>	
Jung Hwan Oh	University of Central Florida
<i>Efficient Techniques for Management and Delivery of Video Data</i>	
Fatma Ozcan	University of Maryland
<i>Improving the Performance of Heterogeneous Databases</i>	
Sumanta N. Pattanaik	Cornell University
<i>Perceptually based techniques for efficient realistic image synthesis</i>	
Scott Pike	The Ohio State University
<i>A New Distributed Resource-Allocation Algorithm With Optimal Failure Locality</i>	
Voicu Popescu	University of North Carolina; Chapel Hill
<i>Forward Rasterization: A Reconstruction Algorithm for Image-Based Rendering</i>	
Neil Pundit	Sandia National Laboratories
<i>The Computational Plant (Cplant) Project</i>	

- William C. Ray Children's Hospital
Bridging the Bioinformatics Concept-Barrier By Example
- Joel Saltz Johns Hopkins University
Programming Tools for Large Dataset Subsetting, Aggregation and Visualization
- Gerik Scheuermann University Kaiserslautern, Germany
Topological Approaches for Vector and Tensor Field Simplifications and Visualization
- Stan Sclaroff Boston University
A Nonlinear Supervised Learning Framework for Estimating Motion of Articulated Structures: Human Body and Human Hands
- Alla Sheffer University of Illinois at Urbana
Cubes and Triangles: Generation and Manipulation of Meshes in 3D
- Yoshihisa Shinagawa The University of Tokyo
Recognition and Generation of Shapes, Images and Motions Based on Singularity and Homotopy
- Murali Sitaraman Clemson University
The Proper Way to Pass Objects as Parameters
- Krishna Sivalingam Washington State University
Design and Analysis of WDM Aware Weight Functions for Shortest Path Algorithms
- Paul Sivilotti The Ohio State University
Distributing Software Components: An Easy Way to Make Things Hard
- Amanda Stent The University of Rochester
Towards More Realistic Natural Language Generation for Spoken Dialogue
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- Prasad Tadepalli Oregon State University
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Providing Absolute Differentiated Services for Real-Time Applications in Static Priority Scheduling Networks
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Zhu, S.C.; Guo, C.E.; Mathematical Modeling of Clutter Descriptive vs. Generative Models, *SPIE AeroSense Conference on Automatic Target Recognition*, 2000, Orlando, FL

Zhu, S.C.; Liu, X.W.; Learning in Gibbsian Fields: How Accurate and How Fast Can it Be?, *International Conference on Computer Vision and Pattern Recognition*, 2000, South Carolina

Zhu, S.C.; Tu, W.; Zhang, R.; Effective Bayesian Inference by Data-Driven Markov Chain Monte Carlo, *SPIE AeroSense Conference on Automatic Target Recognition*, 2000, Orlando, FL

Zhu, S.C.; Zhang, R.; Tu, W.; Integrating Top-down/Bottom-up for Object Recognition by Data Driven Markov Chain Monte Carlo, *International Conference on Computer Vision and Pattern Recognition*, 2000, South Carolina

INVITED TALKS & PRESENTATIONS

Speaker, Title, Place, Location, Misc.

GERALD BAUMGARTNER

“A Virtual Embedded Systems Testbed for Instruction and Design”

- Digital Signal Processing Fest, Houston, Texas, Aug. 2000

PAOLO BUCCI

“Toys Are Us: Improving Instruction with Toys in the Computer Science Classroom”

- 32nd ACM SIGCSE Technical Symposium on Computer Science Education, Charlotte, NC, Feb. 2001

ROGER CRAWFIS

“Volume Synthesis using Splatting”

- 2000 Dagstuhl Workshop on Visualization, Dagstuhl, Germany

JAMES DAVIS

“Motion Recognition: From Templates to Categories”

- Center for Cognitive Science, Ohio State University, Columbus, Ohio, Sept. 2000

“Recognizing Children and Adults by Model Locomotion”

- Image and Visualization Group, Siemens Corporation, Princeton, New Jersey, Dec. 2000

“Visual Categorization and Recognition of Children and Adult Locomotion”

- Purdue University, West Lafayette, Indiana, Mar. 2001

TAMAL DEY

“Detecting Undersampling in Surface Reconstruction”

