



COMP702: Classical Artificial Intelligence  
**1: What Is AI?**



# What is “Classical” AI?



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- ✓ Making decisions to achieve goals

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- ✗ Programming machines to learn by themselves
- ✓ Machine learning is an important sub-field of AI, but there are many other AI techniques

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- ✓ Maybe one day, but for now this is pure sci-fi
- ✓ Programming machines to carry out (or learn to carry out) a specific type of task

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- ▶ A.k.a. **Symbolic AI**
- ▶ Based on symbolic (“human-readable”) representations of problems, logical systems, search spaces
- ▶ As opposed to machine learning, evolutionary algorithms etc which tend to be “black boxes”

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- ▶ 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

# AI architectures



# Rule-based AI

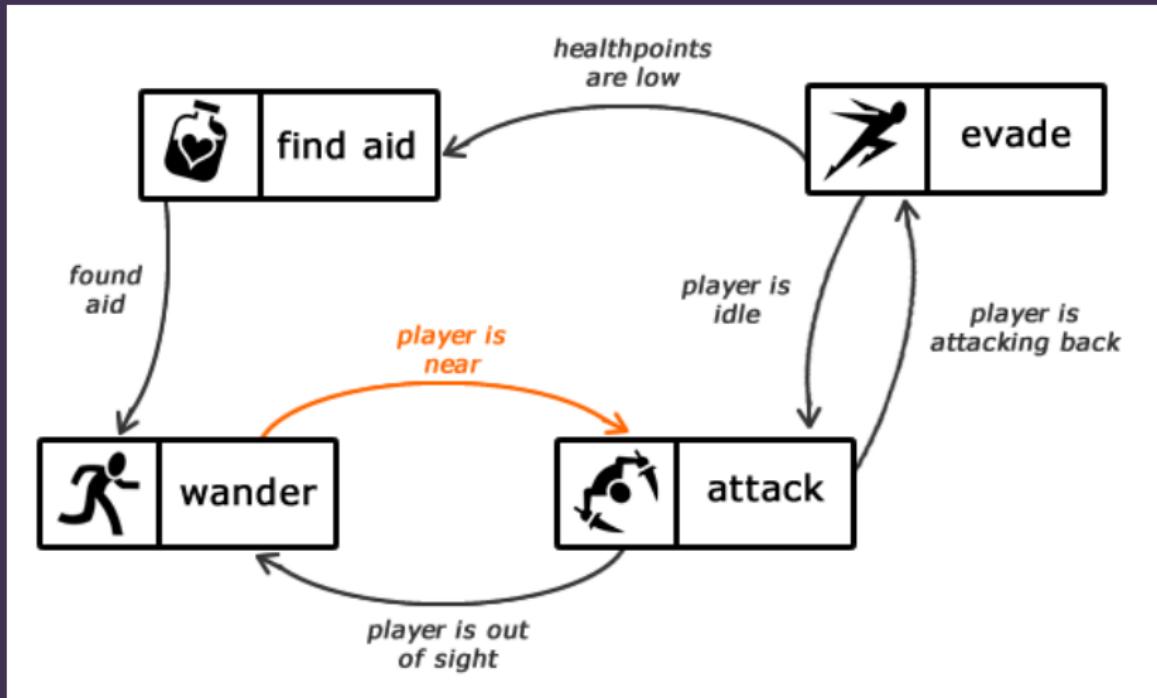
# Rule-based AI

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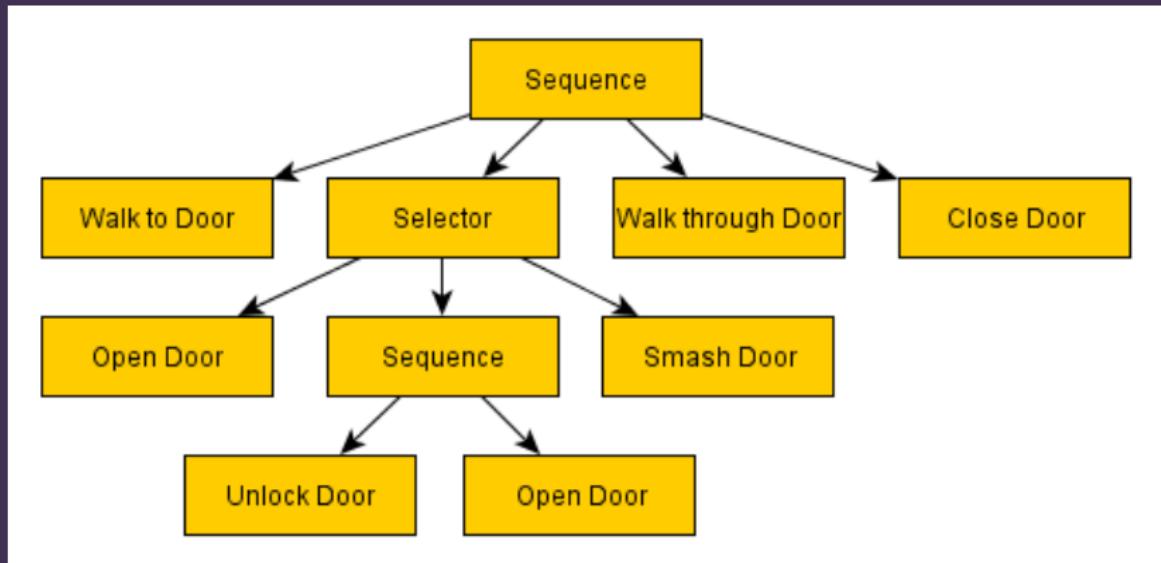
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- ▶ Triggers can be complicated e.g. based on raycasts

