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Traceability recovery: a success story

Prof. Giuliano Antoniol
Departement de Genie Informatique
Ecole Polytechnique de Montreal
Thursday, October 18, 2007

Automatic Program Verification with Separation Logic

Prof. Peter O'Hearn
Department of Computer Science
Queen Mary, University of London
Thursday, October 25, 2007

Computer-aided modeling, planning, guidance and dosimetry for prostate brachytherapy

Prof. Tim Salcudean
Department of Electrical and Computer Engineering
The University of British Columbia
Thursday, November 15, 2007
Co-sponsored by IEEE, Kingston Section

Goal-Oriented Requirements Engineering

Prof. John Mylopoulos
Department of Computer Science
University of Toronto
Thursday, November 22, 2007

An Emergency Preparedness and Response Based Distributed Interactive Simulation System: A Necessary Public Safety Testbed

Prof. Azzedine Boukerche
School of Information Technology and Engineering (SITE)
University of Ottawa
Thursday, January 24, 2008

Understanding hippocampal-cortical interactions in memory, sleep and dreaming: linking computational theory to large-scale neural models

Prof. Suzanna Becker
Department of Psychology
McMaster University
Thursday, January 31, 2008

Theoretical Foundation of Clustering - do practitioners really need theoretical analysis?

Prof. Shai Ben-David
David R. Cheriton School of Computer Science
University of Waterloo
Thursday, February 28, 2008

Prof. Russell Taylor
Department of Computer Science
Johns Hopkins University
Thursday, March 13, 2008

Towards a Radically New Theory of Software Reliability

Prof. Aditya Mathur
Department of Computer Science
Purdue University
Thursday, May 1, 2008

Dr. Guilio Antoniol
Ecole Polytechnique de Montreal

Thurs., October 18 2007
Walter Light Hall 210
2:30-3:30 pm
Refreshments

Queen's
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2007 - 2008

Traceability recovery: a success story.

Traceability is defined as the degree to which a relationship can be established between two or more products of the software life cycle. Accurate, consistent, complete, up-to-date traceability information is vital to ensure verification and validation especially in software critical applications. Indeed, all artifacts produced in the software life cycle should be traceable. Traceability recovery over recent years has been a success story however, current techniques for link recovery and evolution are human intensive and error prone (e.g., due to documentation quality, level of detail, etc.).
This talk recasts the problem of traceability recovery as an information retrieval process. The problem is reformulated as querying an information retrieval system where software artifacts play the roles of documents and queries. The talk will briefly introduce techniques for traceability recovery proposed over the past five years, summarize achievement and goals and present recent advancements in concept location and bug tracing.

Giuliano (Giulio) Antoniol received his degree in electronics engineering from the Universita' di Padova in 1982. He worked in companies, research institutions, and universities. In 2005, he was awarded the Canada Research Chair Tier I in Software Change and Evolution.

Giuliano Antoniol published more than 100 papers in journals and international conferences. He served as a member of the Program Committees and Organization Committees of international conferences and workshops. He is presently a member of the Editorial Board of the Journal Software Testing Verification & Reliability, the Journal Information and Software Technology, the Journal of Empirical Software Engineering, and the Journal of Software Quality.

He is currently Full Professor at the Ecole Polytechnique de Montreal, where he works in the areas of software evolution, software traceability, software quality, and maintenance.

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Dr. Peter O'Hearn
Queen Mary, University of London

Thurs., October 25 2007
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Automatic Program Verification with Separation Logic

Separation logic has provided a fresh approach to the old problem of specifying and verifying properties of linked data structures held in memory. It has led to simpler specifications and proofs of low-level imperative programs than was previously possible, and this has been leveraged in automatic tools that do proofs of certain lightweight properties of programs. This will be a mixed theory/demo talk, where I introduce the ideas in the logic and exemplify them using the experimental program verification tools Smallfoot and Space Invader. I will also describe joint work with colleagues at Microsoft Cambridge, which has uncovered bugs in Windows device drivers.

Peter O'Hearn received his PhD from Queen's in 1991, under the supervision of Bob Tennent. He was on faculty at Syracuse University until 1996, when he moved to Queen Mary, University of London, where he is a Professor of Computer Science. Throughout the 90s, O'Hearn worked on denotational semantics of programs. Then, around the turn of the millennium, he and John Reynolds (CMU) discovered Separation Logic, which addressed the 30 year-old problem of efficient reasoning about linked data structures in memory.

