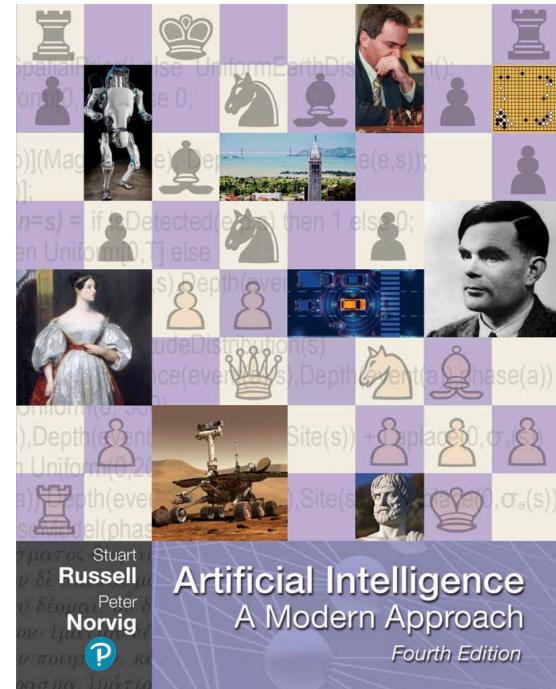


Conclusion

Larry Holder
School of EECS
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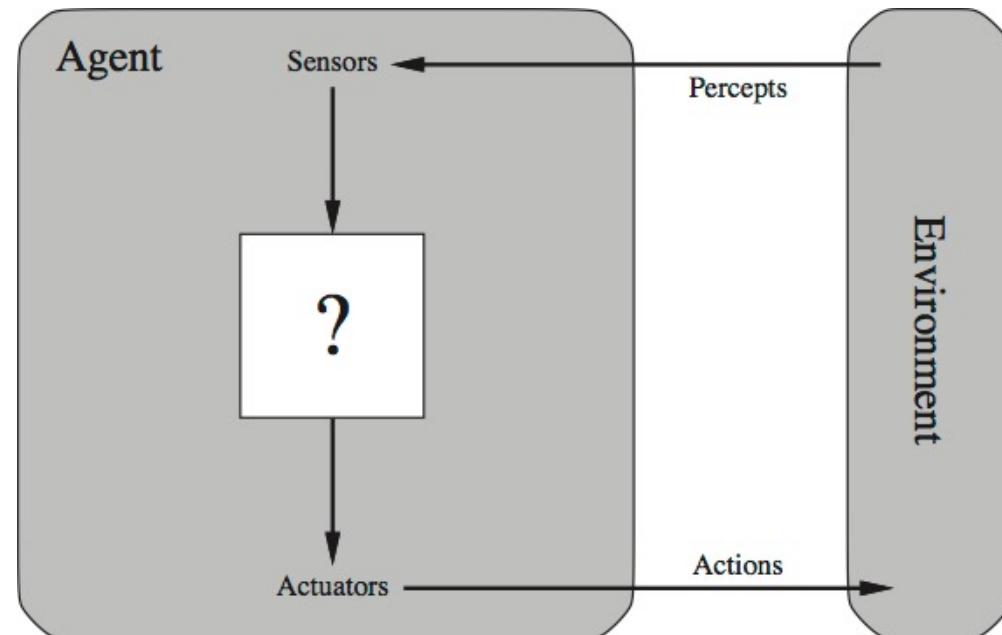
Summary