# Finite state machines



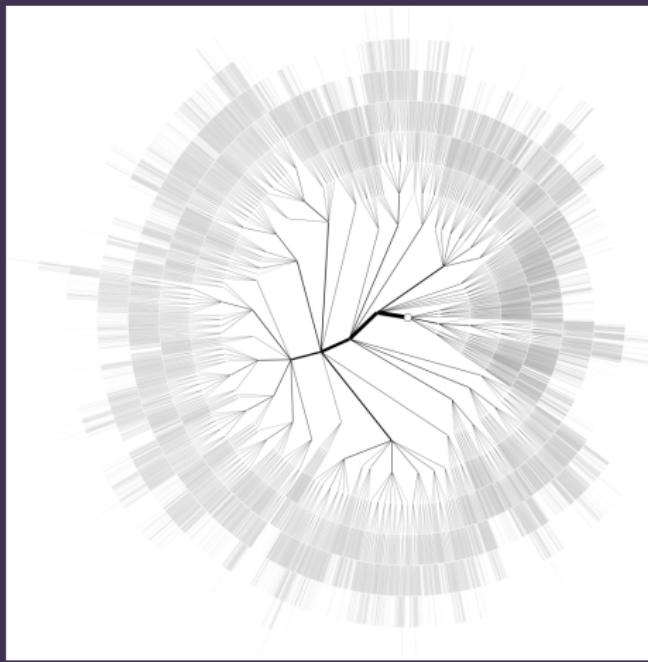
# Behaviour trees



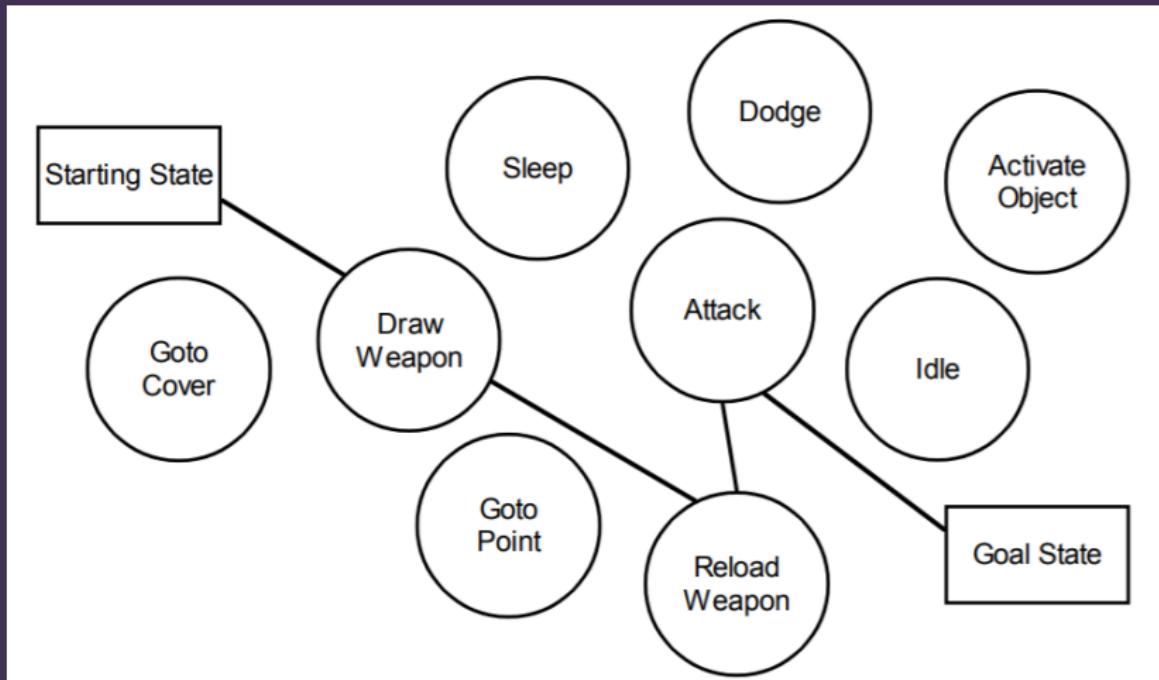
# Multi-agent approaches (e.g. flocking)