Recently, with a vibrant community of researchers in the southeast of England, he has been tackling the problem of automatic verification and analysis of programs' use of the heap, as well as automatic program-termination analysis. In 2007 O'Hearn received the Royal Society Wolfson Research Merit Award for his work on semantics, logic, and program analysis.

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Dr. Tim Salcudean
Professor and Canada Research Chair, University of British Columbia

Thurs., November 15, 2007
DUPUIS HALL 217
2:30-3:30 pm
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SCHOOL OF COMPUTING

2007 - 2008

Computer-aided modeling, planning, guidance and dosimetry for prostate brachytherapy"

Novel ultrasound image processing is enabling the development of a new set of tools that may lead to more consistent prostate brachytherapy planning, execution and quality assurance. We present our progress in the area, including prostate elasticity modeling and segmentation, needle insertion planning and guidance using a robotic guide, and localization of delivered radioactive sources.

Septimiu (Tim) E. Salcudean received the B.Eng and M.Eng degrees from McGill University and the Ph.D. degree from U.C. Berkeley, all in Electrical Engineering. From 1986 to 1989, he was a Research Staff Member in the robotics group at the IBM T.J. Watson Research Center. He then joined the Department of Electrical and Computer Engineering at the University of British Columbia, Vancouver, Canada, where he is now a Professor and holds a Canada Research Chair. He spent one year at ONERA in Toulouse, France, in 1996 - 1997, where he held a Killam Research Fellowship. From 01/2005 to 06/2005 he was on a sabbatical visit at CNRS/TIMG/GMCAO in Grenoble, with Dr. Jocelyne Troccaz. Professor Salcudean has been a co-organizer of the Haptics Symposium from 2000 - 2002, of a Haptics, Virtual Reality, and Human Computer Interaction Workshop at the Institute for Mathematics and its Applications, and a Technical Editor(1992 - 1994) and Senior Editor(1994 - 2000) of the IEEE Transactions on Robotics and Automation.

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Dr. John Mylopoulos
Department of
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University of Toronto

Thurs., Nov. 22 2007
Dupuis Hall, 217
2:30-3:30 pm
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2007 - 2008

Goal-Oriented Requirements Engineering

The last fifteen years have seen the rise of a new phase in software development which is concerned with the acquisition, modelling and analysis of stakeholder purposes ("goals") in order to derive functional and non-functional requirements. We review the history of ideas and research results for this new phase and sketch on-going research on the topic. Specifically, we discuss an agent-oriented software development methodology -- called Tropos -- that is founded on the concepts of goal, actor as well as inter-actor dependencies.

The research reported is the result of collaborations with colleagues at the Universities of Toronto and Trento.

John Mylopoulos earned a PhD degree from Princeton University in 1970 and has been professor of Computer Science at the University of Toronto since that year. His research interests include conceptual modelling, requirements engineering, data semantics and knowledge management. Mylopoulos is a fellow of the American Association for Artificial Intelligence (AAAI) and the Royal Society of Canada (Academy of Sciences). He has served as programme/general chair of international conferences in Artificial Intelligence, Databases and Software Engineering, including IJCAI (1991), Requirements Engineering (1997), and VLDB (2004). He is currently serving as co-editor-in-chief of the Requirements Engineering Journal, published by Springer-Verlag.

Since September 2005 Mylopoulos is Distinguished Professor (chiara fama) of Science at the University of Trento.

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Dr. Azzedine Boukerche
School of Information Technology and Engineering (SITE)
University of Ottawa

Thurs., Jan 24th 2008
Dunning Hall 14
2:30-3:30 pm
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An Emergency Preparedness and Response Based Distributed Interactive Simulation System: A Necessary Public Safety Testbed.

Wireless sensor network and wireless multimedia network technologies combined with interactive 3D virtual visualization can converge into really interesting and functional applications such as detailed real-time monitoring of environments, emergency response and preparedness, distributed collaborative training, and remote walkthroughs, just to name a few examples. With the recent advances in wireless communication, and the proliferation of portable computer and micro-sensor devices, we are witnessing a growing interest in using wireless multimedia sensor networks and distributed simulation technologies for safety and security class of applications.

