

# THE DEPARTMENT OF COMPUTER SCIENCE

## 2013-2015 DEPARTMENTAL REPORT



WHERE INNOVATION IS TRADITION

**DEPARTMENT OF COMPUTER SCIENCE**

Volgenau School of Engineering  
George Mason University  
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Fairfax, VA 22030

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# MESSAGE FROM THE CHAIR

## SANJEEV SETIA

With more than forty-five faculty members, and close to 1500 students, the Computer Science Department at George Mason University is one of the largest computer science departments in the state of Virginia.

Nationwide the last five years have seen a tremendous explosion of interest in computer science. At Mason, the number of undergraduate students enrolled in computer science has doubled during this period. Indeed, during the last two years, more freshmen at Mason have chosen to major in CS than in any other discipline! No doubt, the centrality of smart phones and social media apps to the lives of teenagers today, and the excellent employment prospects for graduates, make computer science an attractive field to students.

Computer Science departments previously experienced similar enrollment during the 1980s (after the advent of the PC) and in the 1990s (during the Internet boom). Unfortunately, those enrollment booms were followed by busts. Given the critical importance of computing and information technology to the nation's economy and its security, it is imperative that universities respond to the current enrollment expansion in a way that avoids repeating some of the mistakes of the past.

Our Computer Science department is the largest department in the Volgenau School of Engineering. This has helped us absorb the increase in enrollment so far, but we are engaged in multiple efforts to continue to provide both an outstanding education and a *welcoming environment* to our students. We have added six new faculty members – Foteini Baldimitsi (joining us in fall 16), Dov Gordon, Thomas LaToza, John Otten, Katherine Russell and Yutao Zhong, and plan to add more faculty this year.

An article in this report describes the SPARC initiative, funded by Google, which aims to address the capacity challenges faced by Computer Science departments in teaching lower division programming courses. A team of Mason faculty, led by Jeff Offutt, are testing an innovative self-paced approach to teaching these classes inspired in part by the model used by martial arts classes in awarding "belts" to students.

Over the last two years, several faculty received national and university awards for their excellence in teaching and research. Yotam Gingold received an NSF Career award, bringing to twelve the number of Career and Young Investigator awards received by our faculty. Danny Menascé added the IEEE fellow distinction to his collection of awards, and was the university's nominee to State Council of Higher Education of Virginia (SCHEV) for the statewide Outstanding Faculty award.

Three CS faculty – Jyh-Ming Lien, Huzefa Rangwala, and Amarda Shehu - were selected to receive the Mason Emerging Scholar/Researcher award for young faculty who show exceptional promise in their discipline. Computer Science now has seven faculty members who have been selected for this award– more than any other department on campus! Last but not least, four faculty members – Huzefa Rangwala (2014), Sean Luke (2015), and Kinga Dobolyi, and Mark Snyder (2016) received the Mason Teaching Excellence award, making it five years in a row that our faculty have been recognized by the university for their outstanding teaching.

This departmental report highlights some of the accomplishments of the faculty and students of the department over the last two years. I invite you to read about our faculty, our academic programs, and the exciting on-going research projects in the Computer Science department at George Mason University.



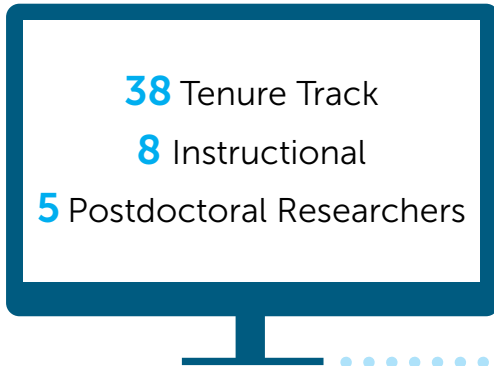
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# FAST FACTS ABOUT CS@GMU

## FACULTY



## Research EXPENDITURES

**\$5.9M**



fiscal year 2014

**\$5.7M**



fiscal year 2015

## Faculty AWARDS



- 10** NSF Career Awards
- 1** AFOSR Young Investigator Award
- 2** ACM Fellows
- 4** IEEE Fellows
- 1** IAPR fellow

BS in Computer Science, BS in Applied Computer Science with concentrations in Bioinformatics, Computer Game Design, Geography, & Software Engineering

MS in Computer Science, MS in Information Systems, MS in Information Security, MS in Software Engineering

PhD in Computer Science



## PROGRAMS

## Students

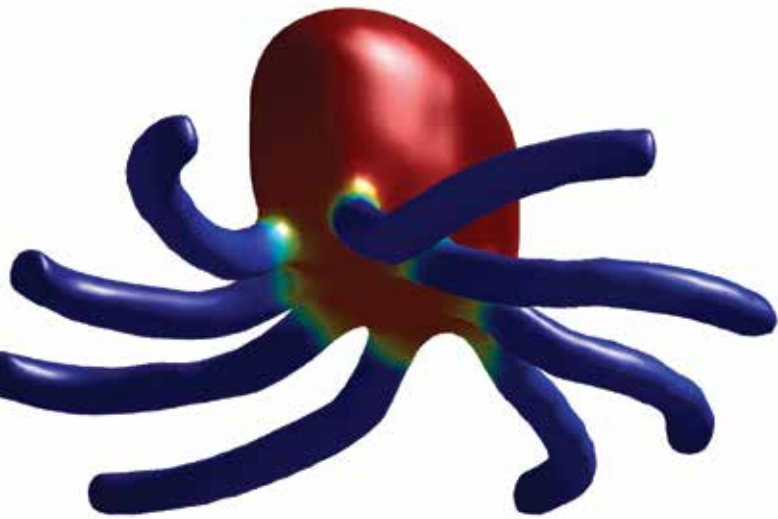


Undergraduates **993** Masters **383** PhD **107**

## DEGREES Conferred

**2013-14:** BS:98, MS:184, PhD:18

**2014-15:** BS:107, MS:162, PhD:23



# SNAPSHOT! VISUAL COMPUTING CREATING NEW SIGHTS

**Visual computing research is inherently optimistic. It brings creativity to life with robots that can see and aid humans in medical and mechanical diagnostics. It powers the promise of safer transportation with autonomous driving cars, and changes the game literally as it relates to 3D graphics and industrial design.**

Research projects and coursework in the Department of Computer Science are expanding on the field's growing databases, devices, and discoveries

**JAN ALLBECK** works with intelligent agents, crowd simulations, and serious games. She is director of the Laboratory for Games and Intelligent Animation (GAIA). Her research focuses on virtual humans, graphical representations of humans, entertainment (movies and games), human factors, architectural design, training, and safety to name a few. She is also working towards functional crowds, populations of characters going about their typical daily activities. Most recently she explains this has taken the form of accumulating the semantics of actions and objects in order to better connect AI controllers for the characters with their animation in virtual worlds.

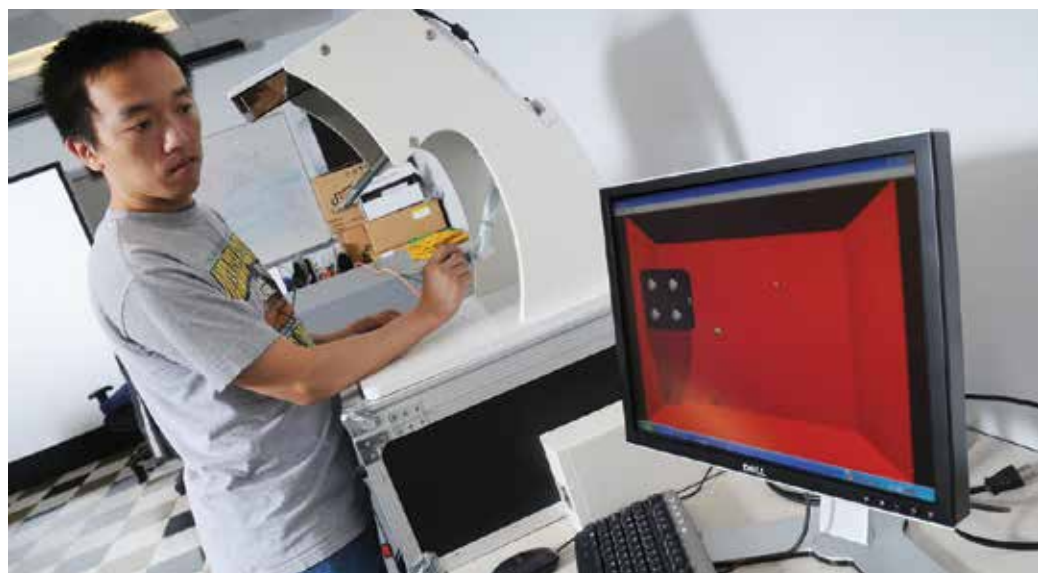
**ZORAN DURIC** works in the the Laboratory for the Study & Simulation of Human Movement. This lab's two-fold mission is to study human movement and the simulation of

human movement. They simulate movement by programming haptic (sensory) devices that train people to perform functional tasks. This work is especially important for people suffering from traumatic brain injury.

**YOTAM GINGOLD** is the director of the Creativity and Graphics Lab (CraGL), funded by an NSF CAREER award and

a Google Faculty Research Award. Its mission is to solve challenging visual, geometry, and design problems and pursue foundational research into human creativity.

Gingold and the students working in the CraGL, are working to find new ways to change the shape of 2D computer illustrations to 3D images.



They are also working to speed up algorithms used in human-computer interaction to provide faster and even predictive feedback. One example is placing furniture inside a 3D scanned room and having it align perfectly with the floor, walls, and other objects in the room. This has applications for industrial design and manufacturing. The lab is also looking at the properties of crowd-sourced creativity. What happens when multiple creative works such as paintings, drawings, sculptures, or songs are averaged together? Is there a wisdom-of-the-crowds effect on the overall product?

**JANA KOŠECKÁ** is an expert in computer vision and object recognition with the goal of being able to program robots to navigate and perform autonomous tasks in unique environments. She explains that robots, even simple machines, need to be able to function and possibly move from place-to-place before they can perform a specialized task. A robot employed in a war zone to investigate explosives most likely won't be moving along a paved street surface. A robot designed to help the elderly needs to navigate around everyday objects such as chairs and tables. While the machine can be programmed to move, it must also be programmed to see and to react. Košecká's research has applications to street level-mobility and large scale geographic identification. Imagine being able to use a robot to identify where in the world a building was situated based on visual markers.

**JYH-MING LIEN** directs the Motion and Shape (MASC) group affiliated with the GMU Autonomous Robotics Laboratory. MASC works to develop efficient algorithms for representing, manipulating, and analyzing massive geometric data of shape and motion. Two of the many recent projects are Continuous Visibility Feature (CVF) and Collision Prediction. CVF is a new type of visibility measurement. A paper was published in the 28th IEEE Conference on Computer Vision and Pattern Recognition. Collision Prediction proposes a new approach to predict



Images generated from an automatic method to abstract high resolution images into very low resolution outputs with reduced color palettes in the style of pixel art. This method simultaneously solves for a mapping of features and a reduced palette needed to construct the output image. The results are an approximation to the results generated by pixel artists.

collision by assuming that obstacles are adversarial. The tool advances collision prediction beyond the translational and disc robots; arbitrary polygons with rotation can be used to better represent obstacles and provide tighter bound on predicted collision time. Several papers have been published and can be found online at [masc.cs.gmu.edu](http://masc.cs.gmu.edu).

**HARRY WECHSLER** focuses on how to connect people to machines, specifically mobile devices. Wechsler is working on using biometrics for identification including faces, hands, fingerprints, and retina. His work at Mason has involved facial recognition. His students are working on time lapse facial models and aging. He

says "looking ahead, computers will become more and more our assistants as they learn about us and can assess our condition [health] and predict our needs." ■

*Page 4: Left image credit: Yotam Gingold, Jyn-Ming Lien, Guilin Liu*

*Page 4: Bottom left image credit: Creative Services*

*Page 5: Top image credit: Yotam Gingold*



# PhD RECIPIENTS 2013-2015

## 2013-2014

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### COMPUTER SCIENCE

**Samuel J. Blasiak**

Dissertation Title: *Latent Variable Models of Sequence Data for Classification and Discovery*

Dissertation Chair: Huzefa Rangwala, PhD

**Mark Coletti**

Dissertation Title: *An Analysis of a Model-Based Evolutionary Algorithm: Learnable Evolution Model*

Dissertation Chair: Kenneth A. De Jong, PhD

**David D. DeBarr**

Dissertation Title: *Spam, Phishing, and Fraud Detection Using Random Projections, Adversarial Learning, and Semi-Supervised Learning*

Dissertation Chair: Harry Wechsler, PhD

**Naeem Esfahani**

Dissertation Title: *Management of Uncertainty in Self-Adaptive Software*

Dissertation Chair: Sam Malek, PhD

**Quan Jia**

Dissertation Title: *Mitigating Denial-of-Service Attacks in Contested Network Environments*

Dissertation Chair: Angelos Stavrou, PhD

**Yanyan Lu**

Dissertation Title: *Path Planning in Similar Environments*

Dissertation Chair: Jyh-Ming Lien, PhD

**Quyen L. Nguyen**

Dissertation Title: *Quantitative Framework to Design Services with Intrusion Tolerant QoS*

Dissertation Chair: Arun K. Sood, PhD

**Brian S. Olson**

Dissertation Title: *Evolving Local Minima in the Protein Energy Surface*

Dissertation Chair: Amarda Shehu, PhD

**Zhi Zhang**

Dissertation Title: *Scheduling Algorithms Optimizing Throughput and Energy for Networked Systems*

Dissertation Chair: Fei Li, PhD

### INFORMATION TECHNOLOGY

**Mohammad Ababneh**

Dissertation Title: *A Dynamic Dialog System Using Semantic Web Technologies*

Dissertation Chair: Duminda Wijesekera, PhD

**André B. Abadie**

Dissertation Title: *Combining Operational and Spectrum Characteristics to Form a Risk Model for Positive Train Control Communications*

Dissertation Chair: Duminda Wijesekera, PhD

**Khalid Albarrak**

Dissertation Title: *An Extensible Framework for Generating Ontology from Various Data Models*

Dissertation Chair: Edgar H. Sibley, ScD

**Susan M. Farley**

Dissertation Title: *Top-k Algorithms for SimQL: A Decision Guidance Query Language Based on Stochastic Simulation*

Dissertation Chair: Alexander Brodsky, PhD

**Wendy Jing Jin**

Dissertation Title: *Towards Evasive Attacks: Anomaly Detection Resistance Analysis on the Internet*

Dissertation Chair: Jeff Offutt, PhD

**Uday Krishna Kamath**

Dissertation Title: *An Evolutionary Machine Learning Framework for Big Data Sequence Mining*

Dissertation Chair: Kenneth A. De Jong, PhD

**Yun-Sheng Wang**

Dissertation Title: *Unsupervised Bayesian Musical Key and Chord Recognition*

Dissertation Chair: Harry Wechsler, PhD



# 2014-2015

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## COMPUTER SCIENCE

### **Shouvik Bardhan**

Dissertation Title: *Design and Modeling of Schedulers for Multi-Task Jobs on Computer Clusters*  
Dissertation Chair: Daniel Menasce, PhD

### **Nathan E. Egge**

Dissertation Title: *Decision Guidance Query Language (DGQL), Algorithms and System*  
Dissertation Chair: Alexander Brodsky, PhD

### **David Lee Etter**

Dissertation Title: *Multi-view Rank Learning for Multimedia Known Item Search*  
Dissertation Chair: Carlotta Domeniconi, PhD

### **John Martin Ewing**

Dissertation Title: *Autonomic Performance Optimization with Application to Self-Architecting Software Systems*  
Dissertation Chair: Daniel Menasce, PhD

### **Ryan Joseph Farley**

Dissertation Title: *Toward Automated Forensic Analysis of Obfuscated Malware*  
Dissertation Chair: Xinyuan Wang, PhD

### **Mohammed Anowarul Hassan**

Dissertation Title: *Computation Offloading and Storage Augmentation for Mobile Devices*  
Dissertation Chair: Songqing Chen, PhD

### **Kevin P. Molloy**

Dissertation Title: *Probabilistic Algorithms for Modeling Protein Structure and Dynamics*  
Dissertation Chair: Amarda Shehu, PhD

### **Raimi Ayinde Rufai**

Dissertation Title: *Convex Hull Problems*  
Dissertation Chair: Dana S. Richards, PhD

### **Tanwistha Saha**

Dissertation Title: *Learning in Relational Networks*  
Dissertation Co-Chairs: Carlotta Domeniconi, PhD and Huzefa Rangwala, PhD

### **Gautam Singh**

Dissertation Title: *Visual Scene Understanding through Semantic Segmentation*  
Dissertation Chair: Jana Košecá, PhD

### **Keith M Sullivan**

Dissertation Title: *Hierarchical Multiagent Learning from Demonstration*  
Dissertation Chair: Sean Luke, PhD

### **Hao Sun**

Dissertation Title: *Motion Comparison and Tactic Analysis in Sports Training*  
Dissertation Chair: Jim X. Chen, PhD

### **Nalini Vishnoi**

Dissertation Title: *An Approach to Analyzing and Recognizing Human Gait*  
Dissertation Co-Chairs: Zoran Duric, PhD and Naomi Lynn Gerber, PhD, Center for Study of Chronic Illness and Disability

### **Christopher Vo**

Dissertation Title: *Robust and Reusable Methods for Shepherding and Visibility-Based Pursuit*  
Dissertation Chair: Jyh-Ming Lien, PhD

### **Fengwei Zhang**

Dissertation Title: *Using Hardware Isolated Execution Environments for Securing Systems*  
Dissertation Chair: Angelos Stavrou, PhD

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## INFORMATION TECHNOLOGY

### **Arwa Aldhalaan**

Dissertation Title: *Autonomic, Optimal, and Near-Optimal Allocation in Cloud Computing*  
Dissertation Chair: Daniel Menasce, PhD

### **Mohammed A. Alhusein**

Dissertation Title: *A Highly Recoverable Filesystem for Solid State Drives*  
Dissertation Chair: Duminda Wijesekera, PhD

### **Joshua W. Church**

Dissertation Title: *Recommending Service Repairs*  
Dissertation Chair: Amihai Motro, PhD

### **Jason W. Clark**

Dissertation Title: *Profiling, Tracking, and Monetizing: An Analysis of Internet and Online Social Network Concerns*  
Dissertation Co-Chairs: Damon McCoy, PhD and Duminda Wijesekera, PhD

### **Jing Guan**

Dissertation Title: *Software Architecture Testing for Wireless Network Application in Component Based Real-Time Embedded Communication Systems*  
Dissertation Chair: Jeff Offutt, PhD

### **John D. McDowall**

Dissertation Title: *Method and Models to Enable Optimal Automated Service Composition*  
Dissertation Co-Chairs: Larry Kerschberg, PhD and Alexander Brodsky, PhD

### **Bo Yu**

Dissertation Title: *Enforcing Careflows and Treatment Consents in Electronic Medical Record Systems*  
Dissertation Chair: Duminda Wijesekera, PhD



# FACULTY AWARDS

## MASON TEACHING EXCELLENCE AWARDS

The award is Mason's highest recognition for faculty members who demonstrate exceptional skill in and commitment to their teaching and learning practices.

