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*Dreese Labs on a snowy day.*



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*From the Chair's chair:*

*I never grow tired of reveling in the accomplishments of our department, and the past year again gave me ample opportunities to do so. The annual report documents most of them, and I hope you take the time to read through the rest of the report to see more about our past year's activities.*

*Our stature as a top 20 department among public universities continues to grow, with faculty awards at the College, local, national and international levels. External research funding continues its rate of doubling over a four-year period. Two new faculty hires will help us to continue this trend. Jim Davis, from MIT joins us in summer 2000 to work with our AI group in the area of computer vision. Jim is a specialist in the area of motion understanding, and his work will also further our collaboration with cognitive science and design groups elsewhere on campus. Srini Partharathy, from Rochester, also joins us in summer 2000 to work with our parallel and distributed computing group. Srini's expertise is in the data mining area, and he also will help our collaborative efforts in the bioinformatics arena.*

*I was particularly pleased that, in addition to research awards that CIS faculty won this year, we had two faculty honored for their excellent and innovative efforts in computer science instruction. We not only teach a large number of students, but we take this part of our mission very seriously and do it effectively. As further evidence of this, our computer science and engineering program was accredited this year by the Accreditation Board for Engineering and Technology (ABET) and the Computing Sciences Accreditation Board (CSAB).*

*Also this year, we received renewal funding from the G.E. Foundation for a special program to promote diversity in the computer science workforce. The program strongly supports our research activities, and offers opportunities to both undergraduate and graduate students.*

*Speaking of students, we graduated a record number of them this past year, largely the result of the past several years' increase in demand for our undergraduate programs. This is good news for employers of our graduates, who continue to be in great need of highly competent workers in the information technology area. Our students are among the best at OSU, based on their academic profiles. We continue to raise the bar for admission into our undergraduate programs. For fiscal year 2001, it was raised to a 3.0 GPA in pre-major courses.*

*Among our bachelors graduates this year was an NSF graduate fellowship winner and a student with a perfect 4.0 GPA. Both of these are very unusual accomplishments. We also had a seventh consecutive year in which at least one of our graduate students won a university presidential fellowship. This award also is prestigious within the OSU community, but for CIS, it appears to not be such an unusual accomplishment any more!*

*Our biggest challenges continue to be the recruitment and retention of faculty, and the recruitment and retention of Ph.D. students. The fact that this also is a problem faced nationwide doesn't make it any less real, or any less important that we do well in dealing with it. We will be aggressive in trying to fill several faculty positions with individuals who will further our move upward in reputation and accomplishments.*

*The Department celebrates its 32<sup>nd</sup> anniversary with a special weekend on October 27-28, 2000 (only a computer science department would think of having a special party on a "power of 2" anniversary). The weekend includes featured alumni speakers, a research lab open house, and a banquet. I hope that many of you are there to help us celebrate.*

*As always, I welcome your input and appreciate your support of the Department. Please continue to help us improve.*

*Sincerely,*



Stu Zweben



## *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;*
- ♦ to 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 and technology 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

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*The 1999-2000 Academic year in the Department of Computer & Information Science was shining with awards; not only did faculty members receive recognition, but so did many of our students, alumni and our undergraduate advisor. The details are listed within the appropriate report sections. The individuals involved have much for which to be proud and the Department is honored to be associated with these outstanding people.*

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The CIS faculty once again has garnered great praise and many accolades.

The Columbus Technical Council conferred their Technical Person of the Year 2000 award to Department Chairsperson **Dr. Stuart Zweben**. The Central Ohio Chapter of the Association for Computing Machinery (COC-ACM) nominated Dr. Zweben for the award, which is given in recognition of the achievements and contributions of an outstanding citizen of Central Ohio. The ACM is an international scientific and educational society of more than 80,000 professionals in the computing discipline.



*Dr. Zweben with ACM representatives. (L-R) Otto Juelich, Stu, Clint Foulk and Paul Buerger.*

The Columbus Technical Council comprises Central Ohio societies in various scientific and technical disciplines. It works to raise awareness of the science and engineering fields within all levels of the academic world.

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**Dr. Raj Jain** received the *siliconindia Leadership Award for Excellence and Promise in Business and Technology*. This is a new award bestowed by *siliconindia* magazine. The award is given to ten South Asian/Indian professionals who have achieved a level of drive, determination and success which sets them above their peers and establishes them as role models.

*siliconindia* magazine is a young business and technology publication focused on the South Asian/Indian professionals.

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The Institute of Electrical Engineering and Electronics Engineers (IEEE) gave **Dr. Ming (Mike) Liu** their IEEE Third Millennium Medal. The organization also named him a Life Fellow. IEEE also presented **Dr. Anish Arora** with a IEEE Computer Society Certificate of Appreciation.

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The National Science Foundation (NSF) has awarded **Drs. Roger Crawfis & Wu Chi Feng** Career awards. These grants are given to scientists at the beginning of their careers in expectation of excellence in both research and teaching. Ten members of OSU faculty at some point in their profession have received this award.

---

**Dr. Song Chun Zhu** and one of his graduate students, **Xiuwen Liu**, were nominated for the prestigious David Marr Memorial Prize. The presented paper, *Equivalence of the Julesz and Gibbs Ensemble*, also in collaboration with Y. N. Wu, a colleague from Yale, derives a mathematical definition for natural texture phenomena, and demonstrates by experiments that various natural textures can be modeled in a common framework. It also proves that all the texture theories and models developed in the past forty years can be put in a single unified mathematical framework. The paper has automatically been accepted for publication in the *International Journal of Computer Vision*.

---

The College of Engineering's Annual Awards Ceremony was a bright night for members of CIS faculty. **Roger Crawfis** and **Leon Wang** received Lumley Research Awards. Research Accomplishment Awards were given to **Wuchi Feng** and **Song Chun Zhu**. These research awards recognize outstanding contributions in research. The Boyer Award for Excellence in Teaching was given to **Bruce Weide** and **Tim Long** in recognition of their exceptional efforts and innovation in undergraduate instruction.



*Bruce Weide & Tim Long,  
Boyer Award winners.*

Students of the Department of Computer & Information Science are continually a source of astonishment and pride. Each year they surpass not only our expectations, but they raise the proverbial bar to new heights over where their predecessors had gone. Several of our students received awards outside our own department's.

**Sarah Jane Waterson** was one of 850 undergraduates nationwide awarded National Science Foundation (NSF) Research Fellowships. These gifts go to promising mathematicians, scientists and engineers who exhibit potential for making significant contributions in their future careers. Eighteen former NSF Fellows have won Nobel Prizes.



Sarah, from Hudson, Ohio, graduated in June 2000. She is pursuing her graduate degree at the University of California-Berkley. Her research interest can be generally listed as Human Computer Interaction (HCI); however she is particularly excited by a cross discipline study of psychology, sociology and design. Sarah also was named to the Honors list by the College of Mathematics and Physical Sciences.



The Women in Engineering Organization recognized several of CIS's outstanding female students. **Jennifer Marie Butler** received the Wildah Turnball Walkup Scholarship which is granted to a student who demonstrates "First-Year Outstanding Academic Achievement." Top Academic Award Recipients were **Adrienne Olwert** and **Marianne Poch**. Ms. Poch also received a Leadership Award. Outstanding Academic Awards were given to: **Elizabeth Rosselot**, **Niketa Shah** and **Mary Tanner**. For funding these awards, the Department thanks Allstate Insurance Company, Dell Computer and Solectron Technology.

*Dept. Chair, Stu Zweben congratulates Jennifer Butler at the Women In Engineering Banquet. Jennifer is also a Denman and COC-ACM Scholarship winner.*

Several of the Department's undergraduates also received awards from the Minority Engineering Program. The Academic Status Award is given to students who maintain a cumulative grade point average of 3.0 or higher. CIS students attaining this level of scholarship were: **Peter Gephardt**, **Jermaine Glass**, **Sean Taylor**, **Herve Thomas**, and **Laurence Thomas**. **Robert Alonao** received an Academic Year Award given in recognition of his earning a 3.0 or higher GPA for the current academic year.



Eight CIS students received Excellence in Scholarship Awards from the College of Mathematical and Physical Sciences. These students were: **Andrew John Baxter**; **Jong Wuk Choi**; **Scott Matthew Coplin**; **Yevgeniy Fratkin**; **Joshua D. Humphrey**; **Jennifer Molsberry Kannen**; **Sarah Jane Waterson**; **Jonathan Lee Woodring**. To receive this award the students must be following a curriculum of the highest challenge and maintaining a 3.8 g.p.a. while doing so.

*Four of the Honor Students as recognized by the College of Mathematical and Physical Sciences. Left to Right: Yevgeniy Fratkin, Jennifer Kannen, Andrew Baxter, Jong Wuk Choi.*



At this year's Denman Undergraduate Research Forum, **Jennifer M. Butler** and **Rupal Mehta** shared the Outstanding Junior Award for their project *An Efficient Search for Data Sets or How to find a Needle in a Haystack*. The Denman award is given in recognition of quality research and is funded by distinguished alumni, Richard J. and Martha D. Denman. Rupal also won a CIS Department Scholarship.



*Steve Miller*

**Steven Miller Jr.** received the Square D Company Scholarship and Internship. This is a unique and highly beneficial program which gives the student a summer internship with their company and money toward school costs.



*Ryan Geiss, at Spring 2000 Graduation*

At the Spring 2000 Graduation, University President Kirwin acknowledged **Ryan Geiss's** Achievement of a college career GPA of 4.0.

At the Graduate level, **Jun Xu** received the University's Presidential Fellowship Grant. This is the seventh year in a row that a CIS student has received this recognition. Jun Xu's work was also recognized by the Department with an Outstanding Research Award.



*Jun Xu*

The spirit of excellence pervades every area of the Department.

Undergraduate Advisor **Peg Steele** coauthored a paper, "Habits of Professional Development" with Jennifer Grube Vestal which won the Positions on Professionalism Program Award from the Ohio Academic Advising Association.



*Advisor Peg Steele and Niketa Shah one of the Women in Engineering Awardees.*



**Tom Fletcher** and **Ron Salyers** were nominated for the Above and Beyond Staff Recognition Award from the College of Engineering. This award is presented to the staff personnel who show dedication to quality and customer service in their daily work ethics.

*Ron Salyers receiving his nomination certificate from Dean Ashley of the College of Engineering.*

While the Department believes all of our alums are exceptional each year select alumnae and alumni excel beyond the norm in their chosen careers. Two of those are **Kendra VanderMeulen** (M.S. 1972) and **Sargur N. Srihari** (M.S. 1972, Ph.D. 1976).



**Kendra VanderMeulen** received the AT&T Catherine B. Cleary Woman of the Year Award. Ms. VanderMeulen received this recognition for her position as an industry leader in wireless data. The award is named for a former board member of AT&T. She heads the AT&T wireless Group's product-development and strategy team. Ms. VanderMeulen is a former Distinguished Alumni Award Recipient.

The College of Engineering awarded **Dr. Sargur N. Srihari** the Distinguished Alumni Award recognizing his achievements in the field of document analysis and pattern recognition. **Dr. Srihari** is a Distinguished Professor in the Department of Computer Science and Engineering at the State University of New York at Buffalo. Concurrently, he is the Director of the Center of Excellence for Document Analysis and Recognition, one of the largest and best-funded research groups in any computer science department in the country. The Center, staffed by 30 research scientists, developed handwritten address interpretation software from its research which the U.S. Postal Service currently uses and will be soon used worldwide. The holder of six patents and author of over 200 technical papers, Dr. Srihari's research has been featured regularly in the media, such as CNN, ABC News, the New York Times, Business Week, Science and Scientific American.

## ALUM VISITS

*"It is indeed ironic that we spend our school days yearning to graduate and our remaining days waxing nostalgic about our school days."*

Isabel Waxman

*Alums Richard Baum (left), IBM, and Rik Knablein (right), TRW, visiting Stu Zweben.*



*Elizabeth O'Neill receives a hug from alumni, Srini Raghavan.*



*More alumni visit! From left to right: Fawzi Gherfal (alum), Marty Marlatt (Administration), Elizabeth O'Neill (Administration), Ahmed Elmagarmid (alum).*

## FOURTH ANNUAL AWARDS BANQUET

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The CIS Awards Banquet is an evening of excellence; excellence in teaching, excellence in research, excellence in service, and excellence in scholarship. Individuals who have excelled in these areas are recognized and rewarded. This year's banquet drew the largest audience to date, including more undergraduates than ever before. Everyone agrees this is a trend that needs to continue.

The Awards Banquet would not be possible without the Department's Corporate Partners. Everyone in CIS is especially grateful to:

*Daimler Chrysler Corporation*

*Central Ohio Chapter of the Association for Computing Machinery (COC-ACM)*

*Crowe Chizek & Company, LLP*

*Dupont Corporation*

*EDS*

*The Leggett Family Fund*

*Lockheed Martin Corporation*

*Lucent Technologies*

*Microsoft Corporation*

*Procter & Gamble*

*Qwest Communications*

*Robin  
receiving his  
Chrysler  
Scholarship  
certificate.*



*Crowe Chizek presented two  
scholarships. Foreground are the  
winners Nicole Perdue and Igor  
Grobman. Standing behind them are  
company representatives Bill Paterson  
and Mike Shively.*



*Adam Moody (foreground)  
winner of the Lucent  
Technology Scholarship  
with Don Gutt & Bill  
Mielke of Lucent.*



*Lockheed Martin  
representative, Carol  
Marshall (center)  
with scholarship  
recipient, Patrick  
Coleman (left) and  
Stuart Zweben  
(right), Dept.  
Chairperson.*



## TEACHING, SERVICE & RESEARCH AWARDS

### Outstanding Teaching Awards

Stephen Fridella

Paul Sivilotti

### Outstanding Research Awards

Mohammad Banikazemi

Chunlei Liu

Jun Xu

*Neelam Soundarajan,  
Service Award.*



### Outstanding Service Awards

Neelam Soundarajan

## SCHOLARSHIP AWARDS

Chrysler Corporation

Robin

COC-ACM Scholarship

Jennifer Butler

Crowe Chizek

Igor Grobman

Nicole Perdue

Dupont Corporation

Gary Lerhaupt

EDS

Matthew Sidesinger

The Leggett Family Fund

Miriam Reddoch

Lockheed Martin

Patrick Coleman

Lucent Technologies

Adam Moody

Procter & Gamble

Aleksandr Dubinskiy

CIS Undergraduate Scholarship

Timothy Daoust

George Locktish

Rupal Mehta

Pratik Bhavsar

Annual Report Cover Winner



*Outstanding Researchers Chunlei Liu (left) and Mohammed Banikazemin (below).*



*Gary Lerhaupt, the Dupont Scholarship recipients.*



*Outstanding Teacher, Steve Fridella (center) with his wife, Marika Whaley and Ph.D. candidate, Scott Pike.*

*Aleksandr Dubinsky winner of the Proctor & Gamble Scholarship.*



*The Leggett Family Fund Scholarship recipient, Miriam Reddoch shaking hands with Stu Zweben.*



*The CIS Scholarship Recipients. L-R: Rupal Mehta, Tony Pretarca (founder of the scholarship fund), Stu Zweben, Timothy Daoust and George Locktish.*

*Paul Sivilotti, Outstanding Teaching Award recipient, and his wife Linda.*





## MAJOR RESEARCH PROJECTS

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### ARTIFICIAL INTELLIGENCE AREA HIGHLIGHTS

#### 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.

#### COMPUTATIONAL FOUNDATIONS OF HUMAN COGNITION AND LANGUAGE

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

Rick Lewis has been involved in investigating the computational foundations of human cognition. The focus is on aspects of language comprehension and other cognitive tasks that help reveal the fixed structure of mental architecture. The approach he is pursuing starts with functional computational models and brings to bear independent constraints from psycholinguistics, cognitive psychology, theoretical linguistics, and cognitive neuroscience. He has several projects underway, including collaborations with researchers at Carnegie Mellon, the University of Michigan, the University of Pittsburgh, Rutgers University, and Potsdam University, Germany. Some of this work is summarized in more detail in the research section of his web page.

#### 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.

## OSU VISION AND LEARNING

[www.cis.ohio-state.edu/oval](http://www.cis.ohio-state.edu/oval)

Dr. Song Chun 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 understands 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:

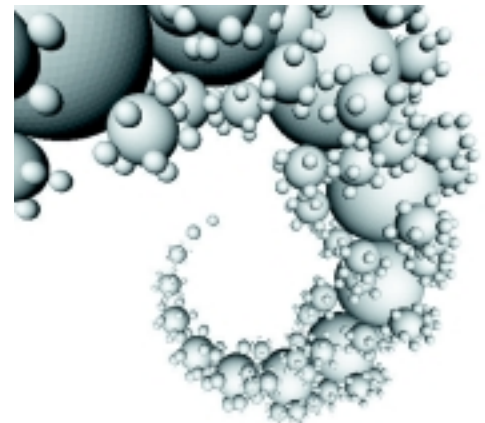
1. In representational aspect. The team pursues a unified mathematical theory for learning probability models for a variety of stochastic visual patterns, such as texture, texton, line/curve processes, region, shape, and object processes.
2. In computational aspect. OVAL studies stochastic search (computing) 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.

