

Course wrap up

CS 486/686

University of Waterloo

Lecture 24: July 24, 2017

Outline

- Course wrap up
- Final exam info (see course website)
- Other AI courses, options and programs
- AI research
- AI jobs

Topics Covered

- Search algorithms
- Probabilistic Inference
- Decision Making under Uncertainty
- Machine Learning
- A bit of Natural Language Processing
- A bit of Robotics

Topics That We Didn't Cover

- Computer Vision
- Natural Language Processing
- Robotics
- Multi-agent Systems

Other AI courses

- CS485/685: Theoretical Machine Learning (Shai Ben-David S18)
- CS489/698: Intro to Machine Learning (Yaoliang Yu F17, Pascal Poupart W18)
- CS484/684: Computer Vision
- CS499R: Readings in Computer science
- CS499T: Honours thesis

AI Option

- Bachelor in CS or SE with AI Option (starting F18)
- Joint option between CS and Engineering
- 7 courses
 - CS 486: Intro to AI
 - CS 492: Social Implications of Computing
 - One of
 - CS489: Intro to Machine Learning
 - CS485: Machine Learning Theory
 - One of
 - SE 380: Intro to Feedback Control
 - ECE 486: Robot Dynamics and Control
 - ECE 380: Analog Control
 - MTE 546: Multi-sensor Data Fusion
 - Three additional elective courses

Elective Courses in AI Option

- Three additional elective courses among
 - CS489: Intro to Machine Learning
 - CS485: Machine Learning Theory
 - CS452: Real-time Systems
 - STAT341: Intro to Computational Statistics
 - STAT440: Computational Inference
 - STAT441: Statistical Learning: Classification
 - STAT444: Statistical Learning: Function estimation
 - ECE423: Embedded Computer Systems
 - ECE481: Digital Control
 - ECE486: Robot Dynamics and Control
 - ECE488: Multivariate Control
 - MTE544: Autonomous Robotics
 - MSCI446: Data Warehousing and Mining
 - SYDE372: Pattern Recognition
 - SYDE552: Machine Intelligence
 - SYDE556: Simulating Neurobiological Systems

Data Science

- <https://uwaterlo.ca/data-science>
- Bachelor's degree in data science
 - Available soon
- Master's degree in data science
 - Joint program between CS and Statistics
 - 8 courses
 - STAT 845: Statistical Concepts for Data Science
 - STAT 847: Exploratory Data Analysis
 - CS 651: Data-Intensive Distributed Computing
 - One course among
 - CS648 Database System Implementation
 - CS689 Intro to Machine Learning
 - CS685 Machine Learning Theory
 - 4 additional elective courses

Waterloo AI Institute

- Web: uwaterloo.ca/artificial-intelligence-institute
- Joint institute between Math and Engineering
- Foundational AI
 - Machine learning, statistical learning, data mining
 - Probabilistic models, knowledge discovery, knowledge representation
 - Intelligent agents and game theory
 - Optimization and decision making
 - Data science and analytics
 - Affective computing and human-machine interaction
- Operational AI
 - Scalable AI: commercialization by both small startups and large corporations
 - Compact AI: deployed wherever cost, energy and bandwidth are limited
 - Secure AI: private data protected locally, metadata shared by cloud users
 - Accessible AI: tailored for ease of use
 - Dependable AI: with reliable performance regardless of connectivity
 - Transparent AI: performance of safety critical systems can be certified

AI research group in CS

- Web: ai.uwaterloo.ca
- Professors:
 - Peter van Beek (applied machine learning, constraint prog.)
 - Shai Ben David (learning theory)
 - Robin Cohen (multi-agent systems, user modeling)
 - Jesse Hoey (health informatics, applied machine learning, computer vision)
 - Kate Larson (game theory, mechanism design)
 - Edith Law (social computing, human-computer interaction)
 - Richard Mann (computational audio, computer vision)
 - Pascal Poupart (machine learning, natural language processing, health informatics)
 - Yaoliang Yu (machine learning, optimization)

Pascal's research projects

- Machine Learning and Planning
 - Sum-Product Networks
 - Bayesian learning
 - Reinforcement learning
 - Data Complexity Analysis
- Natural language processing
 - Conversational agents
 - Natural language understanding
- Health Informatics
 - Mobile health, activity tracking, emotion recognition

AI jobs

- Data Science: golden age of Machine Learning
- AI is revolutionizing Computer Science
 - Machine Learning: new paradigm that avoids programming
 - Computer vision: computers can finally see
 - Natural Language Processing: new paradigm for HCI
- All large companies have AI R&D groups
 - Google, Microsoft, Facebook, IBM, Amazon, Baidu, Huawei
- Many small companies use AI
 - ProNavigator, TalkIQ, Focal Systems, HockeyTech, Kik Interactive, In the Chat