**Huzefa Rangwala**, Associate Professor received Mason's 2014 Teaching Excellence Award. Rangwala teaches structural bioinformatics, chemoinformatics, genomics, data mining, and high performance computing.

**Sean Luke**, Associate Professor received Mason's 2015 Teaching Excellence Award. Luke teaches evolutionary computation, multi-agent systems, distributed knowledge representation, robotics, and virtual biology.

**Kinga Dobolyi**, Assistant Professor received Mason's 2016 Teaching Excellence Award. Dobolyi teaches software testing, web applications, and software engineering.

**Mark Snyder**, Assistant Professor received Mason's 2016 Teaching Excellence Award. Snyder teaches language interpretation, type-driven language specification, language semantics, type systems, domain specific languages, compilation and systems level design.

## MASON EMERGING RESEARCHER/SCHOLAR AWARD

To qualify for this award and its \$3,000 stipend, the faculty member must be within 10 years of receiving his or her terminal degree and have growing national and international recognition for his or her work.

### 2014 Winners

**Huzefa Rangwala**, Associate Professor  
**Amarda Shehu**, Associate Professor

### 2015 Winner

**Jyh-Ming Lien**, Associate Professor

## NSF CAREER AWARD

The NSF CAREER Award is a prestigious five-year award in support of junior faculty who exemplify the role of teacher-scholar through outstanding research, excellent education, and the integration of education and research.

**Yotam Gingold**, Assistant Professor, "Direct Manipulation of Numerical Optimization for Structured Geometry Creation."

## IEEE FELLOW

**Danny Menascé** University Professor became an IEEE Fellow for "contributions to research and education in performance evaluation of computer systems."

## Department of Computer Science Industrial Advisory Board Members 2016

### **BARBIE S. BIGELOW**

*Chief Information Officer*  
Jacobs Engineering

### **DR. HARRY FOXWELL**

*Principal Consultant*  
Oracle Corporation

### **ALAN HARBITTER**

*Consultant*  
Harbitter Consulting, LLC

### **MARK HARTONG**

*Senior Scientific Technical Advisor*  
Federal Railroad Administration

### **LAUREL FIELDING MYSLEWICZ**

*Chief Technology Officer*  
NetComm, Inc.

### **DR. KENNETH E. NIDIFFER**

*Director of Strategic Plans for Government Programs*  
Software Engineering Institute

### **DENNIS V. PEREIRA**

*Senior Technical Consultant*  
Data Works, Inc.

### **DR. ROBERT G. PETTIT, IV**

*Sr. Project Leader*  
The Aerospace Corporation

### **DR. KEN SMITH**

*Sr. Principal Database Scientist*  
Center for Innovative Computing & Informatics  
The MITRE Corporation

### **JIM STANLEY**

*Director of Programs*  
Northrop Grumman Corporation

### **MARC SURETTE**

*National Manager, DoD and Intelligence*  
Palo Alto Networks

### **SHERI WILLIAMSON**

*Software Analyst*  
Metron, Inc.

### **BRIAN ZIMAN**

*Software Engineer*  
Google

## DISTINGUISHED LECTURE SERIES

Each year the Department of Computer Science hosts its Distinguished Lecture Series to feature notable and engaging computer scientists to come and share their research with the Mason community.

### 2014-2015

#### **DAVID BLEI**

Professor, Computer Science Department  
Columbia University  
*"Probabilistic Topic Models and User Behavior"*  
September 26, 2014

#### **PETER STONE**

Professor, Department of Computer Science  
University of Texas, Austin  
*"Learning and Multiagent Reasoning for Autonomous Robots"*  
November 12, 2014

#### **RICARDO BIANCHINI**

Professor, Department of Computer Science  
Rutgers University & Microsoft  
*"Greening Datacenters: Past, Present, and Future"*  
March 27, 2015

#### **WU-CHUN FENG**

Professor, Department of Computer Science and Department of  
Electrical and Computer Engineering  
Virginia Tech  
*"Confessions of an Accidental Greenie: From Green Destiny to the  
Green 500"*  
April 17, 2015

### 2015-2016

#### **HENRIK CHRISTENSEN**

KUKA Chair of Robotics at the College of Computing, Georgia  
Institute of Technology  
Executive Director of Institute for Robotics and Intelligent Machines  
*"2D and 3D Model Based Visual Tracking"*  
October 30, 2015

#### **CARLA BRODLEY**

Dean of the College of Computer and Information Science  
Northeastern University  
*"Challenges and Opportunities of Applied Machine Learning"*  
November 11, 2015

#### **BRUCE MAGGS**

Pelham Wilder Professor of Computer Science, Duke University  
Vice President, Research, Akamai Technologies  
*"The Internet at the Speed of Light"*  
February 24, 2016

#### **CHRISTOS FALOUTSOS**

Professor of Computer Science  
Carnegie Mellon University  
*"Mining Large Graphs: Patterns, Anomalies, and Fraud Detection"*  
March 25, 2016

#### **MANEESH AGRAWALA**

Professor of Electrical Engineering and Computer Sciences  
University of California, Berkeley  
*"Storytelling Tools"*  
April 29, 2016



**JAN M. ALLBECK**

Associate Professor  
*PhD Computer and  
Information Science, University  
of Pennsylvania, 2009*

Jan Allbeck is the faculty advisor for the BS ACS concentration in Computer Game Design and is affiliated with the laboratory for Games and Intelligent Animation. She has taught at George Mason University since 2009. She has explored many aspects of computer graphics, but is most drawn to research at the crossroads of animation, artificial intelligence, and psychology in the simulation of virtual humans.

**Selected Publications**

1. Balint, T. and Allbeck, J.M. "Automated Generation of Plausible Agent Object Interactions." In proceedings of Intelligent Virtual Agents (2015): 295-309.
2. Balint, T. and Allbeck, J.M. "Is that How Everyone Really Feels? Emotional Contagion with Masking for Virtual Crowds." In proceedings of Intelligent Virtual Agents (2014): 26-35.
3. Pelkey, C. and Allbeck, J.M. "Populating Virtual Semantic Environments". *Computer Animation and Virtual Worlds Journal*. Vol. 24 Iss. 3-4, (May 2014): 405-412.
4. Li, W. and Allbeck, J.M. "Virtual Humans: Evolving with Common Sense." In Proceedings of Motion in Games (2012): 182-193.



**PAUL AMMANN**

Associate Professor  
*PhD Computer Science,  
University of Virginia, 1988*

Paul Ammann has taught at George Mason University since 1989. His areas of interest and expertise are software testing and secure information systems. He received the Volgenau School Outstanding Teaching Award in 2007.

**Selected Publications**

1. Lin Deng, Nariman Mirzaei, Paul Ammann, Jeff Offutt. "Towards mutation analysis of Android apps." ICST Workshops (2015): 1-10.
2. Paul Ammann, Márcio Eduardo Delamaro, Jeff Offutt. "Establishing Theoretical Minimal Sets of Mutants" ICST (2014): 21-30.
3. Ammann, Paul, and Jeff Offutt. *Introduction to Software Testing*. Cambridge, U.K.: Cambridge University Press, 2008.
4. Paul Ammann, Ravi S. Sandhu. "The Extended Schematic Protection Model." *Journal of Computer Security* 1 no. 3-4 (1992): 335-384.



### **HAKAN AYDIN**

Associate Professor  
*PhD Computer Science,  
University of Pittsburgh, 2001*

Hakan Aydin has taught at George Mason University since 2001. His research interests include real-time embedded systems, low-power computing, and fault tolerance. He served as the technical program committee chair of the IEEE RTAS 2011, and as the general chair of the IEEE RTAS 2012 conferences. He was a recipient of the NSF CAREER Award in 2006.

#### **Selected Publications**

1. Haque, M. A., H. Aydin, and D. Zhu. "Energy-Aware Standby-Sparing for Fixed-Priority Real-Time Task Sets." *Sustainable Computing: Informatics and Systems* 6 (2015): 81–93.
2. R. Begam, D. Zhu, and H. Aydin. "Preference-Oriented Fixed-Priority Scheduling for Real-Time Systems." In proceedings of the 12th IEEE International Conference on Embedded Computing, Dalian, China, August 2014. (Best Paper Award)
3. Haque, M. A., H. Aydin, and D. Zhu. "Real-Time Scheduling under Fault Bursts with Multiple Recovery Strategy." In proceedings of the IEEE 20th Real-Time and Embedded Technology and Applications Symposium, 63–74. IEEE, 2014.
4. Devadas, V., and H. Aydin. "On the Interplay of Voltage/Frequency Scaling and Device Power Management for Frame-Based Real-Time Embedded Applications." *IEEE Transactions on Computers* 61, no. 1 (2012): 31–44.



### **FOTEINI BALDIMTSI**

Assistant Professor  
*PhD Computer Science,  
Brown University, 2014*

Foteini Baldimtsi is an assistant professor at George Mason University, as of the fall of 2016. She is currently a postdoctoral researcher in the BU Security Group at Boston University. Her research interests are in cryptography, security, and data privacy, with a focus in electronic cash, cryptocurrencies, and private authentication techniques. During her study at Brown University, she spent a semester at Microsoft Research in Redmont, WA, and a summer at IBM Research in Zurich working on e-cash and anonymous credentials.

#### **Selected Publications**

1. Baldimtsi, Foteini, Melissa Chase, Georg Fuchsbauer, and Markulf Kohlweiss. "Anonymous Transferable E-Cash." In proceedings of the 18th IACR International Conference on Practice and Theory in Public-Key Cryptography, Gaithersburg, Maryland, March 30–April 1, 2015.
2. Baldimtsi, Foteini, and Anna Lysyanskaya. "On The Security of One-Witness Blind Signature Schemes." In proceedings of the 19th International Conference on the Theory and Application of Cryptology and Information Security, Bengaluru, India, December 1–5, 2013.
3. Baldimtsi, Foteini, and Anna Lysyanskaya. "Anonymous Credentials Light." In proceedings of the 2013 ACM SIGSAC Conference on Computer and Communications Security, 1087–1098. ACM, 2013.
4. Hinterwalder, Gesine, Christian T. Zenger, Foteini Baldimtsi, Anna Lysyanskaya, Christof Paar, and Wayne P. Burleson. "Efficient E-Cash in Practice: NFC-Based Payments for Intelligent Transportation Systems." In proceedings of the 13th International Symposium, Bloomington, Indiana, July 10–12, 2013.



**DANIEL BARBARÁ**  
Professor  
*PhD Computer Science,  
Princeton University, 1985*

Daniel Barbará has taught at George Mason University since 1997. His areas of expertise are data mining and machine learning. He served as the program chair of the SIAM International Conference on Data Mining in 2003, and he has received numerous grants from the National Science Foundation, the Army, and other federal and state institutions.

### Selected Publications

1. Kevin Molloy, M. Jennifer Van, Daniel Barbará, Amarda Shehu: "Exploring representations of protein structure for automated remote homology detection and mapping of protein structure space." *BMC Bioinformatics* 15(S-8): S4 (2014).
2. AlSumait, Loulwah, Daniel Barbará, James Gentle, and Carlotta Domeniconi. "Topic Significance Ranking of LDA Generative Models." In proceedings of the European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases, 2010.
3. AlSumait, Loulwah, Daniel Barbará, and Carlotta Domeniconi. "The Role of Semantic History on Online Generative Topic Modeling." In proceedings of the Workshop on Text Mining, SIAM International Conference on Data Mining, Siam, 2009.
4. AlSumait, Loulwah, Daniel Barbará, and Carlotta Domeniconi. "On-line LDA: Adaptive Topic Models for Mining Text Streams with Applications to Topic Detection and Tracking." In proceedings of the IEEE International Conference on Data Mining, 2008.



**ALEXANDER BRODSKY**  
Professor  
*PhD Computer Science,  
Hebrew University of  
Jerusalem, Israel, 1991*

Alex Brodsky has taught at George Mason University since 1993. His research interests include decision support, guidance and optimization systems and their applications to energy, power, manufacturing, sustainability, and supply chain management. He has published over 110 refereed journal and conference papers and been supported by an NSF CAREER Award, NSF Research Initiation Award, and grants from ONR, NASA, NIST, and Dominion Virginia Power. He served as program chair of the 2012 IEEE International Conference on Tools with Artificial Intelligence, program co-chair of the 2012 and 2013 IEEE ICDE workshops on Data-Driven Decision Guidance and Support Systems, and conference chair of the 5th International Conference on Principles and Practice of Constraint Programming.

### Selected Publications

1. Brodsky, Alexander and Juan Luo. "Decision Guidance Analytics Language (DGAL): Toward Reusable Knowledge Base Centric Modeling." In proceedings of the 17th International Conference on Enterprise Information Systems, 67–78. 2015.
2. Krishnamoorthy, Mohan, Alexander Brodsky, and Daniel Menascé. "Optimizing Stochastic Temporal Manufacturing Processes with Inventories: An Efficient Heuristic Algorithm Based on Deterministic Approximations." In proceedings of the 14th INFORMS Computing Society Conference, Richmond, Virginia, January 11–13, 2015.
3. Brodsky, A., N. E. Egge, and X. S. Wang. "Supporting Agile Organizations with a Decision Guidance Query Language." *Journal of Management Information Systems* 28, no. 4 (2012): 39–68.
4. Egge, Nathan, Alexander Brodsky, and Igor Griva. "Distributed Manufacturing Networks: Optimization via Preprocessing in Decision Guidance Query Language." *International Journal of Decision Support System Technology* 4, no. 3 (2012): 25–42.



**RICHARD CARVER**  
Associate Professor  
*PhD Computer Engineering,*  
*North Carolina State*  
*University, 1989*

Richard Carver has taught at George Mason University since 1990. His areas of interest and expertise are in the specification, testing, and verification of concurrent programs. He won the Volgenau School Outstanding Teacher Award in March 2007.

#### Selected Publications

1. Xu, Jing, Lei, Yu, Carver, Richard, and Kung, David, "A Lightweight Approach to Detecting Unbounded Thread-Instantiation Loops," In proceedings of the IEEE International Conference on Software Testing, Verification and Validation (ICST), (2015): 1-10.
2. Xu, Jing, Richard H. Carver, Yu Lei, and David Kung. "A Dynamic Approach to Isolating Faulty Patterns in Concurrent Program Executions." In proceedings of the International Conference on Multicore Software Engineering, Performance, and Tools, 2013.
3. Carver, Richard H., and Yu Lei. "A Class Library for Implementing, Testing, and Debugging Concurrent Programs." *International Journal on Software Tools for Technology Transfer* 12, no. 1 (2010): 69–88.
4. Carver, Richard H., and Yu Lei. "A Stateful Approach to Testing Monitors in Multithreaded Programs." In proceedings of the 12th IEEE International Symposium on High-Assurance Systems Engineering. (2010): 54-63.