In the first part of this talk, we will give an overview of some research projects related to emergency preparedness and response that are currently being investigated at the PARADISE Research Laboratory at the uOttawa. We will show how distributed simulation, context aware computing, wireless multimedia, and wireless ad hoc and sensor networks can be used to ensure public safety and security. We will focus upon the design of large-scale distributed simulation system for applications that require critical condition monitoring using both location/context aware computing and wireless sensor technologies.

The second part of the talk will focus on the coverage problem in wireless sensor networks. How well a given area can be monitored by WSN is a critical issue whose solution is required for successful deployment of many important applications on such networks. I will discuss some new results on coverage mechanisms, and show their effectiveness in identifying fully covered sensors, discovering blind holes and reaching reasonable coverage quality.

Lastly, and as time permits, the talk will conclude by presenting two testbeds that are currently under development at PARADISE: the LIVE testbed, and the SWiMNet testbed. LIVE is a testbed for applications that require emergency preparedness and response. LIVE's architecture integrates wireless sensor networks with wireless multimedia and virtual environment technologies. SWiMNet is a testbed of a high performance simulation system that supports very detailed and realistic model specifications to enable the design and evaluation of new protocols and applications for future generations of mobile ad hoc networks, as well as sensor networks.

Dr. A. Boukerche is a Full Professor of Computer Science and holds a Canada Research Chair Position at the University of Ottawa Prior to this, he was Faculty Member at the Dept. of Computer Sciences, University of North Texas. He also worked as a Senior Research Scientist at Metron Corp. located in San Diego, California, where he was leading several DoD projects on data distribution management for large-scale distributed and interactive systems. He also worked as a visiting scientist at Caltech/JPL-NASA, where he contributed to a project centered on the specification and verification of the software used to control interplanetary spacecraft operated by JPL/NASA Laboratory. He is the Founding Director of PARADISE Research Lab at uOttawa. His current research interests include Wireless Networks and Mobile Computing, Wireless Ad hoc and Sensor Networks, Wireless Multimedia, distributed management and security system for wireless and mobile networks, and large-scale distributed interactive simulations and collaborative virtual environment.

He serves as an Associate Editor for the IEEE Transactions on Parallel and Distributed Systems, IEEE Transactions on Vehicular Technology, IEEE Wireless Communication Magazine, ACM/Springer Wireless Networks, ELsevier Int'l Journal on Pervasive and Mobile Computing, Wiley Wireless Communication and Mobile Computing, Int'l Journal of Parallel and Distributed Computing (JPDC), and SCS Transactions on Simulation. He serves as a Program Co-Chair for Globecom 2008-Ad Hoc and Sensor Networking Symposium, and the Steering Committee Chair for ACM/IEEE MSWiM symposium. He is the recipient of several awards, including IEEE/ACM PADS Best Paper Award, The Ontario Distinguished Researcher Award, the prestigious Premier's Ontario Research Excellence (PREA) Award, and the George S. Glinski Award for Excellence in Research.

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Dr. Suzanna Becker,
Department of Psychology,
McMaster University

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Understanding hippocampal-cortical interactions in memory, sleep and dreaming: linking computational theory to large-scale neural models

In a familiar environment, an animal can learn a new route to a goal extremely quickly. In contrast, learning sequential information by trial and error using traditional machine learning algorithms is typically a slow, iterative process. Some models incorporate a rapid caching mechanism to improve learning efficiency. In this talk, I address the neural mechanisms which may underlie such a memory system. The hippocampal region of the brain has unique circuitry and physiology ideally suited for rapid sequence caching. A probabilistic model of hippocampal sequence coding is proposed, based on recent developments of the Restricted Boltzmann Machine by Hinton and colleagues. The model accounts for a wide range of neurobiological data not explained by previous hippocampal models, including the role of: 1) neurogenesis in the dentate gyrus, 2) feedback connections from CA3 to the dentate gyrus, 3) dynamic modes of firing within the hippocampal circuit (theta oscillations and sharp wave / ripple events), 4) phasic changes in the direction of plasticity between LTP and LTD during the theta cycle, and 5) forward and reverse sequence replay during REM sleep and sharp wave events. This is joint work with Geoff Hinton.