## 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. A number of research projects spanning various aspects of computer graphics such as image based rendering, computer animation, geometric modeling, scientific visualizations have been taken up by six faculty members. Large number of students supported by this research group and a number of publications in premier conferences uphold the visibility of the group.

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.

The CIS faculty in Computer Graphics has expanded by three members in the last year with the inclusion of Raghu Machiraju (visualization), Tamal K. Dey (geometric modeling), and Han-Wei Shen (visualization) in addition to the existing faculty members Roger Crawfis, Richard Parent and Rephael Wenger. A brief account of research interest and current projects of each faculty member is listed below.



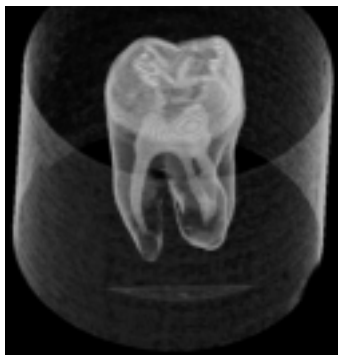
*Snowflakes with Level-of-Detail Spheres*

Raghu Machiraju's research interests include graphics, visualization and computational methods. He is 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 his 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, geometry, signal processing, wavelets and coding theory.

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. The mainstay of this work includes feature detection, signal processing, geometry and image synthesis. His 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>.

Han-Wei Shen is interested in scientific visualization with a focus on algorithms and software architectures for three-dimensional time-varying data visualization. Before joining OSU, Han-Wei Shen spent three years at NASA Ames Research Center, where he focused on the research and development of reusable software components for building data analysis and visualization systems. The visualization techniques he is particularly interested include time-varying data visualization [1], isosurface extraction [2], adaptive volume rendering, and flow visualization [3]. Han-Wei Shen is also interested in parallel volume and polygon rendering visualization algorithms, and the use of distributed system middleware such as CORBA to support the needs of large-scale visualization.

*Results of volDG of second-order moment volume*



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. Currently, he is involved in projects for visualization of four-dimensional data, reconstruction of curves and surfaces in two and three dimensions, and image analysis for cancer detection and diagnosis.

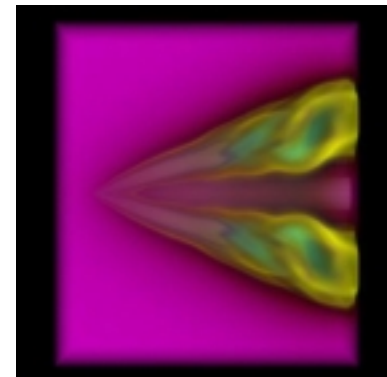
Drs. Roger Crawfis, Tamal Dey, Han-Wei Shen, and Rephael Wenger are involved in visualization of four or more dimensional data. Such data sets are typical in dynamic 3-dimensional systems such as atmospheric or fluid flow models. They also are produced by parametric studies of three dimensional models and simulations where each parameter adds a dimension. Our 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. Rephael Wenger is supervising the development of software to automate this image analysis.

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. See <http://www.cis.ohio-state.edu/~tamaldey> for more details.



*Time-varying volume visualization of an aircraft simulation data.*



*Reconstructed model of a foot from sample points.*



Rick Parent is interested in computer animation, especially as it relates to the human figure. He is currently writing a book on the subject, "Computer Animation: Algorithms and Techniques," to be published by Morgan-Kaufman in the spring of '01. His students are working on various projects related to human figure design and motion control. Scott King, a Ph.D candidate, has developed a system that takes text as input and automatically generates facial animation. The facial model incorporates an underlying skull model including an articulated mandible. Scott has developed new parameterized models for the tongue and lips in order to generate more effective animation. Graduate Student, 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. candidate, Lawson Wade has developed a system to allow the automatic generation of control skeleton for arbitrary polyhedral objects. 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. His dissertation extends this approach to include anatomic knowledge to further refine the control skeleton. Other work includes: extracting human figure motion from markerless video; analyzing secondary motion of human figures based on differences in age, sex, and weight; and preliminary software development intended to contribute to a large digital human project.



*Facial animation for speech.*

## NETWORKING AREA HIGHLIGHTS

### OSU WIRELESS COMMUNICATIONS TESTBED

The objective of this project is to achieve significant gains in wireless system performance and spectral efficiency through a tight, synergistic theory-experiment loop. The research objectives of the seven proposed focus areas are summarized below:

**Wireless Testbed:** An existing and functioning wireless testbed will be leveraged to build an experimental system which forms the bedrock of the proposed research. This flexible design permits operation at multiple frequencies, with multiple bandwidth and array capabilities.

**Multiple Access Signaling:** Advanced multi-user receivers will be designed by considering novel characterizations of multiple access interference, inherent parameter mismatch, and systems that offer multiple data rates. Coupled model order selection/parameter estimation techniques will be employed to optimally characterize and mitigate interference.

**Space-Time Modems:** Traditional models for space-time characteristics will be validated via field tests. Experimentally refined models will be used to optimize space-time codes. Both coupled and decoupled space-time processing algorithms will be developed to perform multi-user separation and channel equalization for multiple data rate systems.

**Error Control:** An interactive/iterative design process between physical layer system design and network layer protocol design will be employed to efficiently distribute system complexity. To this end, experimental error statistics will be characterized and error statistic shaping methods will be developed. For given error statistics, optimal protocols will be designed and analyzed.

**Access Methods:** Based on the error characteristics drawn from experimental data, we will design medium access control protocols to support timely establishment of message streams and to support different levels of temporal QoS in the presence of channel errors and fading.



*Base-Station Radio*

**Mobility:** The testbed will be used to study how the channel error and fading characteristics of wireless links impact the design of a robust handoff mechanism and how error characteristics can be shaped and tuned to facilitate the design.

**Flow Control:** Flow control is an important resource management problem for reliable data transmission, especially in a high demand situation. A stable, robust, adaptive controller design scheme will be developed for a class of time-varying, time-delay system models appearing in basic flow control problems of communication networks.

**Principal Investigators:** Prof. Michael Fitz (EE), Prof. Urbashi Mitra (EE), Dr. Steve Wellingson (ESL), Prof. Raj Jain (CIS), Prof. Jennifer C. Hou (EE) Prof. Hitay Ozbay (EE)

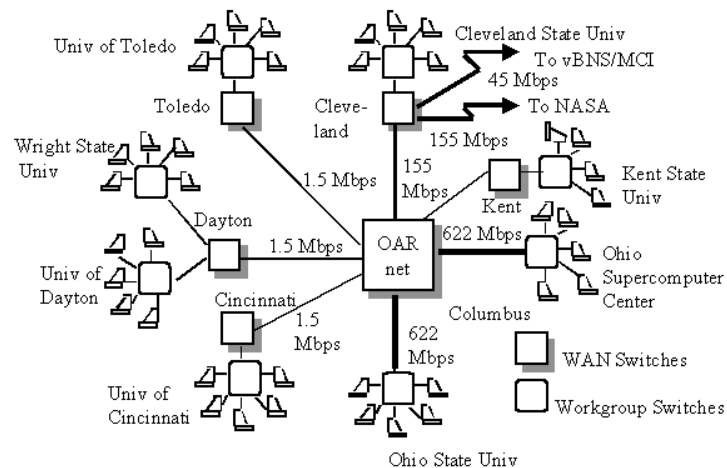
**Graduate Students:** Chunlei Liu, Ye Ge, Siwaruk Siwamogsatham, Venkata Bharani, Wei-peng Chen, Yue-Heng Sun , Kang Wang, Rakesh Arora

**Sponsor:** National Science Foundation (NSF)

## OCARNET: OHIO COMMUNICATION AND COMPUTING ATM RESEARCH NETWORK

The Ohio Computing and Communication ATM Research Network (OCARNet) is a wide-area ATM testbed connecting nine Ohio Institutions: The Ohio State University (OSU), The Ohio Supercomputer Center (OSC), OARNet, Cleveland State University, University of Dayton, University of Cincinnati, Kent State University, Wright State University, and University of Toledo.

This state-wide ATM testbed is used for conducting state-of-art research in the areas of networking and its applications. This testbed is targeted to benefit multiple research directions along the strategic High Performance Communications and Computing (HPC) research program. These directions include performance testing, parallel/distributed computing, and network management. This project has boosted the dominance of the State of Ohio in the emerging ATM networking technology.



Most inter-city links are T1 (1.5 Mbps) links mainly due to their cost. The links between OSC/OARNet and OSU were originally OC-3 (155 Mbps). These links are now being upgraded to OC-12 (622 Mbps) with additional instrumentation funding from NSF. This funding also allows OCARNet to be connected to NASA Lewis Research Center at Cleveland with a OC-3 (155 Mbps) link and to NSF's vBNS network with a T3 (45 Mbps) link.

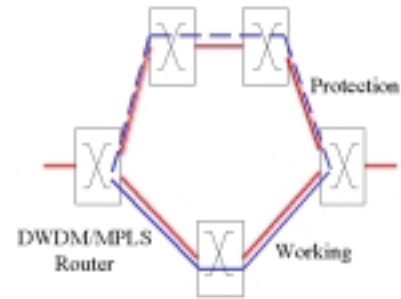
OARNet acts as the central hub for the network. It also provides points of presence (POPs) at various cities for connection to different universities. Stratacom/Cisco switches are being used for telecommunication links. FORE switches are being used inside the campuses for workgroups. Such a network, unlike a production network, provides flexibility to experiment and validate our proposed research and demonstrate the significance of our solutions.

**Principal Investigators:** Raj Jain and D.K. Panda (Ohio State University), A.E. Stutz (Ohio Supercomputer Center), G. Wallis (OARNet), M. Farrell (Kent State University), B.A. Blake, C.H. Lin, and J. Sang (Cleveland State University), M. Atiquzzaman and Y. Pan (University of Dayton), H. Carter (U. of Cincinnati), P.A. Vendt and O. Garcia (Wright State University), and T. Saliga (U. of Toledo)

**Sponsor:** Ohio Board of Regents Investment Fund, National Science Foundation

## ALL-OPTICAL NETWORKING: IP OVER DWDM

Dense wavelength division multiplexing (DWDM) allows optical fibers to carry hundreds of wavelengths 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.



Personnel: Prof. Raj Jain, Dr. Arjan Duresi, Dr. Gojko Babic

Current MS Students: Nikhil Chandhok, Srinivasan Seetharaman, Ramesh Jagannathan, Vinodkrishnan Kulathumani, V. R. Sitaraman

## PARALLEL & DISTRIBUTED COMPUTING AREA HIGHLIGHTS

### NETWORK-BASED COMPUTING RESEARCH LABORATORY

Primary Members: Dr. Mario Lauria, Dr. Dhabaleswar Panda and Dr. Ponnuswamy Sadayappan

Work in the Network-Based Computing Research Laboratory (<http://nowlab.cis.ohio-state.edu>) is addressing a number of issues towards the goal of efficient use of NOW (Networks of Workstation) clusters for high-performance computing.

#### 1.1 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 communication. Efficient implementation of these protocols to achieve low latency and high bandwidth point-to-point communication requires research along several directions: balanced work distribution between the host processor and the Network Interface Card (NIC) processor, efficient packetization, minimization of copying at sender and receiver side, and flow control. The latest industry standard for ULNP is the Virtual Interface Architecture (VIA). 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 implementation on the IBM Netfinity cluster. This implementation achieves one-way latency of 18.2 microseconds and bandwidth of more than 100 Mbytes/sec (maximum among all VIA implementations so far). The NCB Lab has also developed a comprehensive benchmark suite to compare different VIA implementations and study the performance impact on the MPI layer built on top of VIA. An implementation of TreadMarks (a popular DSM package) on top of VIA has also been developed and is being evaluated. These design studies related to VIA and the associated implementations are becoming popular and are attracting industrial collaboration from Intel and Dell (in addition to the on-going collaboration with IBM).

### 1.2 Efficient algorithms for collective communication with unicast message passing

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. These operations can be used explicitly by distributed memory programs (as indicated in the Message Passing Interface (MPI) standard) or implicitly by distributed shared memory programs (such as multicast operation for cache invalidation and gather operation for collecting acks). In the absence of any architectural support, these operations are typically implemented on top of point-to-point communication layer (known as unicast message passing). Such implementations of collective communication on unicast message passing require the algorithms to be developed in a careful manner so as to minimize both link and node contention.

The Network-Based Computing Research Laboratory team has worked extensively along this research direction for several collective operations and several categories of systems and networks. For clusters with irregular networks, the team has proved that contention free multicasting schemes cannot be developed with the popular Up\*/Down\* routing algorithm. Within this work a series of algorithms to minimize link contention has also been developed. For multiple multicasts, the impact of node contention has been investigated and shown how algorithms can be developed to minimize both node and link contention by considering only source-specific information, i.e., no global information is required. An optimal multicast algorithm for clusters with NIC-level packetization has also been proposed. Several algorithms for efficiently implementing complete exchange on meshes and tori have been proposed. A set of algorithms for low latency implementation of all-to-all broadcast on switch-based clusters has also been developed. The emerging workstation/PC clusters demonstrate heterogeneity in processing speeds (at the hosts) and in the networks. A novel framework to take advantage of such heterogeneity in developing fast and scalable collective communication algorithms has also been proposed. This framework is being used by other researchers to develop better algorithms for collective operations on modern heterogeneous clusters.

### 1.3 NIC-level support for collective communication

Modern networks of workstations are using Network Interface Cards (NICs), which are programmable in nature. This helps to implement collective communication operations with reduced latency. Using such framework, a broadcast/multicast implementation has been developed for clusters with Myrinet interconnection and FM communication layer. This implementation has been demonstrated to deliver very good broadcast/multicast performance at both the FM layer and at the MPI layer. A barrier synchronization implementation has also been developed recently by modifying GM layer for Myrinet. For a 16-node system, the implementation reduces the barrier synchronization time by a factor of 1.8, compared to the host-level implementations. The researchers are currently evaluating the impact of these efficient implementations at the application-level.

### 1.4 Designing efficient communication subsystems for Distributed Shared Memory (DSM) systems

Past research on designing DSM systems has mainly focused on the cache coherency protocol and application-level performance issues. However, the overall performance of DSM systems is quite dependent on the performance of the underlying communication subsystem. Along this research direction, for the first time in the literature, the impact of communication subsystem design on the overall performance of DSM systems has been able to show. Additionally guidelines about how to design better communication subsystems for DSM systems have been established. The impact of network contention and network interface contention on the overall DSM system performance has been analyzed. This study has led to established guidelines for designing better networks for DSM systems. The NCB Lab has also demonstrated that router-based multidestination message passing can reduce the cache coherency overheads in DSM systems significantly. The impact of network adaptivity in irregular networks on the performance of DSM traffic has also been analyzed. As DSM systems are incorporating networks with multiple paths, we have proposed a new block correlated FIFO channel concept to design DSM systems with better performance and less complex cache coherency protocols. The architectural, communication, and network guidelines established along this research direction can be observed to have impact on the design of modern DSM systems like SGI Origin and HAL DSM system.

### 1.5 Mapping and Scheduling on Heterogeneous Systems

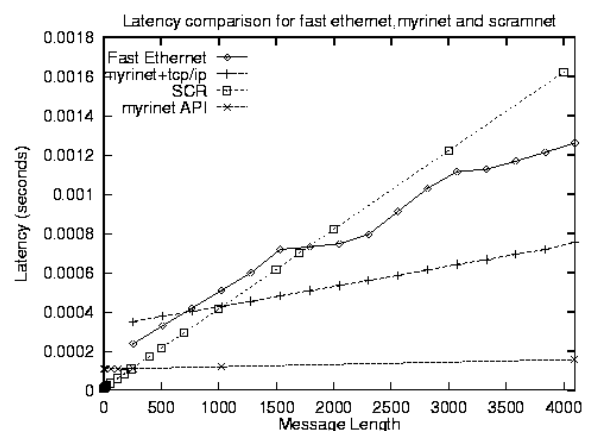
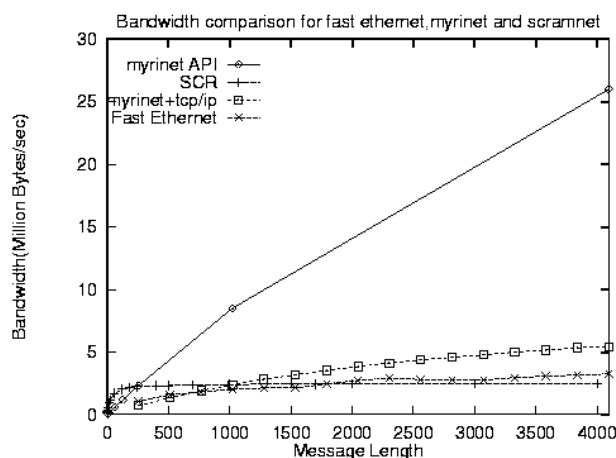
Since commercial off-the-shelf components are used for the processors as well as the networking for NOWs, incremental upgrades to the system are facilitated. As new processors and nodes are added to evolving systems, it becomes heterogeneous with respect to performance characteristics, since the newer nodes employ the latest technology. This leads to the following challenge: how a set of applications can be mapped to such a heterogeneous system to minimize user response time and maximize system throughput? The team has investigated solutions to such mapping and scheduling problems for efficiently mapping a set of independent jobs to a heterogeneous NOW. Scenarios for both static and dynamic cases have been investigated. A new metric of efficacy has been developed to evaluate the effectiveness of a mapping scheme to a heterogeneous node. Using this metric, a set of mapping heuristics has been developed that balance the efficacy and utilization metrics for static scenarios. For dynamic scenarios, a set of heuristics have been developed which minimize response time and maximize system throughput. Currently, we are incorporating these heuristics to the PBS scheduler. The team is also extending this framework for parallel jobs.

