Artificial Intelligence (CS F407)

Credits: 3
Lecturers: Ashwin Srinivasan (Room D-167) and Tirtharaj Dash (Room CC-107)
Office-Hours: By appointment (send an email to fix a time)
Teaching Assistants: TBA

Lecture and Lab Details

Day	Time	Location	What?
Mon	12-1+	DLT-7	Lecture
Wed	12-1+	DLT-7	Lecture
Fri	12-1+	DLT-7	Lect/Tutorial
?	*?*	*?*	*Labs*

Introduction

Pre-requisites (courses a student should have taken before this):

- Preferable: Data Structures and Algorithms

Post Condition (on student capability after successfully completing the course):

- At the end of the course, the student will be able to:
    1. Understand the basic concepts underlying classical Artificial Intelligence (AI) tasks, namely problem solving, search, representation, reasoning, decision making and learning;
    2. Able to understand use new AI tools (like LLMs) to address old AI problems.

Lectures and Labs

In the tabulation below, the number in brackets refers to the number of lectures for that topic. “GOFAI” stands for “Good Old Fashioned AI”; “NEWFAI” stands for “New Fashioned AI”,

<table>
<tr><th>Week</th><th>GOFAI</th><th>NEWFAI</th><th>Labs
(NewFAI meets GOFAI)</th></tr>
<tr><td>1</td><td>Introduction (1)</td><td>Foundation Models (2)</td><td rowspan="4">Using LLMs to generate code for solving:
Brute-force search
Heuristic search
Constraint satisfaction</td></tr>
<tr><td>2</td><td>Search Intelligence(2)</td><td>Prompt Engineering(1)</td></tr>
<tr><td>3</td><td colspan="2">Stuart Russell Reith Lectures Part I</td></tr>
<tr><td>3</td><td>Logical Intelligence (1)</td><td>Extending LLMs: Agents(1)</td></tr>
<tr><td>4</td><td>Logical Intelligence (1)</td><td>Extending LLMs-Agent s(2)</td><td>QA with LLM-Agents</td></tr>
<tr><td>5</td><td>Logical Intelligence(1))</td><td>Extending LLMs: Tools(2)</td><td></td></tr>
<tr><td>6</td><td colspan="2">Stuart Russell Reith Lectures Part II</td><td rowspan="4">Planning with LLM-tools</td></tr>
<tr><td>6</td><td>Probabilistic Intelligence(1)</td><td>Extending LLMs: RAG(1)</td></tr>
<tr><td>7</td><td>Probabilistic Intelligence(2)</td><td>Fine-tuning(1)</td></tr>
<tr><td>8</td><td colspan="2">Stuart Russell Reith Lectures Part III</td></tr>
<tr><td>8</td><td>Neural Intelligence(1)</td><td>Deep Learning (1)</td><td rowspan="5">Project</td></tr>
<tr><td>9</td><td>Reward-based Intelligence(2)</td><td>RLHF(1)</td></tr>
<tr><td>10</td><td colspan="2">Stuart Russell Reith Lectures Part IV</td></tr>
<tr><td>11</td><td colspan="2">Course Summary, Open Discussion</td></tr>
<tr><td>12</td><td colspan="2">Project Presentations</td></tr>
<tr><td>13</td><td colspan="2">Project Presentations</td></tr>
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Assessment

	Assessment Component	**Marks**
1	Mid-semester	30
2	Comprehensive	40
3	Project	20
4	Paper Reading	10

Note:

- The lab-work may be assessed by questions in the Final exam. This will be in the form of questions covering the topics covered in the laboratory. That is, there will not any lab assignments to submit, and you can work co-operatively in the labs. The purpose of the labs is to improve your AI skills.
- The audio lectures may be assessed by questions in the Mid-Sem and Final exams in the form of questions covering the points covered in the lectures.
- The paper-reading component will be assessed by questions on a classic paper. The paper will be given to you in Week 1. There will be questions on the paper as part of your Mid-Sem exam.
- Student projects will consist of short presentations on a topic or topics selected by us.
    - Projects can be done in groups (no more than 3). Project marks will be a weighterd average of a presentation mark and a performance mark. Presentation marks for a group will be awarded by all other groups (peer-marks) and by the lecturers. The final presentation mark for a group will be a weighted-average of the peer-marks and the lecturer-marks.

Bonus Marks Scheme

In addition to the above, there is a “bonus marks” scheme, that you can subscribe to, by reading a list of AI-related books. Bonus marks will be awarded based on whether you can convince the lecturers that you have indeed read the books. For this semester the books and their *maximum* bonus marks are shown in brackets:

- Non-fiction. Any or all of:
    a. Yuval Noah Harari, *Nexus*. (3 marks)
    b. Judea Pearl, *The Book of Why*. (3 marks)
    c. Arvind Narayanan and Sayash Kapoor, *AI Snake Oil*. (2 marks)
- Fiction. At most 2 of:
    a. Isaac Asimov, *Bicentennial Ma*n (1 mark)
    b. Arthur C Clarke, *2001: A Space Odyssey* (1 mark)
    c. Philip K. Dick, *Do Androids Dream of Electric Sheep* (1 mark)
    d. Peter Watts, *Blindsight* (1 mark)

Note: If the lecturers decide that you have not actually read the book but have relied on a summary from other sources (human or machine), you will be penalized the book's maximum mark. That is, you will get -X marks for a book worth at most X marks if you are deemed to have attempted this deception.

Text

- **S. Russell and P. Norvig**, *Artificial Intelligence: A Modern Approach*, Prentice-Hall, 4th ed. (2021)
    - The most comprehensive introductory text around for AI