Artificial Cognitive Systems

No of Lectures

The course will comprise ten two-hour lectures, given over 5 full days.

Recommended for

PhD students in cognitive science (and related research areas, e.g. AI, HCI).

The course was last given

The course has not been given before.

Goals

The aim of the course is to provide student with a comprehensive overview of the issues involved in creating an artificial cognitive system, i.e. an autonomous system that can perceive its environment, learns from experience, anticipate the outcome of events, act to pursue goals, and adapt to changing circumstances. It will provide students with a clear understanding of the scope of the domain, the various approaches that exist, and the principal research issues confronting the area.

Prerequisites

None.

Organization

The course will be given over a period of ten weeks, starting September 23rd, with one full day in Skövde every two weeks. Each day will comprise two two-hour classes, one in the morning and one in the afternoon. Each class will be followed by two hours of self-study and each lecture will begin with a brief review of the material covered in the previous class.
Contents

Introduction
- Overview of the course
- Motivation for studying cognitive systems
- Definition of a cognitive system

Paradigms of Cognitive Science
- History of cognitive science and artificial intelligence
- Cognitivist models of cognition
  - Cognitivism and artificial intelligence
  - Examples cognitivist systems
- Emergent approaches to cognition
  - Connectionist systems
  - Dynamical
  - Enactive systems
- Hybrid approaches

Cognitive Architectures
- The function and characteristics of a cognitive architecture
  - The cognitivist and emergent perspectives on cognitive architectures
  - Desirable characteristics of a cognitive architecture
  - Facets of a cognitive architecture: component functionality, component interconnectivity, and system dynamics
- A survey of cognitive architectures
- Requirements for a developmental cognitive architecture
- A case study: the iCub cognitive architecture

Embodiment
- The importance of embodiment for cognition
- Different types of embodiment

Development and Learning
- The relationship between learning and development
- Phylogeny and ontogeny
  - The phylogeny/ontogeny trade-off: precocial and altricial species
  - Phylogeny: innate capabilities
  - Ontogeny: modes of learning, and the importance of motivation & exploration

Autonomy
- Types of autonomy
- Robotic autonomy
- Biological autonomy
- Autonomic systems
- Different scales of autonomy
- Goals
- Measures of autonomy
- Autonomy and cognition

**Philosophical Foundations of Cognitive Science**
- The cognitivist approach: logical positivism, functionalism, and mind-body dualism
- The emergent approach: phenomenology and enaction

**Literature**

Course notes will be provided. The following supplementary material will be provided.


Lecturers

David Vernon, Skövde University
Examiner

David Vernon, Skövde University

Examination

To be decided: it will be either a written examination or a multiple-choice examination. All material in the course notes will be examinable.

Credit

7,5 hp

Other information

None.