## 1.6 Research Plans

The high performance-computing arena is gradually moving towards clusters and computational grids. New generation of applications such as visualization, multimedia, web, data mining, and e-commerce are also targeted for such systems. These applications are interactive in nature and thus require certain Quality of Service (QoS) from the underlying communication subsystems. These clusters and computational grids (by considering both the server and the clients) are also geographically distributed and span across SANs, LANs, and WANs.

Current work in the NBC Lab focuses on many of the architectural and communication challenges faced by these emerging systems and applications:

- 1) Achieving low latency and high bandwidth intra-cluster communication with VIA and the emerging Infiniband user-level communication architectures,
- 2) Design of routing and gateway protocols to achieve scalable inter-cluster communication among multiple Myrinet clusters connected over ATM or Gigabit Ethernet interconnection,
- 3) Development of high performance APIs (MPI for distributed memory programming, TreadMarks for distributed shared memory programming, and sockets for general applications) with minimal overhead on top of VIA and Infiniband communication architectures,
- 4) Designing NIC-level support for QoS (pacing and bandwidth guarantee) and resource management (admission control and global arbitration),
- 5) Scheduling strategies and resource management schemes for heterogeneous systems, and
- 6) Development of middleware layer for efficiently supporting resource-adaptive visualization and multi-media applications.



Some of the above research directions are being worked on in a collaborative manner with other faculty members in the Network-Based Computing Systems and Applications group in the department. The objectives of this group are to design and develop solutions to some of the above problems in an integrated manner by considering both systems-level and applications-level issues. Combinations of theoretical, analytical, and experimental (on the available LAN and WAN testbeds) approaches are being used to derive the solutions. Such an approach promises solutions that are not only efficient but also practical and thus can be deployed on the current and future network-based computing platforms.

### 1.7 Networking and Computing Infrastructure

The laboratory has an excellent networking and computing infrastructure to carry out experimental research along the above-mentioned topics. It currently has a 16-node dual Pentium cluster (32 processors) with Myrinet, Gigabit Ethernet, and ATM interconnections. It 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 being enhanced with additional 16-node quad Pentium systems (64 processors). This enhanced cluster will also be connected with a video wall to carry out integrated network-based computing systems and applications research. The current cluster is also connected with a Beowulf cluster (128 processors) at the Ohio Supercomputer Center through two dedicated 155 Mbps ATM links. Both these clusters are also connected to NSF/vBNS and Internet II for running geographically distributed applications.

## 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.

## INFORMATION SYSTEMS AREA HIGHLIGHTED PROJECTS

### ACUITY

The ACUITY project is devoted to innovative information-system technology to support cancer research. The project is housed in the Dept. of Computer & Science. The project name may be remembered more easily by thinking of it as an acronym for A Cancer-related Use of Information TechnologY. Alternatively the name is a reflection of the team's sensitivity to the needs of cancer researchers and a keenness to meet those needs.

*Members of the ACUITY Project.  
Front row: Prof. Sandy Mamrak,  
Vinod Tipparaju. Center row: Harry  
Fu, Dipali Trikannad.  
Back row: Bin Yu, Suresh  
Ramachandran, Dennis Hennen.*



*Learn from yesterday, live for today,  
hope for tomorrow. The important  
thing is not to stop questioning.*

Albert Einstein

## RESEARCH & DEVELOPMENT AWARDS

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### *Dependability Components for Distributed and Network Systems*

A. Arora

National Science Foundation

Total amount funded (09/99 - 08/02): \$225,000

### *Component-Based Dependable Networks*

A. Arora

Ameritech Faculty Fellowship

Total amount funded (10/98 - 09/99): \$30,000

### *Travel Grant: U.S. attendance at the International Dagstuhl Seminar on Self-Stabilization*

A. Arora

National Science Foundation

Total amount funded (08/98 - 07/00): \$12,000

### *Career: Three-Dimensional Volume Visualization of Multi-Variate Ddata*

R. Crawfis

National Science Foundation CAREER grant

Total amount funded (01/99 - 12/02): \$108,798

### *Designing an Object Oriented Language to better support Real World Wrogramming*

B. Baumgartner

The Ohio State University

Total amount funded (09/99 – 03/00): \$24,246

### *Experiments with a decision support architecture for exploring large space of decision alternation in agent based simulation models*

B. Chandrasekaran

J. Josephson

Marine Corps

Total amount funded (09/99 – 03/00): \$20,000

### *Functional Representation for Modeling and Simulation*

B. Chandrasekaran

Army Research Office

Total amount funded (07/95-06/00): \$202,404

### *An Image Based Approach to Scientific Visualization*

R. Crawfis

W. Feng

D. Stredney, Ohio Supercomputer Center

R. Yagel

University of California

Total amount funded (12/98 - 12/01): \$484,000

### *Accurate Voxelization and Analysis Techniques for Diecasting Applications*

R. Crawfis

R. Yagel

MSX International

Total amount funded (09/98 – 08/99): \$98,294

### *Bandwidth Smoothing Techniques for the Delivery of Stored Video Across Best-Effort Net-works*

W. Feng

Ameritech Fellowship

Total amount funded (10/98 - 10/99): \$29,257

### *A Video-Based Testbed for Scientific Visualization and Networking Research*

W. Feng

R. Jain

R. Crawfis

National Science Foundation & OSU

Total amount funded (12/98 - 12/00): \$182,000

### *CAREER: Bandwidth allocation techniques for video-on-demand system (REU supplement)*

W. Feng

National Science Foundation

Total amount funded (09/99 – 08/03): \$325,000



*Stackable middleware services for multimedia applications*

W. Feng

R. Crawfis

B. Weide

Department of Energy

Total amount funded (07/99 – 07/00): \$245,424

*An Experimental Testbed for Research in Advanced Wireless Communications*

M. Fitz, Department of Electrical Engineering, OSU

S. Ellingson, Department of Electrical Engineering, OSU

C. Hou, Department of Electrical Engineering, OSU

R. Jain

U. Mitra, Department of Electrical Engineering, OSU

H. Ozbay, Department of Electrical Engineering, OSU

National Science Foundation

Total amount funded (09/98-08/01): \$963,839

*Congestion Avoidance in High Speed Networks*

R. Jain

National Science Foundation

Total amount funded (09/96-08/00): \$375,000

*Quality of service for real time applications over next generation data networks*

R. Jain

University of Dayton

Total amount funded (01/00 – 12/00): \$65,000.

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

M. Caffrey, Department of Chemistry, OSU

D. Kerr

National Science Foundation

Total amount funded (01/00 – 12/02): \$444,441

*Computational Models and Coordinated Neuroimaging of Learning and Cognitive Function*

R. Lewis

University of Pittsburgh

Total amount funded (10/98-09/01): \$154,886

*Development of a New Undergraduate Course Sequence in Software Design and Development*

T. Long

B. Weide

U.S. Department of Education

Total amount funded (09/98 - 08/99): \$50,529

*CISE Educational Innovation Program: Development and dissemination of a new under-graduate course sequence in software design and development*

T. Long

B. Weide

National Science Foundation

Total amount funded (02/98 – 07/00): \$19,958

*Molecular Genetics of low grade Gliomas*

S. Mamrak

OSU Interdisciplinary Seed Grant Program

Total amount funded (03/99-09/00): \$1,000

*Associate Director for the Computer Services, Biostatistics Program*

S. Mamrak

The Ohio State University. Total amount funded (10/98-09/99): \$10,000

*Value of glycolipids for classifying human gliomas*

A. Yates, Department of Pathology, OSU

S. Mamrak

National Cancer Institute

Total amount funded (12/97 – 11/99): \$308,885

*Scalable Parallel Computing over geographically distributed ATM-Interconnected Workstation Clusters*

D. Panda

Ameritech Faculty Fellowship

Total amount funded (10/98-03/00): \$375,000

*1999/00 IBM cooperative fellowship*

D. Panda

IBM Co.

Total amount funded (10/99 – 06/00): \$30,405

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

D. Panda

P. Sadayappan

J. Duato

R. Crawfis

W. Feng

National Science Foundation

Total amount funded (05/00 – 04/03): \$175,000

*Human figure animation*

R. Parent

Honda R&D Co.

Total amount funded (04/00 – 06/01): \$88,371.

*Scalable parallel solution of Navier Stockes equations*

P. Sadayappan

Ohio Aerospace Institute

Total amount funded (01/00 – 12/00): \$47,936

*Scalable Collective Communication Support for Heterogeneous Networks of Workstations*

D. Panda

National Science Foundation

Total amount funded (07/97-06/00): \$225,959

*CEWES Climate, Weather and Ocean Modeling Program*

K. Bedford

P. Saddayappan

Dept. of Defense High Performance Computing Modernization Program

Total amount funded (08/97-03/00): \$800,000

*Algorithm for Treating Correlated Many-Fermion Systems on a Lattice: The Constrained Path Monte-Carlo (CPMC) Method*

P. Sadayappan

J. Wilkins

National Science Foundation

Total amount funded (09/96-08/99) \$508,966

*Scalable Parallel Software for Sparse Linear System Solution*

P. Sadayappan

Dynamic Engineering Inc.

Total amount funded (08/96-12/99): \$105,810

*Program Directorship of the Operating System and Compilers program*

M. Singhal

National Science Foundation

Total amount funded (09/98 – 08/00): \$249,224.

*Acoustic source segregation and its application to undersea signals*

D. Wang

NAVY Underwater System Center

Total amount funded (09/99 – 09/00): \$79,000

*Center for excellence in software evaluation*

B. Weide

T. Long

West Virginia University

Total amount funded (09/99 – 08/00): \$53,502

*Practical control algorithms for nonlinear dynamical systems using phase-space knowledge and mixed numeric and geometric computation*

F. Zhao

OFC Naval Research

Total amount funded (06/97 – 12/99): \$179,451

*Intelligent Simulation Methods for dynamical systems*

F. Zhao

*National Science Foundation - National Young Investigator Award*

Total amount funded (09/94-08/00): \$312,500

Sloan Research Fellowship Award

F. Zhao

Alfred P. Sloan Foundation

Total amount funded (10/94-9/98): \$30,000

*Learning probability models for surface appearance and shape by minimax entropy principle*

S. Zhu

National Science Foundation

Total amount funded (08/99 – 07/00): \$115,872.

*Clutter modeling and performance analysis in automatic target recognition*

S. Zhu

Washington University

Total amount funded (09/98 – 09/99): \$30,000

*Clutter modeling and performance analysis in automatic target recognition*

S. Zhu

Johns Hopkins University

Total amount funded (03/99 – 02/00): \$26,660

*Hierarchical segmentation and attribution of high resolution aerial images with a view to change detection and analysis*

K. Boyer, Department Electrical Engineering, OSU

P. Flynn, Department of Electrical Engineering, OSU

S. Zhu

NASA

Total amount funded (05/00 – 05/01): \$200,000

*Advanced Research Trends in Computer and Information Science*

S. Zweben

Honda R&D, Inc.

Total amount funded (01/99 – 01/01): \$173,667



*Networking students of Professor Mike Liu with visiting scholar, Mikihiro Ueno. (Front row, l-r: Cho-Yu (Jason) Chiang, Yan Zhou and Yingjie Li. Secon row, l-r: Zhengping Zuo, Xinhau Feng, Tao Ma, Mikihiro Ueno and Ming Liu.)*

*Winter Scenes from  
Around the  
Dreese Neighborhood*



## 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 Advisement 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 or CIS and Mathematics.

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

Student demand for CIS courses is still increasing. The number of students taught in all courses during the July 1, 1999 - June 30, 2000 academic year was 14,278. Graduation numbers also increased: 296 baccalaureate degrees; 58 masters; 10 Ph.D.s.

The Graduate Program saw growth this year. We received 703 applications for graduate admissions to the Autumn 1999 quarter. The Department accepted 99 for admission and 49 of those joined the Department; 35 being supported. Graduate student enrollment, new and in process, was 156. Research grants and departmental funds supported 111 of these students. Entering graduate students scores on the quantitative graduate record examination averaged as: verbal = 605; quantitative = 772; analytical = 718. Their mean grade point average was 3.6.

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 28 full time faculty members, the lowest number in over ten years, seven full-time lecturers and twenty part-time lecturers. The Faculty Search Committee is putting forth a major effort to find qualified professors.



*Summer 1999 grads lining up in French Field House prior to their entrance into St. John Arena.*

## 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

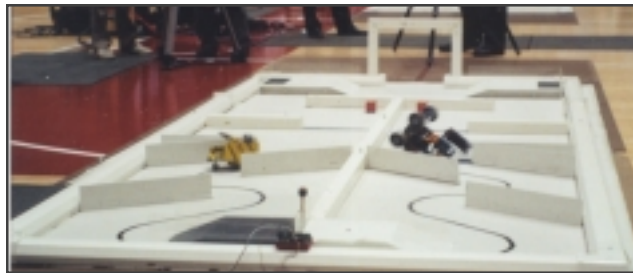
The CIS portion of the Honors Program consists of a two-course sequence: CIS H221 Software Development using Components and CIS H222 Development of Software Components.

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.



