



Games AI

Lecture 1.1

What is games AI?

- What is good game AI?
 - go to YouTube
 - show us an example of good game AI
 - what makes it good?
 - what makes it AI?

- We want to make good games AI
 - What is games AI?
 - What is “good”?

Artificial Intelligence:

Making computers able to do things which currently only humans can do

Games AI:

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humans can do

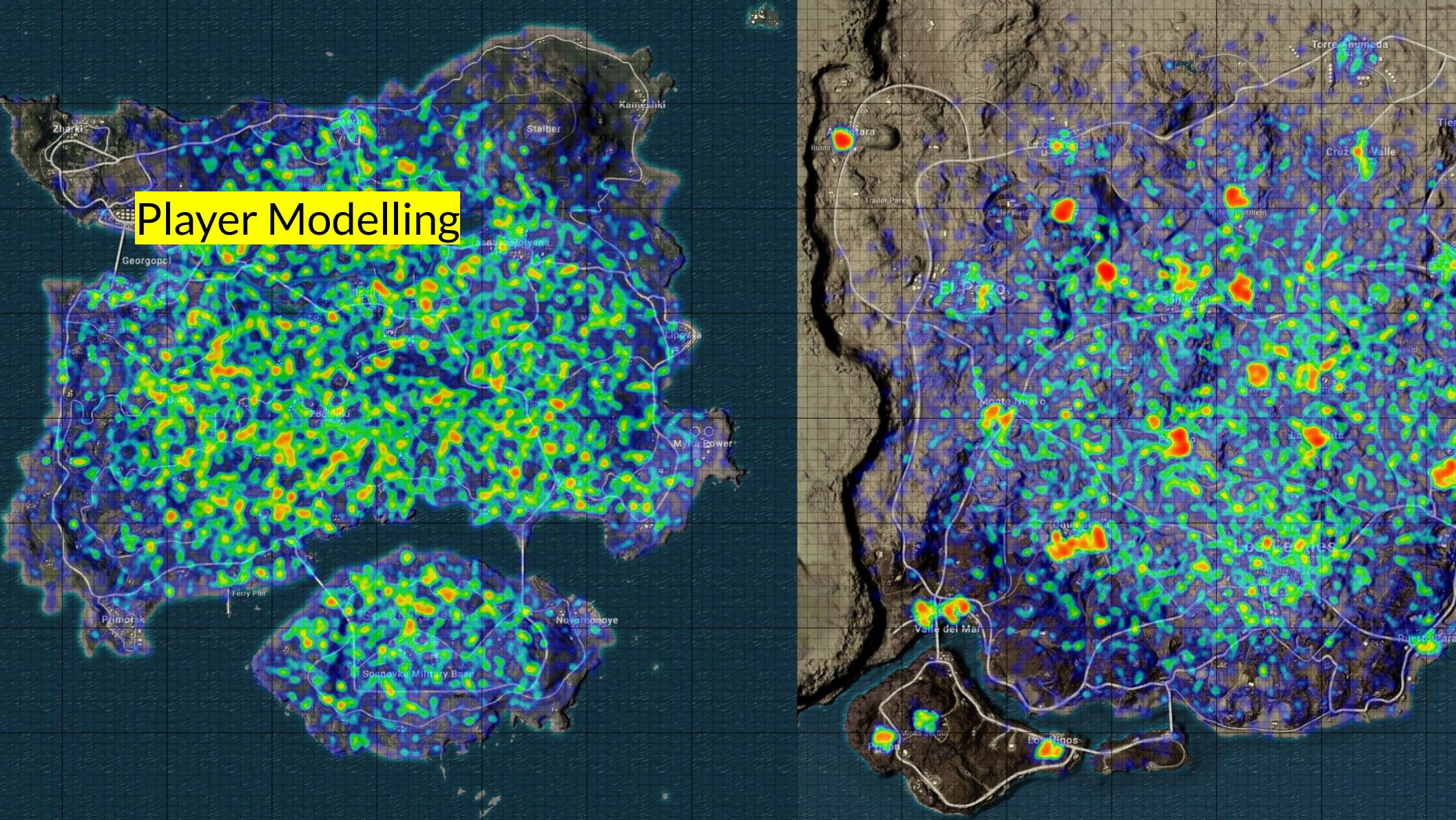
in games

- Games AI:
 - Content Creation
 - Player Modeling
 - Game Playing

A screenshot from the video game Minecraft. The scene shows a vast landscape with a winding blue river flowing through it. The terrain is composed of various blocks, including brown dirt, grey stone, and green grass. In the background, there are tall, dark green trees and rocky mountains. The sky is a clear blue with a few white clouds.