- MaxPlanck University, Germany, 2001

- Workshop on Algorithm Engineering as a New Paradigm, Kyoto University, Japan, 2001
 - University of Texas, Austin, TX, Aug. 2000
 - MaxPlanck Institute, Germany, Sep. 2000
 - Duke University, North Carolina, Nov. 2000
- “Detecting Undersampling in Surface Reconstruction: Theory and Experiments”
- Keynote speaker in the Workshop on Algorithm Engineering as a New Paradigm, Kyoto University, Japan, Oct. 2000
- “Sample-Based Geometric Modeling”
- SME Workshop on Solid Modeling, Detroit, MI, Nov. 2000
- “Surface Reconstruction Simplified”
- Duke University, University of North Carolina, Chapel Hill, 2001
- “Advanced Research Projects in Networking”
- Polytechnic University of Tirana, Tirana, Albania, Mar. 20, 2001

ARJAN DURRESI

- “Hot Topics Networking Research in NetLab”
- ITECOhio, Columbus, OH, Jan. 22, 2001
- “QoS for RealTime Applications over Next Generation Data Networks”
- NASA LRC, Cleveland, OH, Dec. 8, 2000
- “QoS in IP over Satellite Networks”
- TRE, OAI, Honeywell, CIS Dept., Columbus, OH, Nov. 15, 2000
- “Research in Emerging Networking Technologies at NetLab”
- Windows on the Future, Columbus, OH, Mar. 29 - 30, 2001

WU CHI FENG

- “Bringing Video Streaming to the Masses”
- IBM TJ Watson Research Center, Hawthorne, New York, Aug. 17, 2000
- “Streaming Media: Past, Present, and Future”
- Central Ohio Chapter of the ACM Computer Symposium, Columbus, OH, May 15, 2001

EITAN GURARI

- “From LaTeX to MathML and Back with TeX4ht and PassiveTeX,”
- The First MathML International Conference, Urbana - Champaign, IL, 2000

RAJ JAIN

- “Hot Topics in Networking”
- Comdex, Las Vegas, NV, Nov. 12, 2000
 - NetWorld+Interop, Atlanta, GA, Sept. 25 - 26, 2000
- “IP over DWDM Networks”
- OPNETWORK’2000, Washington, DC, Aug.28 - Sept.1, 2000

“IP over DWDM: Trends and Issues”

- CITO/OCRI Tech Talk Workshop on Optical Networks, Ottawa, Ontario, Oct. 17, 2000

TIMOTHY LONG

“Toys Are Us: Improving Instruction with Toys in the Computer Science Classroom”

- 32nd ACM SIGCSE Technical Symposium on Computer Science Education, Charlotte, NC, Feb., 2001

RAGHU MACHIRAJU

“Feature-Based Visualization for Large Datasets”

- First Workshop on Mining Scientific Datasets, Army HPC Research Center, Minneapolis, MN, July 2000

“Terascale Visualization”

- Simon Fraser University, Burnaby, CA, Sept. 2000

DHABALESWAR PANDA

“Cluster Computing: Where are We Headed?”

- Pacific Northwest National Laboratory, Pasco, WA Jul. 27, 2000

“Designing High Performance Communication Subsystems for Clusters”

- Argonne National Laboratories, Scoville, ID, Feb. 8, 2001

“Experiences on Implementing VIA and Higher Layers on Modern Interconnects”

- Intel Corporation, Portland, OR, Jul. 28, 2000

“NetworkBased Computing: Current Trends, Challenges, and the Future”

- International Conference on High Performance Computing (HiPC’00), Bangalore, India, Dec. 17, 2000
- ACM Chapter, Columbus, OH, Nov. 21, 2000

“Supporting Efficient Communication in NetworkBased Computing Systems”

- Mississippi State University, Mississippi, MS, Oct. 2, 2000

“VIA and InfiniBand Architecture”

- International Symposium on High Performance Computer Architecture (HPCA7), Monterrey, Mexico, Jan. 22, 2001

“End-to-end QoS Support for Collaborative Networked Computing”

- Windows on the Future Conference, Organized by ITECOhio, Columbus, OH, March 30, 2001

PAUL SIVILOTTI

“Distributing Software Components: An Easy Way to Make Things Hard”

- Lucent Colloquium: Academic and Industry Perspectives on Component Based Software Engineering, Columbus, OH, Oct. 10, 2000

“Optimum Failure Locality in Distributed Systems”

- Queen's University, Kingston, Canada, May 22, 2001

NEELAM SOUNDARAJAN

"Incremental Reasoning in Object Oriented Systems"

- University of Kiel, Germany, Jun. 26, 2000

"Incremental Reasoning in Object Oriented Systems"

- University of Oslo, Norway, Jun. 30, 2000

"Reasoning Issues in Object Oriented Systems"

- Washington University, St. Louis, MO, Oct. 26, 2000

DELIANG WANG

"A Solution to the Minsky Paper Connectedness Problem Using Synchronized Oscillators"

- IJCNN Special Session on Noisy and Chaotic Neural Networks for Information Storage and Retrieval, Como, Italy, Jul. 2000