*Two robots at the bomb pick-up stage.*

*Each year the Freshman Engineering Honors Program holds a Robot Competition. Students build small robots which must travel a course via part electromagnetic track and part pre-programming. To make it extra tricky, the students don't know from what side they will be starting (the two sides have different color-coding) nor do they know where the interior obstacles will be placed. Those decisions are made with a throw of the dice immediately prior to each individual race. Additionally the robot must pick-up a "bomb" which it finds via a sensor. The bomb must be transported up a ramp to a disposable area. Then the robot must go out the exit.*



*This event truly mixes learning with FUN! Kudos to the staff of the Freshman Honors Program.*

*Whoops! I think the tires are supposed to be on the ground.*



*Freshman Clif Enard suffers the "agony of defeat" when his team's robot, Bob, fails to complete the course.*

*Mission nearly accomplished.*



## DOCTORATES AWARDED

NAME	ADVISOR WHERE THEY WENT	HOME
<i>SUMMER 1999</i>		
Guohong Cao	Dr. Mukesh Singhal Penn State University; University Park, PA	Beijing, P.R.C
Sonia Fahmy	Dr. Raj Jain Purdue University; West Lafayette, IN	Cairo, Egypt
Sandeep Sadashiv Kulkarni	Dr. Anish Kumar Arora Michigan State University; Lansing, MI	Sangli, India
Chi Chung Lam	Dr. P. Sadayappan Chemical Abstracts; Columbus, Ohio	Hong Kong, P.R.C.
Srividhya Subramanian	Dr. Mukesh Singhal Valicert Inc.; Mountain View, CA	Pilani, Rajasthan, India
<i>AUTUMN 1999</i>		
Xiuwen Liu	Dr. DeLiang Wang Florida State University; Tallahassee, FL	Beijing, P.R.C.
Iván Ordóñez	Dr. Feng Zhao Reinoso-Bios Group; Santa Fe, NM	Ecuador
<i>WINTER 2000</i>		
Xingang Huang	Dr. Feng Zhao Netscreen Technologies; Santa Barbara, CA	Zhuhai, P.R.C.
Yuping Yang	Dr. Mukesh Singhal Electron Economy; Cupertino, CA	Columbus, OH
<i>SPRING 2000</i>		
Bobby Rajaraman Vandalore	Dr. Raj Jain Amber Networks; Santa Clara, CA	Chennai, Tamil Nadu, India

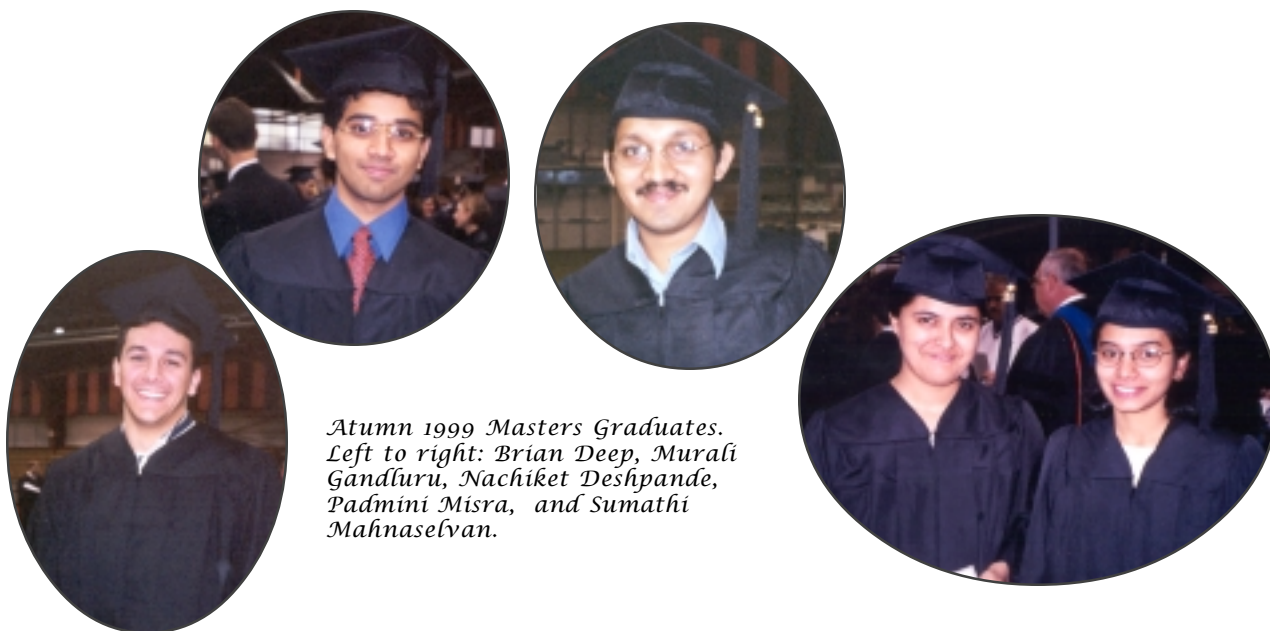
# MASTERS DEGREES

NAME	UNDERGRADUATE/ OTHER DEGREES	HOME
<i>SUMMER 1999</i>		
Jason David Knight	B. S. Case Western Reserve University	Lakewood, Ohio
Ilia Valentinovich Lebedenko	B.S., M.S. Moscow Institute of Physics & Technology	Kaliningrad, Russia
<i>AUTUMN 1999</i>		
Anuradha Alwar	B.Engineering, University of Madras	Columbus, Ohio
Brian J. Deep	B.S. Univ. of Dayton	Beavercreek, Ohio
Nachiket Jayant Deshpande	B. Engineering & M.S. Birla Institute of Technology & Science	Nagpur, India
Xiaoning Fu	B. Engineering Tsinghua University	Beijing, P. R. C.
Murali Krishna Gandluru	B. Tech. Banaras Hindu University	Hyderabad, India
Wangmao Ge	B.S. & M.S. Xiamen University	P. R. C.
Dennis S. Hennen	B. S. David Lipscomb University	Triadelphia, West Virginia
Jason A. Lescalleet	B. S. The Ohio State University	Newark, Ohio
Pei Lu	B. S. Zhejiang University M. S. Nanjing University	Xuanzhou, P. R. C.
Tao Ma	B. Engineering Taiyuan University M. S. Beijing Univ. of Aeronautics & Astronautics	Taiyuan, Shanxi, P. R. C.
Padmini Misra	Bachelors Birla Institute of Technology & Science	Basti, India
Sumathi Mahanselman	B. Engineering PGS College of Technology, Bharathiar University	Pollachi, India
Scott M. Pike	B. A. Yale University	Columbus, Ohio
Marco A. Renedo	Licenciado & Ph.D. Universidad de Chile	Santiago, Chile
James J. Steinbugl	B.S.I.S.E., M.S. The Ohio State University	Reynoldsburg, Ohio
Wei Sun	B. S. Nankai University Master's Tsinghua University	Beijing, P. R. C.
Dipali Dinesh Trikannad	B. Engineering Goa University	India
Raoul L. Veroy	B. S., B.S. Ateneo de Manila University	Philippines
Huaxing Wu	B. Engineering Univesity of Sciene & Technology M. S. Chinese Academy of Sciences	Shexian, P. R. C.
Bin Yu	B. S. Beijing University	Beijing, P. R. C.
Ying Yu	B. S. Zhejiang University	Harbin, P. R. C.
Yan Zhou	B. Engineering & M. S. Chongqing University	Shenzhen, P. R. C.
Zhengping Zuo	B. S. Wuhan University M. S. Tsinghua University	Yichang, Hubei, P. R. C.



## MASTERS DEGREES

NAME	UNDERGRADUATE/ OTHER DEGREES	HOME
<i>WINTER 2000</i>		
Sergey Georgiyevich Butkevich	Engineer Moscow Aviation Institute	Moscow, Russia
Murat Demirbas	B.S. Middle East Technical University	Trabzon, Turkey
Xinhua Feng	B.S. Beijing University of Posts & Telecommunications.	Ningbo, P.R.C
Karthik Kalyanaraman	B. Tech. Indian Institute of Technology	Chennai, India
Young-Soo Kim	B.Engineering Korea University	Kangnam, Seoul, Korea
Thomas John Lee	B.S. Kent State University	Gahanna, OH
Jinmei Liao	B.A. Beijing University of Aeronautics & Astronautics	Sichuan, P.R.C.
Sergey Zenonovich Malyushitsky	M.S. OSU	Minsk, Belarus
Kovalan Muniandy	B.S. Toledo University	Shah Alam, Makaysia
Ruslan Pavlovich Ovechkin	Diploma, M.S. Novosibirsk State University	Novosibirsk, Russia
Julian Ivanov Petrov	B.A. American University in Bulgaria	Varna, Bulgaria
Nicoleta Roman	B.S., M.S. Universitatea din Bucuresti	Romania
Vladimir Sadv	Bachelor's, Magister Novosibirsk State University	Novosibirsk, Russia
Benjamin James Taylor	B.S. Michigan Technological University M.S. OSU	Au Gres, MI
Shaoyong Want	B.Engineering Tsinghua University	Yichang, P.R.C.
Vladimir A. Yarmolenko	B.S. National Technical University of Ukraine	Kiev, Ukraine
Liwei Zhou	B.S. - Peking University M.S. - Academia Sinica	Beijing, P.R.C.



*Autumn 1999 Masters Graduates.  
Left to right: Brian Deep, Murali  
Gandluru, Nachiket Deshpande,  
Padmini Misra, and Sumathi  
Mahnasehvan.*

# MASTERS DEGREES

SPRING 1999

NAME	UNDERGRADUATE/ OTHER DEGREES	HOME
Amit Agarwal	B. Tech, Indian Institute of Technology - Kharagpur	Darjeeling, India
Praveen Bhaniramka	B. Tech, Pradesh, India Institute of Technology - Banaras Hindu University	Bahraich, Uttar
Bharanikumar Venkata Chadalavada	B. Tech, Regional Engineering College - Sambalpur University	Nellore, India
Gheorghe Craciun	Diploma, Universitatea din Bucuresti	Valcea, Romania
Charles Patton Giles	M.S., Ohio State B.S., Ohio State	Gahanna, Ohio
Nafi Sencer Kutlug	B.S., Bogazici Universitesi	Istanbul, Turkey
Yingjie Li	B.Engineering Quindao University	Yangtai, P.R.C.
Nigamanth Sridhar	B.S. Birla Institute of Technology & Science	Madras, India
Eugene Yablonsky	Diploma, Moscow Institute of Oil & Gas M.S., Ohio State	Moscow, Russia
Rong Zhang	B. Engineering University of Science & Technolgy of China	Jiaozou, P.R.C.



*If you're like me, you've got a big head,  
not to mention a funny robe, full of music—  
poems and melodies, the tunes  
we move to, shower and shave by,  
study, write to.*

-From the poem  
*Pomp, Circumstance, and Other Songs of a Lifetime*  
by David Citino, OSU English Dept.

*Spring 2000 Graduation -- always a grand  
occasion! Above, Masters grad  
Nigamanth Sridhar. To the right, Charlie  
Giles, Masters grad, poses with Undergrad  
Advisor Peg Steele. Charlie was Peg's  
Graduate Assistant for three years and  
will be greatly missed.*



# BACHELOR DEGREES

## COLLEGE OF ARTS & SCIENCE

## COLLEGE OF BUSINESS

## COLLEGE OF ENGINEERING

### *SUMMER 1999*

John Christopher Campbell  
Christopher Stephen Coomer  
James Edwin McCubbin  
Jon Carter Merry  
Jun Newman  
Priyank Patel  
Constance Renae Reising  
Brent Michael Roberts  
Alain E. Roper  
Ji-Young Shin  
Andi Taufiq  
Nebula LaToya White  
Jincheng Wu  
Kazuhiro Yamada  
John Yan  
Huixian Zhen

Lisa Cai  
Chang Feiwen  
Nevin Colvin  
Brian Corotis  
Cathrine Dabkowski  
Michael Dishong  
Eric Drap  
Chung-shu Fan  
Gregory Gebhart  
Michael Hein  
Jeffrey Jones  
Jason Miller  
Steve Nguyen  
Sana Shamsi  
Ronald Sprinkle  
Wan Ilyana Wan Yahya  
Fang Wang

Randy L. Blankley, Jr.  
Kurt Daniel Bohman  
Monica S. Carrillo  
Bijan Changizi  
Gary James Christopher  
David Edward Dozer  
Roman Frid  
Sandeep Rangarajan  
Chi Wai Wong



## AUTUMN 1999

Maria Victoria Divierte  
 Jon-Paul Futey  
 Robert K. Graffagnino  
 Martha J. Gray, *Magna Cum Laude*  
 Erik Lynn Grimes  
 Jerry Park Grimsic  
 Ming Jian, *Cum laude with distinction in CIS*  
 Robert Douglas Karkoska  
 Mitchell William Kidder  
 Monica Sheh Yuan Kok  
 David Anthony Pitroff  
 Michael Lee Plumley  
 William Thomas Powers  
 Daniel Joseph Sablosky  
 William Anthony Schrickel  
 Frank Charles Shaskus  
 Hariyanto Sukri  
 Donald L. Taylor, *Summa cum laude*  
 David Michael Toney  
 Nichelle TaMia Tyler  
 Ming-Jr Wang  
 Garth Donald Wilson

Chin Nam Chang, *Magna cum laude*  
 Qing Chen  
 Brian Coleman  
 Joseph Cooper  
 Bryan Daniels  
 Douglas Daniels  
 Bradley Dufour  
 Bachtiar Farlin  
 Craig Ferguson  
 Rory Gaydos  
 Chong-Yong Kerk  
 Amy Kinniff, *Cum Laude*  
 Trisha Kishler  
 Ronald Mantini  
 Dwight Mickley  
 Stephen Murdock, *Magna cum laude*  
 John O'Connor  
 Sven Seyffert, *Summa cum laude*  
 Timothy Smith  
 Kris Soekiatno  
 Valeria Stachler  
 Chia-Chao Tung  
 Kaushal Vyas  
 John Walker  
 Fang Qun (Kathrine) Wang  
 Emily Wayne  
 Shiau-Wei Wee  
 Chung Ho Yip

Ratnamala Bearavolu, *Magna cum laude*  
 Zachary Samuel Brown  
 Leonard Howard Chalk Jr.  
 Roger Kai Wong Chu  
 Jin-Sang Chung  
 Nse Edidiong Ekpoudom  
 Rakhi Ghosh, *Cum laude*  
 Shawn A. Hendricks  
 Charles Matthew John  
 David Mills Kale  
 Qiang Lin, *Cum laude*  
 Charles Edward Long III  
 Jeremy Michael Lublin  
 Michael Ernest Moore  
 Shadi Awni Motasem  
 Tedy Pranolo  
 Johannes Permadi Setiabudi  
 Christian James Shondel  
 David William Stought  
 Agus Tantojo  
 Divya Tejaswi Vishwamitra  
 Michael Daniel Zorio





*WINTER 2000*

Gleb Aronsky  
 Lee Taggard Ayres  
 Stephen Baishanski  
 Jonathan Michael Baker  
 Erin Kathleen Cavanaugh  
 Charles Eugene Crego IV  
 Alexander Eugene Dukat  
 Brian Phillip Grossberg  
 Brian Patrick Haines  
 James Scott Heine  
 Kai Huang  
 Kelly L. Kinnen  
 Maria Melissa Luna  
 Dallas Stephen Mahrt  
 Nishant H. Patel  
 Pinal N. Patel  
 Sanjay N. Patel  
 Quinton David Quast  
 Jeffrey Brian Rose  
 Ting Wang

Matthew Bailey  
 Ryan Case  
 Hei Yan Cheung  
 James Conley  
 Robert Elliot, *Summa cum laude*  
 Timothy Elsner  
 Edward Hamod  
 Jianfeng Huan  
 Srujal Jariwala  
 Hendra Jeo  
 Susanto Ng  
 Tony Ngo  
 Matthew Palenshus  
 Eric Portzline  
 Charles Reiche  
 Donald Stillion  
 Christopher Tritt  
 Bradley Tuller  
 Felix Utama  
 Serena Wong  
 Zhen Zhang, *Cum laude*

David Paul Abraham  
 Donald Houston Galbriath  
 David William Grillo  
 James Todd Hill  
 Matthew Earl Ozbun  
 Prasada Rao Rayarao  
 Jason Steven Reed  
 Kyle Joseph Rogers  
 Rivai Salim  
 Eric Todd Shaffer  
 Pirayogah Shanmugarajah *cum laude*  
 Rashid K. Thahim  
 Brian Damon Wilson



*This sheepskin is your passport.  
 You're bound for emigration to  
 the next song of your life. Ohio State  
 is the ark on which you've been sailing.  
 You've been the precious cargo.*

-From the poem  
*Pomp, Circumstance, and Other Songs of a Lifetime*  
 by David Citino, OSU English Dept.



*SPRING 2000*

Ling Ai  
 William Max Alabran  
 Luis Roberto Alicea-Gonzalez  
 Scott Michael Angle  
 Christopher Michael Beam  
 Laura Kathryn Bosse  
 Kelly Gwyn Bryan Crawford  
 Samson Yen-Hsien Chiao  
 Ernest H. Choung  
 Daniel James Cottrell  
 Robert Andrew Dzubak  
 Joseph Lee Eitel  
 Patrick Michael Farrell  
 Brian Todd Fieldhouse  
 Rajesh Vikram Fotedar  
 Jennifer Sue Fox  
 Christopher Andrew Francosky  
 Kenneth Anthony Friece  
 David Michael Friedman  
 William Jason Gilmore  
 Rishi Kant Joshi  
 Suk-Hoon Kang  
 David D. Kneisly  
 Su Ting Lai  
 Andrew K. Lin  
 Michael J. Mangino  
 Agata Anna Milanowska  
 Donna Ruth Popovich  
 Joseph John Porostosky  
 David James Roe  
 Daniel Oren Rubin  
 Jason Howard Shepherd  
 David Jason Shoaf  
 Andrew Boyd Smith  
 Benjamin J. Snyder  
 Jonathan Arie Sofer  
 Christopher Charles Stolfi  
 Junghyun Sung  
 Michael Suwiryo  
 Mark Thomas Vukovic  
 Sarah Jane Waterson  
 Ricardo Eric Wilkins, Jr.  
 Jonathan L. Woodring



Todd Babione  
 Melanie Boulderston  
 Jonathan Board  
 James Boyd  
 James Boys  
 Ryan Browder  
 Bridget Carmichael  
 Ian Coughlin  
 Joshua Dack  
 Chad Ernst  
 Daniel Fu  
 Param Ghangas  
 Brian Greene  
 Stephen Hartz  
 Bradley Hohenbrink  
 Tarek Jark  
 Ema Kamara  
 Aaron Kieseewetter  
 Jongsung Kim  
 Jason Lehmiller  
 Huey-Shan Loy  
 Allen Mayton  
 Ryan McGrath  
 Andrew Michaelson  
 Mark Morelli  
 Natalie Mosher  
 Ferdi Mulyadi  
 Kim Ooi  
 Liz Oommen  
 Bhairavi Parikh  
 Charlotte Patin  
 Gim Pee  
 Elisabeth Popkie  
 Gregory Reeves  
 Rebecca Rush  
 Marc Sasala  
 Edo Suhendra  
 Prislia Surjawinata  
 Susanti  
 Darlene Talkington  
 Fransisca Tanoto  
 Jason Valentine  
 Jason Wallace  
 Andrea Warner  
 Anton Wijaya  
 Sakit Yee



Kenny E. Bevins, Jr.  
 Aaron Jack Connolly  
 John Scot Duncan  
 Patrick Brian Feldman  
 Douglas G. Fromm  
 Ryan Michael Geiss  
 Scott E. Goldman  
 Cherie J. Hall  
 Hai Huang  
 Aiko Ishikawa  
 Navin Suresh Kekane  
 Steven Christopher Layne  
 Austin James Leichner  
 Shawn Robert Leis  
 John Raymond Lindsley  
 Ronald John Luman II  
 Jeffrey Aaron Merkel  
 Ngan Son Nguyen  
 John Nicholas Phillips  
 Scott Michael Risley  
 Anthony Lawrence Santen  
 Vincent Edward Scheib  
 Charles Kim Shin  
 Ryan Lewis Stone  
 Craig Michael Thornton  
 Steven C. Tiell  
 Silpachaitan Uppalapati  
 Steven Anthony Verhoff  
 Olga Volgin  
 Joshua T. Weiser  
 Michael David Wingerd  
 Shih-Shen (Andrew) Yang  
 Daniel John Zylstra



## STUDENT ORGANIZATIONS

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The student organizations kept busy this year past year; particularly, UPE, ACM and the new Opensource Club.

