

CPLT 750 - Minds, Brains, and Intelligent Machines

Professor John Johnston

Fall 2010, Th 1-4

Course Description:

This seminar will introduce and explore a range of approaches to the understanding and production (or simulation) of intelligent behavior. Our approach will be primarily historical and conceptual, rather than technical, in an effort to develop multi-disciplinary discussion of primary ideas, guiding assumptions, and significant shifts in the relevant research. Beginning with an overview of cybernetics and the computational approach to intelligence developed in the early foundational work of Artificial Intelligence and Cognitive Science, we will then consider neural network theory and Connectionism, followed by the dynamical systems approach in robotics and "situated cognition." From there we will consider the development of evolutionary robotics and bottom-up emergent systems. Along our itinerary we shall look at examples of intelligent machines (or software) , with an eye toward assessing their specific achievements and limitations. Although often deemed successful, they all share one limitation: they can only operate in very restricted domains. Since human intelligence, in contrast, operates in multiple domains or across domains, we must wrestle with some difficult questions: What is the key to human intelligence? What is the role of technology? And what aspects of human thinking, perception, language, consciousness, memory, and evolutionary adaptability might hold clues for the development of more intelligent machines?

It should also be noted that the course is sponsored by Center for Mind, Brain, Culture, which has generously provided funds for several guest speakers. This will enable us to hear presentations from several researchers actively engaged with questions central to the course and from whose work we shall read samples in advance.

Readings:

Minds, Brains, and Computers, ed. Robert and Denise Cummins (selections)

Mind Design II, ed. John Haugeland (selections)

The Engine of Reason, the Seat of the Soul, Paul Churchland (selected chapters)

Connectionism and the Mind: Parallel Processing, Dynamics, and Evolution in Networks, William Bechtel and Adele Abrahamsen (selected chapters)

Being There: Putting Brain, Body, and World Together Again, Andy Clark

Creation: Life and How to Make It, Steve Grand

Cambrian Intelligence: The Early History of the New AI, Rodney Brooks

Intelligence as Adaptive Behavior, Randall Beer (selections)

Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies, Floreano and Mattiussi (selections)

Evolutionary Robotics: The Biology, Intelligence, and Technology of Self-Organizing Machines, Nolfi and Floreano (selections)

On Intelligence, Jeff Hawkins

Course Requirements:

A seminar essay due at the end of the semester; every student will also be expected to lead the group discussion of two short readings.