Content Creation

Player Modelling





Game Playing

Game playing

- AI for games
- AI in games

AI for Games



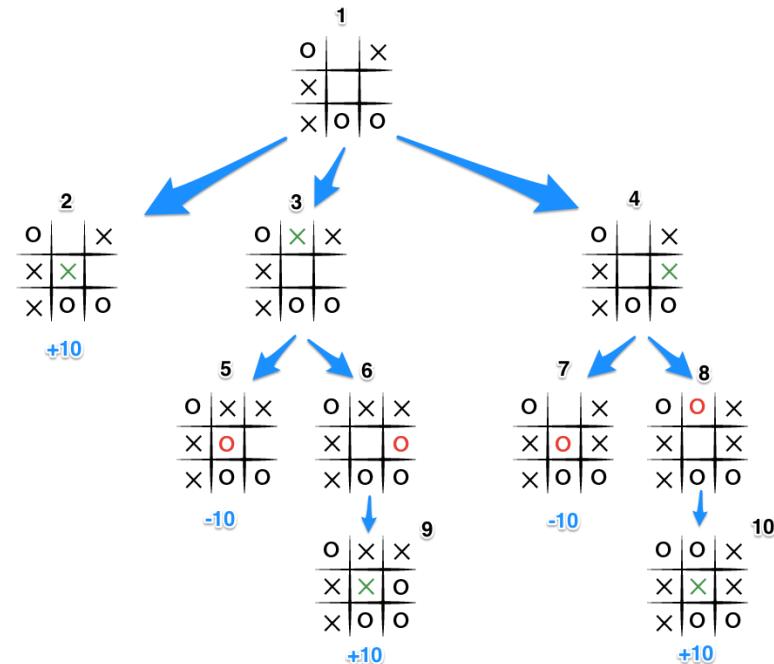
- Deep Blue beats Garry Kasparov 1997
 - Minimax algorithm with modifications
 - Highly tuned evaluation function
 - Custom supercomputer
- AlphaGo beats Lee Sedol 2016
 - Deep convolutional neural networks and MCTS
- OpenAI playing Dota2 at a professional level
 - Deep reinforcement learning





- Why do AIs play games?
 - To provide opponents
 - Because they are challenging tests
 - Prestige
 - Automatic testing and game balancing
 - e.g. for QA and content creation

- How do AIs play games?
 - Planning
 - Reinforcement Learning
 - Supervised Learning
 - ...cheating!



- So what IS AI?

- Representing knowledge
- Assigning utility
 - Good actions
 - Good states

- Representing knowledge
 - Variables
 - Data
 - NPC “state”
 - Game “state”
 - Symbolic representation of the world

- Assigning Utility
 - What is a good action?
 - What is a good state?
 - Optimal chance of winning
 - Most informative

AI in Games



START MENU

- Brainstorm:
 - What sorts of AI are there in games?
 - What roles does it take?
 - What makes it good/bad?
 - Get examples on the web/YouTube

“Game AI should be about one thing and one thing only: enabling the developers to create a compelling experience for the player” (Kevin Dill 2014).

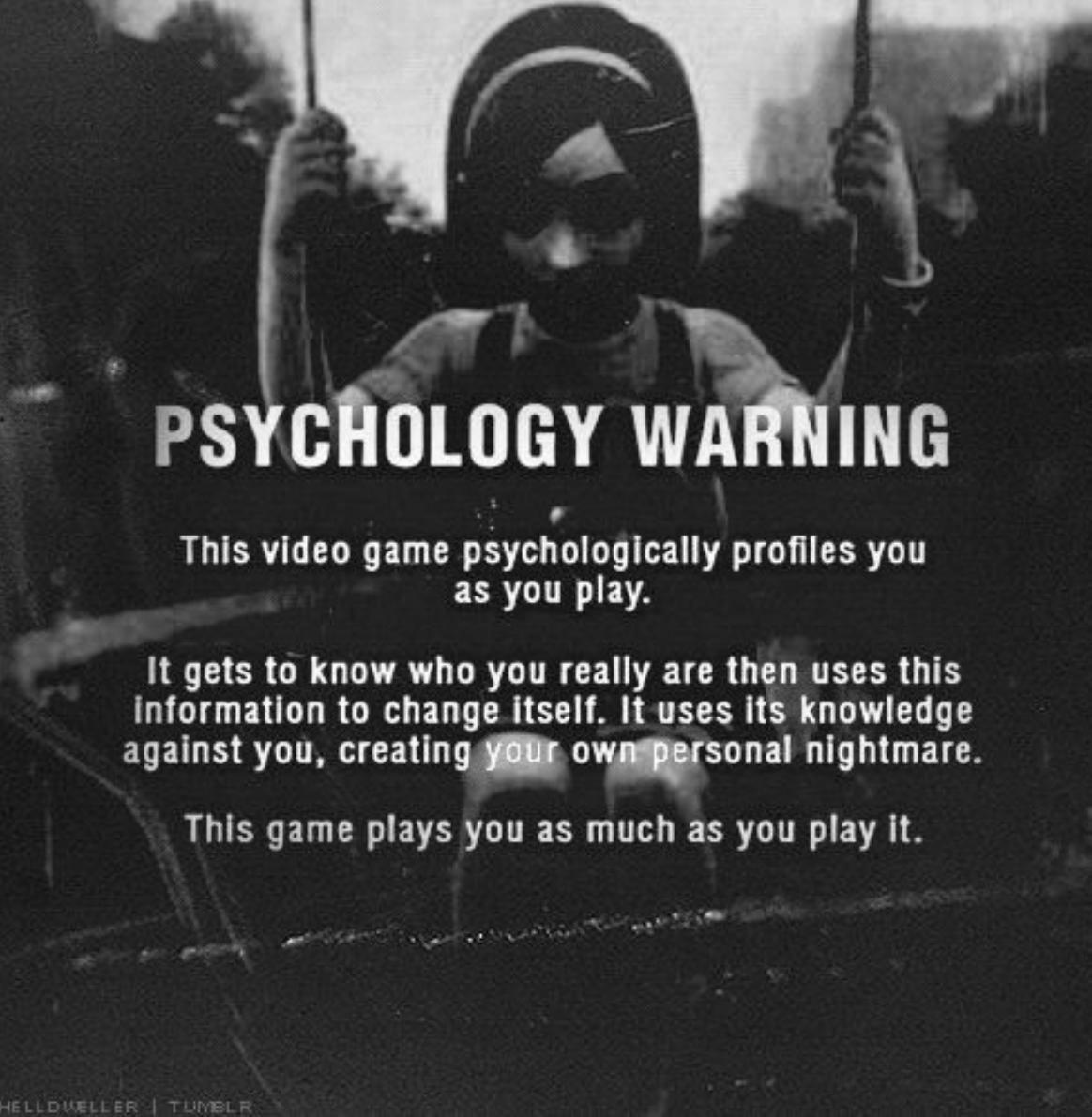
- Roles of AI in games
 - **Opponent**: providing challenge
 - **Character**: part of atmosphere or story
 - **Advisor**: assisting the player
 - **Trainee**: being taught by the player
 - **Director**: controlling the action
 - **Analyst**: interpreting the gameplay
 - **Designer**: creating the game
 - **Cameraman**: controlling what is on screen

