

Introduction to Artificial Intelligence

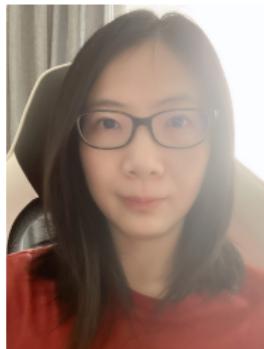
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Welcome!



Martha Lewis



Jin Zheng



Ayush Joshi

Welcome!

- Sophie Baker (Teaching Fellow)
- Gaby Miles (lead TA)
- Marcelli Wac
- Tayfun Karaderi
- Yifan Xing
- Vijay Chandiramani
- Keyao Song
- Oli Deane
- Amarpal Sahota
- Davide Turco
- Harry Emerson
- Otto Brookes
- Mauro Comi
- Hugo Alcaraz Herrera
- Grant Stevens
- Hendrik Eichhorn
- Tashi Namgyal
- Roussel D. Nzoyem Ngueguin

Welcome!

We will give a broad introduction to key concepts in Artificial Intelligence

- Supervised Learning
- Unsupervised Learning
- Knowledge Representation and Reasoning
- Agent-based Systems

Aims of this course

By the end of the course, you should be able to:

- 1 Explain basic concepts and assumptions underpinning key AI algorithms
- 2 Implement AI algorithms using a suitable programming language and toolboxes
- 3 Rigorously compare the performance of competing methods
- 4 Apply machine learning to analyse data
- 5 Model the behaviour of simple autonomous systems

What is AI?

- “*The exciting new effort to make computers think ... machines with minds, in the full and literal sense*” (Haugeland, 1985)
- “*The automation of activities that we associate with human thinking, activities such as decision-making, problem solving, learning ...*” (Bellman, 1978)
- “*The study of mental faculties through the use of computational models*” (Charniak and McDermott, 1985)
- “*The study of the computations that make it possible to perceive, reason, and act*” (Winston, 1992)
- “*The art of creating machines that perform functions that require intelligence when performed by people*” (Kurzweil, 1990)
- “*The study of how to make computers do things at which, at the moment, people are better*” (Rich and Knight, 1991)
- “*A field of study that seeks to explain and emulate intelligent behavior in terms of computational processes*” (Schalkoff, 1990)
- “*The branch of computer science that is concerned with the automation of intelligent behavior*” (Luger and Stubblefield, 1993)

The Goals of AI

Artificial Intelligence is the discipline concerned with the creation of intelligent behaviour in machines (typically computer systems, but not necessarily). By intelligent behaviour we mean the capability to achieve (complex) goals in (complex) environments, exploiting information gathered in the environment in order to perform the most appropriate actions, making informed decisions in order to achieve their goals. (Russell and Norvig)

This gives us four possible goals to pursue in artificial intelligence:

- Systems that think like humans.
- Systems that think rationally.
- Systems that act like humans.
- Systems that act rationally.

Historically, all four approaches have been followed. All have provided insights.

What can AI do for you?

Which do you think would be hardest for an AI to do today?

- Translating an article from Spanish to English.
- Transcribing a conversation at a party.
- Autonomous cars navigation.
- Playing chess.
- Proving theorems.
- Automatically replying to your email.

Web Page Ranking

A screenshot of a Google search results page. The search bar at the top contains the query "artificial intelligence". Below the search bar, there are several navigation links: "Web" (which is underlined in red), "Images", "Maps", "Shopping", "More", and a "Search tools" button. Underneath these links are dropdown menus for "Any country", "Any time", "Verbatim", and "Clear".

The Future of AI - intelligence.org
Ad www.intelligence.org/

MIRI does the research needed for beneficial artificial intelligence
Machine Intelligence Research Institute has 477 followers on Google+
Publications - Support

Artificial Intelligence - AI Will Change the World Soon

Ad www.foundational-research.org/AI/

Learn More About The Future Here!

Read our essays - About us - Donate - Get involved

Artificial intelligence - Wikipedia, the free encyclopedia

en.wikipedia.org/wiki/Artificial_Intelligence

Jump to The possibility/impossibility of **artificial general intelligence** - For details see

Philosophy of artificial intelligence: Lucas, Penrose and ...