"Auditory Scene Analysis Based on Oscillatory Correlation"

- McMaster-Gennum Workshop on Intelligent HearingAid Systems, Lake Louise, Canada, Oct. 2000

"Object-based Visual Selection"

- USC Symposium on Computational and Cognitive Neuroscience, Los Angeles, CA, Aug. 2000

"Oscillatory Correlation Theory to Scene Analysis"

- British Hearn Meeting, Sheffield, U.K., Aug. 2000

"Speech Segregation Based on Oscillatory Correlation"

- Air Force Research Laboratory, Dayton, OH, Jan. 2001
- Microsoft Research Beijing, Beijing, China, Aug. 2000

SONG CHUN ZHU

"Stochastic Computing in Computer Vision"

- University of Cincinnati, Cincinnati, OH, May 2001

"Conceptualization and Modeling of Visual Patterns"

- Workshop on Bayesian Statistical Image Analysis, San Francisco, CA, Dec. 2000

"Data Driven Markov Chain Monte Carlo"

- Compaq Research Lab, Cambridge, MA, Apr. 2001

"Lecture Series on Statistical modeling and Stochastic Computing"

- Microsoft Research Institute Beijing, Beijing, China, Jul. 2000

"Short Course on Statistical Methods in Image Analysis"

- The Abdus Salam International Centre for Theoretical Physics, Italy, Sep. 2000

"Statistical Modeling of Visual Patterns"

- University of California at Los Angeles, Los Angeles, CA, Apr. 2001
- “Tackling Visual Complexity by Statistical Modeling and Stochastic Computing”
- Institute for Mathematics and Its Applications, University of Minnesota, MN, Nov. 2000
- “Visual Learning from Descriptive to Generative Models”
- School on Mathematical Problems in Image Processing, Italy, Sep. 2000

STUART ZWEBEN

- “Computing’s Role in Public Policy”
- University of Cincinnati, Cincinnati, OH, Nov. 2000
- “IT Workforce Development”
- Batelle, Columbus, OH, Apr. 2001
- “Recent Experiences with Computer Science and Engineering Accreditation”
- Computing Research Association Biennial Conference, Snowbird, UT, Jul. 2000

TECHNICAL REPORTS

Memory-Optimal Evaluation of Trees Involving Large Objects, Lam, C. Cociorva, D., Baumgartner, G., Sadayappan, P., OSU Department of Computer and Information Science Technical Report No. OSU-CISRC-5/99-13, May 1999, Updated Mar. 2001

Recognizing Children from Adults by Modal Locomotion, Davis, J., OSU Department of Computer and Information Science Technical Report OSU-CISRC-11/00-TR24, 2000

Relating Categories of Intentional Animal Motions, Davis, J., Richards, W., OSU Department of Computer and Information Science Technical Report OSU-CISRC-11/00-TR25, 2000

Framework for IP over Optical Networks, Chandok, N., Durresi, A., Jagannathan, R., Jain, R., Seetharaman, S., Vinodkrishnan, K., Internet Draft, draft-osu-mpls-ipo-02.txt, March 2001

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Working Document Towards Draft New Recommendation: Achieving Quality of Service (QoS) for Transmission Control Protocol (TCP) Traffic over Satellite Networks with Differentiated Services, Kota, S., Durresi, A., Jain, R., Goyal, M., ITU-WP4B, Document No.: USWP4B-004, Reference : Question ITU-R 263/4 August 18, 2000

Framework for IP over Optical Networks, Chandok, N., Durresi, A., Jagannathan, R., Jain, R., Seetharaman, S., Vinodkrishnan, K., Internet Draft, draft-osu-mpls-ipo-01.txt, July 2000

An Implicit Surface Prototype for Evolving Human Figure Geometry, Lewis, M., Parent, R., OSU-ACCAD-11/00-TR2, 2000

Half & Half: Multiple dispatch and retroactive abstraction for Java., Baumgartner, G., Jansche, M., and Läufer, K., Technical Report OSU-CISRC-5/01-TR08, Department of Computer and Information Sciences, The Ohio State University, May 2001

A Foundation for Component Verification in RESOLVE, Arora, A., Leal, W., Technical Report OSU-CISRC-4/99-TR11

EQUIPMENT*

Servers:	3	Sun Ultra Enterprise 250
	15	Sun Ultra Enterprise 450
	3	Sun Ultra Enterprise 2
	3	Sun Ultra Enterprise 1
	11	Dell Poweredge 6300
	1	Dell Poweredge 6400
	1	Dell Poweredge 2300
Workstations:	400	Explora 452 NCD Thin Clients
Disk Space:	660+ GB of disk space	
Peripherals:	7	HP 4si/mx Laser Printer
	4	HP 5si/mx Printer
	3	HP 5m Color Laser Jet Printer
	5	HP 8100 Laser Printer
	4	HP 8150 Laser Printer
	6	Eiki LC-SX1U LCD Projectors
	2	Epson Portable Projectors
	1	100 MB Zip drive
	2	HP Scanjet 6300c scanner

**Please note: these figures do not include equipment in our graduate or research labs.*

FACULTY SEARCH REPORT

The Faculty Search Committee was exceptionally busy this year. The following figures represent its endeavors.

