03-02-2022

CS051A

INTRO TO COMPUTER SCIENCE WITH TOPICS IN AI

12: Intro to AI

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he/him/his

Lectures

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she/her/hers

Lectures

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Labs

Lecture 12: Intro to AI

- Administrative
- Artificial Intelligence

Midterm I is graded

- Midterms handed
- Grades on Sakai
- Going over solutions
- Check my comments for your responses

Assignment 6 is out

- Make sure to sign up for 03/21 group presentations on AI + Ethics.
  - Talk to your classmates or use Slack to find 1-2 more students interested in the same topic (must be in the same section).

Course feedback

- Thank you for providing us with feedback!
- For the most part, we are in a good pace and the load outside lectures/labs seems reasonable.
- Assignments and mentor sessions are a highlight: Yay!
- Make sure you review material after each lecture:
  - Code is always linked at the end of the slides so you can follow along.
  - Practice problems are linked both at the course website and the end of the slides.

Lecture 12: Intro to AI

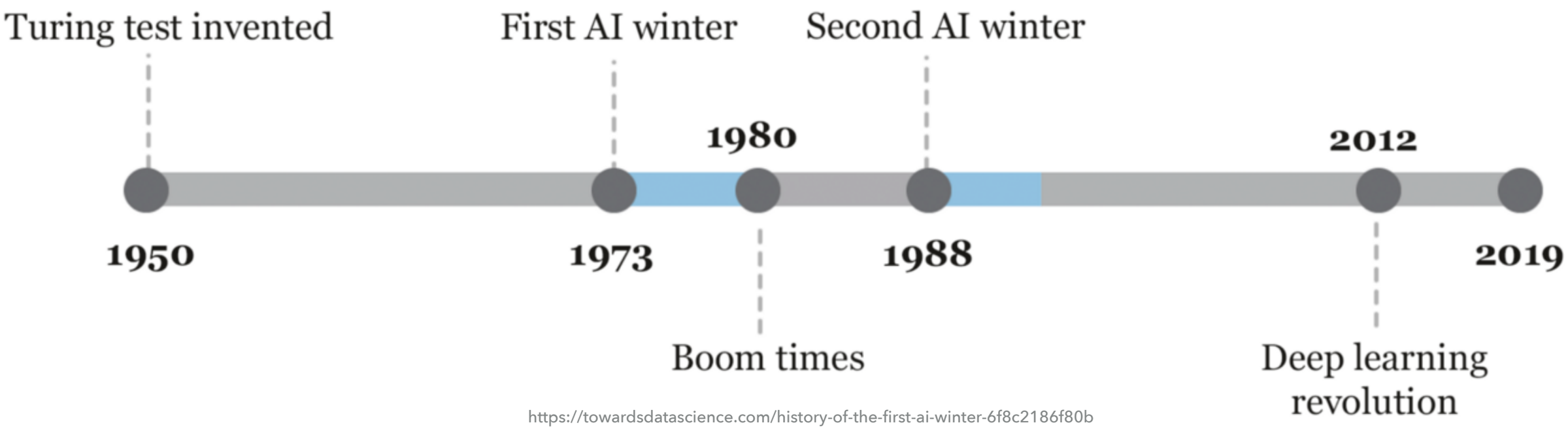
- Administrative
- Artificial Intelligence

The field of Artificial Intelligence

- A (huge!) subfield of Computer Science.
- Term coined in mid-1950s by John McCarthy and the field officially began at the Dartmouth Conference.
- But ideas around intelligent machines are old:
  - Storytelling devices in antiquity,
  - Mary Shelley's Frankenstein,
  - Karel Čapek's R.U.R. introduced the word robot.

AI winters followed by boom times

- Excitement around AI has been often followed by stalling in funding and falling short of expectations.
- Since ~2010, we are experiencing a deep learning revolution due to advances in computation supported by hardware and data.



https://towardsdatascience.com/history-of-the-first-ai-winter-6f8c2186f80b

What is Artificial Intelligence?