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



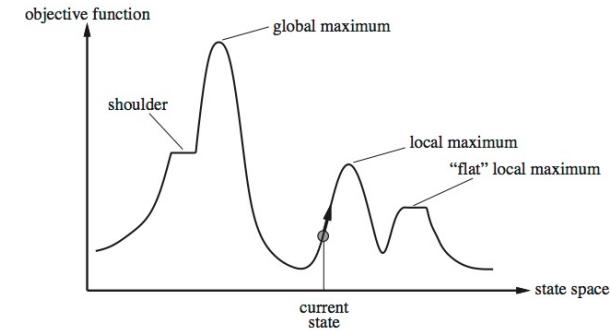
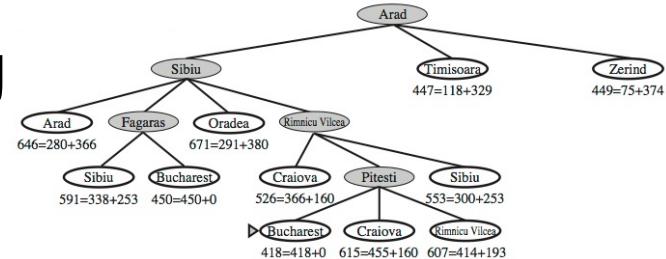
Intelligent Agents

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



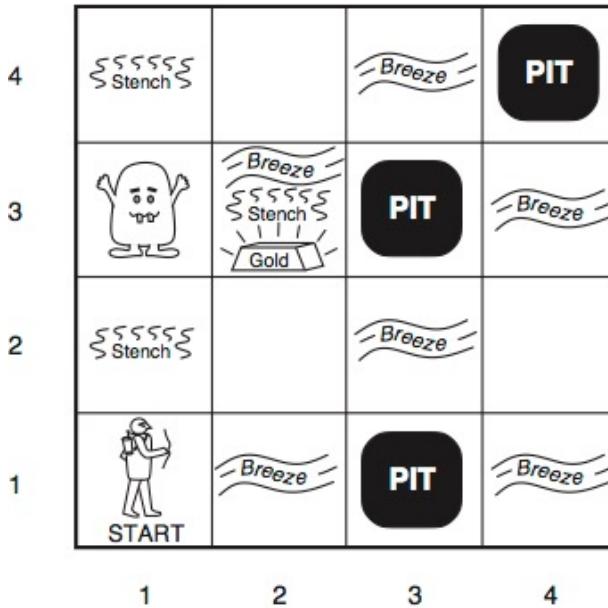
Search

- ▶ 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

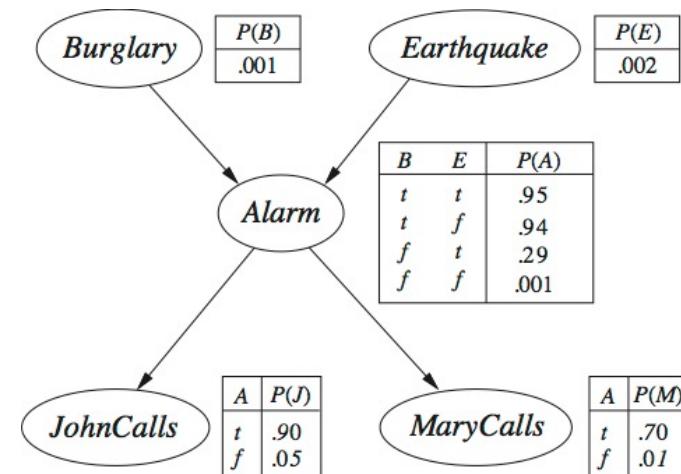


Probabilistic Reasoning

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

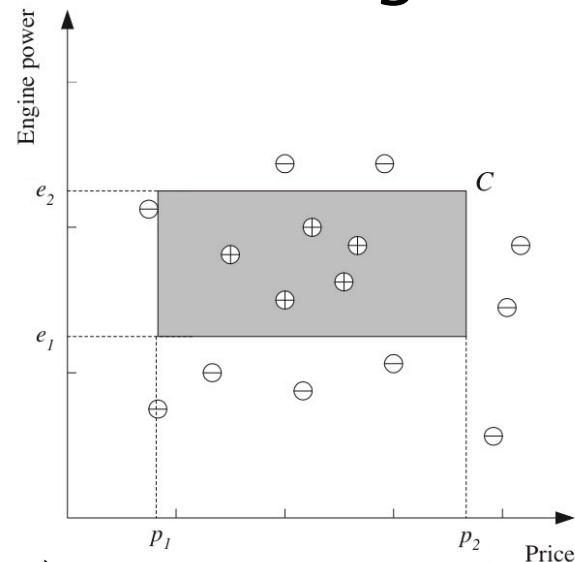


Thomas Bayes
(1701–1761)



