

Defining Artificial Intelligence

- A science and a set of computational technologies that are inspired by, but typically operate quite differently from, the ways people use their nervous systems and bodies to sense, learn, reason, and take action
- NOT one thing
 - More than just deep learning
 - RL, NLP, vision, planning, symbolic reasoning, algorithmic game theory, computational social choice, human computation
- Getting Computers to do the things they can't do yet
 - Once it works, it's engineering

Origins of Computer Science and AI

- Precursors
 - Systems
 - Abacus 2500-3000 BC
 - Analog astronomical mechanisms (Antikythera, astrolabes, mechanical clocks) – 100 BC...
 - Mechanical calculators – 1600s
 - Conceptual, Mathematical
 - Grammars, transformations - 500 BC
 - Cryptography – 800 AD (2000 BC?)
 - Mathematical logic – 1700s-1800s

Origins of Computer Science and AI

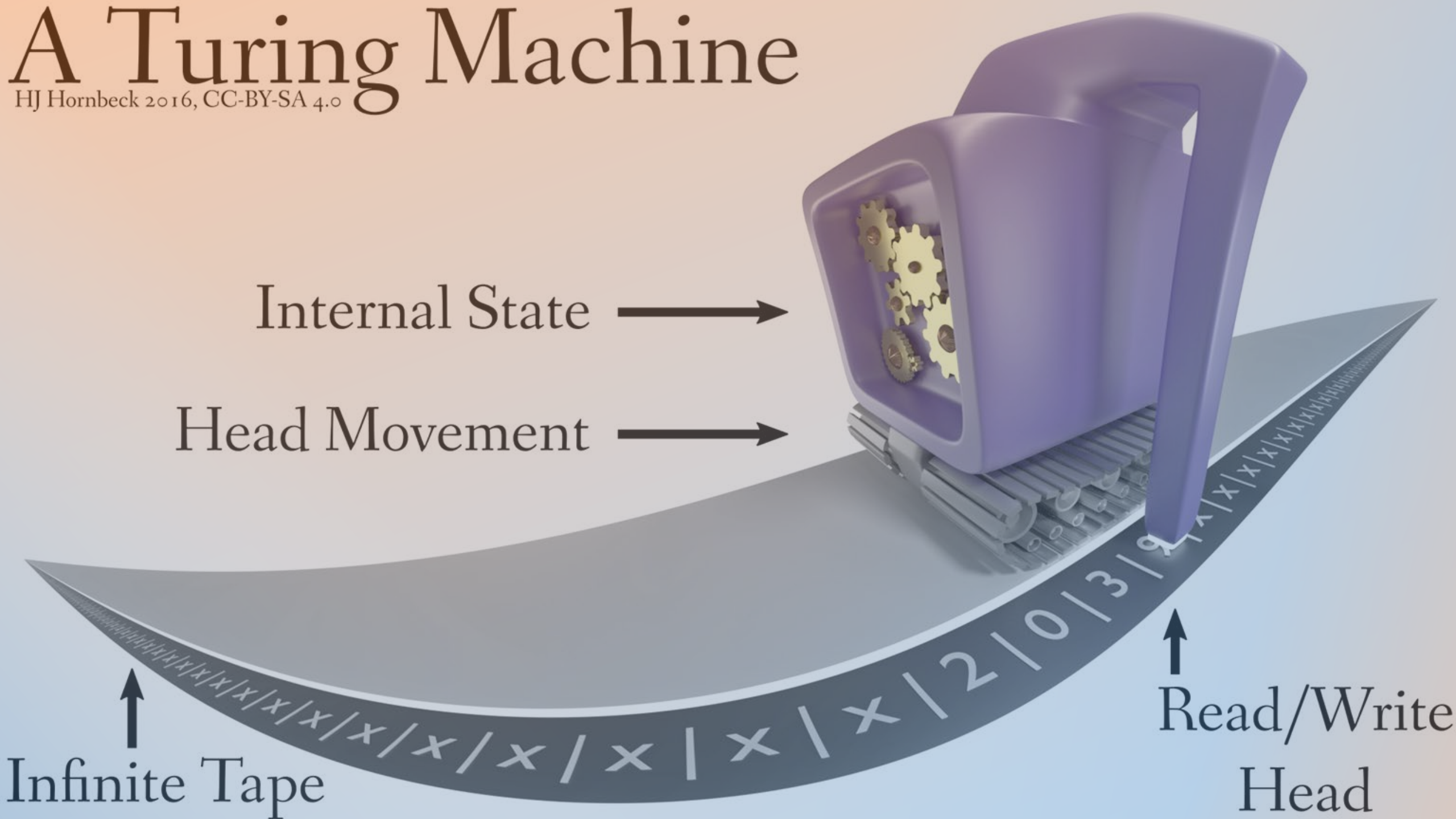
- 1837 Design of Analytical Engine
 - Charles Babbage
 - Programmable
 - Turing complete (as powerful as modern computers)
 - First computer algorithms- Ada Lovelace and Babbage
- 1880-1910 Electronic logic gates, universal logic gates
- 1930s Switching Circuit Theory (Shannon et al.)
- 1930s Universal Turing machines and equivalent
 - what can computers do?
- 1940s Programmable computers, von Neumann architecture
- ...