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Upsilon Pi Epsilon (UPE), the International Honor Society for the Computing Sciences, continued building. As well as their bi-annual initiations, they participated in the Annual Engineering Week games with a Binary Relay Tournament and hosted Pizza luncheon socials.

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The Central Ohio & Student Chapters of the Association for Computing Machinery (ACM) hosted a very special guest, Dr. H. J. Siegel from Purdue University. They also sent two teams to the annual ACM Programming Contest where one team placed 24th in a field of 106 while the other came in less well but still in the top 50%.

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The Opensource Club is a student initiated group that advocates the advancement of free software projects like Linux and the Gnu project. They held a variety of events including several speakers and an All-Night Hack-A-Thon.



*UPE's Spring 2000  
initiates*



*UPE's Vince Scheib handing  
off to Steve Miller during the  
Binary Relay.*



*The members of the ACM Programming teams  
were: Sandy Barnabas, Dennis Hennen, Ralph  
Hutchison, Joseph Malicki, Tyler Neylon, Ryan  
Schuerger, Vinod Tipparaju.*

# STUDENT DIVERSITY PROGRAM

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The Department of Computer and Information Science is committed to making our student environment one that is not only open and accessible to women and minority students, but aggressively attractive to them. To this end, 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.

In our efforts, we are very fortunate to receive support from GE Foundation through its GE Fund *Faculty for the Future* program. This plan give funds to students allowing them to focus on research and enhancing their own mentorship skills. In the 1999-2000 academic year, Bill Leal and Hakeem Shittu benefited from this program.

For additional information, you may visit the web-site <http://www.cis.ohio-state.edu/diversity>.



*If we cannot now end our differences, at least we can help make the world safe for diversity.*

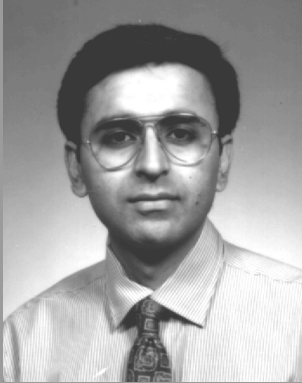
-John F. Kennedy

*Graduate and Professional Student Visitation Day (GPSVD), our annual campus-wide recruitment fair for prospective minority grad students. Students from a variety of schools including Morehead State, University of Kentucky and Morgantown visited Ohio State and learned what about the programs available.*





## FACULTY PROFILES



**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.*

My present research focuses on fault-tolerant computing. I have discovered a uniform and general definition of fault-tolerance; based on which I am developing formal methods for the design and verification of fault-tolerant systems. Special emphasis is being given to applications in distributed and real-time computing, some of which are being implemented as part of a project on robust primitives for distributed operating systems.

More generally, I am interested in the study of dynamic concurrent systems that are subject to cost, control, and state constraints. My approach to reasoning about such systems is based on discrete and nondeterministic mathematics, unlike most conventional approaches which are based on continuous or probabilistic mathematics.

### *Selected Publications*

A. Arora and S. Kulkarni, "Component based design of Multi-tolerance," *IEEE Transactions on Software Engineering*, 24(1), 1998, 63-78

A. Arora and S. Kulkarni, "Designing masking fault-tolerance via nonmasking fault-tolerance," *IEEE Transactions on Software Engineering*, 24(6) 1998, 435-450

S. Kulkarni and A. Arora, "Multi-tolerance in distributed reset," *Chicago Journal of Theoretical Computer Science*, 4, 1998, 46pp

My research interest is in making the programmer's job easier, particularly in the design and implementation of object-oriented programming languages, in compilation techniques, and in building software engineering tools to support object-oriented programming and embedded systems programming.

We are currently developing the object-oriented language Brew based on Java syntax and a novel object model that provides support for implementing design patterns. The language will also provide syntactic support for expressing the communication protocols between program components in the form of sets of regular expressions. We are developing debugging tools that use the information provided in protocols to detect errors in method call sequences and the possibility of deadlocks.

I am also involved in a project on building an environment for teaching embedded systems programming. For this project we are building 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.

### *Selected Publications*

K. Läuffer, G. Baumgartner, and V.F. Russo, "Safe Structural Conformance for Java." *Object-Oriented Systems*, Vol. 6, 1999, pp. 72-92.

C. Lam, D. Cociorva, G. Baumgartner, and P. Sadayappan, "Memory-Optimal Evaluation of Expression Trees Involving Large Objects." In *Proceedings of the 1999 International Conference on High Performance Computing (HiPC '99)*, Calcutta, India, December 1999. Springer Verlag, *Lecture Notes in Computer Science*, Vol 1745.

C. Lam, D. Cociorva, G. Baumgartner, P. Sadayappan, "Optimization of Memory Usage and Communication Requirements for a Class of Loops Implementing Multi-Dimensional Integrals." In *Proceedings of the 12th International Workshop on Languages and Compilers for Parallel Computing (LCPC '99)*, La Jolla, CA, August 1999.



**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.*

My research involves computer graphics and scientific visualization. I am currently working in the areas of fluid flow visualization, medical visualization, information visualization, and volumetric rendering for computer graphics, such as fog, fire and clouds.

#### *Selected Publications*

- Roger Crawfis, Nelson Max, and Barry Becker, "Vector Field Visualization," *IEEE Computer Graphics & Applications*, September 1994, pp. 50-56.
- Nelson Max, Roger Crawfis, and Dean Williams, "Visualization for Climate Modelling," *IEEE Computer Graphics and Applications*, July 1993, pp. 34-40.
- Nelson Max, Pat Hanrahan, and Roger Crawfis, "Area and Volume Coherence for Efficient Visualization of 3D Scalar Functions," *Computer Graphics*, Vol. 24, No. 5, pp. 27-33.
- Roger Crawfis and Nelson Max, "Direct Volume Visualization of Three-Dimensional Vector Fields," *Proceedings of the 1992 Workshop on Volume Visualization*, Kaufman and Lorensen, eds., ACM SIGGRAPH, NY, pp. 55-60.
- Roger Crawfis and Nelson Max, "Texture Splats for 3D Vector and Scalar Field Visualization," *Proceedings of Visualization '93*, October '93, IEEE CS Press, Los Alamitos, pp. 261-266.
- Nelson Max, Barry Becker, and Roger Crawfis, "Flow Volumes for Interactive Vector Field Visualization," *Proceedings of Visualization '93*, October 1993, IEEE CS Press, Los Alamitos, pp. 19-24.



**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.*



**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 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 R. Wenger. "Reconstructing curves with sharp corners." 16th Symposium on Computational Geometry, (2000), 233—241.
- 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.
- T. K. Dey, H. Edelsbrunner, S. Guha and D. V. Nekhayev. "Topology preserving edge contractions." *Publ. Inst. Math. (Beograd) (N. S.)*, Vol. 66, (1999), 23—45.
- T. K. Dey and P. Kumar. "A simple provable algorithm for curve reconstruction." *Proc. 10th ACM-SIAM Symposium on Discrete Algorithms (SODA'99)*, (1999), 893-894.
- S. W. Cheng and T. K. Dey. "Improved construction of Delaunay based contour surfaces." *Proc. ACM Sympos. Solid Modeling and Applications*, (1999), 322—323.
- 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*, 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.*

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*

W. Feng, Ming Liu, "Extending Critical Bandwidth Allocation Techniques for Stored Video Delivery Across Best-Effort Networks", in Proceedings of the International Conference on Distributed Computing Systems, April 2000.

W. Feng, J. Rexford, "Performance Evaluation of Smoothing Algorithms for Transmitting Pre-recorded Variable-Bit-Rate Video", IEEE Transactions on Multimedia, Sept. 1999.

W. Feng, C.C. Lam, M. Liu, "A Movie Approximation Technique for the Implementation of Fast Bandwidth Smoothing Algorithms", Journal of High Speed Networks (Special Issue on Multimedia Networking), Vol. 7, Nos. 3 and 4, pp. 281-300, 1998.

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



**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., Computer Science, University of Minnesota, 1978.*

My research interests are in software engineering with a focus on program-analysis-based testing and maintenance. My students, colleagues, and I are currently involved in several projects. First, we are developing techniques that improve the efficacy of software testing. Second, we are investigating ways to scale up program-analysis-based testing and maintenance techniques, such as data-flow analyses and slicing. Third, we are developing techniques to represent, analyze, and test object-oriented and component-based software. Finally, we are constructing an infrastructure for experimentation that includes analysis systems for C and Java programs. This infrastructure supports the design and implementation of new techniques, and artifacts, such as programs, tests, and versions, that can be used for experimentation with such techniques.

#### *Selected Publications*

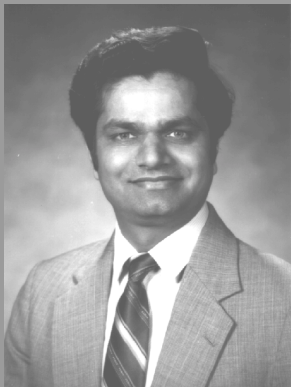
- D. Liang and M. J. Harrold. "Efficient Points-To Analysis For Whole-Program Analysis" Joint Seventh European Software Engineering Conference (ESEC) and Seventh ACM SIGSOFT International Symposium on the Foundations of Software Engineering, September 1999.
- S. Sinha, M. J. Harrold, and G. Rothermel. "System-Dependence-Graph-Based Slicing of Programs with Arbitrary Interprocedural Control Flow", Proceedings of 21th IEEE International Conference on Software Engineering, May 1999, pp. 432—441.
- G. Rothermel and M. J. Harrold, "Empirical Studies of a Safe Regression Test Selection Technique," IEEE Transactions on Software Engineering, vol. 24, no. 6, June 1998 pp. 401-419.



**MARY JEAN  
HARROLD**

*Associate Professor*

*B.A., Mathematics, Marshall University, 1970; M.A., Mathematics, Marshall University, May 1975; M.S., Computer Science, University of Pittsburgh, April 1985; Ph.D., computer Science, University of Pittsburgh, December, 1988.*



**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.





**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 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.

My research interests are in

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

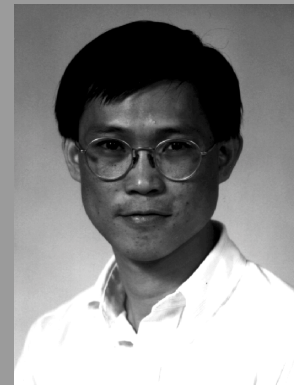
*Selected Publications*

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.*

My research interests are in the area of commodity parallel computing architectures and high speed communication software. Current PCs have microprocessors that deliver instruction and floating point processing rates in excess of 1 billion operations per second. In addition, high speed networks (Myrinet, Giganet, Gigabit Ethernet) provide low latency, high bandwidth interprocessor communication capability. My research focuses on the software infrastructure needed to integrate multiple PCs and a fast interconnect into a single machine with supercomputer performance. More specifically, I am interested in the following aspects of the cluster design:

- Low overhead communication at the user and at the network interface level,
- high speed parallel access to storage,
- remote connectivity between clusters.

I am also interested in studying the requirements of new classes of applications that pose new challenges to the designer of machines for high performance computation. Presently I am mostly looking at some interesting data intensive applications in Bioinformatics and in other emerging fields.

#### *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



**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*



**RICHARD L. LEWIS**

*Assistant Professor*

*B.S., Computer Science, University of Central Florida, 1987; Ph.D., Computer Science, Carnegie Mellon University, 1993*

My research is directed toward understanding the computational foundations of human cognition. In particular, I work on developing theories of language comprehension and other tasks that help reveal the fixed structure of mental architecture. I pursue an interdisciplinary approach that starts with functional computational models and brings to bear independent constraints from cognitive psychology, linguistics, and psycholinguistics. Over the past few years, this approach has yielded a detailed theory of human sentence processing that accounts for a broad range of cross-linguistic phenomena, including short-term memory effects on multiple embeddings, and contrasts between difficult and easy structural ambiguities.

#### *Selected Publications*

Lewis, R.L., "Cognitive modeling, symbolic." In Wilson, R. and Keil, F. (eds.), The MIT Encyclopedia of the Cognitive Sciences. Cambridge, MA: MIT Press, 1999  
Lewis, R.L., "Leaping off the garden path: Reanalysis and limited repair parsing." In Fodor, J.D. and Ferreira, F. (eds), Reanalysis in Sentence Processing. Boston: Kluwer Academic, 1998  
Lewis, R. L., "Interference in short-term memory: The magical number two (or three) in sentence processing." The Journal of Psycholinguistic Research 25:93-115, 1996



*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.

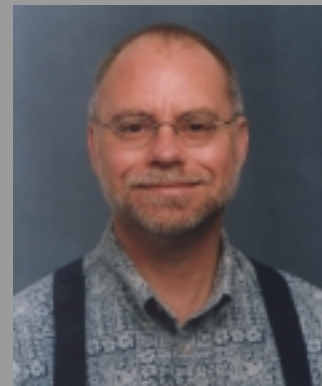
M. Liu, "Protocol Engineering," *Advances in Computers*, ed., M. Yovits, Academic Press, Vol. 28, July 1989, pp. 79-195.

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 injection of the RESOLVE technology into the undergraduate curriculum through the design, development, installation, and evaluation of an integrated 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 1998 ACM SIGCSE Symposium, 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.



*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.
- Burton L., Machiraju R., Reese D., "Dynamic View-Dependent Partitioning of Grids with Complex Boundaries for Object-Order Rendering Techniques," Proceedings of Symposium on Parallel Graphics and Visualization'99, pp. 89-100.
- 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*

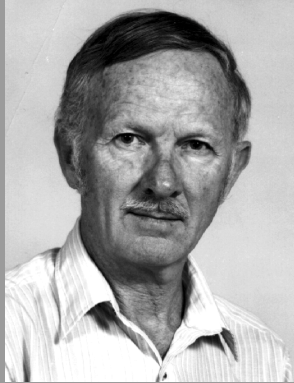
*B.S., Mathematics, Notre Dame College of Ohio, 1967; M.S., Computer Science, University of Illinois, Urbana-Champaign, 1973; Ph.D., Computer Science, University of Illinois, Urbana-Champaign, 1975.*

My current interest is in architectures to support web-based informations systems (WBIS). 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. We have used Java and Object-JavaScript client side, choosing an object-oriented framework approach to building client applications. We used physical and virtual versions of Apache for HTTP service, servlets a for dynamic web-page capability and an Oracle RDBMS for database service. We also tried to incorporate a web application server, Zope, into our WBIS, but found it unsuitable.

#### *Selected References*

- 'The Object-JavaScript Language,' with D. Hennen and S. Ramachandran, Software Practice and Experience, accepted June, 2000, 21 manuscript pages.
- '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.



**RAMON E. MOORE**

*Full Professor*

*A.B., Physics, University of California, Berkeley, 1950; Ph.D., Mathematics, Stanford University, 1963.*

I have been developing reliable methods for scientific computing for several decades. In the early sixties, I introduced new concepts and methods based on computing with intervals. Since that time more than 2000 works in the field of interval methods have appeared. Interval methods provide completely reliable (infallible) algorithms which guarantee the reported accuracy of computed results. It is my goal to help make this approach to scientific computing more widely known and easier to use. For information on current international activity look up <http://www.cs.utep.edu/interval-comp/main.html>.