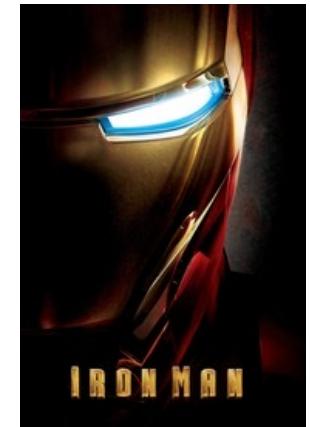
Learning

- ▶ 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



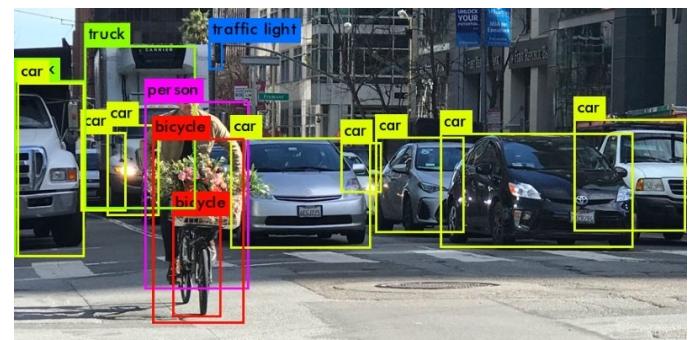
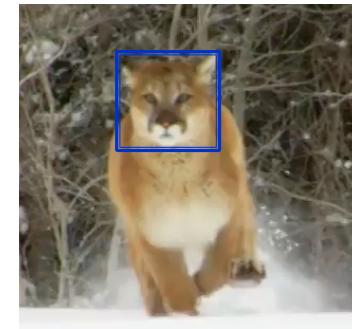
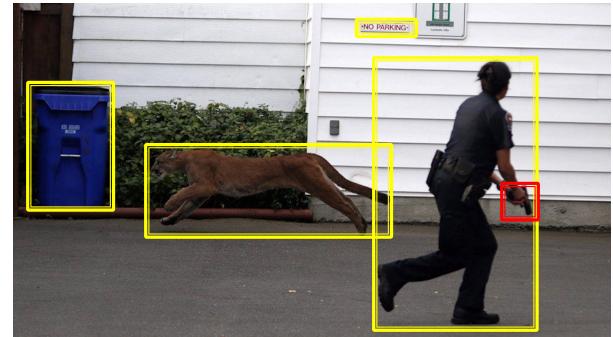
Natural Language

- ▶ Natural language processing
 - Language models
 - Text classification
- ▶ Natural language communication
 - Grammars and parsing
 - Semantic interpretation
 - Generation
 - Speech recognition and synthesis



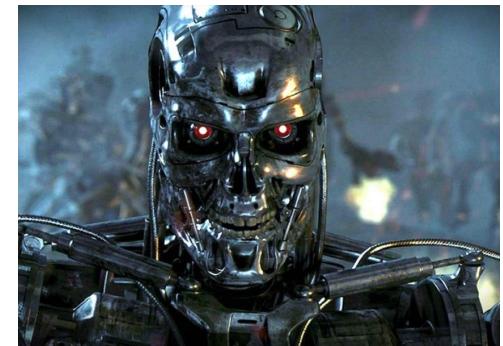
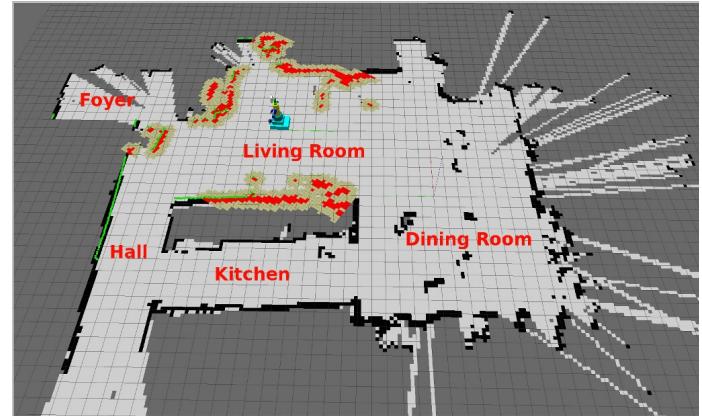
Vision

