



COMP250: Artificial Intelligence **1: Introduction to AI**

Proposal

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 - ▶ What is the high concept of your computing artefact?

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 - ▶ Why is this artefact needed?

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 - ▶ How will you address the architect and research requirement?

What is AI?



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- ✓ Performing tasks by machine (or by software) which would ordinarily require human intelligence
- ✓ Making decisions to achieve goals

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- ✓ Machine learning is an important sub-field of AI, but there are many other AI techniques

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- ✓ Programming machines to carry out (or learn to carry out) a specific type of task

Computers vs brains

Discuss:

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- ▶ For what kinds of tasks are digital computers “better” than human brains?

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- ▶ For what kinds of tasks are both “good”, but approach the task in different ways?

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Discuss: are these examples of AI?

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- ▶ Robot

AI in games



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Why game AI?

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- ▶ Games are a useful testbed for new AI technologies

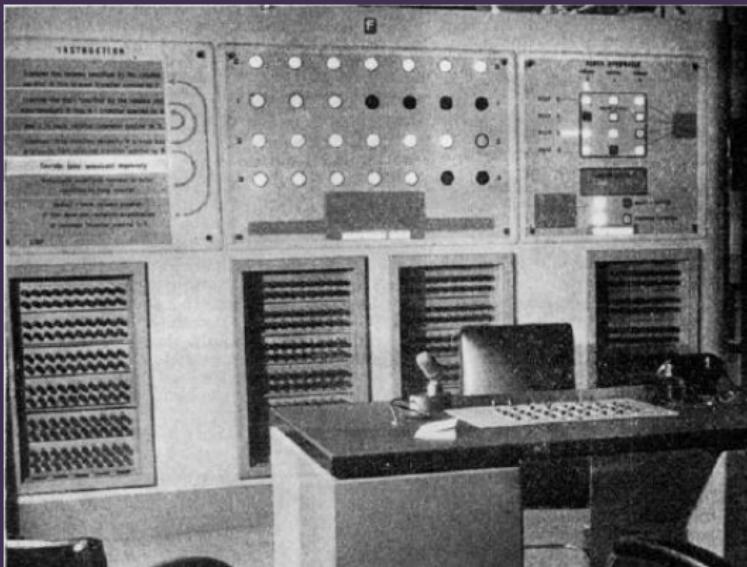
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- ▶ Games are a useful testbed for new AI technologies
- ▶ Game theory is a useful mathematical abstraction for many types of problem
- ▶ Game AI is more than pure problem solving — game AI needs to create an entertaining experience

Nimrod (Ferranti, 1951)



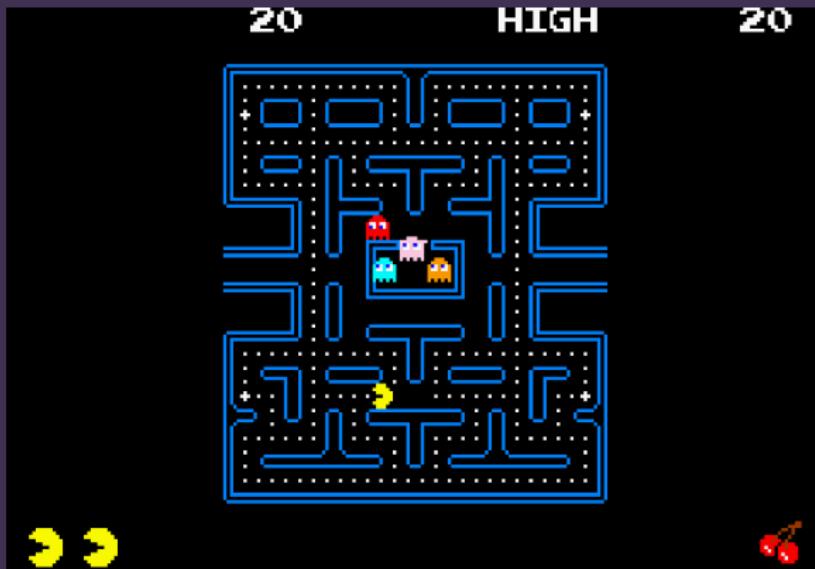
Samuel's Checkers program (IBM, 1962)



Galaxian (Namco, 1979)



Pac-Man (Namco, 1980)



Deep Blue (IBM, 1997)



Half-Life (Valve, 1998)



The Sims (Maxis, 2000)



Black & White (Lionhead, 2001)



Halo 2 (Bungie, 2004)



F.E.A.R. (Monolith Productions, 2005)



Façade (Mateas & Stern, 2005)



Chinook (Schaeffer et al, 2007)



