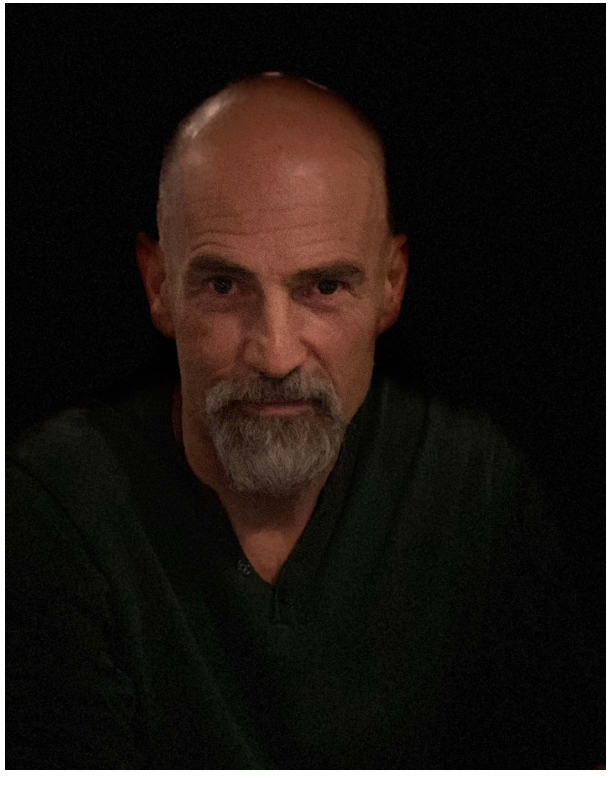
Artificial Intelligence I

Introduction by Jim Smith,

- Professor in Interactive AI
- Module Leader for AI 1
- Led design of the AI pathway



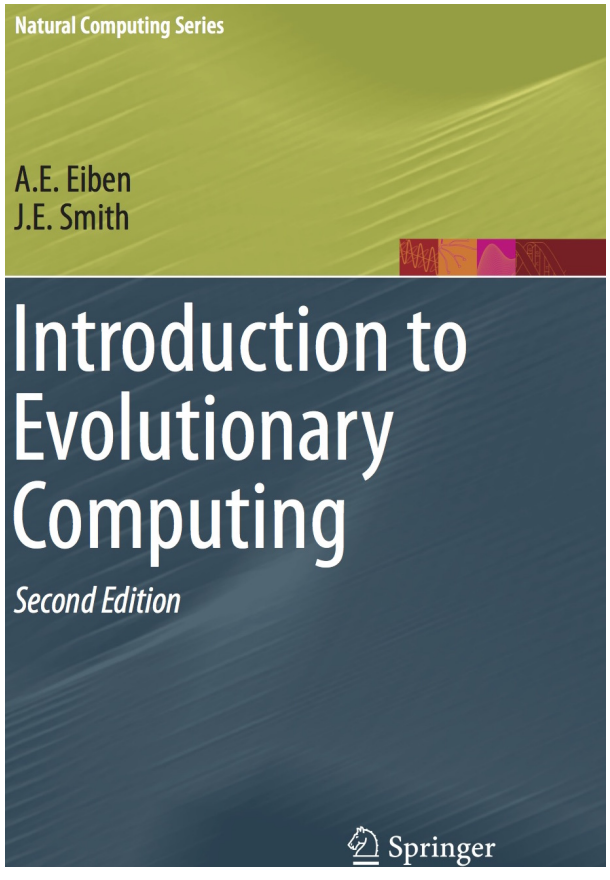
Jim

A bit about me

- 1st degree Cambridge
- 6 years away from academia
- MSc. then PhD at UWE
- 20 years researching & teaching AI

Current research interests:

- Systems that learn how to learn
- Human-AI collaboration



Cover of Jim's textbook.