**JIM X. CHEN**  
Professor  
*PhD Computer Science,*  
*University of Central Florida,*  
*1995*

Jim Chen is the director of the Visual Computing and Graphics Lab. He has taught at George Mason University since 1995. He is associate editor-in-chief of *Computing in Science & Engineering*, a senior member of the Institute of Electrical and Electronics Engineers, and an associate member of the Association for Computing Machinery. He has authored four books, edited two conference proceedings, published over 100 research papers, and acquired three patents. His research interests include computer graphics, virtual reality, visualization, networking, and simulation.

#### Selected Publications

1. Wei, Q., J. X. Chen, and N. Yu, "Robust Object Tracking using Enhanced Random Ferns." *Visual Computer* (2013).
2. Yang, L., T. Zhang, J. X. Chen, and P. Dai. "Motion Simulation of Inner Hair Cell Stereocilia." *Computing in Science and Engineering* 15, no. 2 (2013): 27–33.
3. Wan, X., S. Liu, J. X. Chen, and X. Jin. "Geodesic Distance-Based Realistic Facial Animation Using RBF Interpolation." *Computing in Science and Engineering* 14, no. 5 (2012): 49–55.
4. Qiu, H., L. Chen, J. X. Chen, and Y. Liu. "Dynamic Simulation of Grass Field Swaying in Wind." *Journal of Software* 7, no. 2 (2012): 74–79.



## SONGQING CHEN

Professor  
*PhD Computer Science,  
College of William and Mary,  
2004*

Songqing Chen has taught at George Mason University since 2004. His areas of interest and expertise are Internet content delivery systems, Internet measurements and modeling, system security, distributed systems, and high-performance computing. In addition to the NSF CAREER and AFOSR Young Investigator Awards, he has also received the George Mason University Emerging Researcher, Scholar, and Creator Award; the Volgenau Rising Star Faculty Award; and the Department of Computer Science Outstanding Research Award.

### Selected Publications

1. Yao Liu, Mengbai Xiao, Ming Zhang, Xin Li, Mian Dong, Zhan Ma, Zhenhua Li and Songqing Chen. "GoCAD: GPU-assisted Online Content Adaptive Display Power Saving for Mobile Devices in Internet Streaming." In proceedings of the 25th International World Wide Web Conference (WWW 2016), Montreal, Canada, April 11-15, 2016.
2. An Wang, Wentao Chang, Aziz Mohaisen, and Songqing Chen. "Delving into Internet DDoS Attacks by Botnets: Characterization and Analysis." In proceedings of the 45th IEEE/IFIP International Conference on Dependable Systems and Networks (DSN), Rio de Janeiro, Brazil, June 22-25, 2015.
3. An Wang, Yang Guo, Fang Hao, T.V. Lakshman, and Songqing Chen. "Scotch: Scaling up SDN Control-Plane using vSwitch Based Overlay." In proceedings of the ACM CoNEXT 2014, Sydney, Australia, December. 2-5, 2014.
4. Enhua Tan, Lei Guo, Songqing Chen, Xiaodong Zhang, Yihong Eric Zhao. "UNIK: unsupervised social network spam detection." In proceedings of the ACM International Conference on Information and Knowledge Management (CIKM 2013), San Francisco, California, October 27 - November 1, 2013.



## KENNETH DE JONG

University Professor  
*PhD Computer Science,  
University of Michigan, 1975*

Kenneth De Jong is the associate director of the Krasnow Institute at George Mason University. He has taught at Mason since 1984. His research interests include evolutionary computation, complex adaptive systems, and machine learning. He is the founding editor-in-chief of the MIT Press journal *Evolutionary Computation*, a board member of the Association for Computing Machinery Special Interest Group on Genetic and Evolutionary Computation, and the recipient of the Institute of Electrical and Electronics Engineers Pioneer award in evolutionary computation.

### Selected Publications

1. Kamath, U., De Jong, K. and A. Shehu. "Effective Automated Feature Constructions and Selection for Classification of Biological Sequences." *PLOS One*, July 2014.
2. Cioffi, C., K. De Jong, and J. Bassett. "Evolutionary Computation and Agent-Based Modeling: Biologically-Inspired Approaches for Understanding Complex Social Systems." *Computational & Mathematical Organization Theory*. 18, no. 3 (2012): 356-373.
3. De Jong, K. and E. Scott. "Understanding Simple Asynchronous EAs." 85-98. In proceedings of the Foundations of Genetic Algorithms, ACM Press, Aberystwith, Wales, UK, January 2015.
4. De Jong, K. A. *Evolutionary Computation: A Unified Approach*. Cambridge, Massachusetts: MIT Press, 2006.





**KINGA DOBOLYI**

Term Assistant Professor  
*PhD Computer Science,  
University of Virginia, 2010*

Kinga Dobolyi has taught at George Mason University since 2010. Her research focuses on software engineering, testing, web applications, and computer science education.

**Selected Publications**

1. Gero, John, Hao Jiang, Kinga Dobolyi, Brooke Bellow, and Mick Smythwood. "How Do Interruptions During Designing Affect Design Cognition?" *Design Computing and Cognition '14* (2014): 119–113.
2. Dobolyi, Kinga, Elizabeth Soechting, and Westley Weimer. "Automating Regression Testing Using Web-Based Application Similarities." *International Journal on Software Tools for Technology Transfer* 13, no. 2 (2011): 111–129.
3. Dobolyi, Kinga, and Westley Weimer. "Modeling Consumer-Perceived Web Application Fault Severities for Testing." In proceedings of the International Symposium on Software Testing and Analysis, July 2010.
4. Dobolyi, Kinga, and Westley Weimer. "Changing Java's Semantics for Handling Null Pointer Exceptions." In proceedings of the 19th IEEE International Symposium on Software Reliability Engineering, November 2008.



**CARLOTTA DOMENICONI**

Associate Professor  
*PhD Computer Science,  
University of California,  
Riverside, 2002*

Carlotta Domeniconi has taught at George Mason University since 2002. Her areas of interest and expertise are machine learning, data mining, pattern recognition, and feature relevance estimation, with applications in text mining, social network analysis, and bioinformatics. She received the George Mason University Emerging Researcher, Scholar, Creator Award in 2008 and the NSF CAREER Award from 2005 to 2010.

**Selected Publications**

1. Gullo, F., C. Domeniconi, and A. Tagarelli. "Metacluster-Based Projective Clustering Ensembles." *Machine Learning* 98, no. 1 (2015): 181–216.
2. Revelle, M., C. Domeniconi, M. Sweeney, and A. Johri. "Finding Community Topics and Membership in Graphs." In proceedings of the European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases, Porto, Portugal, September 7–11, 2015.
3. Ren, Y., C. Domeniconi, G. Zhang, and G. Yu. "A Weighted Adaptive Mean Shift Clustering Algorithm." In proceedings of the SIAM International Conference on Data Mining, Philadelphia, Pennsylvania, April 24–26, 2014.
4. Gullo, F., C. Domeniconi, and A. Tagarelli. "Projective Clustering Ensembles." *Data Mining and Knowledge Discovery* 26, no. 3 (2013): 452–511.



## ZORAN DURIĆ

Associate Professor  
*PhD Computer Science,  
University of Maryland,  
College Park, 1995*

Zoran Durić is the program coordinator for the Masters of Science in Computer Science degree. He has taught at George Mason University since 1996. His research interests include understanding motions of humans and vehicles, video surveillance, human-computer interaction, and information hiding. Most recently, he has been working on the study and simulation of human movements. He is an area editor of the *Pattern Recognition Journal* and a member of the Editorial Board of the *IEEE Trans. on Intelligent Transportation Systems*.

### Selected Publications

1. G. Shuman, Z. Durić, D. Barbara, J. Lin, and L.H. Gerber. "Using Myoelectric Signals to Recognize Grips and Movements of the Hand." *BMC Medical Informatics and Decision Making*, 2016.
2. L.H. Gerber, C.G. Narber, N. Vishnoi, S.L. Johnson, L. Chen, and Z. Durić. "The feasibility of using haptic devices to engage people with chronic traumatic brain injury in virtual 3D functional tasks." *Journal of NeuroEngineering and Rehabilitation 2014*, 11:117, August 2014.
3. N. Vishnoi, A. Mitra, Z. Durić, and L.H. Gerber. "Motion Based Markerless Gait Analysis Using Standard Events of Gait and Ensemble Kalman Filtering." In proceedings of the IEEE Conference. EMBS, August 2014.
4. N. Vishnoi, Z. Durić, and L.H. Gerber. "Markerless Identification of Key Events in Gait Cycle Using Image Flow." In proceedings of the *IEEE Conference EMBS 2012*, San Diego, August 2012.



## YOTAM GINGOLD

Assistant Professor  
*PhD Computer Science, New  
York University, 2009*

Yotam Gingold has taught at George Mason University since 2012. He directs the Creativity and Graphics Lab, whose mission is to solve challenging visual, geometry, and design problems and pursue foundational research into human creativity. His research interests include computer graphics, human-computer interaction, crowdsourcing, and game design. He has been recognized with a 2015 NSF CAREER Award, a 2014 Google Faculty Research Award, and the 2015 Department of Computer Science Young Faculty Research Award.

### Selected Publications

1. Tan, Jianchao, Marek Dvoroznak, Daniel Sykora, and Yotam Gingold. "Decomposing Time-Lapse Paintings into Layers." *ACM Transactions on Graphics (TOG)* 34, no. 4 (2015).
2. Liu, Songrun, Alec Jacobson, and Yotam Gingold. "Skinning Cubic Bézier Splines and Catmull-Clark Subdivision Surfaces." *ACM Transactions on Graphics (TOG)* 33, no. 6 (2014).
3. Borosan, Peter, Ming Jin, Doug DeCarlo, Yotam Gingold, and Andrew Nealen. "RigMesh: Automatic Rigging for Part-Based Shape Modeling and Deformation." *ACM Transactions on Graphics (TOG)* 31, no. 6 (2012).
4. Gingold, Yotam, Ariel Shamir, and Daniel Cohen-Or. "Micro Perceptual Human Computation for Visual Tasks." *ACM Transactions on Graphics (TOG)* 31, no. 5 (2012).



### **HASSAN GOMAA**

Professor  
*PhD Computer Science,  
Imperial College, London,  
1976*

Hassan Gomaa served as chair of the Department of Computer Science from January 2008 - August 2011, and previously as chair of the Department of Information and Software Engineering from June 2002 - December 2007. He has taught at George Mason University since 1987. He has over thirty years of experience in software engineering, both in industry and academia, and has published over 200 technical papers and four textbooks. His current research interests include software architectures and patterns, dynamic software adaptation, and software modeling and design for concurrent, real-time, and distributed systems and product lines

#### **Selected Publications**

1. E. Albassam, H. Gomaa, and R. Pettit. "Experimental Analysis of Real-Time Multitasking on Multicore Systems." In proceedings 17th IEEE Symposium on Object/Component/Service-oriented Real-time Distributed Computing (ISORC), June 2014.
2. M. Abu-Matar and H. Gomaa. "An Automated Framework for Variability Management of Service-Oriented Software Product Lines." In proceedings 7th International Symposium on Service Oriented System Engineering, San Francisco, California, March 2013.
3. H. Gomaa and K. Hashimoto. "Dynamic Self-Adaptation for Distributed Service-Oriented Transactions." In proceedings ACM/IEEE 7th International Symposium on Software Engineering for Adaptive and Self-Managing Systems (SEAMS), Zurich, Switzerland, June 2012.
4. H. Gomaa. *Software Modeling and Design: UML, Use Cases, Patterns, and Software Architectures*. Cambridge University Press, ISBN: 9780521764148, 2011.



### **S. DOV GORDON**

Assistant Professor  
*PhD Computer Science,  
University of Maryland, 2010*

S. Dov Gordon joined George Mason University in the fall of 2015. His research interests are in both the theoretical foundations and the application of cryptography. His research primarily focuses on securing our data by developing methods for computing on data while it remains encrypted. He is currently teaching a graduate course on the theory of computation.

#### **Selected Publications**

1. Gordon, S. Dov, Feng-Hao Liu, and Elaine Shi. "Constant-Round MPC with Fairness and Guarantee of Output Delivery." In proceedings of the 35th Annual Cryptology Conference, Santa Barbara, California, August 16–20, 2015.
2. Goldwasser, Shafi, S. Dov Gordon, Vipul Goyal, Abhishek Jain, Jonathan Katz, Feng-Hao Liu, Amit Sahai, Elaine Shi, and Hong-Sheng Zhou. "Multi-Input Functional Encryption." In proceedings of the 33rd Annual International Conference on the Theory and Applications of Cryptographic Techniques, Copenhagen, Denmark, May 11–15, 2014.
3. Gordon, S. Dov, Tal Malkin, Mike Rosulek, and Hoeteck Wee. "Multi-party Computation of Polynomials and Branching Programs without Simultaneous Interaction." In proceedings of the 32nd Annual International Conference on the Theory and Applications of Cryptographic Techniques, Athens, Greece, May 26–30, 2013.
4. Gordon, S. Dov, Carmit Hazay, Jonathan Katz, and Yehuda Lindell. "Complete Fairness in Secure Two-Party Computation." *Journal of the ACM* 58, no. 6 (2011): 24.



**CHRISTOPHER KAUFFMAN**  
Term Assistant Professor  
*PhD Computer Science,  
University of Minnesota, 2013*

Christopher Kauffman has taught at George Mason University since 2012. His research interests center on machine learning and optimization applied to structural biology problems such as protein folding.

### Selected Publications

1. Kauffman, Chris, and George Karypis. "Coarse- and Fine-Grained Models for Proteins: Evaluation by Decoy Discrimination." *Proteins: Structure, Function, and Bioinformatics* 81, no. 5 (2013): 754–773.
2. Kauffman, Chris, and George Karypis. "Ligand Binding Residue Prediction." *Introduction to Protein Structure Prediction: Methods and Algorithms*. Hoboken: Wiley, 2010.
3. Kauffman, Chris, and George Karypis. "LIBRUS: Combined Machine Learning and Homology Information for Sequence-Based Ligand-Binding Residue Prediction." *Bioinformatics* 25, no. 23 (2009): 3099–3107.
4. Kauffman, Chris, Huzefa Rangwala, and George Karypis. "Improving Homology Models for Protein-Ligand Binding Sites." In proceedings of the LSS Computational Systems Bioinformatics Conference, Stanford, California, 2008.



**LARRY KERSCHBERG**  
Professor  
*PhD in Systems Engineering,  
Case Western Reserve  
University, Cleveland, 1969*

Larry Kerschberg has taught at George Mason University since 1986 and served as chair of the Department of Information and Software Engineering from 1989 to 1997. His current research interests include social networks, social semantic search, agent-based systems, semantic web, knowledge management, and intelligent information integration. He has over 40 years of experience in both industry and academia, and is the principal inventor on two patents related to intelligent semantic search. He is a founding editor-in-chief of Springer's *Journal of Intelligent Information Systems*, which has been in continuous publication since 1992.

### Selected Publications

1. McDowall John, Brodsky, Alexander, and Larry Kerschberg. "A Formal Model for Optimizing Dynamic Service Composition." *14th INFORMS Computing Society Conference*, Richmond, Virginia, January 11-13, (2015): 149-160.
2. Kerschberg, Larry. "The Role of Context in Social Semantic Search and Decision Making," *International Journal on Artificial Intelligence Tools*, 23 (6) 2014.
3. McDowall, John and Larry Kerschberg. "Leveraging Social Networks to Improve Service Selection in Workflow Composition." *Int. Conf. on Advances in Social Networks Analysis and Mining*, ASONAM 2012, IEEE Computer Society, Istanbul Turkey, August 26,(2012): 1278-1283.
4. Morrell, Thomas and Larry Kerschberg. "Personal Health Explorer: A Semantic Health Recommendation System." Workshop on Data-Driven Decision Support and Guidance Systems (DGSS), *28th IEEE International Conference on Data Engineering*, Arlington, VA, April 1, 2012.



### JANA KOŠECKÁ

Associate Professor  
PhD Computer Science,  
University of Pennsylvania,  
Philadelphia, 1996

Jana Košecká has taught at George Mason University since 1999. Her research interests are the acquisition of static, dynamic, and semantic models of environments by means of visual sensing, object recognition, scene parsing, and human-robot interaction. She has over 100 selected publications in refereed journals and conferences and is a coauthor of a monograph titled, *Invitation to 3D vision: From Images to Geometric Models*. She is a chair of Robotics and Automation Society Technical Committee on Robotic perception and served as a Program Chair of IEEE CVPR 2016 and senior editorial board of ICRA 2015, 2016 and IROS 2016.