Sue Becker is a Professor in the department of Psychology, Neuroscience and Behaviour at McMaster University, and an associate member in the departments of Electrical and Computer Engineering, Computing and Software, and Linguistics and Languages, an adjunct faculty member in the Centre for Vision Research at York University. Becker obtained her BSc in Psychology and MSc in Computer Science from Queen's University, and her PhD in Computer Science from the University of Toronto. She has served as a member of the 5-year review committee for the Riken Research Labs, Program Chair and General Chair of the Neural Information Processing Society (NIPS) meeting, and is currently vice-chair of the External Advisory Board for the NSF-funded Temporal Dynamics of Learning Centre based at UCSD. Becker's research focuses on the neural bases of learning and memory. Her lab employs a variety of methodologies including comptuational modelling, behavioural and fMRI studies to investigate questions such as how the hippocampus codes episodic and spatial memories, how stress and depression affect hippocampus memory functions, and how the auditory cortex re-organizes after hearing loss and gives rise to tinnitus.

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Dr. Shai Ben-David
David R. Cheriton School of Computer Science
University of Waterloo

Thurs., Feb 28th 2008
Dunning Hall 14
2:30-3:30 pm
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2007 - 2008

"Theoretical Foundation of Clustering - do practitioners really need theoretical analysis?"

Clustering is one of the most widely used techniques for exploratory data analysis. Across all disciplines, from social sciences over biology to computer science, people try to get a first intuition about their data by identifying meaningful groups of similar data points.

Despite the popularity of clustering, there exist almost no theoretical foundations to support this task. Questions like "What distinguishes a clustering from any arbitrary data partitioning?" "What is the correct number of clusters for a given data set?" "Which data sets are clusterable?" and "Can we determine the quality of a given data clustering?" must be regularly addressed in any practical application of clustering. Yet, currently there exist no theory that can support answers to such questions. I shall survey recent theoretical insights concerning these questions and discuss their, sometimes perplexing, relations to common clustering practices.

I'll conclude by describing some of the challenges, research opportunities, and the potential practical impact that lie ahead on our way to developing theoretical understanding of clustering.

Shai Ben-David grew up in Jerusalem, Israel. He attended the Hebrew University studying physics, mathematics and psychology. He received his PhD under the supervision of Saharon Shelah and Menachem Magidor for a thesis in set theory (on non-provability of infinite combinatorial statements).

Dr. Ben-David was a postdoctoral fellow at the University of Toronto in the Mathematics and the Computer Science departments, and in 1987 joined the faculty of the CS Department at the Technion (Israel Institute Technology). He held visiting faculty positions at the Australian National University in Canberra (1997-8) and at Cornell University (2001-2004). In August 2004 he joined the School of Computer Science at the University of Waterloo.

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Dr. Aditya P. Mathur
Computer Science
Purdue University
West Lafayette IN
USA

Thurs., Feb. 14, 2008
Dunning Hall 14
2:30-3:30 pm
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2007 - 2008

Towards a Radically New Theory of Software Reliability

We begin by arguing that the existing theory of software reliability is impractical and fraught with perils. Next we consider a proposed framework for an alternate theory that is practical, treats software as a piece of programmed logic--not physical hardware-- and rests on the simple fact that most faults in any software application lie in its components and interfaces. Thus a key determinant of a software reliability estimate is the quantitatively measured extent to which the contained components and interfaces are tested. The framework allows identification of application components and their interfaces using a syntactic and language dependent hierarchy. This hierarchy, test coverage, and application complexity are inputs used in the estimation of reliability and the associated uncertainty. The extremely large input domain associated with almost every software component, and connected components executed in a loop; make it difficult to obtain accurate estimates of reliability and the associated uncertainty. We suggest an approach to overcome these difficulties.

Aditya Mathur is a professor and head in the Department of Computer Science at Purdue University. Aditya's research has focused on empirical evaluation of test adequacy criteria, novel approaches to software reliability estimation, and formal control-theoretic approaches to software process control. Along with his academic and industrial collaborators, he founded the Purdue-Bellcore reliability workshops that led to an increased awareness of the need for new approaches to reliability estimation. Recently he co-founded the Software Cybernetics workshops aimed at establishing a new discipline for creating a solid mathematical and practical foundation for problems related to software process control. Recently Aditya has authored a text titled "Foundations of Software Testing," published by Pearson Education. This is the first in a series of volumes through which Aditya hopes to provide a comprehensive coverage of the basic to the most advanced literature in software testing. He expects this series to elevate education in software testing to the level of other traditional courses in Computer Science and Engineering.

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