Disambiguation - John McCarthy - List of artificial intelligence ... - AI winter

A.I. Artificial Intelligence - Wikipedia, the free encyclopedia

en.wikipedia.org/wiki/A.I._Artificial_Intelligence

A.I. Artificial Intelligence, also known as A.I., is a 2001 American science fiction film written, directed, and produced by Steven Spielberg, and based on Brian ...

A.I. Artificial Intelligence (2001) - IMDb

www.imdb.com/title/tt0212720/

★★★★★ ★ Rating: 7.1/10 - 207,781 votes

A.I. Artificial Intelligence - A highly advanced robotic boy longs to become "real" ...
Steven Spielberg and Haley Joel Osment in A.I. Artificial Intelligence (2001) ...

Association for the Advancement of Artificial Intelligence

www.aaai.org/

Founded in 1979, the Association for the Advancement of **Artificial Intelligence** (AAAI)
(formerly the American Association for Artificial Intelligence) is a nonprofit ...

Games



<https://www.youtube.com/watch?v=Q70ulPJW3Gk>

https://www.youtube.com/watch?v=hx_bgoTF7bs

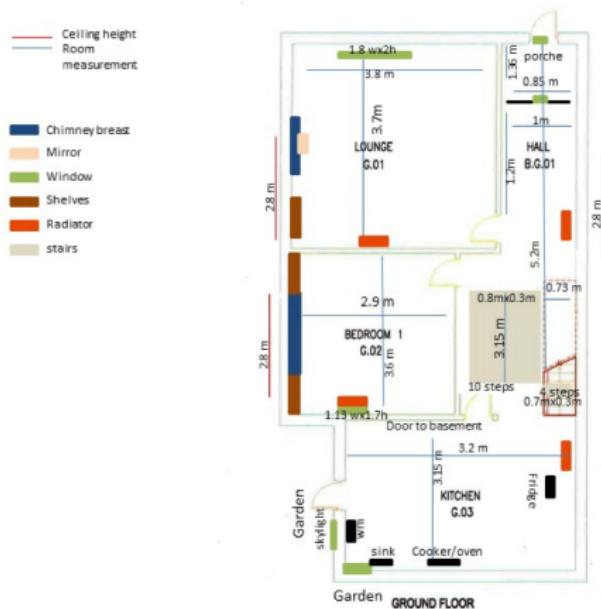
Autonomous Cars



[https://techcrunch.com/2017/10/30/
toyota-will-test-autonomous-cars-at-californias-gomentum-station/](https://techcrunch.com/2017/10/30/toyota-will-test-autonomous-cars-at-californias-gomentum-station/) ↗

Smart Homes and Healthcare

SPHERE-134-AD

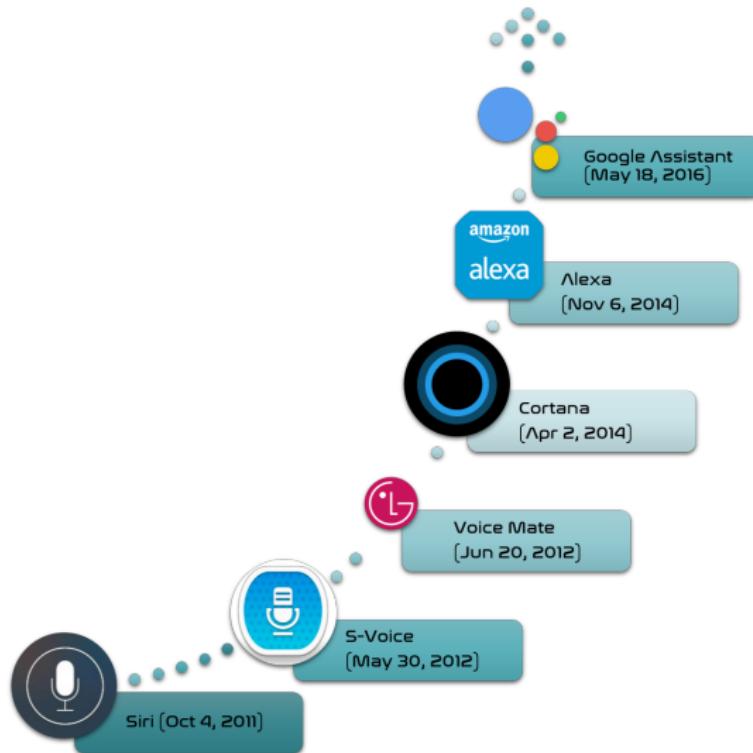


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<http://www.irc-sphere.ac.uk>