#### Selected Publications

1. C. Cadena, J. Košecká a. "Semantic Parsing for Priming Object Search in Indoors RGB-D Scenes." *International Journal of Robotics Research*. Special Issue on Computer Vision, 2015.
2. Arsalan Mousavian, Jana Košecká, Jyh-Ming Lien. "Semantically Aware Bag-of-words for Localization." International Conference on Automation and Robotics (ICRA), Seattle, 2015.
3. Nima Akhlaghi, Clayton Baker, Mohamed Lahlou, Hozaifah Zafar, Karthik Murthy, Huzefa Rangwala, Jana Košecká, Siddhartha Sidkar. "Real-time Classification of Hand Motions using Ultrasound Imaging of Forearm Muscles." *IEEE Transactions on Biomedical Engineering*. November 2015.
4. B. Micusik and J. Košecká and G. Singh. "Semantic Parsing of Street Scenes from Video." *International Journal of Robotics Research*. vol.31, no. 4. (2012): 484-497.



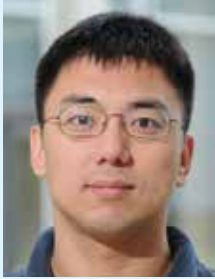
### THOMAS LATOZA

Assistant Professor  
PhD Software Engineering,  
Carnegie Mellon University,  
2012

Thomas LaToza joined George Mason University in 2015. His research interest is in software engineering with a focus on human aspects of software development, and he works in the areas of programming tools, software design, and collaboration. He has served on various program committees and he served as co-chair of the Workshop on the Usability of Programming Languages and Tools and the International Workshop on Crowdsourcing in Software Engineering. His work is supported in part by the National Science Foundation.

#### Selected Publications

1. LaToza, T. D., M. Chen, L. Jiang, M. Zhao, and A. van der Hoek. "Borrowing from the Crowd: A Study of Recombination in Software Design Competitions." In proceedings of the IEEE/ACM 37th International Conference on Software Engineering, 2015.
2. Mangano, N., T. D. LaToza, M. Petre, and A. van der Hoek. (2015). "How Designers Interact with Sketches at the Whiteboard." *IEEE Transactions on Software Engineering* 41, no. 2 (2015): 135–156.
3. LaToza, T. D., W. B. Towne, C. M. Adriano, and A. van der Hoek. "Microtask Programming: Building Software with a Crowd." In proceedings of the 27th ACM Symposium on User interface Software and Technology, 43–54. ACM, 2014.
4. Ko, A. J., T. D. LaToza, and M. M. Burnett. (2013). "A Practical Guide to Controlled Experiments of Software Engineering Tools with Human Participants." *Empirical Software Engineering* 20, no. 1: 110–141.



## FEI LI

Associate Professor  
*PhD Computer Science,  
Columbia University, 2008*

Fei Li has taught at George Mason University since 2007. His areas of interest and expertise include online, approximation, and randomized algorithm design and analysis, and energy-aware scheduling algorithms. He has won IBM's First Patent Application Invention Achievement Award and has been on the editorial board of the *International Journal of Operations Research and Information Systems* since 2008.

### Selected Publications

1. Huangxin Wang, Jean X. Zhang, Bo Yang, Fei Li. "Randomization improving online time-sensitive revenue maximization for green data centers." *IGSC* (2015): 1-8.
2. "A near-optimal memoryless online algorithm for FIFO buffering two packet classes." *Theoretical Computer Science*. Vol. 497 (2013): 164-172.
3. Jez, Lukasz, Fei Li, Jay Sethuraman, and Clifford Stein. "Online Scheduling of Packets with Agreeable Deadlines." *ACM Transactions on Algorithms* 9, no. 1 (2012).
4. Li, Fei. "Scheduling Packets with Values and Deadlines in Size-Bounded Buffers." *Journal of Combinatorial Optimization* 25, no. 2 (2013): 165-175.



## JYH-MING LIEN

Associate Professor  
*PhD Computer Science, Texas  
A&M University, 2006*

Jyh-Ming Lien is an affiliate of the Motion and Shape Computing group and the Autonomous Robotics Laboratory at George Mason University. He has taught at Mason since 2007. His research goal is to develop efficient, robust, and practical algorithms for representing, manipulating, and analyzing massive geometric data of shape and motion. His research finds applications in the areas of computational geometry, computer graphics, GIS, visualization, and robotics.

### Selected Publications

1. Behar, Evan, and Jyh-Ming Lien. "Dynamic Minkowski Sums Under Scaling." In proceedings of the ACM/SIAM Symposium on Solid and Physical Modeling, Dijon, France, October 2012.
2. Lu, Yanyan, Evan Behar, Stephen Donnelly, Jyh-Ming Lien, Fernando Camelli, and David Wong. "Fast and Robust Generation of City-Scale Seamless 3D Urban Models." In proceedings of the SIAM Conference on Geometric and Physical Modeling, October 2011.
3. Lien, Jyh-Ming, and Yanyan Lu. "Planning Motion in Similar Environments." In proceedings of the Robotics: Science and Systems Conference, June 2009.
4. Lien, Jyh-Ming, and Nancy Amato. "Approximate Convex Decomposition of Polyhedra and Its Applications." *Computer Aided Geometric Design* 25, no. 7 (2008): 503-522.



### JESSICA LIN

Associate Professor  
*PhD Computer Science,  
University of California,  
Riverside, 2005*

Jessica Lin joined George Mason University in 2005. Her areas of interest and expertise are temporal, spatiotemporal, multimedia, and stream data mining. Her work particularly focuses on the development of efficient algorithms to visualize and discover non-trivial patterns (e.g. anomalies, motifs, contrasting patterns, and latent structure) in massive time series data. Her work has been applied in domains as diverse as medicine, geoinformatics, earth sciences, astronomy, manufacturing, and national security.

#### Selected Publications

1. Pavel Senin, Jessica Lin, Xing Wang, Tim Oates, Sunil Gandhi, Arnold P. Boedihardjo, Crystal Chen, Susan Frankenstein. "Time series anomaly discovery with grammar-based compression." *EDBT* (2015): 481-492.
2. Pavel Senin, Jessica Lin, Xing Wang, Tim Oates, Sunil Gandhi, Arnold P. Boedihardjo, Crystal Chen, Susan Frankenstein, Manfred Lerner. "GrammarViz 2.0: A Tool for Grammar-Based Pattern Discovery in Time Series." *ECML/PKDD Vol. 3* (2014): 468-472.
3. Li, Yuan, Jessica Lin, and Tim Oates. "Visualizing Variable-Length Time Series Motifs." In proceedings of the SIAM International Conference on Data Mining, Anaheim, California, April 26-28, 2012.
4. Lin, Jessica, Rohan Khade, and Yuan Li. "Rotation-Invariant Similarity in Time Series Using Bag-of-Patterns Representation." *Journal of Intelligent Information Systems* 39, no. 2 (2012): 287-315.



### SEAN LUKE

Professor  
*PhD Computer Science,  
University of Maryland,  
College Park, 2000*

Sean Luke is the associate director of the George Mason University Center for Social Complexity. He has taught at Mason since 2000. His areas of interest and expertise include stochastic optimization and metaheuristics, evolutionary computation, multi-agent systems and multi-agent learning, autonomous robotics and robot swarms, and simulation development. He is the author of several widely used open-source software packages, including the MASON multi-agent simulator and the ECJ evolutionary computation toolkit—the most widely used such tool in the world.

#### Selected Publications

1. Balan, Gabriel, Dana Richards, and Sean Luke. "Long-Term Fairness with Bounded Worst-Case Losses." *Autonomous Agents and Multiagent Systems* 22, no. 1 (2011): 43-63.
2. Hrotenok, Brian, Sean Luke, Keith Sullivan, and Christopher Vo. "Collaborative Foraging Using Beacons." van der Hoek et al, eds. In proceedings of the 9th International Conference on Autonomous Agents and Multiagent Systems, 2011.
3. Luke, Sean. "Essentials of Metaheuristics." 2009. <http://cs.gmu.edu/~sean/book/metaheuristics/>.
4. Panait, Liviu, Karl Tuyls, and Sean Luke. "Theoretical Advantages of Lenient Learners: An Evolutionary Game Theoretic Perspective." *Journal of Machine Learning Research* 9 (2008): 423-457.



## TAMARA A. MADDOX

Term Associate Professor  
*JD Doctor of Jurisprudence,*  
*Marshall-Wythe School of*  
*Law, College of William and*  
*Mary, 1991*

Tamara Maddox has been teaching in the Department of Computer Science at George Mason University since 1999. She is the coordinator of the department's Computer Law and Ethics program and Undergraduate Teaching Assistant program. She teaches courses in computer law and ethics and core technical courses in the curriculum, including C, C++, and Java. She was previously the department's assistant chair from 2003 to 2006 and was responsible for many administrative duties, including scheduling all the department's faculty classes, coordinating undergraduate advising, and hiring adjunct faculty members.

### Selected Publications

1. Maddox, T. "Computer Ethics and Privacy." Presented at the U.S. Library of Congress, Washington, D.C., May 2003.
2. Maddox, T. "Ethics and Computers: Could Any Two Topics Be Farther Apart?" *ITRecruiter Magazine*, November 2000.
3. Maddox, T., and J. Otten. "Using an Evolutionary Algorithm to Generate Four-Part 18th-Century Harmony." *Mathematics and Computers in Modern Science: Acoustics and Music, Biology and Chemistry*. World Scientific and Engineering Society Press, 2000.
4. Maddox, T. (Continuing Legal Education [CLE] coauthor and panel member). "Vice, Greed, Betrayal, and the Practice of Family Law." Presented at the Virginia State Bar Annual Meeting Seminar, June 1996.



## DANIEL MENASCÉ

University Professor  
*PhD Computer Science,*  
*University of California, Los*  
*Angeles, 1978*

Daniel Menascé has taught at George Mason University since 1992. He is a Fellow of the ACM and of the IEEE and he received the A.A. Michelson Award from the Computer Measurement Group in 2001. His areas of interest and expertise include autonomic computing, software performance engineering, service-oriented computing, and the modeling and analysis of computer systems, web, and e-commerce systems.

### Selected Publications

1. S. Bardhan and D.A. Menascé. "Predicting the Effect of Memory Contention in Multi-core Computers Using Analytic Performance Models." *IEEE Transactions on Computers*, vol. 64 no. 8, August 2015.
2. Menascé, D. A., M. Krishnamoorthy, and A. Brodsky. "Autonomic Smart Manufacturing." Special issue on Integrated Decision Support Systems, *J. Decision Systems*, eds. Isabelle Linden et al., Taylor and Francis, vol. 24 no. 2, June 2015.
3. Bardhan, S. and D.A. Menascé. "Predicting the Effect of Memory Contention in Multi-core Computers Using Analytic Performance Models." *IEEE Transactions on Computers*, vol. 64 no. 8, August 2014.
4. Abdullah, I. S., and D. A. Menascé. "The Meta-Protocol Framework." *The Journal of Systems and Software*, vol. 86 no. 11 November 2013.





### **AMIHAI MOTRO**

Professor  
*PhD Computer and  
Information Science,  
University of Pennsylvania,  
1981*

Amihai Motro is the director of the Department of Computer Science's PhD program. He has taught at George Mason University since 1990. His research interests are in database management, information systems (with a focus on information integration), information retrieval, cooperative user interfaces, virtual enterprises, and service-oriented architectures.

#### **Selected Publications**

1. S. Bardhan and D.A. Menascé. "Predicting the Effect of Memory Contention in Multi-core Computers Using Analytic Performance Models." *IEEE Transactions on Computers*. vol. 64 no. 8, August 2015.
2. Menascé, D. A., M. Krishnamoorthy, and A. Brodsky. "Autonomic Smart Manufacturing." Special issue on Integrated Decision Support Systems, *J. Decision Systems*, eds. Isabelle Linden et al., Taylor and Francis, vol. 24 no. 2, June 2015.
3. A. Aldhalaan and D.A. Menascé, "Near-optimal Allocation of VMs from IaaS Providers by SaaS Providers," Proc. 2015 IEEE Intl. Conf. Cloud and Autonomic Computing (ICCAC), Cambridge, MA, September 21-25, 2015.
4. Abdullah, I. S., and D. A. Menascé. "The Meta-Protocol Framework." *The Journal of Systems and Software*, vol. 86 no. 11 November 2013.



### **DAVID NORDSTROM**

Term Associate Professor  
*PhD Mathematics, University  
of California, Berkeley, 1976*

David Nordstrom has taught at George Mason University since 1993. He has over 30 years of teaching experience, including 13 years at Mason, with courses ranging from low-level programming to operating systems, computer systems architecture, algorithms, and compilers. He was the first faculty member to teach several new undergraduate courses, developing the course material and assignments. He has taught a greater variety of undergraduate courses than any other faculty member in the department.

# FACULTY



**JEFF OFFUTT**  
Professor  
*PhD Computer Science,  
Georgia Institute of  
Technology, 1988*

Jeff Offutt is full professor of Software Engineering. He has published over 160 refereed research papers with an H-index of 55, is the coauthor of *Introduction to Software Testing*, and is editor-in-chief of Wiley's journal of *Software Testing, Verification and Reliability*. He is PI of the SPARC educational project, which hopes to revolutionize how introductory programming courses are taught. He was the IEEE International Conference on Software Testing, Verification, and Validation founding steering committee chair. He received the university's Teaching Excellence Award, Teaching with Technology, in 2013, was named an Outstanding Faculty member in 2008 and 2009, and his IEEE Software paper in software engineering education was chosen by ACM as a notable paper for 2014. His current projects include critical systems testing, testing and analysis of web and mobile applications, model-based testing, and software engineering education.

## Selected Publications

1. Offutt, Jeff, and Chandra Alluri. "An Industrial Study of Applying Input Space Partitioning to Test Financial Calculation Engines." *Empirical Software Engineering*, 2014.
2. Offutt, Jeff, Vasileios Papadimitriou, and Upsorn Praphamontripong. "A Case Study on Bypass Testing of Web Applications." *Empirical Software Engineering*, 2014.
3. Jeff Offutt. "Putting the Engineering into Software Engineering Education." *IEEE Software*, 2013.
4. Ammann, Paul, and Jeff Offutt. *Introduction to Software Testing*. Cambridge, U.K.: Cambridge University Press, 2008.



**JOHN OTTEN**  
Instructor  
*MS Computer Science,  
College of William and Mary,  
1992*

John Otten has been teaching at George Mason University since 2014. He teaches courses in C programming, computer ethics, data structures and software engineering. Before joining the university, he was employed by General Dynamics – Advanced Information Systems for 21 years. His areas of interest include parallel and high-performance computing, embedded systems, automotive networks and GSM/cellular technology.



### **J. MARK PULLEN**

Professor  
*DSc, The George Washington University, 1981*

Mark Pullen is the director of the Center of Excellence in Command, Control, Communications, Computing, and Intelligence. He has taught at George Mason University since 1992. His research interests include networked multimedia applications (with an emphasis on command and control), networked education and training, distributed virtual simulation, and interoperation of command and control with simulations. He is a fellow of the Institute of Electrical and Electronics Engineers (IEEE), fellow of the Association for Computing Machinery, and recipient of the IEEE Harry Diamond Award.

#### **Selected Publications**

1. Pullen, J. "Enabling Military Coalition Command and Control with Interoperating Simulations." Paper presented at the 5th International Conference on Simulation and Modeling Methodologies, Technologies and Applications, Colmar, France, August 2015.
2. Clark, N., J. Pullen, and C. Bashioum. "An Experimental Project Course to Prepare Students for Agile Web Application Development." In proceedings of the 2015 ACM Conference on Innovation and Technology in Computer Science Education, 81–86. ACM, 2015.
3. Pullen, J., L. Khimeche, X. Cuneo, U. Schade, and T. Remmersmann. "Linking C2-Simulation Interoperation Servers to Form Distributed Server Systems." In proceedings of the 20th International Command and Control Research and Technology Symposium, 2015.
4. Pullen, J., L. Khimeche, R. Wittman, B. Burland, J. Love, and J. Hyndoy. "Coalition C2-Simulation History and Status." Paper presented at NATO Modelling and Simulation Symposium, Washington, D.C., 2014.



