



COMP250: Artificial Intelligence

# 1: Module Induction

# **Module Introduction**

# Aim

To research and apply creative computing to the domain of artificial intelligence for games.

# Description

On this module, you learn how to apply artificial intelligence in the context of games. You will gain in understanding and experience of the technical dimension of artificial intelligence and you could leverage it in the particular expressive context within game development. You will apply your learning in a practical context where you will design artificially intelligent agents for a game in a live brief format, taking as your cue the game's concept.

# Learning Outcomes

- ▶ **2: Architect.** Integrate appropriate data structures and interoperating components into software, with reference to their merits and flaws.
- ▶ **5: Research.** Develop an argument on a topic using appropriate research methods, primary and secondary sources, and academic conventions.

# Roadmap

- ▶ Weekly **lectures** with me
- ▶ Weekly **portfolio development workshops** with Kate Bergel (joint with COMP210, COMP220, COMP260)
- ▶ Fortnightly **supervisions** (project check-ins) with me
- ▶ Timetable towards end of study block is currently undergoing changes — as always, check MyTimetable regularly for updates
- ▶ Check MyFalmouth for assignment deadlines

# **Assignments**

# COMP250 assignments

- ▶ **Two** assignments based on **one** portfolio project
- ▶ Assignment 1: Computing Artefact (50%)
- ▶ Assignment 2: Technical Report (50%)
- ▶ These assignments assess the **architect** and **research** learning outcomes



# The component task

- ▶ You will design and implement an **AI component**
- ▶ Could be part of your GAM240 game, or a standalone demo project or tool
- ▶ Must demonstrate an appropriately advanced AI technique
- ▶ You are expected to do research beyond the topics covered in class

# Deliverables

- ▶ Assignment 1: a 5-minute video demonstrating your component and describing its architecture
- ▶ Assignment 2: a poster **and** a web page describing the architecture of the component, with appropriate references to research sources

# Proposal

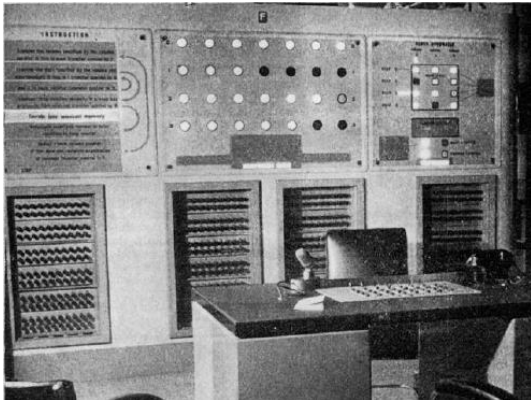
- ▶ For next week!
- ▶ Prepare a 1-2 page proposal document covering the following:
  - ▶ What is the high concept of your computing artefact?
  - ▶ What functionality will your component include?
  - ▶ How does your component fit into your chosen specialism?
  - ▶ Why is this artefact needed?
  - ▶ What are the key requirements?
  - ▶ Is the scope appropriate for the product development time-frame?
  - ▶ How will you address the architect and research requirement?

**AI in games**

# What is AI?

- ▶ Recall COMP280 session 7
- ▶ Performing tasks by machine (or by software) which would ordinarily require human intelligence
- ▶ Making decisions to achieve goals
- ▶ In games, AI systems break down roughly into two categories:
  - ▶ Authored behaviours: AI follows (often sophisticated) rules set out by a designer
  - ▶ Computational intelligence: AI behaviour emerges from an algorithmic system

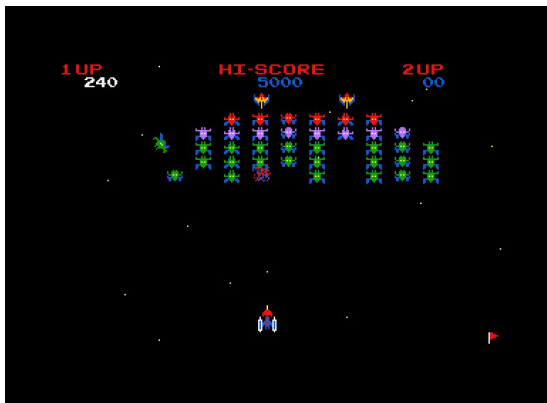
# Nimrod (Ferranti, 1951)



