An Introduction To Artificial Intelligence

It's not all just robots!

A Few Questions

- What do you think Artificial Intelligence is?
- What is it used for?
- Which AI systems have you used recently?

Alan Turing

(23 June 1912 – 7 June 1954)



Alonzo Church

(June 14, 1903 – August 11, 1995)



Church Turing Thesis

- In 1931, Kurt Gödel's first incompleteness theorem proved that some true functions on integers cannot be computed.
- The Church-Turing Thesis characterises exactly which functions can be computed.
- It also states that a Turing machine is capable of computing any computable function.

Which Functions Are Not Computable?

 Halting Problem - "Will this program finish running, or run forever?"

Proved by Alan Turing.

 Decision Problem - "Is this statement provable, given true premises (axioms), using rules of logic?"

Proved by Alonzo Church.

Turing Machines

- An abstract idea, not a real physical machine.
- Works with infinite storage, such as a infinite tape of binary digits.
- A 'head' looks at a cell on the tape, it can both read and write, and move left or right.
- The turing machine has defined states, which tell the head what to do with the cell it is looking at.

<what's a turing machine>



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

How It Works

- 1/0,L If 1, change to 0 and move left
- 0/1,R If 0, change to 1 and move right
- $0/0, \cdot$ If 0, keep as 0 and don't move



Turing Test

- In his 1950, Alan Turing published a paper to Mind journal titled 'Computing Machinery and Intelligence'.
- He discussed the idea of computers being able to think.
- Most importantly, he proposed a test in which somebody (or multiple people) have a conversation with either a person or a machine without knowing which.
- If there is a high success rate of thinking the machine is a person, then the test is passed.

So, What Is Artificial Intelligence?

"The theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages."

Oxford Dictionary

Some Categories of AI

- Natural Computation
- Computer Vision
- Natural Language
- Machine Learning
- Simulation
- Data Mining

These are not official categories, because AI is such a loose term.





Neural Networks



Chess

- It is unlikely that Chess will ever be solved, so you cannot know the correct move to make. Checkers was solved in 2007 and has far less moves.
- On 11/5/1997, Deep Blue (invented by IBM) beat the then World Champion Garry Kasparov.
- Deep Blue was able to compute 200 million positions per second.

Heuristics

"Proceeding to a solution by trial and error or by rules that are only loosely defined"

Oxford Dictionary

• Heuristics are at the heart of Artificial Intelligence.

- An algorithm follows a set of rules.
- A heuristic can be used to extend an algorithm by making an educated guess instead of following predefined rules.

University Essays

"An essay on the biomedical applications of evolutionary algorithms for image segmentation on MRI scans of the brain"



University Projects



Okay, There Are Some Robots



References

- <u>http://en.wikipedia.org/wiki/File:Alan_Turing_photo.jpg</u>
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