*Selected Publications*

R.E. Moore, "Numerical Solution of Differential Equations to Prescribed Accuracy," *Computers and Mathematics with Applications*, 1994, Vol 28, No. 11-12, pp. 253-261.

R.E. Moore, "The Resolution of Close Minima," *Computers and Mathematics with Applications*, 1993, Vol. 25, No. 10/11, pp 57-58.

R.E. Moore, "Parameter Sets for Bounded-error Data," *Mathematics and Computers in Simulation*, 1992, Vol. 34, pp. 113-119.

R.E. Moore (Ed.), "Reliability in Computing. The Role of Interval Methods in Scientific Computing," Academic Press, 1988.

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-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.



**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 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 (ATM, Gigabit Ethernet, and Myrinet) and commodity PCs/workstations. Some of our ongoing 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, scalable algorithms for collective communication distributed shared memory support, and designing scalable servers (multimedia, database, and web) with networks of workstations. 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*, to appear.

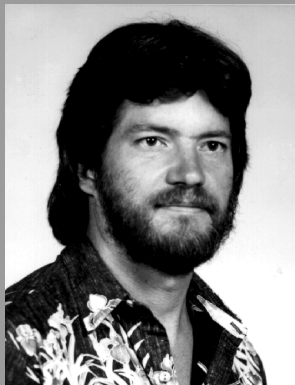
D. Dai and D. K. Panda, "Exploiting the Benefits of Multiple-Path Network in DSM Systems: Architectural Alternatives and Performance Evaluation," *IEEE Transactions on Computers*, Special Issue on Cache Memory, Vol. 48, No. 2, Feb. 1999, pp. 236-244.



**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.*



**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.*

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>



**PONNUSWAMY  
SADAYAPPAN**

*Full Professor*

*B.S., Electrical Engineering, Indian Institute of Technology, Madras, India, 1977; M.S., Electrical Engineering, State University of New York at Stony Brook, 1978; Ph.D., Electrical Engineering, 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. These include the development of efficient schemes for collective communication in heterogeneous systems and effective scheduling and resource management on heterogeneous clusters. 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. Recent work has addressed a number of performance optimization problems motivated by a computational physics application modeling the electronic structure of materials.

*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.

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.

C. Lam, P. Sadayappan, D. Cociorva, M. Alouani and J. Wilkins, "Performance Optimization of a Class of Loops Involving Sums of Products of Sparse Arrays," *Proceedings of 1999 SIAM Conference on Parallel Processing for Scientific Computing*, San Antonio, TX, March 1999.

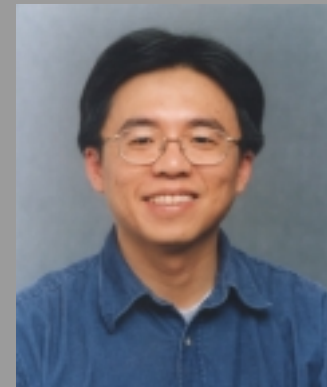
My research interests lie in the area of computer graphics and scientific visualization, with a special focus on the development of efficient algorithms and software systems to facilitate interactive exploration of three dimensional volumetric datasets. Specifically, my current research projects include 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 such as CORBA 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*

David Ellsworth, Ling-Jen Chiang, and H.-W. Shen, "Accelerating time-varying hardware volume rendering using TSP trees and color-based error metrics," *IEEE/ACM 2000 Symposium on Volume Visualization* (to appear).

H.-W. Shen, L. Chiang, and K.-L. Ma, "Time-Varying Volume Rendering Using a Time-Space Partitioning Tree," in *Proceedings of IEEE Visualization'99*, pp. 371-377, October, 1999.

Han-Wei Shen and David Kao, "A New Line Integral Convolution Algorithm for Visualizing Unsteady Flows," *IEEE Transactions on Visualization and Computer Graphics*, Vol. 4, No. 2, 1998.



**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.*



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. Richard and M. Singhal, "Complete Process Recovery: A Vector Time-Based Multiple Failures Recovery Method for Distributed Systems," IEEE Concurrency, Apr-June 1997, pp. 50-59.

R. Prakash, M. Raynal, and M. Singhal, "An Adaptive Casual Ordering Algorithm for Mobile Computing Environments," Journal of Parallel and Distributed Computing, March 1997, Vol. 41, No. 2, 190-204.



**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.*



**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.*

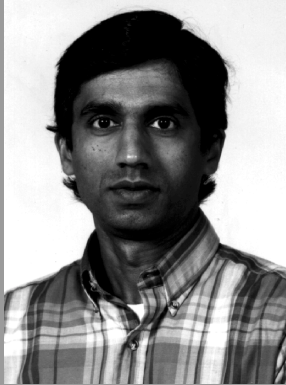
My research interests lie at the intersection of distributed systems and software engineering. I am investigating tools and techniques for supporting a component-based approach to the development of distributed systems. The underlying theme in these investigations is the practical application of elegant 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:*

"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)



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 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 (and concurrent) programs; the approach can be used informally and relatively easily. I am currently working on trying to modify and extend this approach to apply to Object-Oriented distributed programs.

*Selected Publications*

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, S. Fridella, "Inheriting and Modifying Behavior," *Proceedings of Technology of Object Oriented Languages and Systems (TOOLS)*, 1997.

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. Soundarajan, and M. Liu, "A Distributed Deadlock Detection Algorithm and its Correctness Proof," *IEEE Transactions on Software Engineering*, Vol. 14, 1988, pp. 1443-1452.

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.

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

#### *Selected Publications*

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

Wang D.L. and Brown G.J., "Separation of speech from interfering sounds based on oscillatory correlation," *IEEE Transactions on Neural Networks*, vol. 10, 684-697, 1999

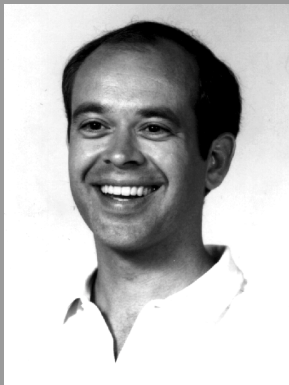
Shareef N., Wang D.L., and Yagel R., "Segmentation of medical images using LEGION," *IEEE Transactions on Medical Imaging*, vol. 18, 74-91, 1999



**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.*



**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 module must have a formal (but still human-comprehensible) specification to say what it does. No one can be expected to use a module without understanding its functionality. Nor should anyone use an implementation of it unless it is known to be correct and efficient. Finally, programming languages and systems must support this approach to software architecture.

#### *Selected Publications*

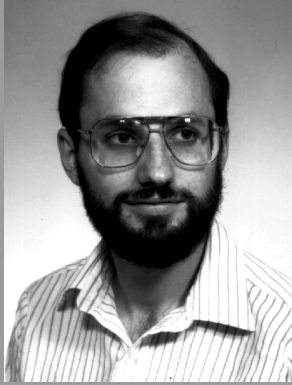
Sitaraman, M., Atkinson, S., Kulczycki, G., Weide, B.W., Long, T.J., Bucci, P., Pike, S., Heym, W.D., and Hollingsworth, J.E., "Reasoning About Software-Component Behavior," *Proceedings Sixth International Conference on Software Reuse*, IEEE, June 2000.

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.

S. Zweben, S. Edwards, J. Hollingsworth, and B. Weide, "The Effects of Layering and Encapsulation on Software Development Cost and Quality," *IEEE Transactions on Software Engineering* 21, 3, March 1995, pp. 200-208.





**REPHAEL WENGER**

*Associate Professor*

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

Surface Reconstruction is the problem of reconstructing a surface from a set of surface sample points. While good algorithms exist for smooth surfaces reconstructing a surface with sharp corners and edges poses a more difficult challenge. I am collaborating with Dr. Tamal Dey on algorithms for building such reconstructions. 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 reconstructing isosurfaces in three dimensions. With Dr. Roger Crawfis, I am working on generalizing isosurface reconstruction to four and higher dimensions.

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*

"Isosurfacing in Higher Dimensions," P. Bhaniramka, R. Wenger, R. Crawfis, Proceedings of the 2000 Symposium on Volume Visualization.

"Reconstructing Curves with Sharp Corners," T. Dey, R. Wenger, Proceedings of the 16th Annual Symposium on Computational Geometry, pp. 233-241.

"Constructing Piecewise Linear Homeomorphisms of Simple Polygons," H. Gupta, R. Wenger, Journal of Algorithms 22, pp. 142-157, 1997.

My research interests include computer vision and machine learning, with an emphasis on statistical modeling and stochastic computing. The 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. I am also interested in bridging computer vision and computer graphics in broad applications.

Because of the stochastic nature of images, computer vision is posed as a statistical inference problem. One basic assumption that dates back to Helmholtz is that given an observed image or video sequence, both human and machine vision systems compute the "most probable" interpretations or causes of the observed images. Thus the essential issues in computer vision are: 1) building probabilistic models for visual patterns, such as texture, color, shapes, and motion etc.; 2) developing stochastic algorithms (Markov chain Monte Carlo) for inference; 3) analyzing the performance of the systems.

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

*Select publications*

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.*

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



**STUART H.  
ZWEBEN**

*Chairperson of Computer and  
Information Science*

*Full Professor*

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



**JAMES W. DAVIS**

*Assistant Professor*

*Research: Human Computer  
Interaction, Motion  
Understanding.*

*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*

#### **NEW FACULTY JOINING OSU-CIS IN 2000**



**SRINIVASAN  
PARTHASATHY**

*Assistant Professor*

*Research: Parallel and  
Distributed Systems, Knowledge  
Discovery, Data Mining*

*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*

## RESEARCH SCIENTISTS



**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: Artificial Intelligence

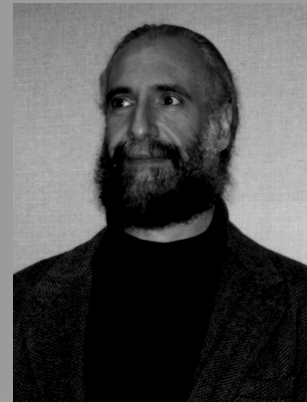
*Selected Publications:*

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).



**JOHN JOSEPHSON**

*Research Scientist  
Ph.D., Ohio State University*

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*



*Mr. LeastCostPathMachine.*

*This "contraption" allows the instructor to demonstrate the behavior of some software components (e.g., `Sorting_Machine`—a component used to sort various kind of items—and `Least_Cost_Path_Machine`—a component used to find the least cost path between nodes in a graph). By asking students to ask the machine to perform its various operations and observing what it does in response, the students have a visual example of what they are asking a computer to do. It is supposed to be fun and entertaining while also pedagogically effective.*





## LECTURERS & SENIOR LECTURERS

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**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 AF-TM 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.

I am also interested in the causes of recent drops in enrollment of young women in Information Technology degree programs. I co-collaborated on requests for funding from General Electric for the CIS department's diversity program, and for funding a diversity study from the National Science Foundation.



**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.

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.

I will be co-coordinating CIS 360 for the 2000-2001 school year.



**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.

*Teaching Assistant  
Achieng' Reggy at work  
in a classroom.*





# EMERITUS FACULTY, ADJUNCT APPOINTMENTS & PART-TIME LECTURERS

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## 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.

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

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

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

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 ACCAD, Advanced Computing Center for the Arts and Design.

## PART-TIME LECTURERS

Alan Beane	P. Krishnasamy	Doug Reeder
Moez Chaabouni	Igor Malkiman	Kathryn Reeves
Alan Cline	Michelle Mallon	Michael Stovsky
Matt Curtin	Robert Mathis	Alvin Stutz
Steve Gomori	Doyt Perry	
John Heimaster	Rajiv Ramnath	

# ADVISING & SUPPORT

## UNDERGRADUATE OFFICE FOR ACADEMIC ADVISEMENT

The Undergraduate Office for Academic Advisement 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, and referrals to various university resources. In an effort to enhance the advising office services to students, a new full time advisor/staff assistant has been added to the staffing of the office. Ms. Katherine Titus-Becker joined the office in June, 2000. In addition to teaching the Engineering Survey class each autumn quarter, and other advising duties, Ms. Titus-Becker will be providing outreach to women students enrolled in the department. She brings a variety of experiences from OSU and from other institutions that will provide the office with a broad sense of student affairs and academic advising.

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 was awarded the Advising Award from the Ohio Academic Advising Association in 2000 for co-authoring a position paper on Professional Development in Academic Advising. She has presented at regional and national conferences that follow:

#### *Selected Publications*

P. Steele, P. Gardner: "What Are We Doing for Advisor Retention". National Academic Advising Association, Denver, October, 1999.

P. Steele, J. Vestal: "Seven Habits of Highly Effective Academic Advising: Defining Professional Development". National Academic Advising Association Region V, March, 2000.

P. Steele, P. Gardner: "Enhancing Advisor Retention through Professional Development". Ohio Academic Advising Association, Columbus, June, 2000.



### 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.

K. Titus-Becker: Impact Leadership I, Lambda Chi Alpha Leadership Seminar, Bowling Green, OH, August, 1999.

*America's future walks through the  
doors of our schools every day.*

Mary Jean LeTendre

## THE INTERACTIVE INSTRUCTIONAL COMPUTING FACILITIES

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The CIS Interactive Instructional Computing Facilities (IICF) organization provides computing support to the Computer and Information Science Department: it's faculty, graduate students, undergraduate majors and non-majors in our service level courses. IICF 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 four departmental labs.

A new departmental lab, completed this summer, offers 160 terminal devices in Caldwell Laboratory. This lab consists of a 100 seat open area, a 40 seat instructional room and a 20 seat instructional room. This lab will support both majors and service level courses.

This past year several new software support tools were introduced into the CIS computing environment. The largest of these was the Account Management System which automates the quarterly maintenance of user accounts and provides faculty much more flexibility in selecting the resources needed for a specific course while dramatically simplifying everyone's lives during the first week of each quarter. A new "Help" system was installed to simplify requests for help from the IICF staff members. Users can send email to the Help system and receive resolution usually within 8 hours, sometimes sooner. Additionally, a new Calendar system was put in place for reserving meeting rooms used by Department faculty and staff.



*Front row: Rick Wagner, Mike Compton, Sandy Farrar, Ron Salyers, Lee Ayres, Shaun Rowland.*

*Back row: Jay Young, Matt Curtin, Dave Kneisley, Ted Welch.*

*(Tami King not pictured.)*

## CIS ADMINISTRATIVE STAFF

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The office staff members contribute in many administrative ways to support the faculty, students, and technical staff. 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.

New to the staff this year are Kim Jackson and Quincy Howard. Kim will handle the travel arrangements, procurement and reimbursements for the Department. Quincy steps into a newly created position, Research Project Coordinator. In this position, he will be the liaison between our faculty and research scientists and the various research funds sources.

### ADMINISTRATIVE STAFF

<i>Catrena Collins</i>	<i>Human Resources Assistant &amp; Technical Associate</i>
<i>Tamera Cramer</i>	<i>Public Relations Coordinator</i>
<i>Tom Fletcher</i>	<i>General Services Administrator</i>
<i>Sandy Hill</i>	<i>Fiscal &amp; Human Resources Officer</i>
<i>Quincy Howard</i>	<i>Research Project Coordinator</i>
<i>Kim Jackson</i>	<i>Travel &amp; Reimbursement Coordinator</i>
<i>Marty Marlett</i>	<i>Administrative Assistant to the Chair</i>
<i>Elizabeth O'Neill</i>	<i>Graduate Studies Assistant</i>
<i>Elley Quinlan</i>	<i>Academic Program Assistant</i>
<i>Matt Warren</i>	<i>Receptionist &amp; Procurement/Key Control Coordinator</i>



*Left to right: Tamera Cramer, Kim Jackson, Catrena Collins, Tom Fletcher, Sandy Hill, Quincy Howard, Elizabeth O'Neill, Marty Marlatt, Elley Quinlan, Matt Warren.*



## THE CIS FAMILY

*For the past 23 years it has been a tradition to begin the Autumn Quarter with a Pizza Party. This event is open to Faculty, Grad Students and Staff, as well as all of their families. The evening includes a clown with balloon animals and face painting.*

*The children all "showing-off" their balloon animals.*



*Prof. Bruce Weide with his two children, Lauren and Alan.*



*Incoming grad student Lori Blankenship and her parents.*



*Prof. Leon Wang with his daughter, Annie.*



## THE YEAR OF BABIES!

*"A baby is God's opinion that life should go on."*

*-Carl Sandburg*



*Paul Sivilotti (faculty), his then fiancée, Linda, Gerald Baumgartner (faculty), Stu Zweben (Dept. chair.) and Pete Ware (lecturer) enjoying the refreshments and conversation.*

*Grad Student Achieng' Reggy snuggles with her son, Otello Reggy-Beane. Part-time instructor, Alan Beane is Otello's very proud daddy.*



*Former staffer Christine (Morgan) O'Connell stopped by the office and introduced her son, Daniel. His is a truly OSU heritage; his father is CIS alum Conleth O'Connell and his grandpa Morgan worked in the University Police Department.*



*Lecturer Dave Mathias introduces his son, Dylan to every baby's grandma, Elizabeth O'Neill.*



*'Departmental Grandma' Elizabeth meeting Graham King. Graham's parents are Tami (IICF staffer) and Scott King (Ph.D. candidate).*



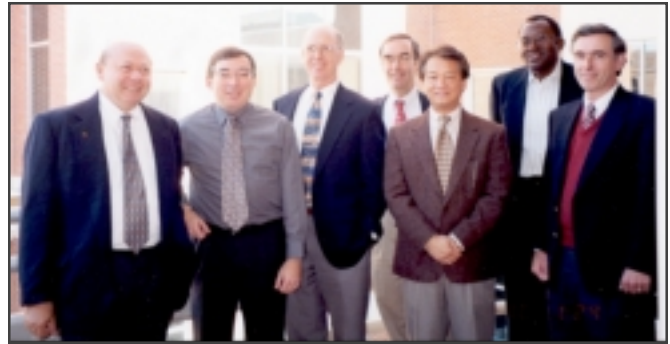
*Kayla Collins, daughter of Catrena, on one of her first visits to Mom's office. She is entranced by Elley Quinlan.*



## EXTERNAL ADVISORY BOARD

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



The external Advisory Board is an entity created in 1987. The members are chosen from industry and other academic institutions and are appointed by the Chair. 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 for the Department to continue excelling. 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's members are:

### **DR. DAVID COHEN, BOARD PRESIDENT**

Dr. David Cohen, an alumni ('77), has over 28 years of experience in software development and systems engineering. He is currently co-founder and President of sente, Inc. Dr. Cohen also founded IEX a System Integrator start-up that is now a division of Tekelek. He has authored several publications in the area of database security, distributed database management, databases in support of new network services, and software development productivity.