- *"Can machines think?"*
  - Alan Turing

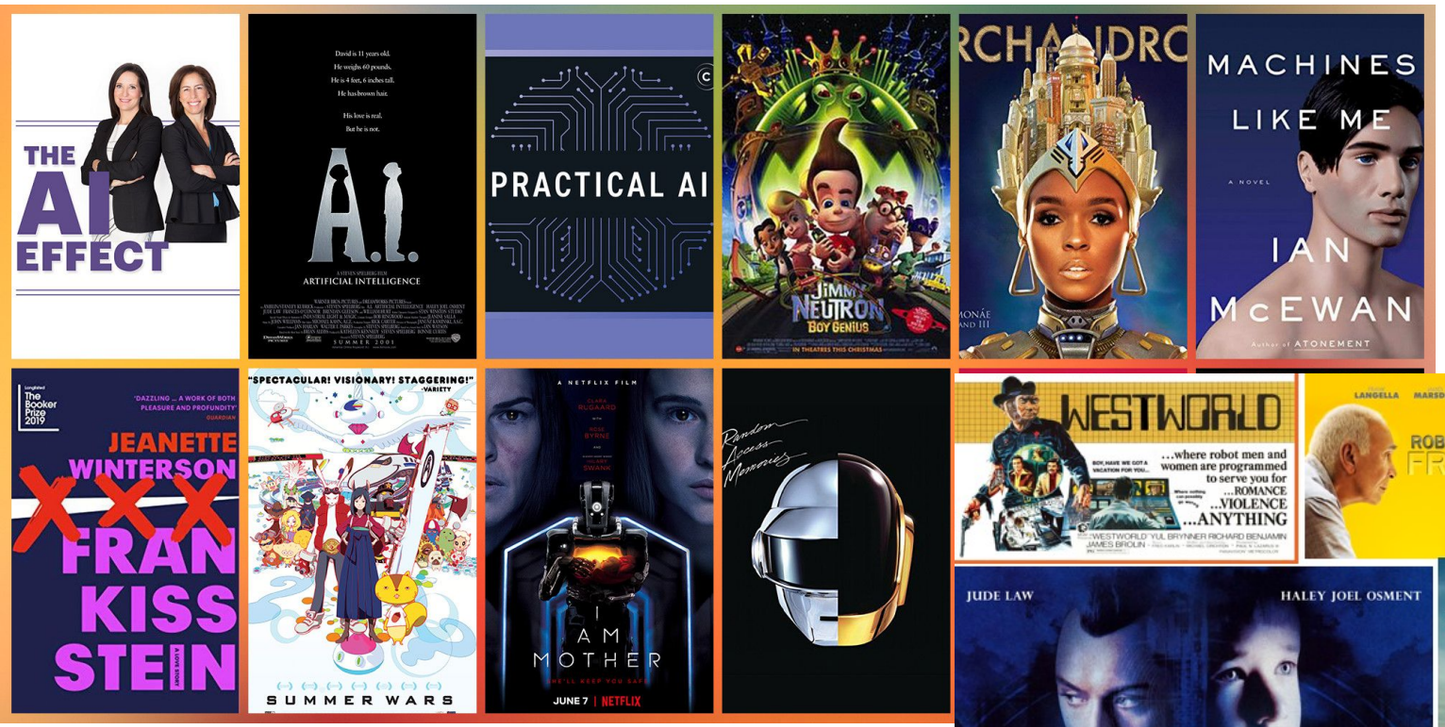
- *"Every aspect of learning or any other feature of intelligence can be so precisely described that a machine can be made to simulate it"*
  - John McCarthy, Marvin Minsky, Claude Shannon and Norbert Wiener

- *"Building programs that enable computers to do intelligent things"*

Traits of intelligence

- reason, use strategy, solve puzzles, and make judgments under uncertainty,
- represent knowledge, including common sense knowledge,
- plan,
- learn,
- communicate in natural language,
- sense (e.g., see, hear, etc.), and
- act (e.g., move and manipulate objects, change own location to explore, etc.)