### **HUZEFA RANGWALA**

Associate Professor  
*PhD Computer Science, University of Minnesota, Minneapolis, 2008*

Huzefa Rangwala has taught at George Mason University since 2008. His areas of interest and expertise are data mining, big data, and high performance computing, with an emphasis on the development of computational methods for proteins structure and function prediction, metagenome analysis, and learning analytics. He is the recipient of the 2014 Mason Emerging, Researcher, Creator and Scholar Award, the 2014 Mason Teaching Excellence Award, the 2013 NSF CAREER award, the 2012 Departmental Outstanding Teaching Award, the 2013 School of Engineering Teaching Award, and the 2011 Departmental Junior Faculty Research Award.

#### **Selected Publications**

1. Anveshi Charuvaka and Huzefa Rangwala. "Classifying protein sequences using regularized multitask learning." *IEEE/ACM Transactions on Computational Biology and Bioinformatic*. IF: 2.25 (2014): 1-14
2. Tanwistha Saha, Huzefa Rangwala, and Carlotta Domeniconi. "Flip: Active learning for relational network classification." In proceedings of the European Conference on Machine Learning and Principles of Knowledge Discovery and Data Mining (ECML-PKDD), Nancy, France, September 2014.
3. Sam Blasiak, Huzefa Rangwala, and Kathryn B. Laskey. "Relevant subsequence detection with sparse dictionary learning." In proceedings of the European Conference on Machine Learning and Principles of Knowledge Discovery and Data Mining (ECML-PKDD), Prague, Czech Republic, September 2013.
4. Zeesham Rasheed and Huzefa Rangwala. "Mc-minh: Metagenome clustering using min-wise based hashing." In SIAM International Conference in Data Mining (SDM), Austin, Texas, May 2013.



**DANA RICHARDS**  
Associate Professor  
*PhD Computer Science,  
University of Illinois, 1984*

Dana Richards has taught at George Mason University since 1994. His research focus is in algorithms. He previously worked at the National Science Foundation and at the University of Virginia.

### Selected Publications

1. Gabriel Catalin Balan, Dana Richards, Sean Luke, "Long-term fairness with bounded worst-case losses," *Autonomous Agents and Multi-Agent Systems* 22(1): 43-63 (2011)
2. Arthur L. Liestman, Dana S. Richards, Ladislav Stacho, "Broadcasting from multiple originators," *Discrete Applied Mathematics* 157(13): 2886-2891 (2009)
3. Dana Richards, Zhenlei Jia, "The Structure of PEC Networks," *Internet Mathematics* 6(1): 3-17 (2009)
4. Inja Youn, Brian L. Mark, Dana Richards, "Statistical Geolocation of Internet Hosts," *ICCCN 2009*: 1-6



**KATHERINE RUSSELL**  
Instructor  
*MS Computer Science,  
George Mason University, 2011*

Katherine "Raven" Russell has taught at George Mason University since 2014. Her current research areas are multiagent systems, swarm intelligence, and multi-robotics. She has over 10 years of industry experience as a professional web developer and is currently a PhD candidate in the Department of Computer Science.

### Selected Publications

1. Russell, K., M. Schader, K. Andrea, and S. Luke. "Swarm Robot Foraging with Wireless Sensor Motes." In proceedings of the 14th International Conference on Autonomous Agents and Multiagent Systems, Istanbul, Turkey, May 2015.
2. Sullivan, K., K. Russell, K. Andrea, B. Stout, and S. Luke. "RoboPatriots: George Mason University 2012 RoboCup Team." In proceedings of the 2012 RoboCup Workshop, Mexico City, Mexico, June 2012.
3. Tecuci, G., D. Schum, M. Boicu, D. Marcu, and K. Russell. "Toward a Computational Theory of Evidence-based Reasoning." Paper presented at the 18th International Conference on Control Systems and Computer Science, University Politehnica of Bucharest, May 24-27, 2011.



### **SANJEEV SETIA**

Professor & Chair  
*PhD Computer Science,  
University of Maryland,  
College Park, 1993*

Sanjeev Setia's research interests are in ad hoc and sensor networks, network security, and performance evaluation of computer systems. In recent years, he has worked extensively on security mechanisms and protocols for ad hoc and wireless sensor networks. He has served as chair of the CS department since September 2011.

#### **Selected Publications**

1. Sankardas Roy, Mauro Conti, Sanjeev Setia, Sushil Jajodia. "Secure Data Aggregation in Wireless Sensor Networks: Filtering Out the Attacker's Impact." *IEEE Transactions on Information Forensics and Security* 9, no. 4 (2014): 681-694.
2. Zhu, Bo, Sanjeev Setia, Sushil Jajodia, Sankardas Roy, and Lingyu Wang. "Efficient Distributed Detection of Node Replication Attacks in Sensor Networks." *IEEE Transactions on Mobile Computing*. 9, no. 7 (2010): 213-926.
3. Roy, Sankardas, Mauro Conti, Sanjeev Setia, and Sushil Jajodia. "Secure Median Computation in Wireless Sensor Networks." *Ad Hoc Networks*. 7, no. 8 (2009): 1448-1462.
4. Huang, Leijun, and Sanjeev Setia. "CORD: Energy-Efficient Reliable Bulk Data Dissemination in Sensor Networks." In proceedings of the 27th IEEE International Conference on Computer Communications, March 2008.



### **AMARDA SHEHU**

Assistant Professor  
*PhD Computer Science, Rice  
University, 2008*

Amarda Shehu holds affiliate appointments in the Department of Bioengineering and in the School of Systems Biology. She has taught at George Mason University since 2008. Her research focuses on modeling complex biological systems in the presence of constraints through novel algorithmic frameworks that unravel the role of molecular sequence, structure, assembly, and dynamics in biological processes in healthy and diseased cells. She has been recognized with several NSF awards, including a 2012 NSF CAREER award, a 2013 Jeffress Memorial Trust Award in Interdisciplinary Science, the 2012 Department of Computer Science Young Faculty Research Award, and the 2013 OSCAR Undergraduate Mentor Excellence Award.

#### **Selected Publications**

1. Tatiana Maximova, Ryan Moffatt, Buyong Ma, Ruth Nussinov, and Amarda Shehu. "A Review of Methods on Macromolecular Structure and Dynamics." *PLoS Computational Biology*. 12 no. 4: e1004619, 2016.
2. Rudy Clausen, Buyong Ma, Ruth Nussinov, and Amarda Shehu. "Mapping the Conformation Space of Wildtype and Mutant H-Ras with a Memetic, Cellular, and Multiscale Evolutionary Algorithm." *PLoS Computational Biololgy*. 11 no. 9: e1004470, 2015.
3. Uday Kamath, Kenneth A De Jong, and Amarda Shehu. "Effective Automated Feature Construction and Selection for Classification of Biological Sequences." *PLoS One*, 9 no.7: e99982, 2014.
4. Kevin Molloy, M. Jennifer Van, Daniel Barbara, and Amarda Shehu. "Exploring Representations of Protein Structure for Automated Remote Homology Detection and Mapping of Protein Structure Space." *BMC Bioinformatics* 15 no. 8:S4, 2014.



## ROBERT SIMON

Associate Professor  
*PhD Computer Science,  
University of Pittsburgh, 1996*

Robert Simon has taught at George Mason University since 1996. His research interests are in wireless and mobile networking, distributed systems, system and network level modeling and performance analysis and cyber security. He has received numerous grants, including NSF, multiple DoD agencies and industry.

### Selected Publications

1. M. Bandari, R. Simon, and H. Aydin. "On Minimizing Expected Energy Usage of Embedded Wireless Systems with Probabilistic Workloads." *Journal of Sustainable Computing*. (to appear).
2. H. Wang and R. Simon. "Modeling Wireless Sensor Networks with Energy Harvesting: A Stochastic Calculus Approach." IEEE WiOpt 2016, Tempe, Arizona, May 2016.
3. A. Gumusalan, R. Simon, and H. Aydin. "Adaptive Transmission Scheduling for Energy-Aware Real-Time Wireless Communication." ACM International Conference on Embedded Wireless Systems and Networks (EWSN 2016), Graz, Austria, February 2016.
4. Kevin Andrea and Robert Simon. "Design and Evaluation of an RPL-based Multi-Sink Routing Protocol for Low-Power and Lossy Networks." ACM International Conference on Modeling, Analysis and Simulation of Wireless and Mobile Systems, Cancun, Mexico, November 2015.



## MARK SNYDER

Term Assistant Professor  
*PhD Computer Science,  
University of Kansas, 2011*

Mark Snyder has taught at George Mason University since 2011. His research interests are in languages and type theory, domain specific languages, and the application of functional languages.

### Selected Publications

1. Frisby, N., M. Peck, M. Snyder, and P. Alexander. "Model Composition in Rosetta." In proceedings of the Engineering of Computer-Based Systems, Las Vegas, Nevada, 2011.
2. Snyder, M., and P. Alexander. "Monad Factory: Type-Indexed Monads." In proceedings of the 11th International Symposium on Trends in Functional Programming, 106–120, Norman, Oklahoma, 2010.
3. Snyder, M., N. Frisby, G. Kimmell, and P. Alexander. "Writing Composable Software with InterpreterLib." In proceedings of the 10th International Conference on Software Composition, ETH, Zurich, Switzerland, 2009.



### **ARUN SOOD**

Professor  
*PhD Electrical Engineering,  
Carnegie Mellon University,  
1971*

Arun Sood is the director of the International Cyber Center. He has taught at George Mason University since 1987. His areas of interest are security architectures, intrusion tolerance, image analysis and computer vision, optimization, parallel and distributed processing, performance modeling, and simulation and modeling. His research team developed "Self-Cleansing Intrusion Tolerance Technology," which was the winner of the Global Security Challenge sponsored by the Security Technology of Tomorrow Challenge.

#### **Selected Publications**

1. Nagarajan, Ajay and Sood, Arun. "SCIT Based Moving Target Defense Reduces and Shifts Attack Surface," 11th International Workshop on Security in Information Systems, WOSIS 2014, April 2014, Lisbon, Portugal.
2. Nguyen, Quyen, and Arun Sood. "Comparative Analysis of Intrusion-Tolerant System Architectures." In proceedings of the IEEE Symposium on Security and Privacy, 2011.
3. Nguyen, Quyen L., and Arun Sood. "Multiclass S-Reliability for Services in SOA." In proceedings of the 5th International Conference on Software Engineering Advances, Nice, France, 2010.
4. Nagarajan, Ajay, and Arun Sood. "SCIT and IDS Architectures for Reduced Data Ex-Filtration." In proceedings of the 4th Workshop on Recent Advances in Intrusion-Tolerant Systems, Chicago, Illinois, 2010.



### **ANGELOS STAVROU**

Associate Professor  
*PhD Computer Science,  
Columbia University, 2007*

Angelos Stavrou is an Associate Professor at George Mason University and the Director of the Center for Assurance Research and Engineering (CARE) at GMU. Stavrou has served as principal investigator on contracts from NSF, DARPA, IARPA, DHS, AFOSR, ARO, and ONR. He is an active member of NIST's Mobile Security team and has written more than eighty peer-reviewed conference and journal articles. Stavrou received his MSc in Electrical Engineering, M.Phil. and PhD (with distinction) in Computer Science from Columbia University. He also holds an MSc in theoretical Computer Science from University of Athens, and a BSc in Physics with distinction from University of Patras, Greece. His current research interests include security and reliability for distributed systems, security principles for virtualization, and anonymity with a focus on building and deploying large-scale systems. Stavrou was awarded the 2012 George Mason Emerging Researcher, Scholar, Creator Award. In 2013, he received the IEEE Reliability Society Engineer of the Year award. He is a NIST guest researcher, a member of the ACM and USENIX, and a senior IEEE member.

#### **Selected Publications**

1. Angelos Stavrou, Daniel Fleck, Constantinos Koliass. "On the Move: Evading Distributed Denial-of-Service Attacks." *IEEE Computer* vol. 49 no. 3 (2016): 104-107.
2. Constantinos Koliass, Georgios Kambourakis, Angelos Stavrou, Stefanos Gritzalis. "Intrusion Detection in 802.11 Networks: Empirical Evaluation of Threats and a Public Dataset." *IEEE Communications Surveys and Tutorials*. 18(1): 184-208 (2016)
3. Fengwei Zhang, Kevin Leach, Angelos Stavrou, Haining Wang. "Using Hardware Features for Increased Debugging Transparency." *IEEE Symposium on Security and Privacy* (2015): 55-69
4. Charles Smutz, Angelos Stavrou. "Preventing Exploits in Microsoft Office Documents Through Content Randomization." *RAID2015*: 225-246



## **GHEORGHE TECUCI**

Professor  
*PhD Computer Science,  
University of Paris-South, 1988*  
*PhD Computer Science,  
Polytechnic Institute of  
Bucharest, 1988*

Gheorghe Tecuci is the director of the Learning Agents Center, member of the Romanian Academy, and former chair of Artificial Intelligence at the U.S. Army War College. He follows a career-long interest in advancing computational theory and technology to develop cognitive assistants that learn complex problem-solving expertise directly from human experts, support experts and non-experts in problem solving and decision making, and teach their problem-solving expertise to students. He has published over 190 papers and 11 books, with contributions to artificial intelligence, knowledge engineering, machine learning, and evidence-based reasoning, and has received grant and contract awards of over \$10 million as principal investigator.

### **Selected Publications**

1. Tecuci G., D. Marcu, M. Boicu, and D. A. Schum. *Knowledge Engineering: Building Cognitive Assistants for Evidence-Based Reasoning*. Cambridge University Press, 2016.
2. Tecuci G., D. A. Schum, D. Marcu, and M. Boicu. *Intelligence Analysis as Discovery of Evidence, Hypotheses, and Arguments: Connecting the Dots*. Cambridge University Press, 2016.
3. Tecuci, G., D. A. Schum, D. Marcu, and M. Boicu. "Computational Approach and Cognitive Assistant for Evidence-Based Reasoning in Intelligence Analysis." *International Journal of Intelligent Defence Support Systems*. 5, no. 2 (2014): 146–172.
4. Schum, D. A., G. Tecuci, D. Marcu, and M. Boicu. "Toward Cognitive Assistants for Complex Decision Making Under Uncertainty." *Intelligent Decision Technologies* 8, no. 3 (2014): 231–250.



## **PEARL Y. WANG**

Associate Professor  
Associate Chair  
Director of Undergraduate Programs  
*PhD Mathematics, University  
of Wisconsin, Milwaukee, 1983*

Pearl Wang joined George Mason University in 1983 as a founding member of the Department of Computer Science. She currently serves as the department associate chair. She is an ABET volunteer and serves on the ABET CAC Commission and the CSAB Board. Her research interests include interconnection networks for massively parallel systems, and the development of sequential and parallel algorithms for combinatorial optimization problems. She has served on the editorial boards of professional journals, including the *IEEE Transactions on Parallel and Distributed Systems*, the *Journal of Parallel and Distributed Computing*, and the *European Journal of Operational Research*.

### **Selected Publications**

1. John E. Dorband, Christine L. Mumford, Pearl Y. Wang, "Developing an aCe Solution for Two-Dimensional Strip Packing," IPDPS 2004
2. Christine L. Valenzuela, Pearl Y. Wang, "VLSI placement and area optimization using a genetic algorithm to breed normalized postfix expressions," *IEEE Trans. Evolutionary Computation* 6(4): 390-401 (2002)
3. Pearl Y. Wang, Christine L. Valenzuela, "Data set generation for rectangular placement problems," *European Journal of Operational Research* 134(2): 378-391 (2001)
4. Christine L. Valenzuela, Pearl Y. Wang, "A Genetic Algorithm for VLSI Floorplanning," *PPSN 2000*: 671-680





**XINYUAN (FRANK) WANG**  
Associate Professor  
*PhD Computer Science,  
North Carolina State University,  
2004*

Frank Wang's research interests are around computer network and system security. His work includes malware analysis and defense, attack attribution, anonymity and privacy, covert channel and steganography, VoIP security, and digital forensics. He is a recipient of an NSF CAREER award and the leading inventor of nine patents.

**Selected Publications**

1. Xinyuan Wang and Douglas Reeves. *Traceback and Anonymity*. Monograph. Springer, 2015
2. Ryan Farley, Xinyuan Wang. "CodeXt:Automatic Extraction of Obfuscated Attack Code from Memory Dump." In proceedings of the 17th Information Security Conference (ISC 2014), October 2014
3. Ryan Farley, Xinyuan Wang. "Exploiting VoIP Softphone Vulnerabilities to Disable Host Computers Attack and Mitigation." *International Journal of Critical Infrastructure Protection (IJCIP)*. vol.7 no. 3, (September 2014): 141-154.
4. Xin Li, Xinyuan Wang, Wentao Chang. "CipherXRay: Exposing Cryptographic Operations and Secrets from Monitored Binary Execution." *IEEE Transactions on Dependable and Secure Computing (TDSC)*. vol. 11 no. 2 (March 2014): 101-114.