My colleagues on this module:

Dr Chris Simons

- Two decades as software engineer
- PhD using EAs to automate software design
- research focussed on "human-in-the-loop" AI systems

Nathan Duran

- BSc Computer Science UWE, 2017
- Final Year Project with me: crowd-sourced AI for detecting exo-planets
- Graduate Tutor studying PhD in AI for conversational analysis

Learning Outcomes

1. Apply the basic concepts, uses and processes of AI to new tasks, identifying: the type of problem; what technologies or algorithms would be appropriate to apply; and suitable representations for candidate solutions. (Assessed in Component A)
2. Recognise the differences between “Knowledge-based” paradigms of AI (inspired by the mind) and “Computational Intelligence” (e.g. inspired by the brain), and select appropriate paradigms according to the needs of a specific problem or application. (Assessed in Component A)
3. Identify potential legal and ethical issues - such as privacy and unintentional bias- associated with the deployment of AI-based systems, and suggest actions to mitigate undesirable effects. (Assessed in Component A)
4. Design and implement basic optimisation, expert system and machine learning systems. (Assessed in Component B)

Assessment

1. Exam 50% Online Exam (2 hours),24 hour window

2. Individual Coursework composed of two deliverables, submitted to an online system (DEWIS) for automatic marking and provision of feedback.

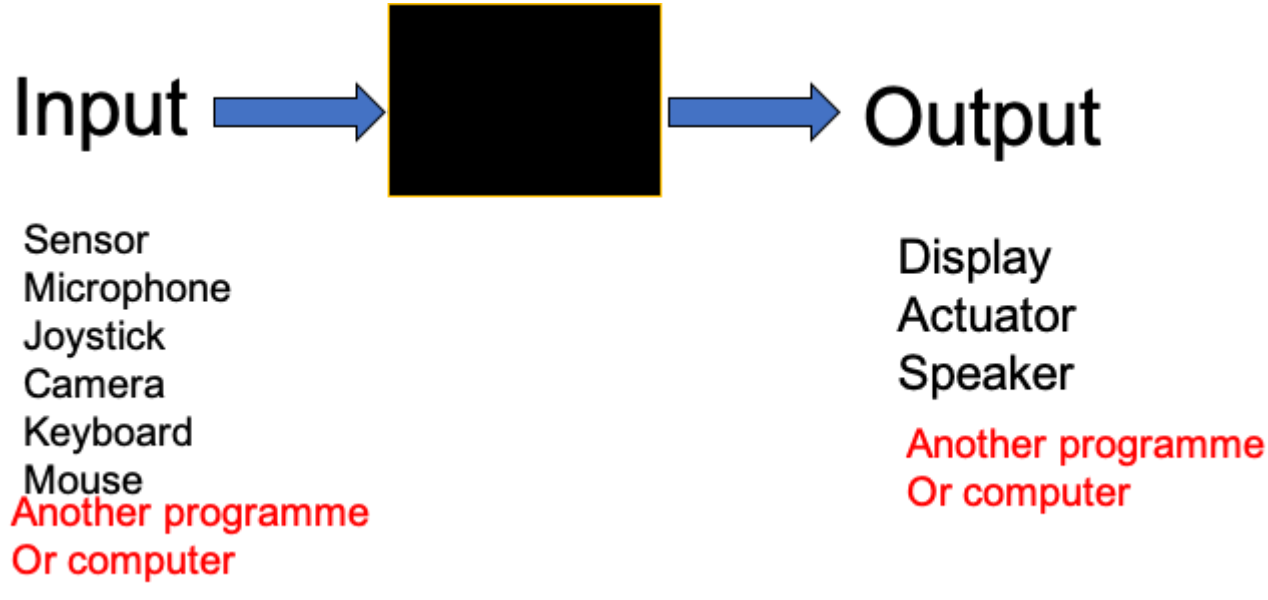
    - Submission 1 – solution to a series of knowledge representation problems
    - Submission 2 – search-based solution to a problem in either machine learning or optimisation.

