Keynote presentation

Cognitive Architectures and Cognitive Social Simulation

Ron Sun

Abstract: In this talk, I will focus on the relationship between cognitive modeling and social simulation — the two currently important endeavors in social and behavioral sciences based on computational intelligence. In order to do so, first, the question of what a computational cognitive architecture is will be answered, and the importance of cognitive architectures to cognitive science, to AI, and to social sciences will be accentuated. Then, an example cognitive architecture will be sketched, and its use in cognitive modeling, in AI, and in cognitive social simulation will be illustrated. I will argue that cognitive architectures are indispensable theoretical tools for social simulations that seek deep understandings of social phenomena. Towards the end of the talk, some important challenges in cognitive social simulation will be identified.

Bio: Ron Sun is a cognitive scientist and currently Professor of Cognitive Science at Rensselaer Polytechnic Institute, and formerly the James C. Dowell Professor of Engineering and Professor of Computer Science at University of Missouri.

His research interest centers around the study of cognition, especially in the areas of cognitive architectures, human reasoning and learning, cognitive social simulation, and hybrid connectionist-symbolic models.

For his paper on integrating rule-based and connectionist models for accounting for human everyday reasoning, he received the 1991 David Marr Award from Cognitive Science Society. For his work on human skill learning, he received the 2008 Hebb Award from the International Neural Network Society.

Throughout the past two decades, he has been conducting research in the fields of psychology of learning and hybrid neural network (in particular, applying these models to research on human skill acquisition). Specifically, he has worked on the integrated effect of "top-down" and "bottom-up" learning in human skill acquisition, in a variety of task domains, for example, navigation tasks, reasoning tasks, and implicit learning tasks. This inclusion of bottom-up learning processes has been revolutionary in cognitive psychology, because most previous models of learning had focused exclusively on top-down learning (whereas human learning clearly happens in both directions). This research has culminated with the development of an integrated cognitive architecture that can be used to provide a qualitative and quantitative explanation of empirical psychological learning data. The model, CLARION, is a hybrid neural network that can be used to simulate problem solving and social interactions as well. More importantly, CLARION was the first psychological model that proposed an explanation for the "bottom-up learning" mechanisms present in human skill

acquisition.

He is the founding co-editor-in-chief of the journal Cognitive Systems Research, and also serves on the editorial boards of many other journals. He was the general chair and the program chair of CogSci 2006, and the program chair of IJCNN 2007. He is a member of the Governing Boards of Cognitive Science Society and of International Neural Networks Society.

Prof. Sun has published more than 150 papers and 7 books in his research area. He has been an invited, plenary, or keynote speaker at many conferences including the International Conference on Neural Information Processing (Shanghai, China, 2001), the 9th Knowledge-Based Intelligent Information and Engineering Systems Conference (Melbourne, Australia, 2005), PRIMA 2005 (Kuala Lumpur, Malaysia, 2005), The Conference on "To Think and Act like a Scientist: The Roles of Inquiry, Research, and Technology" (Lubbock, Texas, 2006), the Workshop on Model Comparison and Model Validation (Syracuse, New York, 2006), the NIAS Workshop on Minds in Interaction at the Netherlands Institute for Advanced Study in the Humanities and Social Sciences (Wassenaar, Netherlands, 2006), the WICI International Workshop on "Web Intelligence Meets Brain Informatics" (Beijing, China, 2006) and many others.