**HARRY WECHSLER**  
Professor  
*PhD Computer and  
Information Science, University  
of California, Irvine, 1975*

Harry Wechsler has taught at George Mason University since 1988. His expertise includes image analysis and computer vision; data mining, machine learning, pattern recognition, contents based image retrieval (CBIR), cyber security, biometrics, and identity management. His research focuses on robust authentication for uncontrolled settings characterized by incomplete information and uncertainty. He is a Fellow of the Institute of Electrical and Electronics Engineers, and a Fellow of the International Association of Pattern Recognition.

**Selected Publications**

1. Wechsler, H. "Cyber Security Using Adversarial Learning and Conformal Prediction." *Intelligent Information Management* 7, no. 4 (2015): 195–222.
2. El Masri, A., P. Likarish, H. Wechsler, and B. Kang. "Identifying Users with Application-Specific Command Streams." In proceedings of the 12th International Conference on Privacy, Security and Trust, Toronto, Canada, 2014.
3. DeBarr, D., H. Sun, and H. Wechsler. "Adversarial Spam Detection Using Randomized Hough Transform – Support Vector Machines (RHT-SVM)." In proceedings of the 12th International Conference on Machine Learning and Applications, Miami, Florida, 2013.
4. Ramanathan, V., and H. Wechsler. "Phishing Detection and Impersonated Entity Discovery Using Conditional Random Field and Latent Dirichlet Allocation." *Computer and Security* 34 (2013): 123–139.



**ELIZABETH WHITE**

Associate Professor  
*PhD Computer Science,  
University of Maryland,  
College Park, 1995*

Elizabeth White has taught at George Mason University since 1994. Her areas of interest and expertise include compilers, software architecture, distributed computing, and dynamic reconfiguration. She is an NSF CAREER Award recipient.

**Selected Publications**

1. Gerald S. Doyle, Elizabeth L. White, "Comparative Architecture Performance Analysis At Design Time," Int. CMG Conference 2007: 231-242
2. Elizabeth L. White, Ranjan Sen, Nina Stewart, "Hide and show: using real compiler code for teaching," SIGCSE 2005: 12-16
3. Elizabeth L. White, "General strategies for dynamic reconfiguration," ACM SIGSOFT Software Engineering Notes 25(1): 93 (2000)
4. Elizabeth L. White, Jeffrey Ruby, Laura Denise Deddens, "Software Visualization of LR Parsing and Synthesized Attribute Evaluation," Software: Practice & Experience. 29(1): 1-16 (1999)



**DUMINDA WIJESEKERA**

Professor  
*PhD Mathematical Logic,  
Cornell University, 1990*  
*PhD Computer Science,  
University of Minnesota, 1998*

Duminda Wijesekera is the acting director of energy initiatives at the Critical Infrastructure and Homeland Security Institute at George Mason University. He has taught at Mason since 1999. His research interests are information security and applying logical methods to computing. He is a fellow of the Potomac Institute of Policy Studies, a visiting scientist at the National Institute of Standards and Technology, and a visiting professor at the Naval Postgraduate School.

**Selected Publications**

1. Kacem, Thabet, Duminda Wijesekera, Paulo Costa, Marcio Conte, Alexander Barreto, and Jeronymo Carvalho. "Secure ADS-B Design and Evaluation." Paper presented at the International Conference on Vehicular Electronics and Safety, Yokomaha, Japan, November 5-7, 2015.
2. Hazzazi, Noha, Bo Yu, Duminda Wijesekera, and Paulo Costa. "Using Temporal Logic to Verify Blood Supply Chain Safety." Paper presented at the 2015 International Conference on Health Informatics and Medical Systems, Las Vegas, Nevada, July 27-30, 2015.
3. Bandara, Damindra, Andre Abadie, and Duminda Wijesekera. "Cell Planning for High-Speed Train Operations in USA." Paper presented at the Joint Rail Conference, San Jose, California, March 23-26, 2015.
4. Liu, Changwei, Anoop Singhal, and Duminda Wijesekera. "A Logic-Based Network Forensic Model for Evidence Analysis." Paper presented at the IFIP WG 11.9, Orlando, Florida, January 26-28, 2015.



## **YUTAO ZHONG**

Term Assistant Professor  
*PhD Computer Science,  
University of Rochester, 2005*

Yutao Zhong rejoined George Mason University in 2014. Her research interests are in program performance analysis and optimization, programming languages, and compilers.

### **Selected Publications**

1. Zhong, Yutao, Xipeng Shen, and Chen Ding. "Program Locality Analysis Using Reuse Distance." *ACM Transactions on Programming Languages and Systems* 31, no. 6 (2009).
2. Zhong, Yutao, and Wentao Chang. "Sampling-Based Program Locality Approximation." In proceedings of 7th International Symposium on Memory Management, Tucson, Arizona, June 2008.
3. Shen, Xipeng, Yutao Zhong, and Chen Ding. "Predicting Locality Phases for Dynamic Memory Optimization." *Journal of Parallel and Distributed Computing* 67, no. 7 (2007): 783–796.
4. Zhong, Yutao, S. G. Dropsho, Xipeng Shen, A. Studer, and Chen Ding. "Miss Rate Prediction across Program Inputs and Cache Configurations." *IEEE Transactions on Computers* 56, no. 3 (2007): 328–343.



M. Brian Blake, PhD



Yao Liu, PhD

# ALUMNI PROFILE

*Computer Science Department graduates have distinguished themselves in academic, government, and business careers in the metro Washington, DC community and across the globe. Our featured alumni have maintained their research interests while applying their academic foundations to reach the top of their professional careers.*

## M. BRIAN BLAKE, PHD

It's fair to say that any town in America would want to claim Brian Blake as their favorite son. As a businessman, consultant, researcher, community leader, and academic, this Savannah, Georgia, native has left a positive and lasting impact on the many places he's called home, including George Mason University, where he earned his PhD in Information Technology.

Blake is now taking on his newest city and challenge as the recently appointed Executive Vice President for Academic Affairs and Provost at Drexel University. His fresh approach to academics in a changing economy, issues of student and faculty diversity, community inclusiveness, and an in-the-trenches respect for faculty and administrators has made him a sought-after leader by many of the nation's prominent universities. Before accepting his new position at Drexel, Blake was a tenured professor of Computer Science, Electrical and Computer Engineering and Human Genetics, and Vice Provost for Academic Affairs and Dean of the

Graduate School at the University of Miami.

He says that leaving Miami was difficult. "My initiatives were taking hold and I had developed great relationships across the campus." Blake's office oversaw the hire of seven tenured and tenure-track black faculty, which, at the time, was over 20% of the original population

*"It's been a life-long passion to give back to under-represented minorities in the STEM field."*

of black faculty. He also managed the creation of the LeadershipU Academy, an enrichment program to develop academic leaders, and led the university's Presidential Task Force and university response associated with the #BlackLivesMatter movement. But despite his momentum in Miami, Blake says, "This was the third time that an

opportunity to work at Drexel had come my way." Wanting to contribute to a research-intensive university in a city with so many opportunities, it was finally the right position and the right time for his family to move.

As a high-ranking African American college administrator, Blake realizes he is carving new pathways for minority students and faculty. He was the first African American Department Chair & Inaugural Director of Graduate Studies at Georgetown University; the first African American Associate Dean of Engineering, Research and Graduate Studies at University of Notre Dame; the first again in his role at the University of Miami, and now again at Drexel.

He jokes, "Sometimes I look around and realize that I am the only black person in all the meetings this week," but then turns serious and says, "I care, very personally, about diversity." To Blake, diversity is more than a talking point. He wants his message and support to grow from the ground-up, starting with the students through the administration. Early in his academic career, he would sit in

on meetings of the National Society of Black Engineers, recognizing that as an engineer he could influence the next generation.

"It's been a life-long passion to give back to under-represented minorities in the STEM field," he says. "When I was working at Georgetown, I was active in the Washington, D.C., schools. I was fortunate to receive great mentoring. I've seen what it means. There are those who grew up with me who are either in jail or no longer with us. I know how important it can be to hear the right message at the right time. I try not to take anything for granted."

Blake's path into academics was not one he had planned. Having developed an entrepreneurial passion that he credits to his parents, he was interested in someday starting his own company. As a newly minted EE from Georgia Tech, Blake began as a software engineer for Lockheed Martin. He followed this degree with an MS in EE and a minor in software engineering from Mercer University. Believing a PhD in computer science would benefit him in starting a consulting business, he began looking at programs in cities where he could transfer with Lockheed. That is when he found Mason. Lockheed Martin was in Gaithersburg, Maryland, however, and it was a long commute to get a degree in Fairfax. He ended up moving to General Dynamics to work on the same government contract in Fairfax. About that time, Blake reunited with and married another Georgia Tech engineer and Johns Hopkins MBA, Bridget Blake. They have two sons, Brendan (11) and Bryce (4).

Mason's program made a huge impact on him. In 2000, the year he graduated, he co-taught Requirements Engineering with his advisors, Hassan Gomaa and Prasanta Bose. Having enjoyed teaching, Blake later landed a position at Georgetown University, stepping between consulting and academics. He eventually became the youngest tenured professor at Georgetown and the first African American Department Chair at the institution.

His advice to emerging CS and STEM students is to "maximize the number of opportunities you can find to get you where you want to go. Think about your five to ten year plan. If you can decide on one, two, even three career paths instead of a single goal, you will be in a better position to achieve even greater opportunities."

Blake has over 170 published works that include refereed papers, editorials, journal articles, books, and chapters, as well as a patent while he was working at The MITRE Corporation. He still advises PhD students, conducts research, and, hopes to, when possible, continue to teach. As Provost, he is now responsible for fifteen academic programs affecting over 26,000 students. He says Drexel is a bold institution willing to lead and try new programs and ideas, and he's up for the challenge.

## YAO LIU, PHD

Chances are good that you are reading this online through a smart phone or tablet. Chances are even better that if there is lag in the screen refresh rate, a poor Wi-Fi connection, or your battery is low, you'll stop reading. This is because our desire to consume information online is balanced by our demand for high quality data delivery and the battery life of our handheld devices.

Yao Liu is an Assistant Professor of Computer Science at SUNY-Binghamton, and a 2013 Mason CS PhD, who is immersed in these technology issues.

Liu's research focuses on uncovering power inefficiencies, with an aim to reduce power consumption on mobile devices and improve the power efficiency of today's distributed systems by combining larger-scale measurements with big data analysis. Translation: faster and more reliable video streaming and data delivery using less power. Full speed ahead!

## *"Teaching brings new, helpful perspectives to the table."*

Liu credits much of her success and academic interests to Mason professor, Songqing Chen, with whom she collaborated on numerous published works including Content-Adaptive Display Power Saving in Internet Mobile Streaming, A Quantitative Study of Video Duplicate Levels in YouTube, and Investigating Redundant Internet Video Streaming Traffic on iOS Devices: Causes and Solutions. Citing him as a mentor, Liu says it was Professor Chen who introduced her to and encouraged her to pursue specific research areas.

Chen for his part is impressed by Liu's work and the passion she shows for her research saying, "Yao has done innovative work on both perspectives to help mobile devices preserve the battery power consumption while improving the streaming quality perceived. Several of her works were published in the best conferences in the field, such as ACM Multimedia."

When asked about publishing her findings again, Liu enthusiastically says, "Yes, I'm definitely looking to publish my current research." Which brings us to her work at Binghamton where she teaches two CS classes, conducts her own research, and advises both Masters and PhD students. She says her teaching is "mutually beneficial." She enjoys teaching and working alongside her students. Many already have years of industry experience and she likes that they bring "new, helpful perspectives" to the table.

As a tenure-track female CS professor, Liu is also a strong role model to female STEM students. Less than 20% of CS majors are women and even fewer work in Liu's field of computer systems research. She takes her teaching seriously and says,

"I'm still learning and testing ways to advise the students," she says with a laugh. "Advising someone how to do research is different from actually doing research yourself." ■



Teaching Assistant Tazeen Refai helping student Nasrin Noor Ahmad

# GOOGLE SPARCS: A NEW WAY TO TEACH PROGRAMMING

**The fall 2015** semester at George Mason University's Department of Computer Science brought a new kind of study and research. A research question, a challenge of sorts, was posed to the department by Google. The tech giant sent out a targeted research request to universities across the country. The goal is to find a way to triple the number of students completing a CS class while also increasing the appeal to non-traditional CS students, minorities, and women, without additional faculty or high dollar resources.

Shifting pedagogical models such as distance learning, flipped classrooms, self-study, and accelerated, executive advanced degree programs are on the rise as students and early career professionals seek specialized training from their college experience and dollars. The workforce is demanding it too—and nowhere more so than in the tech sector. The world's most innovative tech companies are searching for top talent and they are looking to build a more diverse workforce. Diversity, in the form of minorities and women, increases productivity and creativity. But how do you attract these desirable minds to an industry that has a strong cultural bias against them? The answer lies somewhere in changing the culture.

Jeff Offutt, Professor of Software Engineering, along with several department colleagues, had been discussing ways to improve and change how entry-level CS classes were taught. This awareness was a jump-start to the proposal. Offutt says it was a true team effort and needed to be because the problem involved the culture of the department, deconstructing and understanding how courses were taught, how students could learn, what they needed to learn, all while being able to measure the outcomes. A people-centric problem needed the ideas and voices of a lot of people. Google received twenty-five submissions and selected six, including Mason. The resulting winning proposal, Self-Paced Learning Increases Retention and Capacity—SPARC, is a three-year \$900,000 Google Computer Science Capacity Award grant.

## SPARC IGNITION

By some estimates, the culture inherent in the technology industry begins in middle school where the number of girls in STEM classes shifts. We lose girls early. We also lose lower income minorities who may not have the same access to technology. The

American Association of University Women (AAUW) reports that by the time students begin college, there is an 80/20 split of men to women in STEM classes. It's even lower for computer science classes with only twelve percent of women taking them. But women and minorities do go to college. And they graduate with advanced degrees in science and business, fields that also require mathematics and computers. We have the students. We need to find a way to change how they perceive CS and how the material is taught.

This national problem makes George Mason University an ideal research institution for the SPARC model. The school is located in the heart of the Washington, D.C., technology hub and has one of the most ethnically diverse populations in Virginia. The CS Department has seen an almost triple increase in the number of incoming new students from 109 in fall 2011 to 279 in fall 2015. The CS department also has a comparatively large number of female professors who serve as positive role models and mentors.

The SPARC team includes CS professors Jeff Offutt (project PI), Paul Ammann, Kinga Dobolyi, Huzefa Rangwala, Liz White, Pearl Wang, Sanjeev Setia, Chris Kaufmann, Mark Snyder, Yutao Zhang, and Jaime

Lester who teaches higher education in the College of Humanities and Social Sciences. Lester, Offutt, Rangwala, Dobolyi, and Snyder are Mason Teaching Excellence Award winners.”.

Lester’s involvement, by the team’s own admission, has provided the glue to the process. While the CS faculty is immersed in the coursework, handling challenges faced by students, and coming up with fresh ideas, Lester helps to vet the ideas as they relate to a classroom while also offering changes and improvements. She also helps analyze the data in comparison to the control classes.

Offutt says that the concept for the new class grew organically from the group as everyone talked about what they would like to see and ways they could measure student success. The plan developed called for self-paced learning, online assessments, peer-supported learning and collaboration in a flipped classroom environment. Lester says that the ideas of flipped classrooms and self-paced study are not new to the STEM field, but she couldn’t find any examples of employing both in a CS environment. The other elements are unique as well.

## REINVENTING THE CS TEACHING MODEL

“Kinga Dobolyi was the perfect professor to teach the class,” says Offutt. “She had experience teaching these beginning CS classes, is young and open to the idea of the project, and is a woman who serves as a great role model.” That also meant she would be the person primarily responsible for building the class.

“It’s been an incredible amount of work,” says Dobolyi. “Everyone on the team has really contributed to the material. We had to develop the entire course to include online lectures, a self-paced curriculum, and the biggest part, the self-testing evaluation and software assessment program to record the students’ work.”

Dobolyi explains that like a traditional flipped classroom, students are asked to review the material prior to coming to the class. SPARC

classes are nothing like a traditional lecture, more like a lab. Students are presented with hands-on problems to solve. They are encouraged to help each other solve the problems. In addition to Dobolyi, the class has several TAs (Tim Balint, Ben Noble, Jackie Roberts, John Wong, Lilas Dinh and Upsorn Praphamontripong) who walk around and help facilitate the discussion.

Some students will finish ahead of others, but that’s the point. Students work at their own pace. Dobolyi can monitor how students are doing on the problem sets through an online dashboard. She can help pinpoint problems for students and offer specific guidance.

A particular concern for Dobolyi, who has a lot of experience with freshman and sophomore classes, is honor code violations. She says in these entry-level classes, and throughout their studies, students are warned against sharing information to prevent accidental or intentional cheating. “We’re now asking them, encouraging them, to work together to solve problems,” while straddling the fine line that assessments need to be based on individual knowledge.