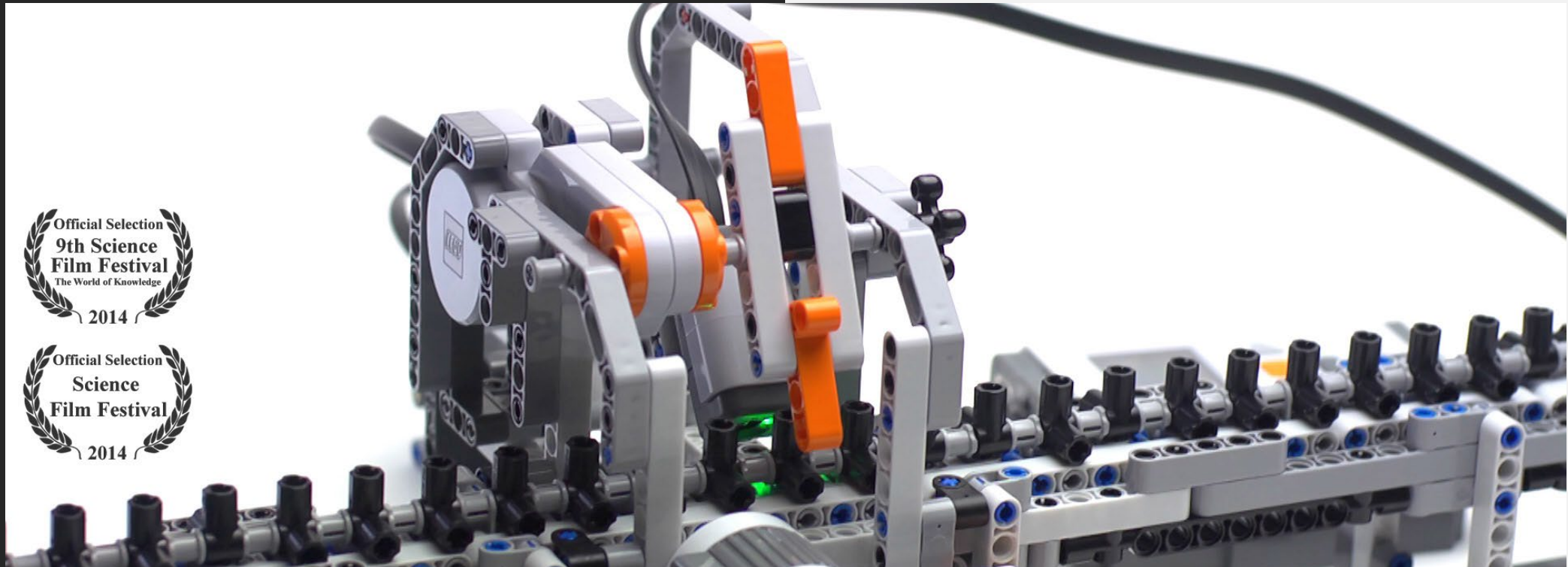
Computer Science and AI

- 1930's What can a computing machine do?
 - Turing (Turing Machine) 1936
 - Church (Lambda Calculus) 1936
 - Post 1936, 1947 Similar to Turing Machine
 - Godel 1930s (Recursive Functions)
 - Kleene, Markov, ...
- Formal notion of an algorithm as an effective procedure realizable by a Turing machine
- Some problems cannot be computed (undecidability)
- All these models equally powerful
- Church-Turing thesis "Any effectively computable function can be computed by a Turing machine"
 - In the general, informal sense, not provable since "effectively computable" not clearly defined
- Is "effectively computable" what humans do?

A Turing Machine

HJ Hornbeck 2016, CC-BY-SA 4.0





Lego Turing Machine

- Well, maybe without the infinite tape
- From: <https://www.andretheelen.nl/portfolio/lego-turing-machine/>

Artificial Intelligence

- 1950 Alan Turing
- Can machines think?
- Can machines do what humans do?
- How can we tell?
- Turing test (“imitation game”)
 - Interrogator communicating with two hidden entities via a text interface
 - First case: the two entities are a man and a woman
 - Second case: the two entities are a machine and a woman
 - Can the interrogator tell which is which as well in the second case as in the first?
 - If not, the machine “passes”