### **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 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.

### **DR. NANCY G. LEVESON**

Currently at MIT, Dr. Leveson, a professor of Aeronautics and Astronautics, has started a new area of research, software safety, which is concerned with the problems of building software for real-time systems where failures. She and her students produced a formal requirements specification for TCAS II, a real collision-avoidance system required on all aircraft in U.S. airspace. Previously, she was with the University of Washington as Boeing Professor of Computer Science and Engineering.

### **MR. BRYAN K. PFLUG**

Located in Seattle, Mr. Pflug is currently a Unit Chief in the Simulation Engineering area of Boeing Commercial Airplanes. 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

After spending a number of years at CompuServ Inc., Alexander B. Trevor has become his own boss and is now an independent technology consultant. He is, also, a director of several local technology companies.

### 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.

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### MORE OF THE CIS FAMILY

*Every 'family' has to have a pet of some kind and the CIS family is no exception. Though some of the 'pets' around the Department are not supposed to be petted. Marty Marlatt is a 'puppy raiser' for Canine Companions for Independence and as part of the training occasionally brings them into the office. Each dog arrives about eight weeks old and lives with her for about fifteen months. They then "matriculate" to CCI's training center for more intense lessons. If they pass that training program, they are matched with a physically challenged person. She has trained seven dogs; three have been placed. She has kept two of the dogs, Thor and Levi, who were released from the program. These pictures record some remembrances from their visits.*

*Dogs' lives are too short,  
their only fault really.*

Agnes Sligh Turnbull (1888-1979)



*Levy (#5) meeting Morgan, daughter of Kim Jackson.*



*Marty's first dog was Thor. He was an exceptionally smart dog knowing over one hundred commands. Thor passed away this year and will be missed.*



*Being a puppy is exhausting! Jake (#8) takes a snooze on his first day in Columbus. Maybe it was information overload.*



*Marty and Fergus (#7) at a Graduate Student fair hosted by Purdue University. Fergus was 'turned in' November 1999.*

# FACTS & REPORTS

## STATISTICS: CURRENT & TEN YEAR HISTORY

	AU 1989	AU 1990	AU 1991	AU 1992	AU 1993	AU 1994	AU 1995	AU 1996	AU 1997	AU 1998	AU 1999
<i>Faculty</i>											
<i>Full Time</i>	38	38	36.0	34.5	34.5	32.5	32.5	31.5	31.5	30	28.5
<i>Part Time</i>	11	8	3	4.25	4.25	7.25	6.25	7.25	12.75	10.25	10.25
<i>Graduate Students Enrolled</i>	236	220	205	210	176	174	165	175	155	169	160
<i>Undergrad Students Enrolled</i>	880	866	927	960	930	886	881	965	1124	1358	1519
<i>Course Enrollment/ Autumn Quarter</i>	4,107	3,906	3,601	3,628	2,963	3,121	3,240	3,507	3,630	4,124	3,693*

	89-90	90-91	91-92	92-93	93-94	94-95	95-96	96-97	97-98	98-99	99-00
<i>Students Taught</i>	13,234	12,733	12,645	11,987	10,261	11,383	11,138	12,140	13,098	14,230	14,278
<i>B.A., B.S. Degrees Awarded</i>	238	211	203	265	246	229	217	214	227	259	296
<i>M.S. Degrees Awarded</i>	48	59	43	48	55	31	40	57	56	64	58
<i>Ph.D. Degrees Awarded</i>	22	25	12	14	13	21	9	11	12	10	10
<i>Ph.D. Degrees (cumulative)</i>	170	195	207	221	234	255	264	275	287	297	307
<i>Graduate Student Applications</i>	633	645	606	642	427	439	298	304	362	536	703
<i>Graduate Students Supported</i>	138	117	89	85	90	80	75	101	128	119	111

\*Three class sections were cut causing the decrease.

## DISTINGUISHED GUEST LECTURERS & GUEST SPEAKERS

Bajaj, Chandrajit  
*Scalable Interrogative Visualization*

The University of Texas at Austin

Cohen, Phillip Center fo  
*Principles, Practice, and Impact of Multimodal Interaction*

Center for Human-Computer Communication

Davis, James  
*Categorical Organization and Machine Perception of Oscillatory Motion Patterns*

Massachusetts Institute of Technology

Edelsbrunner, Herbert  
*Computational Topology*

Duke University

Feng, Wu-Chun  
*Network Interface Cards as First-class Citizens*

Purdue University

Flynn, Patrick J. T  
*Global and Local Features for Model-Based 3D Object Recognition*

The Ohio State University

Fosler-Lussier, Eric University of California  
*Integration of Multiple Information Sources in Automatic Speech Recognition*

University of California at Berkeley

Grosu, Radu  
*Hierarchical Design and Analysis of Reactive Systems*

University of Pennsylvania

Leavens, Gary T.     Iowa State University  
*A Java Modeling Language and also Specification Inheritance*

Iowa State University

Livny, Miron  
*Commodity Computing*

University of Wisconsin – Madison

Marks, Joe

Mitsubishi Electric Research Laboratory

*Tangible Interaction + Graphical Interpretation: A New Approach to 3D Modeling OR How to Build Virtual Worlds with Blocks and Clay*

Mitsubishi Electric Research Laboratory

Minai, Ali A.  
*Synchronization in Arrays of Chaotic Maps*

University of Cincinnati

Mundur, Padma  
*An End-to-End Analysis of Distributed Video-on-Demand Systems*

George Mason University

North, Christopher

University of Maryland

*Snap-Together Visualization: Constructing Customized Coordinated Visualization Environments without Programming*

University of Maryland

Oviatt, Sharon Center for  
*Harnessing New Media in Robust Multimodal Systems*

Center for Human-Computer Communication

Parthasarathy, Srinivasan  
*Active Data Mining in a Distributed Setting*

University of Rochester

Pollack, Jordon  
*Co-evolutionary Robotics*

Brandeis University

Sahu, Sambit  
*On Supporting Heterogeneous Services in the Internet*

University of Massachusetts

Sarkar, Saswati  
*Fairness and Congestion Control in Multirate Multicast Networks*

University of Maryland

Seitz, Steve  
*Modeling Reality from Photographs*

Carnegie Mellon University

Siegel, H.J.  
*High-Performance Heterogeneous Computing: Goals and Open Problems*

Purdue University

Sivasubramaniam, Anand  
*Communication and Scheduling for a Multiprogrammed Cluster*

The Pennsylvania State University

Skjellum, Anthony  
*Moving Beyond MPI for Multi-Teraflop Computing*

Mississippi State University

Thompson, Cynthia  
*An Adaptive Conversational Interface for Decision Making*

Stanford University

Tsaoussidis, V.  
*New Generation Transport Protocols for Heterogeneous Wired/Wireless Internet Environments*

SUNY Stony Brook

Wyckoff, Pete  
*CPlant Cluster: Software Architecture, Wide-Area Connectivity, Applications*

Sandia National Labs

Yuille, Alan L.  
*Order Parameter Theory: Fundamental Bounds of Bayesian Inference*

Smith-Kettlewell Eye Research Institute

*During his visit, Distinguished Lecture Herbert Edelsbrunner (second from left) talks with (l-r) Rafe Wenger, Tamal Dey and Alan Saalfeld (Geodetic Sciences, OSU).*



# PUBLICATIONS & PRESENTATIONS

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## PUBLICATIONS

- C. Lam, D. Cociorva, **G. Baumgartner**, **P. Sadayappan**, "Optimization of Memory Usage and Communication Requirements for a Class of Loops Implementing Multi-Dimensional Integrals," submitted by invitation to a special issue of the International Journal on Parallel Processing (IJPP), March 2000.
- S. Butkevich, M. Renedo, **G. Baumgartner**, M. Young, "Compiler and Tool Support for Debugging Object Protocols," Technical Report No. OSU-CISRC-3/00-TR10, Dept. of Computer and Information Science, The Ohio State University, March 2000.
- K. Läufer, **G. Baumgartner**, V.F. Russo, "Safe Structural Conformance for Java," Object Oriented Systems, Vol. 6, pp. 72-92, 1999.
- N. Amenta, S. Choi, **T.K. Dey**, N. Leekha, "A Simple Algorithm for Homeomorphic Surface Reconstruction," to appear in 16th Symposium of Computer Geometry, 2000.
- T.K. Dey**, **R. Wenger**, "Reconstructing Curves with Sharp Corners," to appear in 16th Symposium of Computer Geometry, 2000.
- S.W. Cheng, **T.K. Dey**, H. Edelsbrunner, S.H. Teng, "Sliver Exudation," to appear in J. ACM, 2000.
- B. Aronov, **T.K. Dey**, "Polytopes in Arrangements," to appear in Discrete Computer Geometry, 2000.
- T.K. Dey**, "Section 9.4 on Polyhedra of CRC Handbook of Discrete and Combinatorial Mathematics," Ken Rosen, Editor, CRC press 2000.
- T.K. Dey**, S. Guha, "Transforming Curves on Surfaces," Journal of Computer System Sciences, vol. 58, pp. 297-325, 1999.
- B. Vandalore, **W. Feng**, **R. Jain**, S. Fahmy, "A Survey of Application Layer Techniques for Adaptive Streaming of Multimedia," to appear in Real-Time Imaging Journal (Special Issue on Adaptive Real Time Multimedia Transmission over Packet Switching Networks.)
- W. Feng**, J. Rexford, "Performance Evaluation of Smoothing Algorithms for the Transmission of Prerecorded Video," IEEE Transactions on Multimedia, Sept. 1999.
- A.S. Tosun, **W. Feng**, "Efficient Multi-Layer Coding and Encryption of MPEG Video Streams," Proceedings of IEEE International Multimedia Computing Expo, New York City, NY, Jul. 2000.
- W. Feng**, M. Liu, "Extending Critical Bandwidth Allocation Techniques for Stored Video Delivery Across Best-Effort Networks," Proceedings of IEEE International Conference on Distributed Computing Systems, Taipei, Taiwan, Apr. 2000.
- W. Feng** "Pseudo-Modeling of Variable-Bit-Rate-Video," IS&T/ SPIE Multimedia Computing and Networking 2000, San Jose, CA, 2000.
- G. Cao, **W. Feng**, **M. Singhal**, "Online VBR Video Traffic Smoothing," in Proceedings of the International Conference on Computer Communications and Networks 1999, Boston, MA, Sept. 1999.
- B. Deep, **W. Feng**, "Adaptive Code Allocation in MultiCode-CDMA for Transmitting H.263 Video," in IEEE Wireless Communications and Networking Conference 1999, New Orleans, LA, Sept. 1999.
- A.S. Tosun, **W. Feng**, "The Effect of Bit Errors on MPEG Video Quality for Wireless Networks," Proceedings of the 5th International Conference on Information Systems Analysis and Synthesis (ISAS '99), Jul. 1999.
- G. Babic**, **R. Jain**, A. Duresi, "ATM Performance Testing and Quality of Service Management," in F. Golshani, Ed., "The ATM Handbook" to be published by International Engineering Consortium, Chicago, IL, 1999. [http://www.cis.ohio-state.edu/~jain/papers/exp\\_book.htm](http://www.cis.ohio-state.edu/~jain/papers/exp_book.htm)



- S. Fahmy, **R. Jain**, "Resource Reservation Protocol (RSVP)," chapter in the "Handbook of Communications Technologies: The Next Decade," CRC Press, pp. 35, July 1999.
- M. Lauria**, S. Pakin, A. Chien, "Efficient Layering for High Speed Communication: the MPI over Fast Messages (FM) Experience," Cluster Computing 2, pp. 107-116, 1999.
- 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, pp. 201-219, Fall 1999.
- R.L. Lewis**, "Falsifying Serial and Parallel Parsing Models: Empirical Conundrums and an Overlooked Paradigm," in The Journal of Psycholinguistic Research, 2000.
- R.L. Lewis**, "Cognitive Modeling, Symbolic," The MIT Encyclopedia of the Cognitive Sciences, 1999.
- R.L. Lewis**, "Accounting for the Fine Structure of Syntactic Working Memory: Similarity-based Interference as a Unifying Principle," Behavioral and Brain Sciences 22, pp.105-106, 1999.
- R.L. Lewis**, "Specifying Architectures for Language Processing: Process, Control, and Memory in Parsing and Interpretation," Architectures and Mechanisms for Language Processing, 1999.
- C. Chiang, **M.T. Liu**, **M.E. Muller**, "Cacheing Neighborhood Protocol: a Foundation for Building Dynamic Web Cacheing Hierarchies with Proxy Servers," Proceedings of the 28th International Conference on Parallel Processing, pp. 516-523, September 1999.
- M. Liu, **M.T. Liu**, **M.E. Muller**, J. He, "A MAC Protocol Supporting TCP in DS-CDMA PCNs," Proceedings 2000 International Performance, Computing, and Communications Conference, pp. 8-14, February 2000.
- C. Chiang, Y. Li, **M.T. Liu**, **M.E. Muller**, "On Request Forwarding for Dynamic Web Cacheing Hierarchies," Proceedings of the 20th International Conference on Distributed Computing Systems, pp. 262-269, April 2000.
- C. Chiang, M. Ueno, **M.T. Liu**, **M.E. Muller**, "Modeling Web Caching Schemes for Performance Studies," Proceedings of the 29th International Conference on Parallel Processing, in press.
- 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.
- N. Sahasrabudhe, J.E. West, **R. Machiraju**, M. Janus, "Spatial Domain Image and Data Comparison Metrics," Proceedings of Visualization '99, San Francisco, CA, pp. 97-108.
- L. Burton, **R. Machiraju**, D. Reese, "Dynamic View-Dependent Partitioning of Grids with Complex Boundaries for Object-Order Rendering Techniques," Proceedings of Symposium on Parallel Graphics and Visualization, Visualization '99, pp. 89-100.
- S. Mamrak**, S. Sinha, "A Case Study: Productivity and Quality Gains Using Object-Oriented Framework," Software Practice and Experience, Vol. 29, No. 6, pp. 501-508, 1999.
- R. Sivaram, C.B. Stunkel, **D.K. Panda**, "Implementing Multidestination Worms in Switch-Based Parallel Systems: Architectural Alternatives and their Impact," in IEEE Transactions on Parallel and Distributed Systems.
- Suba Varadarahan, Xiaonging Fu, **Rick Parent**, Kathy Johnson, "3D Gait Reconstruction Using Two-Camera Markerless Video," Sketches, Siggraph 99, Las Angeles, CA.
- P.E. Morgan, M. Visbal, **P. Sadayappan**, "Application of a Parallel Implicit Navier-Stokes Solver to Three Dimensional Viscous Flows," American Institute for Aeronautics and Astronautics Meeting, Paper 2000-0961, Reno, NV, 2000.
- D. Buntinas, **D.K. Panda**, J. Duato, **P. Sadayappan**, "Boadcast/ Multicast over Myrinet using NIC-Assisted Multidestination Messages," Proceedings of Workshop on Communication and Architectural Support for Network-Based Parallel Computing, January 2000.

