# Proposed new course: Artificial Intelligence, Present and Future

#### Alan Smaill

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### 1 Case for Support

#### **1.1** Overall contribution to teaching portfolio

We have a large number of students on the MSc in AI. Our coverage of AI is very strong in some areas, but patchy at MSc level in some areas where we have strengths. The course will cover quickly some technical foundations, look in more detail at varieties of reasoning processes including current research topics, and present a broad overview of AI approaches and prospects, including ethical and philosophical issues.

#### 1.2 Target audience and demand

The course should appeal to masters level students curious about AI overall and its place for good or ill in the future. It can be a useful complement to course options for the many ML students on the degree. It will be available to MInf students who have not taken Inf2d, in accordance with the spirit of that degree.

It is hard to guess that class size here – maybe 50?

#### 1.3 Relation to existing curriculum

The course is aimed at students on the MSc AI degree, but is available to other MSc degrees. It is designed to complement existing teaching in the School. It is recognised that the content may well have to be updated depending on results of the curriculum review and other taught courses in the area. The specialisms mentioned in the descriptor can make use of this course; it is most relevant to the Agents, Knowledge and Data specialism.

#### 1.4 Resources

The course can be taught jointly by Jacques Fleuriot and Alan Smaill.

We ask for some lab sessions, to deal with an initial formative assessment and the first summative assessment.

#### 2 Course Descriptor

Course title Artificial Intelligence Present and Future

SCQF credit points 10

SCQF Credit level 11

Normal Year Taken MSc

Also available in 5

Undergraduate or Postgraduate Undergraduate

#### Subject area and specialism classification

Artificial Intelligence;

Cognitive Science; Intelligent Robotics; Agents, Knowledge and Data; Machine Learning; Music Informatics; Neural Informatics; Natural Language Processing

Appropriate/important for degree programmes MSc Artificial Intelligence;

Timetabling 2nd semester

Summary course description

AI systems now outperform humans on tasks that were once taken to show great intelligence when undertaken by people (for example, playing chess). How far can this go in the future? What are the assumptions behind different approaches to AI? What dangers can there be from AI systems, and how should AI practitioners take these into account?

The course gives a quick overview of the background and of contemporary work in symbolic AI, and looks at the relationship between statistical and logical approaches to AI. It also addresses some of the philosophical and ethical issues that arise.

#### **Course description**

The topics covered will typically include:

- search strategies
- game playing
- reasoning processes
- – Logic Programming, Higher-Order Logic Programming
- – abduction, inductive logic programming
- probability and inference
- philosophical issues
- Explainable AI
- AI prospects and dangers

Pre-requisite courses None

Co-requisite courses None

Prohibited Combinations Informatics 2d

Other requirements Some background in logic is advisable.

Available to visiting students Yes

#### **Intended Learning Outcomes**

On completion of the course, students should be able to:

- 1. Demonstrate knowledge that covers and integrates the current main conceptual frameworks at use in AI;
- 2. Compare and contrast competing approaches towards the construction of AI artefacts;
- 3. Understand and make use of computational reasoning techniques to solve AI problems;
- 4. Clearly present and justify considered opinions on major debates in the field.

#### **Assessment Information**

One formative assessment involving programming; two short assessed courseworks, one involving programming and the other an essay.

#### Assessment weightings

Written exam:	75%
Practical Examination:	0
Coursework:	25%

Time spent on assessments 30 hours

#### Academic description

The course covers quickly some standard material from Russell and Norvig (search, search heuristics, game playing, logical agents, inference). It looks at developments in varieties of reasoning processes, taking versions of Logic Programming as the programming paradigm, including higher-order logic programming. It covers probabilistic aspects, and symbolic learning through Inductive LP. will be covered. Relationships between different approaches to AI involve the symbolic/sub-symbolic split at the representation level, and recent work on explainable AI. Recent reports on potential risks in AI deployment will be used to introduce debates on the place of AI in society.

#### **Syllabus**

- Search and search heuristics,
- Non-deterministic actions, partial observability
- Adversarial search, game playing
- Reasoning agents
- Logic and inference (first-order)
- Logic Programming
- Higher-order logic, HO Logic Programming
- Reasoning processes
- Relating probability and Logic
- Inductive Logic Programming
- Approaches to machine learning

- Explainable AI
- AI prospects and dangers
- Philosophical issues.

#### Relevant QAA Computing Curriculum Sections Artificial Intelligence

#### Graduate Attributes, Personal and Professional skills

- Apply critical analysis, evaluation and synthesis to issues that are informed by forefront developments in the subject/discipline/sector.
- Demonstrate and work with a critical understanding of the principal concepts and principles

#### **Reading List**

- Russell and Norvig: "Artificial Intelligence: a Modern Approach", 3rd edition, Prentice Hall, 2016
- "The Malicious Use of Artificial Intelligence: Forecasting, Prevention, and Mitigation", M. Brundage et al, 2018.

#### **Breakdown of Learning and Teaching Activities**

Lecture Hours:	18 hours
Seminar/Tutorial Hours:	0 hours
Supervise practical/Workshop/Studio hours:	8 hours
Summative assessment hours:	20 hours
Feedback/Feedforward hours:	2 hours
Programme Level Learning and Teaching Hours:	5 hours
Directed Learning and Independent Learning hours:	45 hours
Total hours:	98 hours

Keywords Artificial Intelligence; Reasoning;

## 3 Course materials

#### 3.1 Sample exam question

To follow.

#### 3.2 Sample coursework

To follow.

#### 3.3 Tutorial/lab sheet questions

Labs are intended to help with the issues that will arise in the formative and first (short) assessed coursework.

#### 3.4 Others

There is much on-line material assocaited with the topics taken from Russell and Norvig.

### 4 Course Management

#### 4.1 Course information and publicity

The course web page will provide information on the content of the course, and lecture plan, together with links to relevant material for lectures where appropriate. The course will be advertised as usual within Informatics and the MSc handbook.

#### 4.2 Feedback

Students will receive written feedback from the formative assessment, and feedback on the summitive assessment in the normal way. The lab sessions will allow more immediate feedback on ideas coming from the students.

The lecturers will be available at advertised office hours.

There will be a Piazza page to support day-to-day queries.

#### 4.3 Management of teaching delivery

Lectures will be prepared and delivered by the course lecturers. They will be responsible with the ITO for arranging lab support at the appropriate part of the course.

## 5 Comments

# 5.1 Year organiser comments

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# 5.2 BoS academic secretary

No comment.