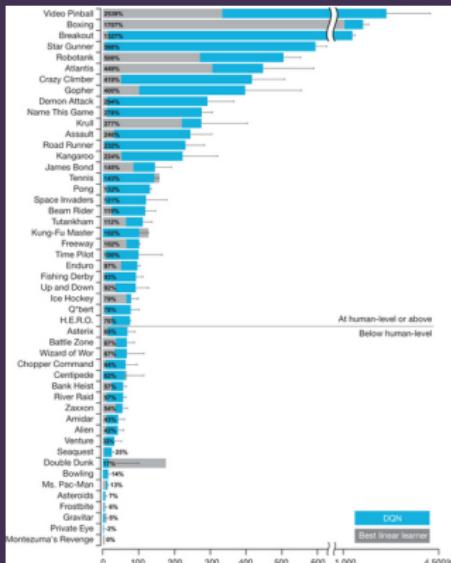
Left 4 Dead (Valve, 2008)



Watson (IBM, 2011)



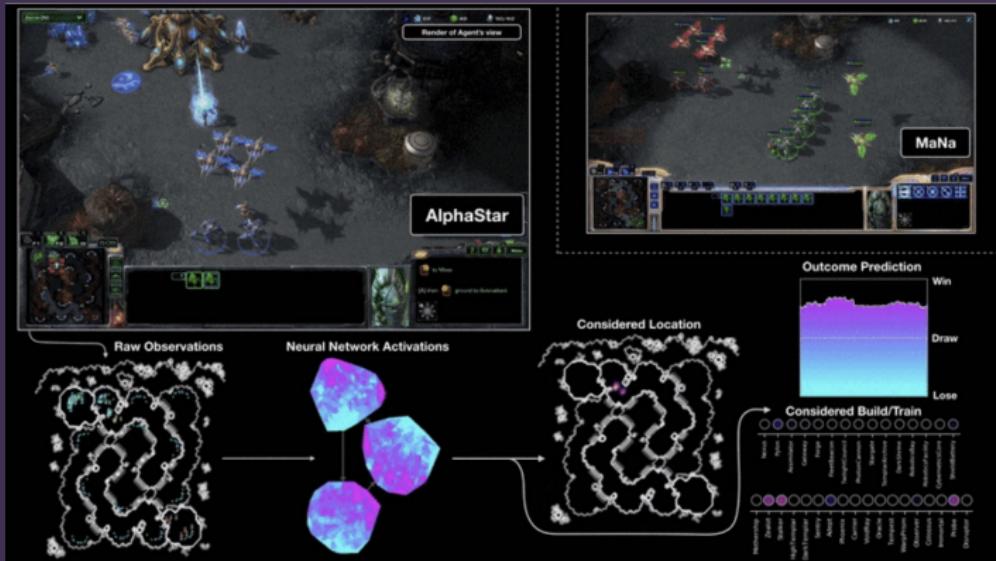
Deep learning for Atari games (DeepMind, 2013)



AlphaGo (Google DeepMind, 2016)



AlphaStar (Google DeepMind, 2019)



