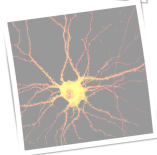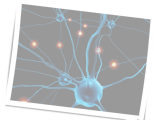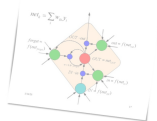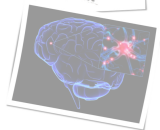# Games
and
Competitions

Spyros Samothrakis
Research Fellow, IADS
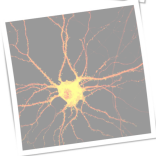Univeristy of Essex

March 4, 2016

Games as a research tool

Competitions

Current state of the (game) AI art

The future of competitions
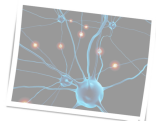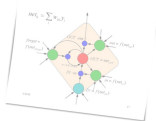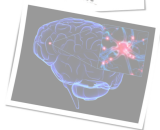
Games as a research tool

- Almost every Game AI paper begins with something along these lines:
- "Games have/can be used for Artificial Intelligence Research"
  - Because games are:
    - Fun (?!)
    - Provide nice abstractions of real world problems
    - Are universally accepted
    - Easy to compare with other researchers' AIs/agents
- Let's have an overview of the modern history of game research

Zermelo

- ▶ First important result by *Ernst Zermelo, 1913*
- ▶ Use the game of Chess as an abstraction
- ▶ Kickstarts game theory - of course no real computers
- ▶ "Given that a player (say White) is in 'a winning position', how long does it take for White to force a win?"
- ▶ Wikipedia cites the correct papers, has the definitions mixed-up with . . .

Von Neumann

- ▶ Modern tools actually invented in *John von Neumann, 1944* or possibly *1928*
- ▶ Backwards Induction
- ▶ You must have heard it as "MinMax" - again, no real computers at the time
- ▶ Poker and bluffing are discussed as well

TURING

- ▶ Most modern additions to min-max pioneered by *Alan Turing, 1953*
- ▶ Learning, look-aheads, evaluation functions
- ▶ Almost every modern method was at least imagined
- ▶ But machines still not capable of beating men
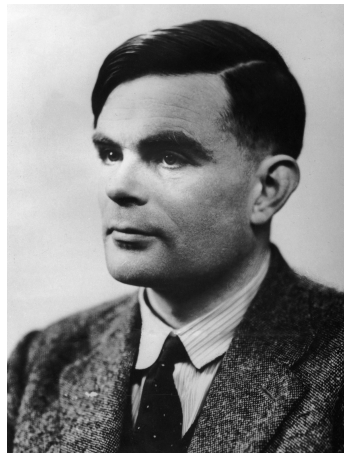
From theory to practice

- From this point onwards, there was a race
- Fundamentally asking the question
- "Can we use computers to actually do what was conceptualised in theory"
  - i.e., can we create (at least) human competitive machines
    - Chess - *IBM Deep Blue, 1996*
    - Head's Up Holdem (Poker) *University of Alberta, 2015*
    - Go *Deep Mind, soon* - apparently Japanese competitor?
- 50-60 years

# WHERE DID ALL THIS RESEARCH GET US?

- ▶ Most classic games will be/are solved
- ▶ But what does it mean for Artificial Intelligence?
    - ▶ Narrow approaches for building narrow Systems
        - ▶ Chess
    - ▶ General approaches for building narrow systems
        - ▶ Backgammon, Poker, *Maybe* GO
    - ▶ *narrow approaches for building general systems*
        - ▶ Nothing # Current state of the art

Enter competitions

- Implicitly one can think of these "races to the top" as competitions
- In the case of go you even had
- Competitions are the most anti-intellectual thing you can do
    - Adoloscent/childish idea of "I can run faster than you"
    - When it comes to algorithms, it's mostly "My dad is stronger than your dad"
- But there must be some value, somewhere
- In fact, the most common sci-fi game design must be "war of resources"
- But you need some way to measure progress!!!

Some modern AI competitions
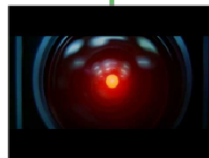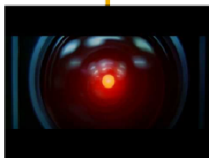
Some videos

Too narrow

- Some people have plenty of time

State of the Art in Game AI

- Some form of lookahead (MCTS)
- Coupled with premature stopping (A value function)
- Some ability to do fast lookaheads (A policy)
- System seeded from Games

General Game Playing

General Video Game Playing Competition (I)

1

General Video Game Playing Competition (II)

The problem with the Model

Characteristics of a good competition

- Competitions can be thought of as a formalisation of "Games as Benchmarks"
- A good looking website
- Instant gratification
  - A "competition slave"
    - Only real requirement!

WHAT ABOUT GENERATION?

- Some people actually care about the games themselves
- Procedural content generation
- Turing competitions

WHAT ABOUT BELIEVABLE CHARACTERS

- ▶ Some people care about this too!
- ▶ Insane!

Text

- ► My interest in in Role Playing Games
- ► . . . or text adventures
- ► Some new benchmarks but not competitions

Where to from here?

- ▶ Need better benchmarks
- ▶ Benchmarks that a machine can solve
- ▶ Without getting into the trap of "General Approaches for Narrow Systems"
- ▶ Models must go away

Thank you!