

Applied Cognitive Science (ACS) Laboratory

<http://acs.ist.psu.edu>



The ACS lab is directed by Dr. Frank Ritter, professor of IST and psychology, and Dr. David Reitter, assistant professor of IST. Ritter, who is on sabbatical during the 2012-2013 academic year, studies cognitive modeling, cognitive architectures, human-computer interaction (HCI), and learning. He has taught cognitive modeling, cognitive architectures, HCI, human factors, user interface design, cognitive psychology, artificial intelligence, and discrete math. Reitter's research interests lie in computational cognition. His field develops models of human cognition that describe how humans communicate and how they make decisions.

"We can come up with rigorous, scientific accounts of how human cognition works," Reitter said.

The projects of the ACS lab are funded primarily by the National Science Foundation (NSF) and the Department of Defense (DoD), particularly the Office of Naval Research (ONR).

The projects developed by the ACS lab have applications in the "real world," Reitter said, including a mobile tool that enables users to manage their intake of the world's most popular drug. Caffeine Zone 2 is an iPhone app that monitors, predicts and displays a user's

OVERVIEW

The Applied Cognitive Science (ACS) Laboratory at the College of Information Sciences and Technology (IST) was created to help move the field of cognitive science. The purpose of the lab, located in 319 IST Building, is to describe and understand human behavior. The projects are focused on models of learning, ranging from how to provide models access to interfaces to analyzing the effects of caffeine on cognition to determining how children develop through the modeling of their development.

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caffeine level in real-time based on a pharmacokinetic model and the user's input of when he or she consumes caffeine. The app became available in December 2011 on the App Store. Caffeine Zone 2 spun out through a small company started by Ritter with the permission of the Office of Naval Research and Penn State. The app is based on research sponsored by ONR.

A large portion of the research in the ACS lab involves cognitive modeling. Cognitive modeling is an area of computer science that deals with simulating human problem solving and mental task processes in a computerized model. Such a model can be used to simulate or predict human behavior or performance on tasks similar to the ones modeled. Cognitive modeling is used in numerous artificial intelligence (AI) applications, such as expert systems, natural language programming, and neural networks, and in robotics and virtual reality applications. Cognitive models are also used to improve products in manufacturing segments such as human factors engineering, and computer game and user interface design. To conduct their experiments and simulations, members of the ACS lab rely on cognitive architectures—theories for simulating and understanding human cognition.

Several of the projects in the ACS lab employ the ACT-R cognitive architecture. ACT-R integrates theories of cognition, visual attention, and motor movement. It has been applied successfully to model higher-level cognition phenomena, such as working memory, scientific reasoning and skill acquisition. Using ACT-R, the ACS researchers have been able to simulate human biological and brain functions, as well as model hierarchical social networks.

“We’re simulating society,” Reitter said.

Some of projects in the ACS lab can be applied to enhance learning in simulation scenarios. Jeremiah Hiam, a research technician in the lab, is working on an intelligent tutoring system that aims to provide immediate and customized instruction or feedback to learners, usually without intervention from a human teacher. To develop these types of learning systems, the researchers use Herbal, a high-level language for behavior representation. It is an integrated development tool that supports modeling of human behavior and intelligent agents. Herbal is funded by the Office of Naval Research and was developed by the ACS lab. The researchers have applied their tutoring system to instruct U.S. Marines in the Combat Lifesaver course.

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