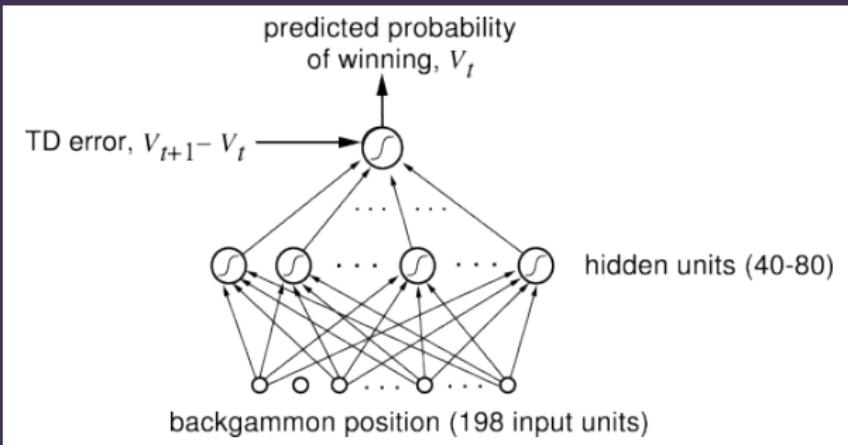
# Game tree search



# Planning



# Machine learning



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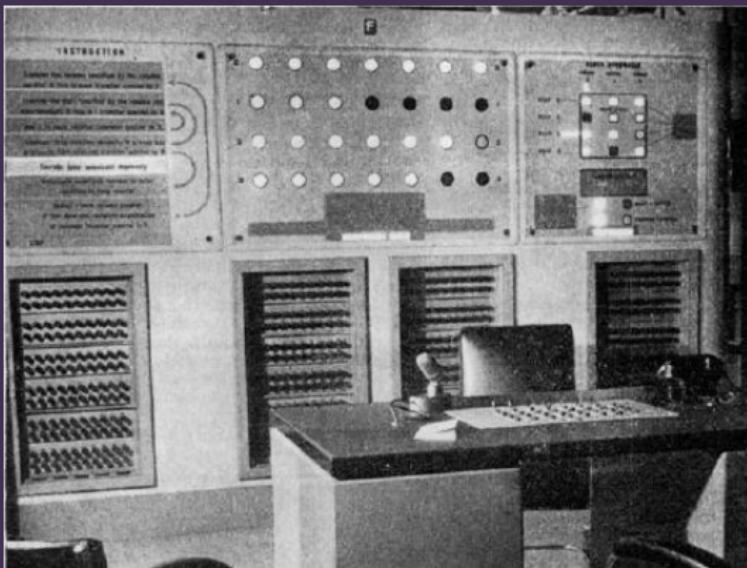
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- ▶ Predictability and authorial control versus adaptability and novelty
- ▶ Can also combine the two, e.g. use a rule-based system to constrain a CI system

# A brief history of game AI



# Nimrod (Ferranti, 1951)



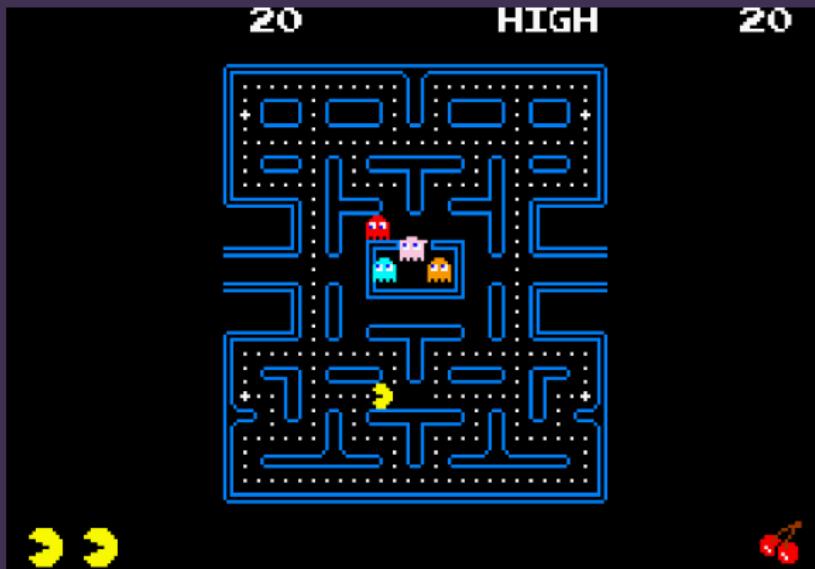