What we'll be covering

Week1:

- Three basic types of problem
- Symbolic vs. Computational AI

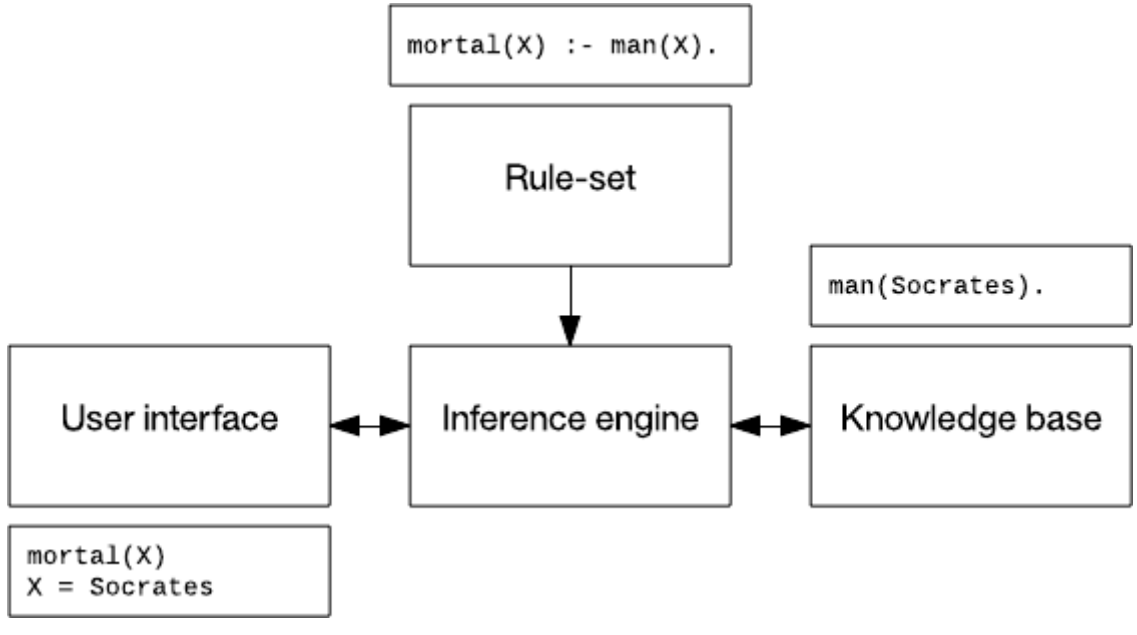
Practical: your first jupyter notebook



Topic 1: Representing Knowledge (weeks 2-4)

- How to represent, store, and manipulate/use human knowledge
- types of knowledge and reasoning
- components of knowledge-based systems
- Illustrated using the chatbot authoring language AIML

Practicals: creating your own chatbots



https://developer.ibm.com/articles/cc-beginner-guide-machine-learning-ai-cognitive/

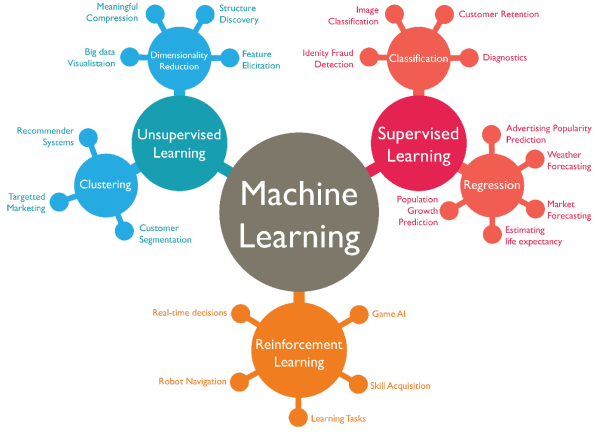
Topic 2: Machine Learning (weeks 5-8)

- Types of Machine Learning
- Ethical and legal issues
- Supervised Machine Learning
    - train-test workflow
    - Common ML models
    - Artificial Neural Networks

Practicals:

Creating interactive visualisations.