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



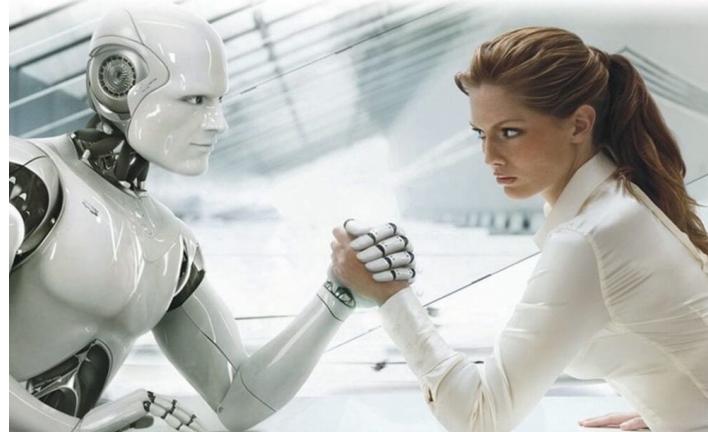
Robotics

- ▶ Sensors and actuators
- ▶ Mapping and localization
- ▶ Navigation
- ▶ Object manipulation



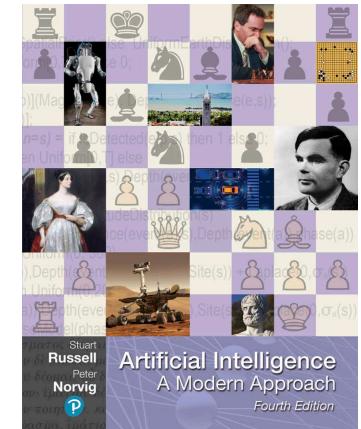
Ethics

- ▶ Weak AI vs. Strong AI
- ▶ Controlling AI
- ▶ AI Laws
- ▶ AI Rights
- ▶ Human Future
- ▶ Policy



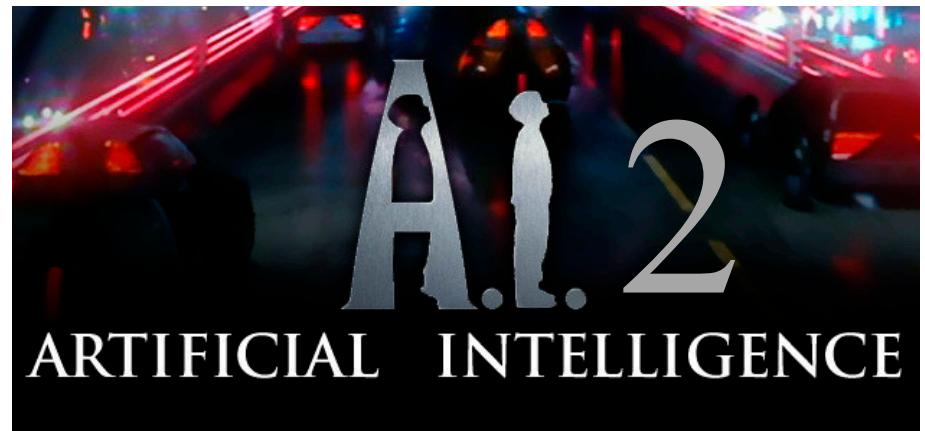
What's Next for AI: The Russell & Norvig View

- ▶ 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!

Please complete your course evaluation.