AI architectures



Rule-based AI

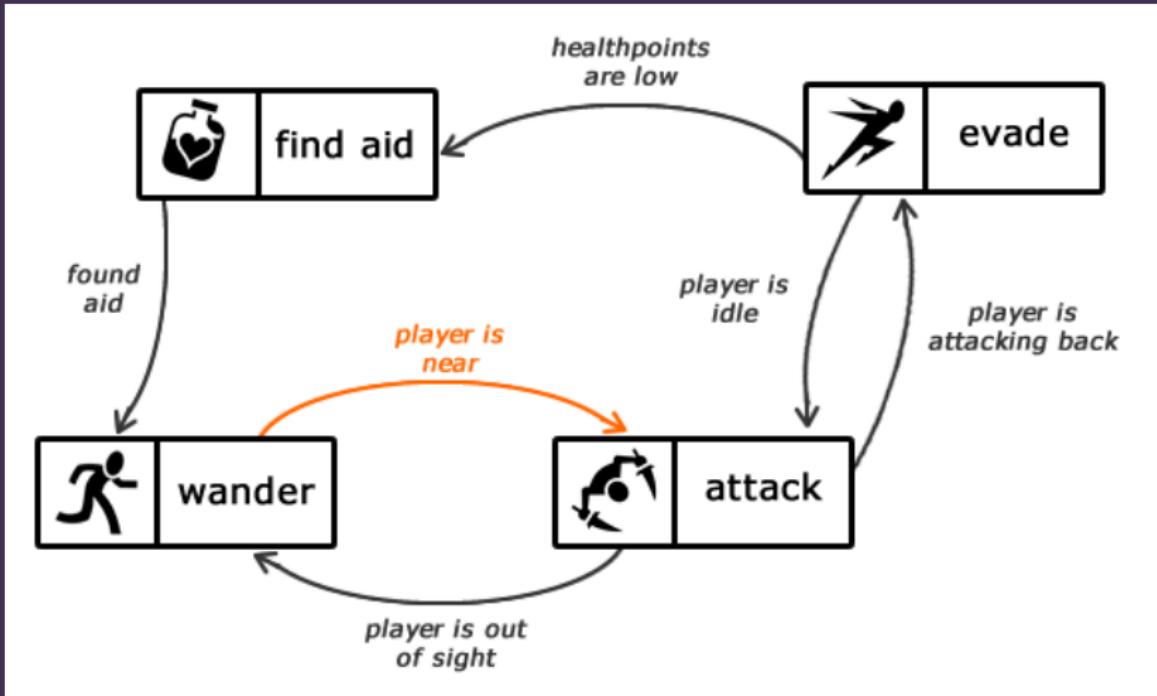
Rule-based AI

- Generally implemented as `if` statements or event-based triggers

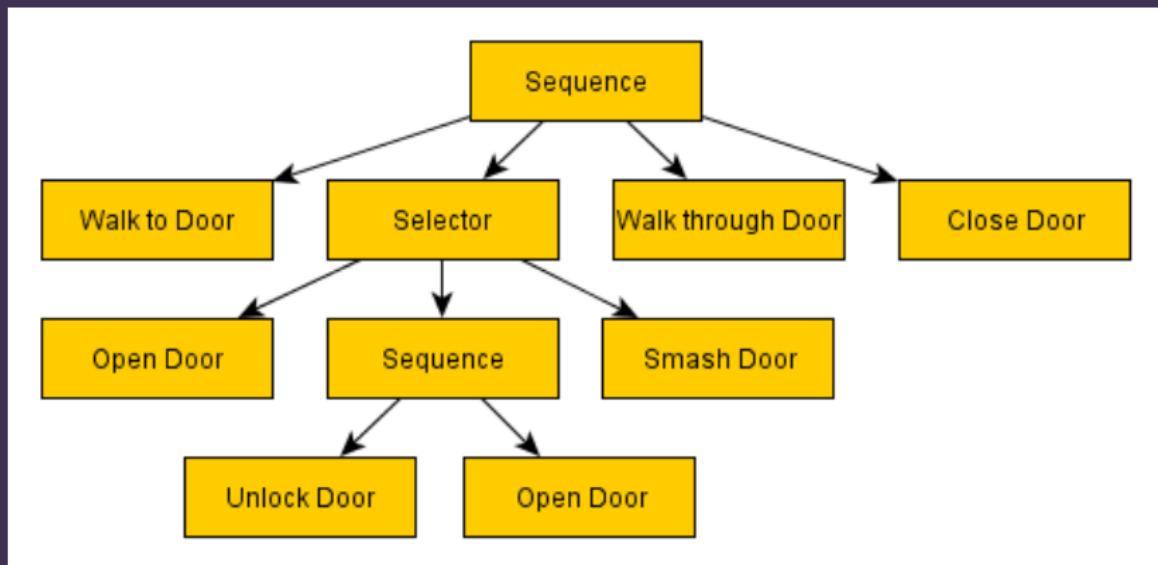
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- ▶ Triggers can be complicated e.g. based on raycasts