<https://www.youtube.com/watch?v=juXcqKj4dcA>

Virtual Assistants



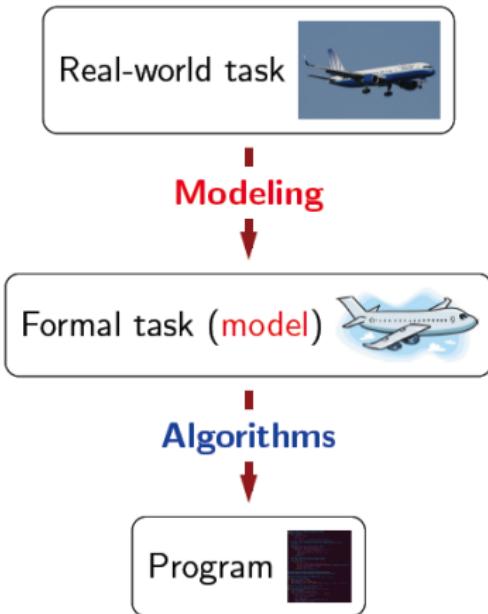
Robotics



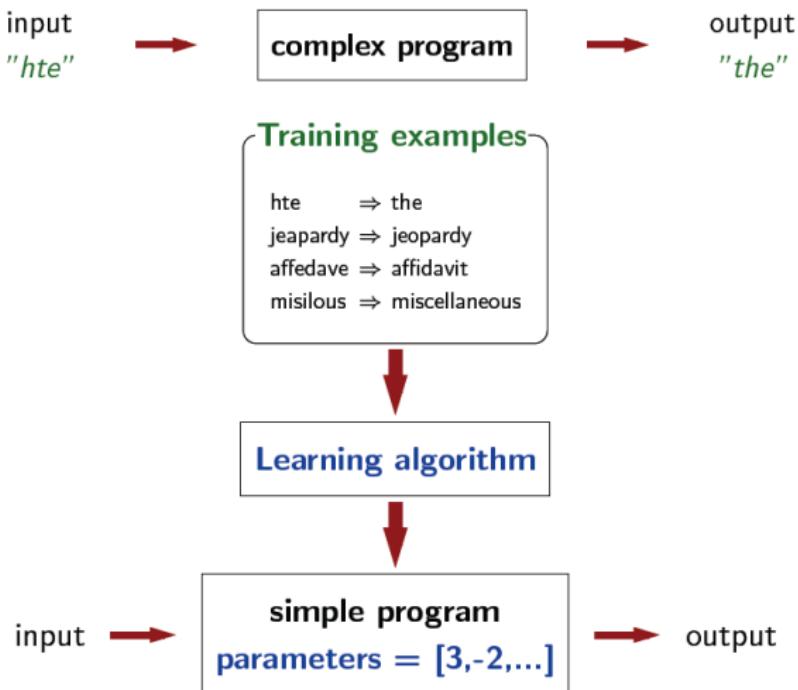
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<https://www.youtube.com/watch?v=g0TaYhjp0fo>

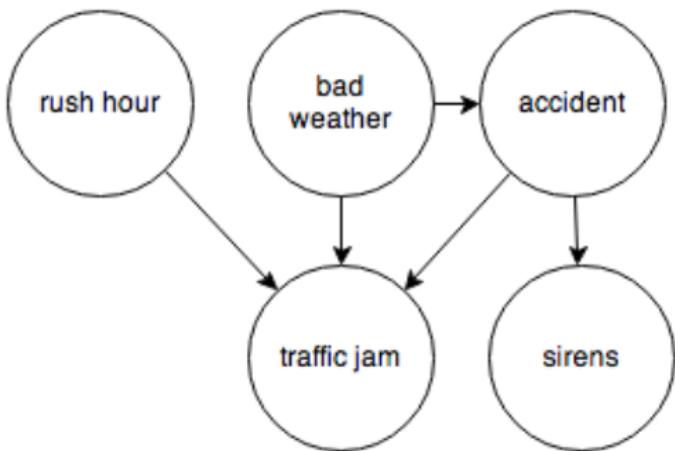
How Do We Tackle These Tasks?