Part of the solution to this is in how Dobolyi and the team developed the course. Classtime is spent working collaboratively on practice problems and programs. After students complete enough problems, they take a computer-based assessment alone. Each student has five attempts to pass each assessment. The tests are designed with a variety of questions so that they are tested on different problems each time. Students need to pass ten assessments to complete the class.

## LOCATION, LOCATION, LOCATION

One of the problems identified even before the first class opened for enrollment was where to hold this new class. The typical entry-level CS class at George Mason University has 120 students. This number was too large to evaluate for the program, so the pilot class size was limited

to 60. The physical space could not be a standard lecture hall. The space needed to allow students and TAs to walk around, have access to computers, and talk with each other.

An alternative learning classroom with round tables and white boards on the walls was used. But the movement of sixty people plus staff during class times and then again during outside office hours added another hurdle. How would students easily engage with the TAs and the instructor in this crowded space? The solution was to have the TAs wear bright yellow sashes. Dobolyi says the yellow sashes help the students spot their teachers and are working well for enabling student-teacher interactions.

*Teachers and assistants wear yellow sashes to help the students identify their instructors.*

Paul Ammann says that he sees this as a way to eventually achieve the threefold class size rate that Google hopes to see developed. It also means that these learning labs can become flexible spaces where they are held potentially on weekends when space is available or at non-traditional class times. Part of the course experiment involved holding office hours in the popular student union. The building is centrally located with lots of tables and room to move. Though students were in an area with hundreds of other students, they were able to find their TAs.

Another obstacle the team needed to work through was how to engage incoming freshman who have no college experience in any university environment, let alone the SPARC test environment. Early on when observing the class, Lester saw that the students weren’t interacting. “The students didn’t have a reason to talk to each other,” she says. CS study is not traditionally a group activity, so Lester suggested changes to the

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Kinga Dobolyi donning a yellow sash working with student Dennis Eghan.

#### SPARCS continued...

class and worked with Dobolyi to develop interactive exercises. Prior to the first class, the TAs also went through course training as they too had never experienced this type of learning environment. The TAs were to become group facilitators encouraging discussion while also helping these novice students master the work.

Dobolyi says that with the slight modifications, the students started to work together. The students have also made natural groupings allowing Dobolyi and the TAs to give spot mini-lectures when there is a need or interest depending on each student group.

### TESTING THE TEST

The CS SPARC class is being compared to other sections of CS 112 taught in a lecture format by professors Mark Snyder and Yutao Zhang. "We're calling them control classes," says Ammann. "We will compare how students do in each

model." Ammann is quick to point out that some students may do better in a traditional lecture setting. "The flipped model doesn't appeal to every student or every instructor. Upper-level, specialized topics may work better in a traditional structure. We won't know for a few years as we follow these students and compare them to others going through the program from the control classes."

At mid-semester, Dobolyi reported that students were doing well, showing mastery of the concepts and achieving high scores. "The distribution shows students doing better on more challenging questions than in past years' exams."

By semester's end, the distribution indicated at least as many students passing as in previous years, with the projection of significantly more students passing the class overall than before. "Due to the self-pacing, we'll have to wait until mid-next-semester to get final numbers," says Dobolyi.

The team is designing the next section and employing modifications

to the coursework as well as the IT infrastructure needed to run the course. "We had to create new software to teach and track the material. One of our graduate students, Upsorn Praphamontriping, has been instrumental with this part of the project," says Dobolyi. "We are encouraging this first group of students to continue with the SPARC model. We also are interested to see students come from the control classes and measure how they adapt and learn this way."

"We anticipate success will come first from the students learning the material," says Offutt, "followed by a higher level of student retention, and ultimately the ability to scale up class size with the same high quality results." The team is also eager to see how students transition from these entry-level SPARC model classes to higher-level traditional lecture-style classes. Will there be the same 80/20 STEM student split or something different? The next few years will be interesting to watch. ■





# COMPUTER SCIENCE COLLABORATIONS ENHANCE MEDICAL RESEARCH

*In a world where data drives everything from communications to cancer research, computer science provides a powerful link to bridge research to results.*

*Our computer science faculty are involved in several cross-disciplinary research programs that are helping to speed up medical research.*

## **MENTHOL AND CIGARETTES: UNDERSTANDING ADDICTION**

Amarda Shehu is a computational biologist who focuses on developing algorithms to bridge computer science and the life sciences. Her lab has a particular emphasis on biophysics and in the newer disciplines of computational structural biology, structural bioinformatics, computational biophysics, molecular design, and molecular structure prediction.

Shehu is a Co-PI with Nadine Kabbani, Associate Professor in the Molecular Neuroscience Department at George Mason University. Kabbani's research focuses on the cellular and molecular mechanisms of nicotinic receptor drug actions in the brain and immune system.

Together they are investigating the effects of menthol, a common additive in cigarettes, and how menthol affects nicotinic receptors in the brain. Nicotine is a chemical found in tobacco that when inhaled through smoking, produces an addictive mood-altering stimulation. This is the "buzz" that habitual smokers come to crave. Shehu and Kabbani's research has shown that menthol enhances nicotinic sensors in the brain making it harder for smokers to quit.

Kabbani says, "Menthol has been an additive in cigarettes since the 1920s, and today can be found in 90% of tobacco products." Menthol is one of thirty common cigarette additives. It has a minty taste and provides a cooling sensation to reduce the irritation caused by smoking.

Kabbani was curious to know how, why, and where menthol interacts in the brain. She sought out Shehu, a computational biologist to help with the research. She says, "Computational tools enable us to make new discoveries that would take decades of lab research, if they were even possible at all." She describes Shehu as someone who "looks at the same biological problems that she does but with the lens of a different scientific culture." It's an effective partnership that can answer big questions faster and in greater detail.

Shehu says, "We are able to perform in vitro modeling, fine level details of the ramifications of additives in cigarettes, and show what may happen to brain cells when exposed to these chemicals." Shehu's models show how menthol combines with dopamine – a neurotransmitter that controls the pleasure and pain receptors in the brain. The menthol kicks-up the addictive buzz and makes it harder for smokers to quit.

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## COLLABORATIONS continued...

To date, several papers have been published on this research. The group's first findings were released in 2013 and coincided with a Congressional investigation to regulate additives in cigarettes.

The menthol research was funded by the Virginia Foundation for Healthy Youth and seed money from George Mason University.

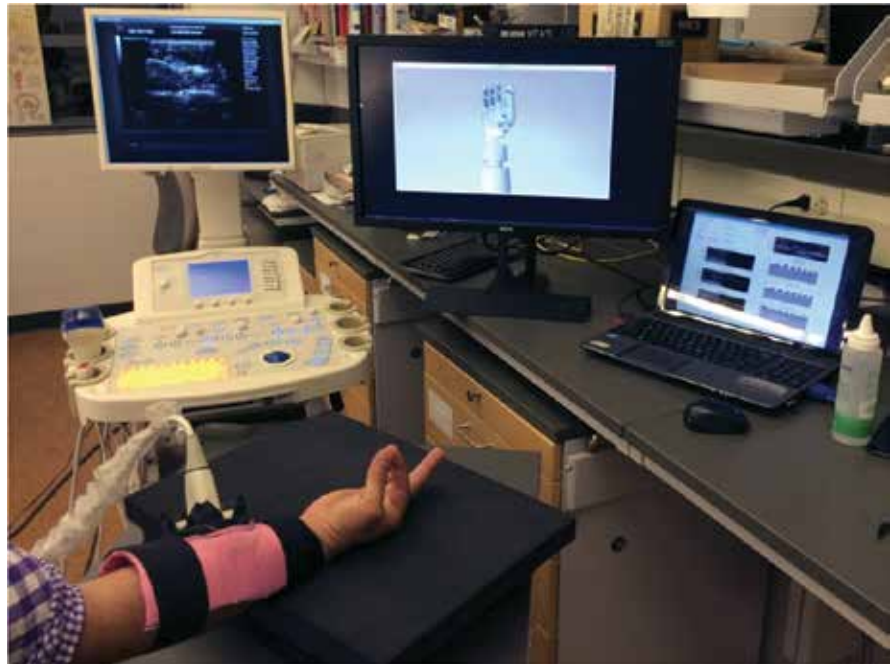
### ADVANCED PROSTHETICS: ANTICIPATING REAL-LIFE MOVEMENT

Research in the emerging area of Cyber-Physical Systems (CPS) involves collaborations between experts in different areas including robotics, networking and embedded systems.

**Siddhartha Sikdar**, Associate Professor of Bioengineering, Electrical, and Computer Engineering is the PI on a nearly \$1-million-dollar NSF-funded grant, *Novel Method for Predicting Dexterous Individual Finger Movements by Imaging Muscle Activity using a Wearable Ultrasonic System*.

The four-year grant, now in its third year, is investigating a way to use ultrasound technology to power an upper arm prosthetic device that would give amputees more realistic arm movements based on a wide range of needs, such as turning a wrist or opening a door. To help with this grant, Sikdar is partnering with two CS faculty and one ECE faculty who each share a Co-PI role: **Jana Košecká**, computer vision, robotics, machine learning, image based rendering; **Huzefa Rangwala**, bioinformatics, chemoinformatics, data mining, high performance computing; and **Houman Homayoun**, electrical and computer engineering, 3D design, embedded systems.

Sikdar explains that the team is using an existing prosthetic that is already available and in use in the market. They are using ultrasound technology to see and map the varied muscle movements of the arm. The goal is to understand from the images what the



Forearm muscle movements viewed with the aid of an ultra sound wand and interpreted as a computer image.

body is doing, and if they can predict, based on the muscle movements, what the person intends to do.

They have successfully shown in an amputee that it is possible to map seven different motions that allow for day-to-day activities like cooking, lifting water bottles, and unlocking a door with a key.

*“The work is at the forefront of human life and it really inspires students.”*

“This has been a great project to involve undergraduates,” says Huzefa Rangwala. “The work is at the forefront of human life and it really inspires students.” Sikdar agrees saying that the research originally started with undergrads but now has three PhD students with one more soon joining.

The collaboration of the team has been a key driver to the success. “Huzefa is a natural ally,” says Sikdar. “His expertise on machine learning and data analysis is a strong fit for the work.”

The investigation involves using an ultrasound probe to measure muscular signatures. The next phase of the research involves miniaturizing the technology and developing a low power ultrasound system small enough to be embedded in a prosthetic device, yet still able to function.

Sikdar will be developing this instrumentation in his lab and working with Košecká, Rangwala, and Homayoun on the design and functional capabilities.

The team is excited about the research and success to date and there is already a patent application pending for part of the research. ■

# EXTERNAL FUNDING

The research expenditures of the Department of Computer Science were \$5.9M in fiscal year 2014 and \$5.7M in fiscal year 2015. Active research grants and contracts during those years are listed below.

## Allbeck, Jan

### ESA Anti-Piracy Game

Entertainment Software Association  
2/13/2015-2/12/2016  
\$20,161

### NVESD Virtual Worlds.

CACI Technologies Inc.  
PI: Jan Allbeck, Co-PI: Michael Hieb  
7/14/2014-3/31/2015  
\$120,000

## Ammann, Paul

### Usability Analysis of Security Protocols

Dartmouth College  
PI: Paul Ammann, Co-PI: Jeff Offutt  
2/1/2012-2/28/2014  
\$128,993

## Aydin, Hakan

### Collaborative Research: Generalized Reliability-Aware Power Management for Real-Time Embedded System

National Science Foundation  
8/1/2010-7/31/2014  
\$268,329

### Collaborative Research: Towards Reliability-Centric Real-time Computing on Heterogeneous Chip Multiprocessor Systems

National Science Foundation  
8/15/2014-7/31/2017  
\$269,966

## Brodsky, Alexander

### Process Analytics Language (PAL) for Sustainable Manufacturing: Modeling, Analysis and Decision Optimization

National Institute of Standards and Technology (NIST)/US Department of Commerce (US DOC)  
PI: Alex Brodsky, co-PI: Daniel Menasce  
9/1/2012-8/31/2016  
\$298,943

### Decision Guidance Approach for Power Optimization & Management

Dominion Virginia Power  
PI: Alex Brodsky, Co-PI: Daniel Menasce  
4/30/13-4/29/14  
\$25,000

## Chen, Songqing

### CAREER: Internet Resource Management to Deliver High Quality Live and On-demand Streaming for Wireless Clients

National Science Foundation  
6/1/2008-1/31/2015  
\$450,000

### CSR: Small: System Research to Advance Real-time Dust Storm Forecasting

National Science Foundation  
PI: Songqing Chen, Co-PI: Phil Yang  
8/15/2011-7/31/2016  
\$425,000

### Moving Target Defense Through Dynamic Virtual Machine Placement in Clouds

US Department of the Army  
6/1/2015-5/31/2018  
PI: Songqing Chen, Co-PI: Fei Li  
\$390,000

### NeTS Small: Towards Energy-efficient Internet Mobile Streaming

National Science Foundation  
PI: Songqing Chen, Co-PI: Fei Li  
10/1/2015-9/30/2018  
\$495,426

## De Jong, Kenneth

### Collaborative Research: BCSP: Automated Parameter Tuning of Large-Scale Spiking Neural Networks

National Science Foundation  
PI: Kenneth De Jong, Co-PI: Giorgio Ascoli (Krasnow Institute)  
9/15/13-8/31/16  
\$474,996.15

## Domeniconi, Carlotta

### Semi-Structured Graph Data

FINRA  
6/1/2015-12/31/2015  
\$74,186

## Gingold, Yotam

### Improving the Quality and Editability of 2D and 3D Shapes via Crowdsourcing and Self-Crowdsourcing

National Science Foundation  
9/1/2014-8/31/2016  
\$70,116.00

### CAREER: Direct Manipulation of Numerical Optimization for Structured Geometry Creation

National Science Foundation  
2/1/2015-1/31/2020  
\$ 550,000

### Diamonds from the Rough: Improving Creative Performance via Aggregation

Google  
2014  
\$42,000

## Gordon, Samuel Dov

### Jana: Ensuring Secure, Private, and Flexible Data Access

Galois Inc.  
9/15/2015-3/14/2020  
\$ 415,883

## Kosecka, Jana

### Acquiring Semantically Meaningful Models for Robotic Localization, Mapping and Target Recognition

US Department of the Army ARO  
9/13/11-9/12/14  
\$365,917

### Geometric and Semantic Techniques for Geolocation

Object Video, Inc./ Intelligence Advanced Research Projects Activity (IARPA)  
3/8/12-7/7/14  
\$274,404

# EXTERNAL FUNDING ...CONTINUED

## **Geometric and Semantic Techniques for Geolocation: FINDER Phase 2A**

OBJECT Video Inc. / Intelligence  
Advanced Research Projects Activity  
(IARPA)  
6/8/2014-5/31/2015  
\$199,007

## **Geometric and Semantic Techniques for Geolocation: FINDER Phase 2B**

ObjectVideo Inc. / Intelligence  
Advanced Research Projects Activity  
(IARPA)  
6/7/2015-9/30/2016  
\$121,125.00

## **Semantic Mapping**

Google  
12/20/11-12/31/14  
\$31,613

## **Confidence Based Segmentation and Labeling on Spatio-Temporal Imagery**

US Department of Commerce  
(UC DOC)  
9/1/2014-8/31/2016  
\$72,579

## **NRI: Collaborative Research: Task Dependent Semantic Modeling for Robot Perception**

National Science Foundation  
9/1/2015-8/31/2018  
\$267,486

## **LaToza, Thomas**

### **SHF: Large: Crowd Programming**

National Science Foundation  
SHF  
1/1/2016-6/30/2018  
\$325,000

## **Li, Fei**

### **Algorithmic Approaches to Energy-Efficient Computing**

National Science Foundation  
09/01/2012-7/31/2016  
\$128,325

### **Online Scheduling Algorithms for Networked Systems and Applications**

National Science Foundation  
08/01/2009-07/31/2014  
\$220,359

## **Lien, Jyh-Ming**

### **Acquisition of a Light Detection and Ranging (LiDAR) Scanner System**

National Science Foundation  
PI: Jyh-Ming Lien; Co-PIs: D. Wong (Dept. of Geography and Geoinformation Sciences), J. Chen, F. Camelli (School of Physics, Astronomy, Computational Sciences), J. Kosecka  
06/01/2012-05/31/2015  
\$200,775

### **Multi-field Responsive Origami Structures - Advancing the Emerging Frontier of Active Compliant Mechanisms**

National Science Foundation  
08/01/2012-07/31/2016  
\$255,000

### **Development of Advanced Gridding and Visualization Tools for the USGS MODFLOW-USG Computer Program for Simulating Groundwater Flow**

United States Geological Society  
(USGS)  
6/25/2013-6/24/2014  
\$112,099

### **DDDAMS-based Urban Surveillance and Crowd Control via UAVs and UGVs**

Air Force Office of Scientific Research (AFOSR)  
05/01/2012-04/30/2015  
\$171,738

### **VASTO - Evolutionary Agent System for Transportation Outlook**

Federal Highway Administration  
(FHWA)  
06/01/11-01/01/14  
\$384,666

### **Simulating Groundwater Flow**

Virginia Tech  
9/22/2014-9/21/21015  
\$39,750

## **Lin, Jessica**

### **Finding and Exploiting Hierarchical Structure in Time Series Using Statistical Language Processing Methods**

National Science Foundation  
9/1/12-8/31/16  
\$250,000

### **Discovering Latent Relationships and Ontological Structures in Massive Spatiotemporal Datasets**

US Army  
09/30/2012-03/29/2016  
\$232,483

### **Contextual Anomaly Detection in Medical Applications**

Strategic Analysis Inc./ Naval Research Laboratory  
07/21/2014-01/31/2016  
\$36,824

### **Trajectory Pattern Mining for Proactive Decision Support**

Strategic Analysis Inc./Naval Research Laboratory  
03/15/2015-12/31/2015  
\$92,164

### **Scalable Multivariate Temporal Pattern Discovery**

Semiconductor Research Corporation  
06/01/2015-05/31/2016  
\$80,000

### **Proactive Data Analysis and Knowledge Sharing**

Semiconductor Research Corporation  
07/01/2011-06/30/2014  
\$240,000

## **Luke, Sean**

### **Online Training of Hierarchical Multirobot Teams**

National Science Foundation  
9/1/2013-8/31/2016  
\$499,998

## **Menasce, Daniel**

### **RASS: Resilient Autonomous Software Systems**

Air Force Office of Scientific Research  
PI: Daniel A. Menasce, co-PI: Hassan Gomaa  
10/15/2015-10/14/2018  
\$1,016,000

**Offutt, Jeff****Self-Paced Learning Advances Retention and Increases Capacity SPARC**

Google

PI: Jeff Offutt, Co-PI: Paul Ammann, Kinga Dobolyi, Jamie Lester (College of Humanities and Social Sciences), Huzefa Rangwala, Liz White, Pearl Wang and Sanjeev Setia.