Learning and comparing predictive models using different algorithms



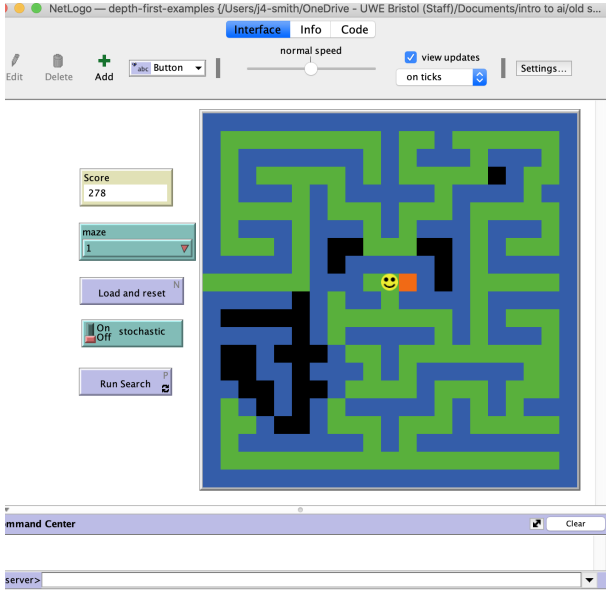
example applications for types of machine learning.

https://www.normshield.com/machine-learning-in-cyber-security-domain-2-cyber-security-rating-and-incident-forecasting/

Topic 3: Search (weeks 9-11)

- Problem solving as search
- Common framework,
- Recognising properties of algorithms and problems
- constructing a solution vs changing one
- uninformed search for decision problems
- Informed search with cost functions

Practicals: Designing and creating route-planning systems



pacman searching for gold.

How this fits in with the rest of the degree

Overall ethos: giving you the skills to undertake AI based projects

- **Artificial Intelligence 1**: fluency in the basic ideas and tools of AI.
- **Artificial Intelligence 2**: More computational AI e.g. Evolutionary Algorithms, Deep Learning, Reinforcement Learning
- **Machine Learning**: what it says ...
- **Security, Data Analytics & Visualisation** : exploring data, linking to ML algorithms to interactive visualisations
- **Autonomous Agents and Multi-Agent Systems**: designing complex deliberate agents to work together
- **Advanced Artificial Intelligence**: latest advances, dealing with complex problems

How we will teach this course: 1 Sessions

Basic timetable is 1 hour lecture + 2 hour tutorials

- I've been working with students to slowly migrate away formal 'traditional' lectures over the last 5-10 years
- in favour of interactive online materials + more student-led sessions with me

Whether or not the tutorials happen online or in labs depends on the Covid situation

Acquisition

- Lectures replaced by videos recorded in 15-20 minute chunks
- Watch them via 'panopto' so you can take notes and see the interactive questions
- Activities between each chunk, and self-assessment test with your answers submitted via Blackboard so we can provide feedback on how you're progressing.
- Extra reading or watching activities to do in your own time

There'll be a **timetabled slot** when I will be available online for group or 1:1 chat/help on the 'lecture' material.

Learning through others:

- Team-based 'quizzes' at the start of each tutorial
- working alongside small groups to solve 'how-do-I?'

Learning through practice

- Using real tools to solve AI problems, and learning python/ jupyter notebooks: the industry standard for AI/ Data Science
- Every week there will be suggestions for extra practical activities to 'stretch' your learning

Online submission system: Automatically marks your work and provides feedback
Available 24/7, and you get several attempts at the coursework

How we will teach this course 2: Tools

Blackboard:

- to host all materials,
- provide self assessment tests so you and we can keep track of how you're getting on
- links to interactive panopto videos

Course will be taught in python

- 'language of choice' for ML
- good open-source libraries
- you will learn Python in 'Principles of Programming

All the lectures and tutorials will use Jupyter Notebooks

- we'll help you install it
- or you can run in the cloud (Microsoft Azure or Google Collab,

In [3]:
```
print ('how do you know this is live?')
```

```
how do you know this is live?
```

Can't wait? Here's some things you could do in the meanwhile ...

1. Reading List : https://uwe.rl.talis.com/lists/3E2EB393-DBA8-2DB6-2F00-BCA5939FED2D.html (https://uwe.rl.talis.com/lists/3E2EB393-DBA8-2DB6-2F00-BCA5939FED2D.html)

2. Get ready to use Jupyter Notebooks:

    - activities in "Learning Materials -> Jupyter"

3. Think about what AI you are already using

    - then share your findings.
    - See "Learning Materials" -> "Teaching Block 0: Introduction to Module"

In [ ]: