Marko Puljic

Department of Computer Sciences,
310 Dunn Hall,
University of Memphis,
Memphis, Tennessee 38111

work: (901) 678-5909
fax: (901) 678-2480
e-mail: mpuljic@memphis.edu
url: http://cnd.memphis.edu/neuropercolation

Education

Ph.D. in Computer Science, University of Memphis, 2005 (planned in Spring)
Concentration: Complexity and Algorithms
Dissertation: Neuropercolation
Committee: Dr. Robert Kozma, Dr. Dipankar Dasgupta, Dr. Paul Balister, Dr. Junmei Zhu

Master of Science in Finance, Fogelman College of Business and Economics, 1998
Concentration: Investments
Thesis: Impact of Internet for Investment Strategies

Bachelor of Science in Economics, University of Zagreb, 1996
Concentration: Economics
Thesis: Pollution and Economic Development

Employment, University of Memphis

Assistant Researcher *2002 to present*
Simulation of a neuropil for the study of brain like computing. This includes the measurements and descriptions of the complex systems, such as brains and societies, in order to understand the emergence caused by the interactions of many components. The maintenance of the hardware and software in the laboratory: linux cluster with 16 nodes, web server, different hardware and software installations.

Course Development *Spring 1998, Summer 1998*
Developing a course about Java. Writing a syllabus and developing course materials, policies, homework assignments, and labs.

Lab Instructor *1996-1998*
Supervised computer Labs where students study, do the homework, projects, and reports.

Calculus Tutor *Fall 1997*
Staffed "Help Room" where students go for help in the undergraduate Calculus courses.

Employment, Dell in Memphis

Technical Assistant *1998-2000*
Hardware and software technical support: problem diagnosis, troubleshooting, and problem solving for different customers.

Other Employment

Software Developer *1999*
Database development for a small software firm in Memphis. Applications were developed for Windows environment.

Research Interest

My research is devoted to the measurements and description of complex systems, such as the brains and societies. Neurons, organized into the central nervous system, through the interactions, give animals and humans the unique intelligence, unseen in the other systems. The aim of my research is to understand the emergence caused by the interactions of many system's components. Like biological brains, societies emerge with goal-directed behavior, even though there is no central authority that controls the system's components. Understanding the emergence and synchronization of many parts, enables the design of computational devices that work in animal-like fashion.
The majority of my work consists of building models, which predict system behavior. The models are based on a modified random cellular automaton. The models simulate the system's emergence, or the point at which the sudden changes occur. In real systems, sudden changes are recognized as natural catastrophes, failures of engineering structures, crashes in the stock market, social revolutions, or disease epidemics. But most interestingly, sudden changes in the brains are recognized as the state transitions, or thought transitions, which create the intentional behavior.

Teaching Statement

My teaching interests expand to areas such as complexity and algorithms, computer modeling, scientific computing, and bioinformatics. From my perspective, it is important for students to gain both the experience and the knowledge. They need to be provided with basic information, but they also need to be actively involved. I believe that this goal is achievable through the use of discussion-style classroom teaching, computer simulations and demonstrations, and involvement of students directly in the professional research. I gain great satisfaction in imparting to others the excitement of learning new subjects. Teaching also helps me deepen my understanding of a subject, by looking at the problem from a different angle. I believe that an excellence in teaching is challenging. A task which requires many different personal and technical skills.

Grant Work

Researcher, NSF Grant EIA-01-30352 *2002-2006*
Principal Investigator: Dr. Robert Kozma
Co-Investigators: Bela Bollobàs, Paul Balister, Walter Freeman, Peter Erdi
A grant for a study on dynamical behavior in percolation models related to phase transitions in the cortex during sensory information processing.

Publications

Journals

M. Puljic, R. Kozma, "Activation Clustering in Neural and Social Networks," *Complexity*, (December 2004 accepted), .pdf

R. Kozma, M. Puljic, P. Balister, B. Bollobás, W.J. Freeman, "Neuropercolation: A Random Cellular Automata Approach to Spatio-Temporal Neurodynamics," *Lecture Notes in Computer Science,* vol. 3305, pp. 435-443, (2004), .pdf

R. Kozma, M. Puljic, P. Balister, B. Bollobás, W.J. Freeman, "Phase Transitions in the Neuropercolation Model of Neural Populations with Mixed Local and Non-Local Interactions," *Biological Cybernetics,* (submitted 2004), .pdf

Conferences

M. Puljic, R. Kozma, P. Balister, W.J. Freeman, "Nontrivial Limit Cycle Oscillations in Random Cellular Automata Models of Excitatory and Inhibitory Neural Populations," *Understanding Complex Systems Symposium,* University of Illinois at Urbana-Champaign, (2004), .pdf

M. Puljic, R. Kozma, "Phase Transitions in a Probabilistic Cellular Neural Network Model Having Local and Remote Connections," *International Joint Conference on Neural Networks IJCNN 2003,* Portland, OR, (July 14-19, 2003), vol. 2, pp. 831 .pdf

References

Dr. Robert Kozma, Professor
Division of Computer Sciences
University of Memphis, Memphis, TN 38152
(901) 678-2497, rkozma@memphis.edu

Dr. Dipankar Dasgupta, Professor
Division of Computer Sciences
University of Memphis, Memphis, TN 38152
(901) 678-4147, dasgupta@memphis.edu

Dr. Walter Freeman, Professor
Department of Molecular and Cell Biology
University of California, 142 LSA #3200, Berkeley, CA 94720
(510) 642-4220, drwjfiii@socrates.berkeley.edu

Hui Chen, Co-Worker
FedEx Institute of Technology
Division of Computer Sciences
University of Memphis, Memphis, TN 38152
(901) 678-1691, hchen2@memphis.edu

Dr. Paul Balister, Professor
Department of Mathematical Sciences
University of Memphis, Memphis, TN 38152
(901) 678-3138, balistep@msci.memphis.edu