Introduction to Artificial Intelligence

- Reading: Russell and Norvig, ch. 1, https://fivethirtyeight.com/features/the-bots-beat-us-now-what/
- Goals
- Approach

Goals

- Initially, AI was supposed to mimic humans
  - Movie robots!
- May not be ideal for supporting domain-specific goals
  - Ex: Computer vision was initially a major part of AI
    - Using optics, signal processing techniques, lots and lots of math generates significantly more accurate understanding of images
    - 1980’s: vision actively dissociates itself from AI
    - Natural language understanding has somewhat similarly dissociated itself and emphasized statistical techniques, but accuracy levels are generally far lower

Goals

- More specific example: chess
  - If goal is to be the best:
    - Done! (1997, Deep Blue defeated then champion Kasparov)
    - Not computationally feasible to explore all possibilities from move 1, so Deep Blue incorporated existing chess knowledge for initial moves
    - Ultimately, though, victory through brute force
- At time of text, computer programs for Go were poor
- 2016, 2017: AlphaGo (by Google subsidiary DeepMind) beats best Go players
  - It does use AI (neural nets)
- Translating success in games to other applications has been hard

Approaches

- Russell and Norvig organize possible ways of achieving AI:
  - Thinking like a human – not well understood
  - Thinking rationally
    - Using logic
  - Acting like a human
    - Turing test – you cannot tell the difference between interacting with a human and with a program
  - Acting rationally (what the book is about)
    - Program maintains knowledge of its “world” (ex: the chessboard, Mars), gets percepts -- new data through sensors, other forms of input (ex: GUI to input opponent’s chess move)
    - Program acts to maximize some performance measure (ex: win the game while satisfying time limits, explore the most terrain possible)

What AI is good for

- Consider Computer Vision and Natural Language Understanding (NLU)
  - Early AI: vision and NLU are treated as part of AI
  - 1980's, 90's: Russell mentions "AI Winter" (and bursting of other AI "bubbles")
    - AI becomes known for a lot of empty boasts, fuzzily defined research
    - Vision and NLU start using a lot of math and statistics to do more fundamentally sound work – dissociate themselves from AI
- AI now being associated with vision and NLU again, but at a higher level of abstraction
  - Ex: Facebook's FAIR project – can see hype and reasons for excitement https://www.engadget.com/2016/08/25/facebook-computer-vision-open-source/

What AI is good for

- So AI tends to be for things that we don't understand that well, and/or have limited ability to process data
  - Sample computer vision problem: Why does the moon look flat?
    - See: https://en.wikipedia.org/wiki/Oren%E2%80%93Nayar_reflectance_model
      - Interreflections (because the surface is actually quite rough)
  - The FAIR article talks about identifying objects in videos
    - Handling a lot of noise (compare to same problem on an assembly line)
  - Other recent news discusses using AI for facial recognition
- A couple caveats:
  - Successful results can still produce poor explanations
  - "Successful" is often quite a bit < 100%, but may still be used