

A13: Models of Reasoning

The course "Models of Reasoning" presents computational models of reasoning proposed in artificial intelligence, which have applicability to the design and construction of intelligent systems. Initially, the course presents basic concepts and foundations of knowledge representation and reasoning. This part explains the symbolic approach of artificial intelligence and illustrates this approach with the main methods (e.g., logic, rules, frames, etc.) and software tools. Next, the course describes models of reasoning for building intelligent autonomous systems that need to make safe and efficient decisions in complex dynamic environments. In this part, we discuss approaches related to reactive, deliberative and reflective reasoning. Finally, the course describes models for common sense reasoning. This type of reasoning is presented as one of the important challenges of artificial intelligence, showing difficulties and partial achievements. For example, this part of the course describes logical-based methods for common sense reasoning (e.g., event calculus) and an introduction to physical reasoning.

The course gives mainly a theoretical description of a number of methods, illustrated in some cases with tools and applications related to practical domains (e.g., autonomous aerial robots). As a general learning objective, students are expected to develop a comprehensive understanding of reasoning methods that may complement other more specific areas in artificial intelligence that make use of symbolic approaches (e.g., autonomous robots, multi-agent systems, automated planning, ontology engineering, etc.). In the course, students will develop research skills in artificial intelligence through the realization of a project that explores a topic of their interest, related to models of reasoning. In this project, students will analyze bibliographic sources, will write a report and will present the results in class.