# Samuel's Checkers program (IBM, 1962)



# Galaxian (Namco, 1979)



# Pac-Man (Namco, 1980)



# Deep Blue (IBM, 1997)



# Half-Life (Valve, 1998)



# The Sims (Maxis, 2000)



# Black & White (Lionhead, 2001)



# Façade (Mateas & Stern, 2005)



# Chinook (Schaeffer et al, 2007)



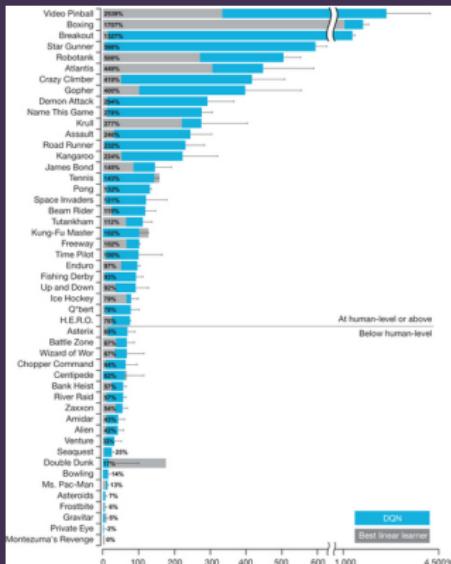
# Left 4 Dead (Valve, 2008)



# Watson (IBM, 2011)



# Deep learning for Atari games (DeepMind, 2013)



# AlphaGo (Google DeepMind, 2016)