Total Applications Received	294
Actively considered	122
Interviews held	27
Hires	4

The concentration of applications were received in the following areas:

Artificial Intelligence	68
Parallel & Distributing	25
Graphics	20
Networking & Multimedia	20
Theory	19
Databases	17
Software Engineering	14
Data Mining	12
HCI	9

COURSE LISTING

COURSE	TITLE	CREDITS
100	Introduction to Computing Technology	3
101	Computer Assisted Problem Solving	4
200	Computer Assisted Problem Solving for Business	5
201	Elementary Computer Programming	4
202	Introduction to Programming and Algorithms for Engineers and Scientists	4
214	Data Structures for Information Systems	4
221	Software Development Using Components	4
222	Development of Software Components	4
230	Introduction to C++ Programming	4
314	Business Programming with File Processing	4
321	Design and Analysis of Component-Based Software	4
360	Introduction to Computer Systems	4
459.12	The UNIX Programming Environment	1
459.21	Programming in C	1
459.22	Programming in C++	1
459.23	Programming in Java	1
459.31	Programming in LISP	1
459.41	Programming in COBOL	1
489	Professional Practice in Industry	2
516	Information System Analysis and Design	4
541	Elementary Numerical Methods	3
560	Systems Software Design, Development and Documentation	5
570	File Design and Analysis	3
601	Social and Ethical Issues in Computing	1
612	Introduction to Cognitive Science	3
621	Introduction to High-Performance Computing	3
625	Introduction to Automata and Formal Languages	3
630	Survey of Artificial Intelligence I: Basic Techniques	3
655	Introduction to the Principles of Programming Languages	4
660	Introduction to Operating Systems	3
662	Operating Systems Laboratory	3
670	Introduction to Database Systems I	3
671	Introduction to DataBase Systems II	3
675.01	Introduction to Computer Architecture	4
675.02	Introduction to Computer Architecture	4
676	Microcomputer Systems	3
677	Introduction to Computer Networking	3
678	Internetworking	3
680	Data Structures	3
681	Introduction to Interactive Graphics	4
693	Individual Studies	1-5

694R	Graphical User Interface Programming 1	1
694V	Multimedia Computing and Networking 3	3
721	Introduction to Parallel Computing	4
725	Computability and Unsolvability	3
727	Computational Complexity	3
730	Survey of Artificial Intelligence II: Advanced Topics	3
731	Knowledge-Based Systems	4
737	Proseminar in Cognitive Science	2
739	Knowledge-Based Systems in Engineering	3
741	Comparative Operating Systems	3
752	Techniques for Simulation of Information Systems	3
755	Programming Languages	3
756	Compiler Design and Implementation	4
757	Software Engineering	3
758	Software Engineering Project	4
760	Operating Systems	3
762	Advanced Operating Systems Laboratory	3
763	Introduction to Distributed Computing	3
770	Database Systems	3
772	Information System Project	4
775	Computer Architecture	3
776	Hardware/Software Interface Design Project	4
777	Telecommunication Networks	3
778	Computer Aided Design and Analysis of VLSI Circuits	4
779	Introduction to Artificial Neural Network Methods	3
780	Analysis of Algorithms	3
781	Introduction to 3D Image Generation	4
782	Advanced 3D Image Generation	3
783	Honors Research	1
788	Intermediate Studies in Computer and Information Science	1-5
793	Individual Studies	1-5
794	Group Studies	1-5
875	Advanced Computer Architecture	3
881	Geometric Modeling	3
885	Seminar on Research Topics in Computer and Info. Science	1
888	Advanced Studies in Computer and Information Science	1-5
894	Group Studies	1-5
889	Advanced Seminar in Computer and Information Science	2
999	Research	1-18

The Policy of The Ohio State University, both traditionally and currently, is that discrimination against any individual for reasons of race, color, creed, religion, sex, sexual orientation, national origin, age, handicap, or Vietnam-era veteran status is specifically prohibited. The University promotes equal opportunity through a positive affirmative action program.



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