# Samuel's Checkers program (IBM, 1962)

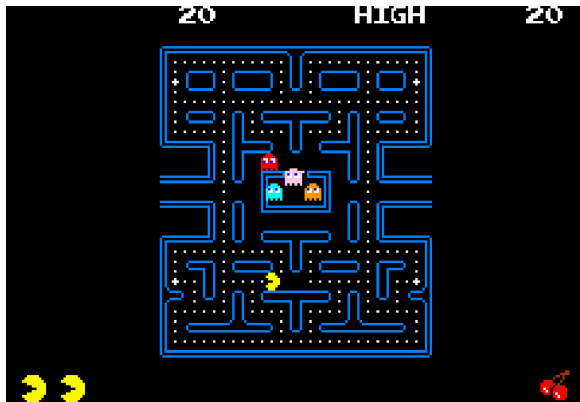


# Galaxian (Namco, 1979)





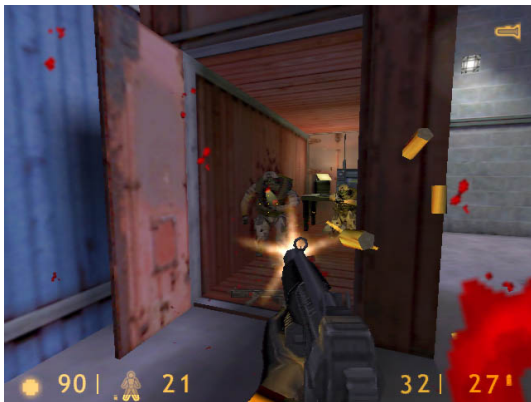
# Pac-Man (Namco, 1980)



# 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)

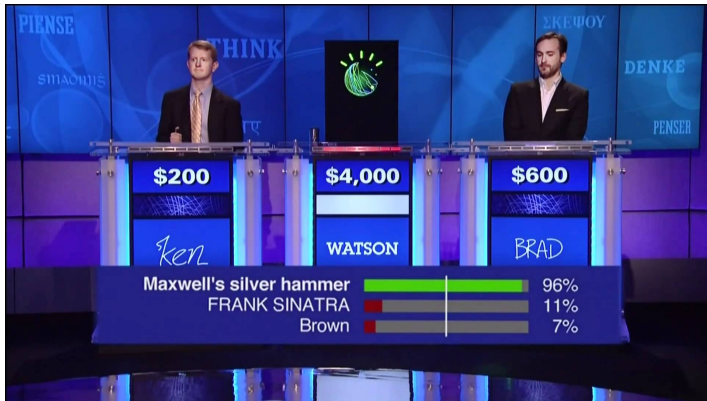


# Left 4 Dead (Valve, 2008)

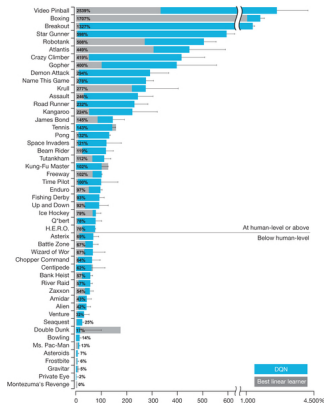




# Watson (IBM, 2011)



# Deep learning for Atari games (DeepMind, 2013)



# AlphaGo (Google DeepMind, 2016)



# What will we be covering?

- ▶ Finite state machines
- ▶ Behaviour trees
- ▶ Game theory
- ▶ Planning
- ▶ Utility-based AI
- ▶ Game tree search
- ▶ Procedural content generation
- ▶ Multi-agent systems
- ▶ Pathfinding and navigation
- ▶ Evolutionary algorithms
- ▶ Artificial neural networks

Remember: proposal due next  
week!