

CM3020: Artificial Intelligence

Module description

Through this module you will learn about the field of Artificial Intelligence. This is a long-standing area of interest in computer science research and it builds on and complements several of the other modules in the programme. The module focuses on topics such as symbolic representations, modelling, task learning and game playing.

This module is focused on Artificial Intelligence techniques. You will understand the historical development of Artificial Intelligence including search, vision and planning. You will become familiar with the foundations of agent-based approaches to software design, decision making and problem solving including under uncertainty. You will have an opportunity to apply Artificial Intelligence techniques to particular problems such as game playing and decision making.

Module goals and objectives

Upon successful completion of this module, you will be able to:

1. Describe and discuss key issues in a range of branches of Artificial Intelligence.
2. Describe and outline strategies that artificial agents can use in game playing scenarios using appropriate representations
3. Select appropriate artificial intelligence algorithms for particular scenarios and evaluate their adequacy and efficiency using appropriate techniques
4. Create working computer programs that implement specific artificial intelligence techniques
5. Describe how information can be represented in an artificial intelligence system and select appropriate representations for different types of information

Textbook and Readings

Specific readings for each week are included in the Readings pages for each week.

Module outline

The module consists of four topics. Each is a case study covering a specific example of an AI system.

Topic 1. Evolving creatures with genetic algorithms	Key concepts: Bio-inspired computing Automated design using genetic algorithms Evaluating systems in simulation Relevant module-level learning outcomes: 1.Describe and discuss key issues in a range of branches of Artificial Intelligence. 3.Select appropriate artificial intelligence algorithms for particular scenarios and evaluate their adequacy and efficiency using appropriate techniques 4.Create working computer programs that implement specific artificial intelligence techniques 5.Describe how information can be represented in an artificial intelligence system and select appropriate representations for different types of information
Topic 2. Robot scientist	Key concepts: Knowledge representation in AI systems Planning techniques

	<p>Scientific discovery using a robot scientist</p> <p>Relevant module-level learning outcomes:</p> <p>1. Describe and discuss key issues in a range of branches of Artificial Intelligence.</p> <p>3. Select appropriate artificial intelligence algorithms for particular scenarios and evaluate their adequacy and efficiency using appropriate techniques</p> <p>4. Create working computer programs that implement specific artificial intelligence techniques</p> <p>5. Describe how information can be represented in an artificial intelligence system and select appropriate representations for different types of information</p>
Topic 3. Game playing AI	<p>Key concepts:</p> <p>Reinforcement learning</p> <p>Q-learning with deep networks</p> <p>Game playing AIs</p> <p>Relevant module-level learning outcomes:</p> <p>1. Describe and discuss key issues in a range of branches of Artificial Intelligence.</p> <p>2. Describe and outline strategies that artificial agents can use in game playing scenarios using appropriate representations</p>

	<p>3.Select appropriate artificial intelligence algorithms for particular scenarios and evaluate their adequacy and efficiency using appropriate techniques</p> <p>4.Create working computer programs that implement specific artificial intelligence techniques</p> <p>5.Describe how information can be represented in an artificial intelligence system and select appropriate representations for different types of information</p>
Topic 4. Creative AI	<p>Key concepts:</p> <p>Using AI techniques to generate creative artefacts Implementation of generative models</p> <p>Ethical aspects of creative AI systems</p> <p>Relevant module-level learning outcomes:</p> <p>1.Describe and discuss key issues in a range of branches of Artificial Intelligence.</p> <p>3.Select appropriate artificial intelligence algorithms for particular scenarios and evaluate their adequacy and efficiency using appropriate techniques</p> <p>4.Create working computer programs that implement specific artificial intelligence techniques</p> <p>5.Describe how information can be represented in an artificial intelligence system and select appropriate representations for different types of information</p>

Activities of this module

The module is comprised of the following elements:

- *Lecture videos.*
- *Practice Quizzes.*
- *Lab worksheets involving programming*
- *Example code*
- *Peer Reviewed Assignments.*
- *Graded Assignments.*
- *Discussion Prompts.*
- *Readings.*

How to pass this module

The module has two major assessments each worth 50% of your grade:

- Coursework
- Unseen exam

Activity	Required?	Deadline week	Estimated time per module	% of final grade
Written, staff graded coursework	Yes	12	Approximately 20-25 hours	50%
Written examination	Yes	22	2 hours 15 minutes	50%