6/1/2015-5/31/2018

\$900,000

**Pullen, J Mark****C2SIM Open Standard**

US Army Modeling and Simulation Office

2016,

\$200,000

**Expedite Second Generation****C2SIM**

US Army Modeling and Simulation Office

2015

\$150,000

**Integrated Standards-Based Initialization Service Set**

US Army Modeling and Simulation Office

2014

\$100,000

**Widely Integrated Systems Environment - Scripted Battle Management Language**

Saab Corporation

2014

\$10,000

**Academic PlugFest Pilot 2**

Defense Intelligence Enterprise Environment

2014

\$87,678

**Rangwala, Huzefa****Computational Methods to Advance Chemical Genetics by Bridging Chemical and Biological Spaces**

National Science Foundation

09/01/2009-08/31/2014

\$331,537. Additional REU

Supplement: \$8000

Career: Annotating the Microbiome Using Machine Learning Methods.

National Science Foundation

CAREER

03/01/2013-02/28/2018

\$550,000

BIGDATA: Collaborative Research: Learning Data Analytics: Providing Actionable Insights to Increase College Student Success

National Science Foundation

9/1/2014-8/31/2018

\$776,202

**Shehu, Amarda****Novel Stochastic Optimization Algorithms to Advance the Treatment of Dynamic Molecular Systems**

National Science Foundation

PI: Amarda Shehu, Co-PI: Kenneth DeJong

7/1/2014-6/30/2017

\$399,997

**Collaborative: A plug-and-play software platform of robotics-inspired algorithms for mapping protein structures and motions**

National Science Foundation

2/1/2015-1/31/2018

\$217,288

**Probabilistic Search Algorithms: Powerful Novel Tools for Peptide Modeling**

Jeffress Trust Program in Interdisciplinary Research

PI: Amarda Shehu, Co-PI: Estela Blaisten-Barojas (Computational Material Sciences Center)

09/15-2013-05/31/2014

\$100,000

**CAREER: Probabilistic Methods for Addressing Complexity and Constraints in Protein Systems**

National Science Foundation

CAREER

03/01/2012-02/28/2017

\$549,924, REU Supplement: \$8,000

**A Unified Computational Framework to Enhance the Ab-initio Sampling of Native-like Protein Conformations**

National Science Foundation

09/01/2010-08/31/2014

\$499,998

**Simon, Robert****Energy Harvesting for Performance Sensitive Wireless Sensor Networks**

National Science Foundation

Pi: Robert Simon Co-PI: Hakan Aydin

8/15/11-7/31/14

\$430,000

**An Experimental Infrastructure for Cross-Domain Research in Wireless Computing, Cybersecurity and Data Mining**

National Science Foundation

PI: R. Simon, Co-PIs: Daniel

Barbara, Brian Mark (Dept. of Electrical and Computer Engineering), Angelos Stavrou

9/1/12-8/31/15

\$547,307

**M2M Communication**

VECTARE LLC

1/7/2014-9/30/2016

\$247,129

**Smart Grid Research**

VECTARE LLC

3/26/2014-9/30/2016

\$343,346

**Internet of Thing (IoT) Research Project**

Vectare LLC

6/8/2015-12/31/2015

\$163,655

# EXTERNAL FUNDING ...CONTINUED

## Sood, Arun

**Proactive Cyber Attack Deterrence: Extending Self Cleansing Intrusion Tolerance (SCIT) to Compute Rich Nodes**  
Office of Naval Research  
1/2013-12/2015  
\$492,040

**A Survey of Taxonomy on the Roots of Trust in Cyber Physical Systems**  
CSRA  
PI: Arun Sood, Co-PI: Duminda Wijesekera  
1/1/2014-8/31/2014  
\$50,000

## Stavrou, Angelos

**MEERKATS: Maintaining Enterprise Resiliency Via Kaleidoscopic Adaptation & Transformation of Software Services**  
Defense Advanced Research Projects Agency (DARPA)  
PI: A. Stavrou, Co-PI: Fei Li  
09/01/2011-09/01/2015  
\$780,000

**CyNomix: Detecting Zero-Day Malware by Generating Behavioral Cyber Genome Sequences. DARPA-CyberGenome.**  
Defense Advanced Projects  
PI: Angelos Stavrou, Co-PI: Huzefa Rangwala  
09/01/10-08/31/14  
\$1,527,225

**Analysis of Mobile Application Communications Using GUI & Data Instrumentation**  
Purdue Univ/Department of Homeland Security  
8/1/13-7/31/14  
\$250,000

**Securely Taking on New Executable Software of Uncertain Provenance (STONESOUP) Program**  
Columbia University  
PI: Angelos Stavrou, Co-PI: Anup Ghosh  
8/1/2010-1/31/2015  
\$2,369,506

**Bridging the Cybersecurity Leadership Gap: Assessment, Competencies and Capacity Building**  
National Science Foundation  
8/1/2013-7/31/2016  
\$408,372

**Collaborative: Scalable Techniques for Better Situational Awareness: Algorithmic Frameworks and Large-Scale Empirical Analyses.**  
National Science Foundation  
9/1/2014-8/31/2017  
\$174,900

**Technical Consulting on the Test and Evaluation Methodology for Cyber-Security Technologies.**  
Agency for Defense Development (South Korea)  
PI: Angelos Stavrou, Co-PI: J.P. Auffret (School of Business)  
6/2/2014-8/15/2015  
\$267,682

**TAPIO: Targeted Attack Premonition Using Integrated Operational Data Sources.**  
Invincea Labs, LLC.  
7/1/2010-5/31/2014  
\$670,000

## Tecuci, Gheorghe

**TIACRITIS User Interface Improvement Roadmap: From TIACRITIS to COGENT.**  
Intelligence Community  
PI: Gheorghe Tecuci Co-PIs: Mihai Boicu (Dept. of Information Sciences and Technology), Dorin Marcu (Learning Agents Center), David Schum (Dept. of Systems Engineering and Operations Research)  
07/30/2012-08/29/2014  
\$370,105

## A Computational Theory of Intelligence Analysis

National Geospatial-Intelligence Agency (NGA University Research Initiatives – NURI)  
PI: Gheorghe Tecuci Co-PIs: Mihai Boicu (Dept. of Information Sciences and Technology), David Schum (Dept. of Systems Engineering and Operations Research)  
09/24/2009-09/23/2015  
\$750,000

## Making the Most of Big Data: Current and Future High-impact Collaborations

National Science Foundation  
09/01/2013-02/28/2014  
\$71,202

## API and Service for Communication between Cogent and Ozone-based User Interfaces

Department of Defense, Combating Terrorism Technical Support Office, through Uncharted Software Inc.  
PI: Gheorghe Tecuci Co-PIs: Mihai Boicu (Dept. of Information Sciences and Technology), Dorin Marcu (Learning Agents Center)  
12/20/2013-2/27/2016  
\$382,135

## Wang, Xinyuan

**CAREER: Malware Immunization and Forensics Based on Another Sense of Self**  
National Science Foundation  
3/1/2009-12/31/2014  
\$400,000

**Cyber Attack Signature Analysis**  
Central Intelligence Agency (CIA)  
9/1/2014-8/31/2016  
\$238,233

## Wijesekera, Duminda

**Providing Wireless Bandwidth for High-Speed Rail Operations,**  
Federal Railroad Administration  
2/1/2013-1/31/2014  
\$330,021

**Using the Policy Machine to Enforce Access to Health Records: Extension**

National Institute of Standards and Technology (NIST)  
9/1/2015-8/31/2016  
\$139,984

**Enforcing Medical Consents on the Policy Machine**

National Institute of Standards and Technology (NIST) 8/2014-8/2015  
\$131,000

**Graduate Fellowship Training for Homeland Security**

US Department of Homeland Security  
PI: Duminda Wijsekera, Co-PI: Angelos Stavrou, Robert Simon, Damon McCoy, Avinash Srinivasan  
9/20/2012-8/31/2017  
\$256,336

**Secure SDR Communication Protocols and Configuration Management for PTC**

US Department of Transportation/ Railroad Administration  
4/1/2015-3/31/2017  
\$550,000

**Providing PTC Subject Matter Expertise to the FRA**

Federal Railroad Administration  
9/1/2015-8/31/2016  
\$228,328

**A Probabilistic Argumentation Based Forensics Framework**

US Department of Commerce (US DOC)  
8/1/2015-2/29/2016  
\$50,000  
Grants with PIs in other Departments

## GRANTS WITH PIS IN OTHER DEPARTMENTS

**Collaborative research: Deep Insights Anytime, Anywhere (DIA2)**

National Science Foundation  
PI: Aditya Johri, Department of Information Sciences and Technology; Co-PI: Carlotta Domeniconi  
4/18/2014-8/31/2016  
\$372,251

**Cyber-Enabled Understanding of Complexity in Socio-Ecological Systems via Computational Thinking**

National Science Foundation  
PI: Claudio Cioffi-Revilla (Center for Social Complexity), Co-PIs: Paul Schopf (Dept. of Atmospheric, Oceanic and Earth Sciences), Sean Luke, and Dan Rogers (Smithsonian Institution)  
9/1/2011-8/31/2015  
\$1,680,000

**Close Air Support (CAS) Experimentation Campaign**

Alion Science & Technology Corporation and the U.S. Air Force  
PI: Bill Roeting (C4I Center), Co-PI: Mark Pullen, Tod Levitt (C4I Center), Nicholas Clark (C4I Center)  
2015-2016  
\$1.09M

**JTAC Degree Program**

PAR Government Systems Corp. and the Department of Defense  
PI: Bill Roeting (C4I Center), Co-PI: Mark Pullen, Walter Powell (C4I Center)  
2015-2016  
\$400,000

**CPS: Synergy: A Novel Biomechatronic Interface Based on Wearable Dynamic Imaging Sensors.**

PI: Siddhartha Sikdar, Bioengineering Department, Co-PI: Huzefa Rangwala, Jana Kosecka and Houman Homayoun.  
02/01/2014-01/31/2018.  
\$995,055

**Molecular Mechanisms Underlying Menthol Cigarette Addiction**

Virginia Youth Tobacco Program  
PI: Nadine Kabbani (Krasnow Institute), Co-PI: Amarda Shehu  
05/24/2013/05/23/2014  
\$27,544

**Virginia Global Defense Initiative-Cybersecurity Exports and Trade**

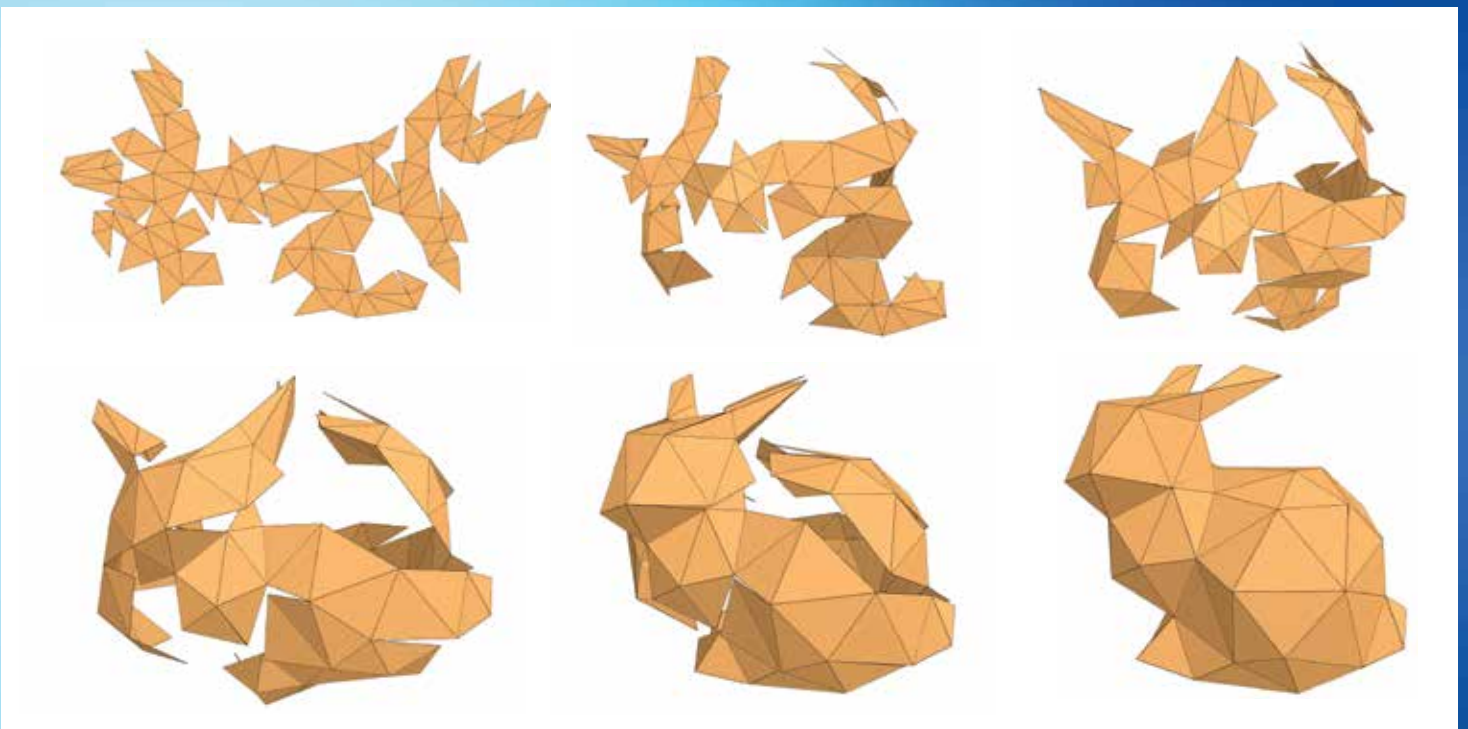
Virginia Economic Development Partnership  
PI: Stuart Malawer, School of Public Policy ; Co-PI: Arun Sood  
8/1/2013-7/31/2014  
\$50,000

**Decision Support for Secure Air Transport**

Brazilian Air Force Department of Aerospace Control  
PI: Paolo Costa, Systems Engineering and Operations Research Department, Co-PI: Duminda Wijsekera  
8/2/2015-3/31/2016  
\$28,443

“Ideas are like rabbits. You get a couple and learn how to handle them, and pretty soon you have a dozen.”

–John Steinbeck



Computational Origami. Image from the Motion and Shape Computing Group (MASC) courtesy of Jyn-Ming Lien and Zhonghua Xi. MASC's goal is to develop efficient, robust and practical algorithms for representing, manipulating and analyzing massive geometric data of shape and motion.