Artificial Intelligence in popular media



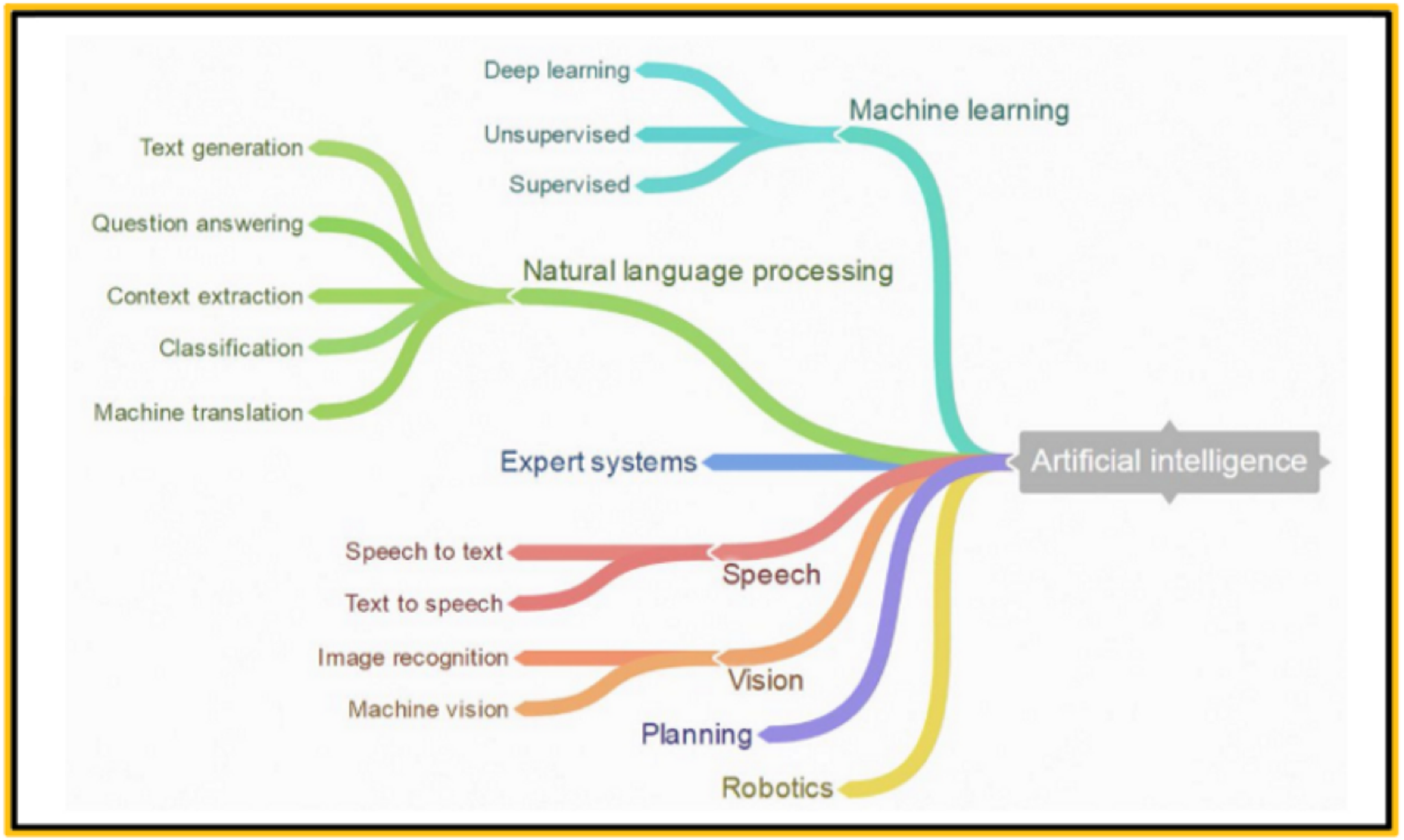
https://www.esquire.com/entertainment/movies/g29653413/best-ai-artificial-intelligence-movies-tv-shows-books-podcasts/

https://www.newworldai.com/top-22-best-artificial-intelligence-and-robotics-movies-of-all-time/

Weak AI, Strong AI, Super AI

- Artificial Narrow Intelligence (ANI) or Weak AI: a machine performs a narrow single task extremely well.
- Artificial General Intelligence (AGI) or Strong/Full AI: a machine performs any intellectual task that a human being can.
  - Can we avoid human-level error and cognitive hazards?
    - Prejudice, change blindness, sloppy reasoning.
  - A fantasy of slavery:
    - The worker who never tires or strikes
    - The “lover” who can’t say “no”
- Artificial Super Intelligence (ASI): a machine far surpasses the brightest and most gifted human minds.

Subfields of AI



https://storage.googleapis.com/cdn.thenewstack.io/media/2018/07/53726660-marconi.png

Challenges

- Perception
  - Perceive the environment via sensors.
- Computer Vision
  - Process visual information.
  - Object identification, face recognition, motion tracking.
- Natural language processing and generalization
  - Speech recognition, language understanding.
  - Language translation, speech generalization, summarization.

Challenges

- Knowledge representation
  - Encode known information.
    - Facts about environment, etc.
- Machine Learning
  - Learn from environment/data (more soon).
- Reasoning/problem solving.
- Robotics

Accomplishments

- Language
  - Capturing spoken language as text is getting pretty okay
    - Is this the same as understanding spoken language?
- AI can speak and sing (easier in some languages, interestingly)
  - Mobile: Siri, Ok Google, etc.
  - Home assistants: Alexa, Google Home, etc.

Accomplishments

- Self-driving cars
  - Driver assisting technologies (breaking, lane drift avoidance, etc) are pretty great already.
  - Good on highways.
  - Okay off-roading.
  - Urban driving very hard.

Accomplishments

- Emotions
  - It’s generally not too hard for humans to read emotions.
- It’s super hard for computers
  - People have different faces,
  - People emote with their whole body,
  - People don’t always say what they mean.
- Limited success so far.

Accomplishments

- Automated Reasoning
  - Really good on isolated problems
    - Chess, Go, Starcraft, …
  - Really hard in general

Accomplishments

- Robots
  - Robots have had a variety of locomotion methods
    - Walking with legs, is challenging:
      - Differing terrains, stairs, running, ramps, etc.
    - Some impressive developments:
      - Boston dynamics: https://www.youtube.com/watch?v=tF4DML7FIWk

Resources

- https://www.youtube.com/watch?v=2ePf9rue1Ao
- https://www.youtube.com/watch?v=oV74Najm6Nc
- https://bdtechtalks.com/2018/11/12/artificial-intelligence-winter-history/

Homework

- Assignment 6 (sign up for 03/21 presentations)