- C. Lam, D. Cociorva, **G. Baumgartner**, **P. Sadayappan**, "Memory-Optimal Evaluation of Expression Trees Involving Large Objects," Proceedings of the Sixth International Conference on High Performance Computing, Springer Verlag Lecture Notes in Computer Science, December 1999.
- H Shen**, L. Chiang, H. Shen, "A Fast Volume Rendering Algorithm for Time-varying Fields Using a Time-Space Partitioning (TSP) Tree, IEEE Visualization '99, pp. 371-377, Oct. 1999.
- P.A.G. Sivilotti**, C.P. Giles, "The Specification of Distributed Objects: Liveness and Locality," Proceedings of CASCON '99, Toronto, Canada, pp.150-160, 1999.
- N. Soundarajan**, "Documenting Framework Behavior," in special issue of ACM Computing Surveys on OO Application Frameworks.
- N. Soundarajan**, S. Fridella, "Base Classes, Derived Classes, and Client Programs: Effectively Reasoning about Inheritance Based Code," in Journal of Object Oriented Programming.
- N. Soundarajan**, "Understanding Frameworks," Chapter in Building Application Frameworks: Object-Oriented Foundations of Framework Design, M. Fayad, J. Wiley, Editors, pp. 289-308, 1999.
- X. Liu, **D.L. Wang**, J.R. Ramirez, "Boundary Detection by Contextual Nonlinear Smoothing," Pattern Recognition, Vol. 11, pp. 263-280, 2000.
- D.L. Wang** "On Connectedness: A Solution Based on Oscillatory Correlation for Image Segmentation," Neural Computation, Vol. 12, pp. 131-139, 2000.
- K. Chen, **D.L. Wang**, X. Liu, "Weight Adaptation and Oscillatory Correlation for Image Segmentation," IEEE Transactions on Neural Networks, in press.
- E. Csemeli, **D.L. Wang**, "Motion Segmentation Based on Motion/ Brightness Integration and Oscillatory Correlation," IEEE Transactions on Neural Networks, in press.
- X. Liu, K. Chen, **D.L. Wang**, "Extraction of Hydrographic Regions from remote Sensing Images Using an Oscillator Network with Weight Adaptation," to appear in IEEE Transactions on GeoScience and Remote Sensing, 2000.
- G.J. Brown, **D.L. Wang**, "Timing is of the essence: Neural oscillator models of auditory grouping," in Listening to Speech: An Auditory Perspective, S. Greensburg, W. Ainsworth, Editors, Oxford University Press, in press.
- R. Wenger**, "Progress in Geometric Transversal Theory," Contemporary Mathematics, pp. 375-393, 1999.
- Y.N. Wu, **S.C. Zhu**, X.W. Liu, "Equivalence of Julesz Ensembles and FRAME Models," International Journal of Computer Vision, 2000.
- S.C. Zhu**, X.W. Liu, Y.N. Wu, "Exploring Texture Ensembles by Efficient Markov Chain Monte Carlo: A Conclusion to Julesz Quest?" IEEE Transactions on Pattern Analysis and Machine Intelligence, 2000.
- S.C. Zhu**, "Stochastic Jump-diffusion Process for Computing Medial Axes in Markov Random Fields," IEEE Transactions on Pattern Analysis and Machine Intelligence, Vol. 21, No. 11, Nov. 1999.
- S.C. Zhu**, "Embedding Gestalt Laws in Markov Random Fields," IEEE Transactions on Pattern Analysis and Machine Intelligence, Vol. 21, No. 11, Nov. 1999.
- S.C. Zhu**, Y.N. Wu, "From Local Features to Global Perception," Journal of Neurocomputing, 26, July 1999.
- S.C. Zhu**, R. Zhang, Z.W. Tu, "Integrating Top-down/ Bottom-up for Object Recognition Data Driven Markov Chain Monte Carlo," Proceedings of the International Conference on Computer Vision and Pattern Recognition, SC, 2000.
- A.L. Yuille, J. Coughlan, Y.N. Wu, **S.C. Zhu**, "Order Parameter Theory for Minimax Entropy Models: How Does High Level Knowledge Help?" Proceedings of the International Conference on Computer Vision and Pattern Recognition, SC, 2000.

- S.C. Zhu**, X.W. Liu, "Learning in Gibbsian Fields: How Accurate and Fast can it Be?" Proceedings of the International Conference on Computer Vision and Pattern Recognition, SC, 2000.
- S.C. Zhu**, C.E. Guo, "Mathematical Modeling of Clutter: Descriptive vs. Generative Models," Proceedings of SPIE AeroSense Conference on Automatic Target Recognition, Orlando, FL, 2000.
- A.L. Yuille, J. Coughlan, **S.C. Zhu**, "A Unified Framework for Performance Analysis in Bayesian Inference," Proceedings of SPIE AeroSense Conference on Automatic Target Recognition, Orlando, FL, 2000.
- S.C. Zhu**, Z.W. Tu, R. Zhang, "Effective Bayesian Inference by Data-Driven Markov Chain Monte Carlo," Proceedings of SPIE AeroSense Conference on Automatic Target Recognition, Orlando, FL, 2000.
- Y. Wu, **S.C. Zhu**, X. Liu, "Equivalence of Julesz and Gibbs Texture Ensembles," 7th International Conference on Computer Vision, Greece, Sept. 1999.
- S. Zweben**, "Seed Corn at the Millenium: What Can We Learn from the Taulbee Data?" Computing Research News, September 1999, pp. 3-4

## PRESENTATIONS

### Anish Arora

- "Fault-tolerance in Component Based Systems"  
-Mini-Symposium on Software Engineering with Components, Rice University, March 2000
- "Gray-Box Components"  
-NASA, Ames, November 1999  
-EPFL, Lausanne, Switzerland, July 1999

### Gerald Baumgartner

- "Extending Java with Structural Subtyping and Multimethods"  
-Midwest Society for Programming Languages and Systems, Illinois Institute of Technology, Chicago, IL, October, 9 1999
- "A Virtual DSP System for Design and Instruction of Power Converters"  
-Digital Signal Processing (DSPS) Fest, Houston, TX, August 1999

### Tamal Dey

- "Reconstructing Curves and Surfaces from Samples"  
-University of Wisconsin, Milwaukee, 1999
- "Surface Reconstruction Simplified"  
-Duke University, 2000  
-University of North Carolina, Chapel Hill, 2000

### Eitan M. Gurari

- "LaTeX to XML/ MathML"  
-The 20<sup>th</sup> Annual Meeting of the TeX Users Group, Vancouver, British Columbia, August 1999

### Raj Jain

- "IP over DWDM Networks"  
-GTE, Boston, January 19, 2000  
[http://www.cis.ohio-state.edu/~jain/talks/opt\\_gte.htm](http://www.cis.ohio-state.edu/~jain/talks/opt_gte.htm)
- "Optical DWDM Networks"  
-Nortel Networks, November 5, 1999  
[http://www.cis.ohio-state.edu/~jain/talks/h\\_5opt.htm](http://www.cis.ohio-state.edu/~jain/talks/h_5opt.htm)

## PRESENTATIONS (CONT'D.)

### “IP over DWDM”

-Nortel Networks, November 5, 1999  
[http://www.cis.ohio-state.edu/~jain/talks/h\\_aipwd.htm](http://www.cis.ohio-state.edu/~jain/talks/h_aipwd.htm)

### “Quality of Service in Data Networks”

-Workshop on Next Generation Networks, Nortel Networks, Ottawa, Canada, October 28-29, 1999  
<http://www.cis.ohio-state.edu/~jain/talks/qos9910.htm>

### “Networking and Telecommunications Research at OSU”

-To CIS 885 Class at Ohio State University, October 13, 1999  
[http://www.cis.ohio-state.edu/~jain/talks/osu\\_net.htm](http://www.cis.ohio-state.edu/~jain/talks/osu_net.htm)

### “Quality of Service in Data Networks: Trends, Solutions, and Issues”

-Keynote speech at ICON'99, Brisbane, Australia, September 29, 1999  
<http://www.cis.ohio-state.edu/~jain/talks/icon99.htm>

### “Current Trends in Networking Traffic Management and Quality of Service”

-Invited Speech at OPNETWORK'99, Washington, DC, August 30, 1999  
<http://www.cis.ohio-state.edu/~jain/talks/opnet99.htm> (Video available).

### “Quality of Service and Traffic Engineering using Multiprotocol Label Switching “

-ETRI, Korea, August 17, 1999  
[http://www.cis.ohio-state.edu/~jain/talks/mppls\\_te.htm](http://www.cis.ohio-state.edu/~jain/talks/mppls_te.htm)

### “Quality of Service In Data Networks: Problems, Solutions, and Issues”

-Seoul National University, and Samsung, Seoul, Korea, August 16, 1999  
<http://www.cis.ohio-state.edu/~jain/talks/qos9908.htm>

### “Traffic Management in Satellite Networks”

-Invited speech at International Symposium on Radio Technologies (ISART'99), Boulder, CO, August 1, 1999  
<http://www.cis.ohio-state.edu/~jain/talks/isart99.htm>

### “Traffic Management in ATM Networks over Satellite Links”

-Communications and Interoperability Section and TR34.1, Satellite Communications Division, Telecommunications Institute of America (TIA), Arlington, VA, July 7, 1999  
<http://www.cis.ohio-state.edu/~jain/talks/tiarpt.htm>

### “Quality of Service In Data Networks: Problems, Solutions, and Issues”

Nokia Research Center, Helsinki, Finland, June 8, 1999  
<http://www.cis.ohio-state.edu/~jain/talks/qos9906.htm>

## **Ten-Hwang (Steve) Lai**

### “COS-Based Interswitch Handoff in Wireless ATM: Pitfalls and Solutions”

-IEEE Wireless Communication Networking Conference, New Orleans, September 1999

### “A Relaxed Mutual Exclusion Problem with Application to Channel Allocation in Mobile Cellular Networks,”

-IEEE 2000 International Conference on Distributed Computing Systems

### “Guaranteeing Call Dropping Rate and Providing Bandwidth Efficiency in the Third Generation Wireless Communications”

-IEEE 2000 International Conference on Third Generation Wireless Communications

### “An Efficient Approach to Support QoS and Bandwidth Efficiency in High Speed Wireless Networks”

-IEEE 2000 International Conference on Communications

## **Raghu Machiraju**

### “Data and Image-Centric Exploration of Terascale Datasets”

-Workshop on Mining Scientific Datasets, Army HPC Research Center, Minneapolis, MN, September 1999

“Trends in Visualization”

-Modeling Based Simulation Workshop, National Science Foundation, Arlington, VA, May 2000

**Dhabaleswar Panda**

“Network-Based Computing: Issues, Trends, and Challenges”

-IEEE Calumet Section, Chicago, March 21, 2000

“Experiences with Network-Based Computing Research and Beowulf Cluster at OSU-CIS”

-Beowulf Focus Group Meeting, Ohio Supercomputer Center, Columbus, September 28, 1999

**Paul Sivilotti**

“Components for Distributed Systems”

-University of Cincinnati, November 23, 1999

“Software Engineering and Distributed Systems”

-OSU IEEE Computer Society, OSU, November 23, 1999

**Deliang Wang**

“Visual Scene Analysis Based on Oscillatory Correlation”

-University of Chicago (Computational Neuroscience), Chicago, IL, November 1999

“Auditory Scene Analysis Based on Oscillatory Correlation”

-Naval Underwater Warfare Center, Newport, RI, July 1999

**Song Chun Zhu**

“Integrating Bottom-Up/ Top-Down by Data Driven Markov Chain Monte Carlo”

-International Workshop on Generic Object Recognition, September 1999

“Mathematical Modeling of Image Ensembles and Applications”

-School of Math, Georgia Institute of Technology, September 1999

“Image Segmentation by Data Driven Markov Chain Monte Carlo”

-Brown University, June 1999

**Stuart H. Zweben**

“IT Workforce Development: A Provider’s Perspective

-Central Ohio Information Technology Forum, Columbus, Ohio, December 1999



# FACULTY SEARCH REPORT

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This year the department again conducted an extensive Faculty Search. The following represents the summary of our Faculty Search and the intensive effort exerted.

Actively considered	71
Interviews held	16
Unsuitable applications	122
The breakdown according to area of interest/expertise:	
AI	62
P & D	26
Graphics	16
Networking	16
Theory	15
HCI	12
DB	9
SE	9
Multimedia	3
Programming Languages	3
Miscellaneous*	22
Total	193

\*MISCELLANEOUS INCLUDES: CAD/CAM; COMP. BIOLOGY; CS; DATA MINING; EE; INFORMATION SYSTEM; LANGUAGE IMPLEMENTATION; OS; REAL-TIME SYSTEMS; SECURITY; SYSTEM; VLSI; UNKNOWN.

## EQUIPMENT\*

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Servers:	22	HP 9000 725/75
	13	Sun Ultra Enterprise 450
	4	Sun Ultra Enterprise 2
	1	Sun Ultra Enterprise 1
	11	Dell Poweredge 6300
	1	Dell Poweredge 6400
	1	Dell Poweredge 2400
Workstations:	95	HP 9000 715/64
	250	Explora 452 NCD Thin Clients
Disk Space:	Over 660 GB of disk space	
Peripherals:	17	HP 4si/mx Laser Printer
	4	HP 5si/mx Printer
	3	HP 5m Color Laser Jet Printer
	5	HP 8100 Laser Printer
	7	Sony 1271 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.

# COURSE LISTING

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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
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
294	Group Studies	1-5
314	Business Programming with File Processing	4
321	Design and Analysis of Component-Based Software	4
360	Introduction to Computer Systems	4
459	Programming Languages for Programmers	1
459.01	Programming in FORTRAN	1
459.11	Programming in PL/1	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
640	Numerical Analysis	3
642	Numerical Linear Algebra	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	3
675	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
694	Group Studies	1-5
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
788	Intermediate Studies in Computer and Information Science	1-5
793	Individual Studies	1-5
794	Group Studies	1-5
797	Interdepartmental Seminar	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
889	Advanced Seminar in Computer and Information Science	2
899	Interdepartmental Seminar	1-5
999	Research	1-18



*Tuttle Plaza behind our building has been the site of many recent activities. During the grand opening festivities Gateway Computers sponsored a "cow" roping contest. The Coca-Cola Company used its products to build a replica of Ohio Stadium.*



## MORE OF THE CIS FAMILY

Another annual tradition is the Department's Holiday Pot Luck! Faculty, Students, Staff and Families all join together for everyone's favorite activity = eating! The food selection is a sampling of multi-cultural delights; Iranian omlets, humus, bean soup, gulab jamun, and apple pie!



Carol Feng, (left) wife of faculty member

Wuchi Feng with their son Justin, sits with Debrashree Panda (right), wife of Dhabaleswar, and young Ahba Panda.



Part-time lecture Michelle Mallon and her daughter talk with Debby Gross while behind them others fill their plates.



Sandy Hill and Marty Marlatt displaying their Holiday spirit.



One sleepy Santa! Matt Warren succumbs to the post-feast lethargy.



Call it a clan, call it a network, call it a tribe, call it a family. Whatever you call it, whoever you are, you need one.

Jane Howard (1935-1996) US journalist, writer



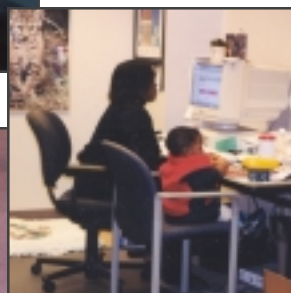
Raghu Machiraju and his sons, Siddharth and Gautam.



Ashley Jackson enjoys time with her mother on "Take Your Daughter to Work Day."



Children are never too young to learn about computers. Joseph Collins gives his mother, Catrena a hand in the office.



P. Sadayappan's daughter, Shambavi, had a day off from school, but Dad had a meeting. So the office got a visit!



## OUR APPRECIATION

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*The Department wishes to say*

**THANK YOU**

*to the individual and corporate sponsors who have donated to the Computer and Information Science Department; both to the Discretionary Fund and the Undergraduate Scholarship Fund.*

*Naturally, the unrestricted (discretionary) donations have the most impact as they allow the Department to allocate the funds where the need is greatest.*

*Donations to the Undergraduate Scholarship Fund are used to honor the very best CIS students. We are committed to continually improve both our graduate and undergraduate programs. We hope you will join in this commitment.*

*Please remember us when responding to any University fund-raising campaigns. You may designate your funds for the CIS Department and specify which departmental fund. The University address is:*

*Office of Development - Professional Schools*

*The Ohio State University*

*Fawcett Center*

*2400 Olentangy River Road*

*Columbus, Ohio 43210*

*Feel free also to send your check (made payable to The Ohio State University) directly to us. Our address is shown on the title page.*



*Children from the A. Sophy Rogers Lab School play in the Garden of Constants while art students work on their projects.*