Finite state machines



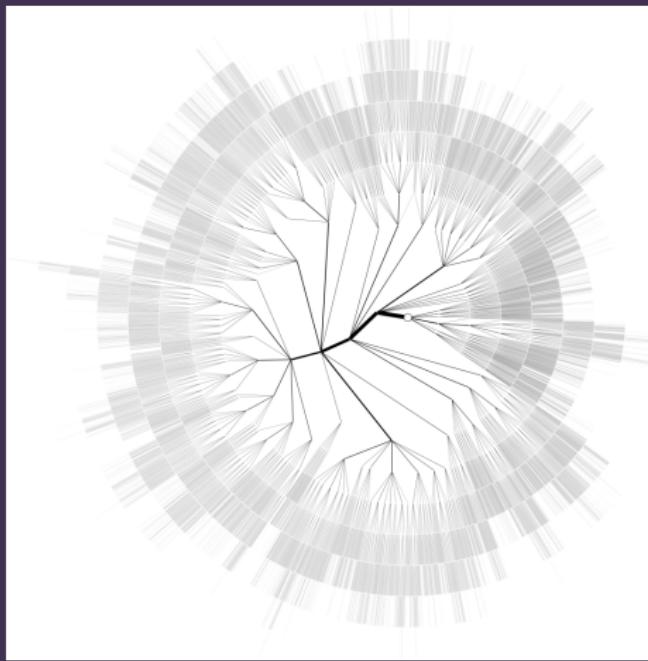
Behaviour trees



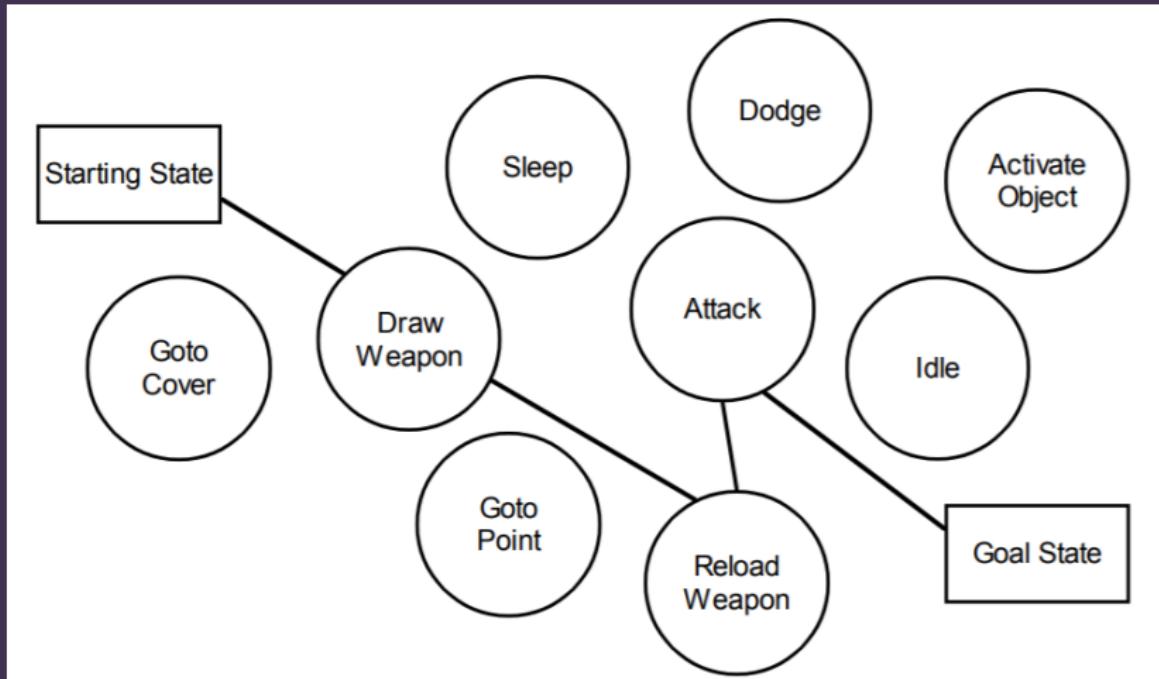
Multi-agent approaches (e.g. flocking)



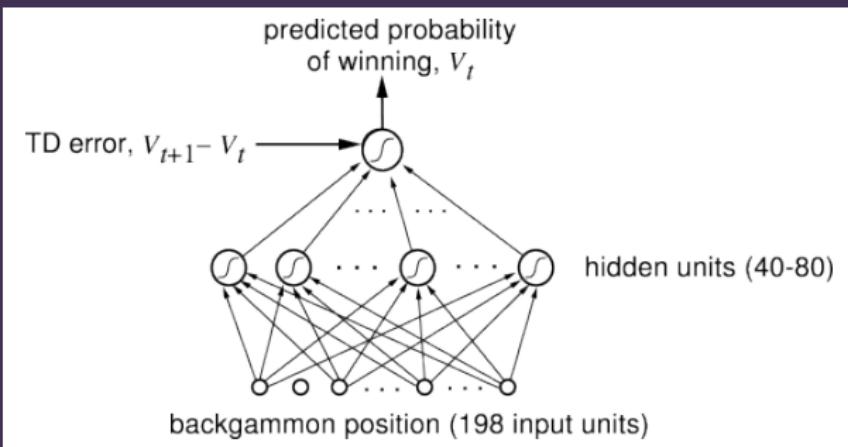
Game tree search



Planning



Machine learning



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- ▶ Predictability and authorial control versus adaptability and novelty

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- ▶ Predictability and authorial control versus adaptability and novelty
- ▶ Can also combine the two, e.g. use a rule-based system to constrain a CI system

Workshop

- ▶ Begin (or continue) preparing your **proposal**
- ▶ Discuss and brainstorm your ideas with your peers
- ▶ Ask me for feedback or suggestions!