Conclusion

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Summary

- AI is the science and engineering of making intelligent machines
- Intelligent agents
- Search
- Logic
- Probabilistic reasoning
- Learning
- Natural language
- Vision
- Robotics
Intelligent Agents

- Rational agent acts to achieve best possible outcome (i.e., maximize expected utility)
- Type of agent depends on type of environment
Goal-based, problem-solving agent

Uninformed search
- E.g., Iterative-deepening depth-first

Informed (heuristic) search
- E.g., A*
- Designing good heuristics

Local search
- E.g. Hill climbing, stochastic

Adversarial (game) search
- E.g., Minimax with alpha-beta pruning
Logic

- Propositional logic
  - $\text{At}(\text{Wumpus}, 1, 3)$
- First-order logic
  - $\exists x, y \ \text{At}(\text{Wumpus}, x, y)$
- Inference
- Resolution
- Theorem proving

- Planning combines search and logic
Probabilistic Reasoning

- Probability
- Conditional probability
- Probabilistic inference
- Bayes’ rule
- Bayesian network
  - Exact inference
  - Approximate inference

Thomas Bayes (1701–1761)
Learning

- Improving performance at some task through experience
- Supervised learning methods
  - Naïve Bayes
  - Neural network
- How to choose the right model?
  - Overfitting
- Unsupervised learning (clustering)
- Reinforcement learning
Natural Language

- Natural language processing
  - Language models
  - Text classification

- Natural language communication
  - Grammars and parsing
  - Semantic interpretation
  - Generation
  - Speech recognition and synthesis
Vision

- Edge and shape detection
- Optical flow
- Tracking
- Object detection
- Image classification
- Scene understanding
- Deep learning
- Deep fakes
Robotics

- Sensors and actuators
- Mapping and localization
- Navigation
- Object manipulation
What’s Next for AI: The Russell & Norvig View

- Rational hybrid agent with probabilistic reasoning and learning
- Hierarchical knowledge representations to cope with scale
  - Knowledge from WWW
- “Compile” knowledge to solve specific, simpler problems
- Real-time AI
- **Bounded optimality**: Agent acts as best it can given its resources
What’s Next for AI

- Artificial General Intelligence (AGI)
  - Integration of techniques
  - Cognitive architectures
- Brain simulators
- Reverse engineering the brain
  - Neuroscience
- Deep learning
- Big data

- More AI movies!
Thank you!

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