- How do AIs work in games?
 - Rule-based approaches
 - Finite State Machines
 - Behaviour Trees
 - Utility-based AI
 - Planning
 - Tree search, e.g. A*
 - Symbolic planners, e.g. GOAP
 - Machine learning
 - Evolutionary algorithms
 - Supervised learning

- How do AIs work in games?
 - Showmanship

6 8 REVOLVER





PSYCHOLOGY WARNING

**This video game psychologically profiles you
as you play.**

**It gets to know who you really are then uses this
information to change itself. It uses its knowledge
against you, creating your own personal nightmare.**

This game plays you as much as you play it.

- Challenges
 - Authorial control
 - Performance overhead
 - Development time
 - Required architecture
 - Game design constraints/opportunities

Summary

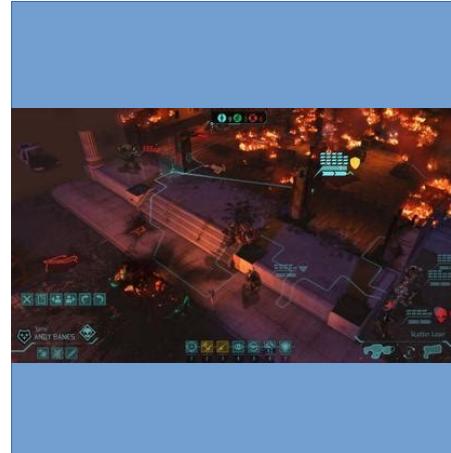
- Summary
 - AI can do a bunch of things

Summary

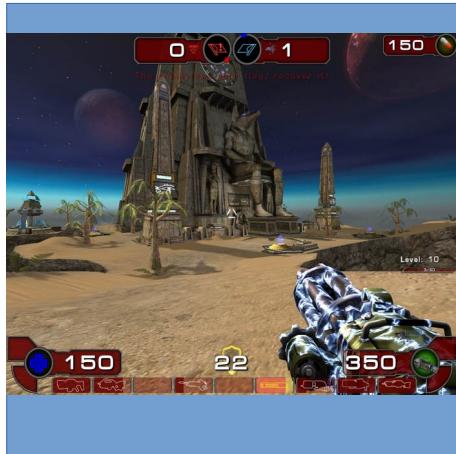
AI Player



AI NPC



Play to win



Create an experience



- We're going to be focusing on NPC AI to support the player experience
 - i.e. how most games AI is used in industry
 - “Cheating” is encouraged
 - We'll discuss whole-game playing AI later in the course, mostly in the context of its uses for testing and content creation

- Recommended Texts
 - Steve Rabin (ed), *Game AI Pro* series
(free!) www.gameaipro.com
 - Steve Rabin (ed), *AI Game Programming Wisdom* series.
 - Russell & Norvig, *Artificial Intelligence: A Modern Approach*, 3rd ed., 2010.



Coming up

- Coming up:
 - Get Fuseblade running
 - Break
 - **Finite State Machines**
 - What kind of game do you want to make?

