Artificial Intelligence Programming

This module introduces students to the tools and techniques required to build practical solutions to many well established problems in Artificial Intelligence (AI). The module introduces important issues (e.g. knowledge representation and inference) which underpin much of symbolic AI.

Students will be given a solid grounding in Clojure as a Lisp-based language for symbolic computation, developing rules and other declarative knowledge structures as well as building simple inference mechanisms.

The module is assessed by in-course assessment.

Module Aims

This module aims to:

1. Introduce the main concepts of symbolic computation.
2. Provide an introduction to knowledge representation.
3. Examine inference mechanisms based on search.
4. Investigate the practical tools and techniques required for building simple rule-based systems and other inference mechanisms.
5. Provide an introductory course in using Clojure as a practical language for developing AI software.

Indicative Content

- Introduction to Clojure: basic language features, creating data and functions, pattern matching and other tools for AI programming.
- Symbolic computation and symbolic representations: building and manipulating representations in Clojure (tuples, maps & sets; coding facts and rules, applying rules, legal move generators, constructing & applying planning operators).
- Problem solving and inference methods: search (basic search mechanisms, using costs and estimations, legal move generation); expert systems (facts and rules, inference mechanisms); planning (means-end analysis, operator structure and application); game-playing (evaluation functions, minimax, alpha-beta pruning, other strategies).
- Knowledge representation: schemes and inference mechanisms; computational representation; styles of representation (e.g. facts and rules, logic, semantic nets).

Learning Outcomes

Knowledge & Understanding

1. Demonstrate how to program a simple agent (robotic agent or game non-player character) to act upon its environment.

Cognitive & Intellectual Skills

2. Evaluate different approaches to search and their relative benefits in different situations.

Practical & Professional Skills

3. Create small scale AI systems to solve problems, plan sequences of actions or play games.
4. Construct simple knowledge representational schemes and the inference mechanisms that support them.
5. Use a Lisp-based language to build symbolic representations (rules, knowledge, planning operators, etc) for use with a selection of inferencing mechanisms.

Key Transferable Skills

6. Research appropriate resources.
7. Produce documentation for software design.