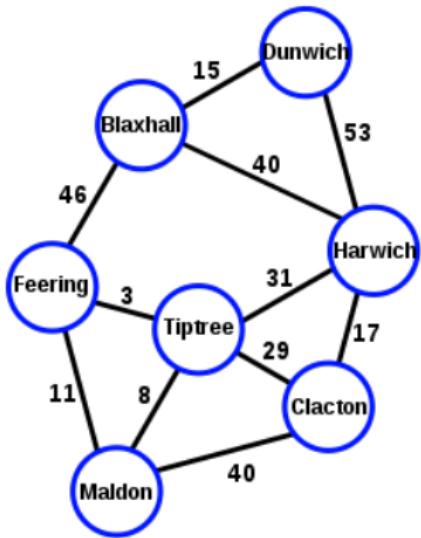
Machine Learning



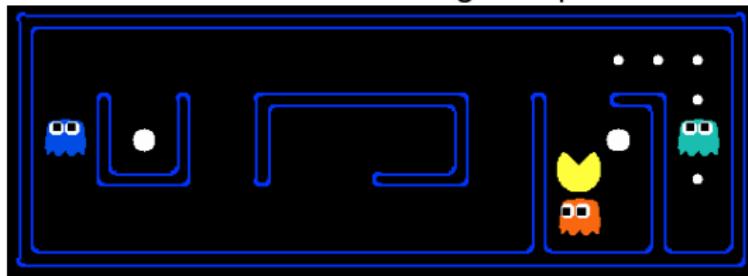
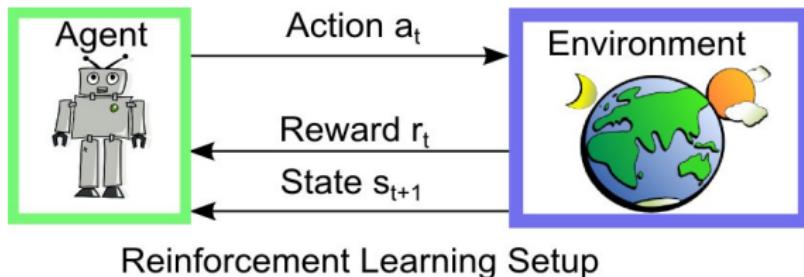
Bayesian Networks



Search



Markov Decision Process



Syllabus

- Week 13: Unit overview (this lecture!), Introduction to Machine Learning: *supervised and unsupervised learning, classification and regression, performance and generalisation.*
- Week 14: Supervised Learning: *k-nearest neighbour, linear regression and naive Bayes.*
- Week 15: Unsupervised Learning: *k-means, hierarchical clustering, competitive clustering, Gaussian clustering*
- Week 16: Neural Networks: *Simple single layer networks, gradient descent, limitations, multiple layer network, back-propagation*
- Week 17: Decision Trees: *Purity based learning, pruning*
- Week 18: Reading Week

Syllabus

- Week 19: Ethics in AI: *bias in datasets, explainability, accountability*
- Week 20: Search Methods: *search trees, heuristic search, A**
- Week 21: Knowledge Representation and Reasoning: *Bayesian networks, knowledge graphs*
- Week 22: Agent-based Systems: *MDP, reinforcement learning*
- Easter Break
- Week 23: Evolutionary algorithms
- Week 24: Catch up/revision

Course and Contact Details

- Dr Martha Lewis (martha.lewis@bristol.ac.uk), Dr Jin Zheng (jin.zheng@bristol.ac.uk), Dr Ayush Joshi (ayush.joshi@bristol.ac.uk)
- Course material: Lecture slides and worksheets (Python).
- The course material aims to be self contained but if you want another perspective the recommended text is: Russell and Norvig, Artificial Intelligence: A Modern Approach. You do not need to buy the book!
 - You can get access to an electronic version of the book under Resource Lists on Blackboard
- Lectures: around 1 hour pre-recorded and 1 hour live.
- Problem classes (2 hours per week)
- Assessment: 50% coursework and 50% online exam

Next video

Introduction to Machine Learning

- Supervised and unsupervised learning
- Classification and regression
- Performance and generalization