More aspects of machine learning!

- Statistics
- Probabilistic modeling
- Theory
- Systems
- Applications
- Ethics

Broad, more advanced

- 6.867 : Machine Learning

Statistics

- Ideas:
  - Draw conclusions about the world from noisy data
  - Quantify the uncertainty about your conclusions (e.g. how sure are you that treatment A is better than treatment B?)

- Classes
  - 18.05 : Introduction to probability and statistics
  - 18.650 : Statistics for applications
  - 6.401/6.481 : Introduction to statistical data analysis
  - More in courses 14 and 15

Probabilistic modeling

- Ideas
  - Combine data with prior knowledge
  - Reason about distributions over complex structures :
    - Large collections of variables
    - Graphs, programs, etc

- Classes
  - 6.041: Introduction to probability
  - 6.008 : Introduction to inference
  - 6.435 : Bayesian modeling and inference
  - 6.436 : Fundamentals of probability
  - 6.437 : Inference and information
  - 6.438 : Algorithms and information
  - causality

Theory

- Ideas
  - Characterize model errors as a function of how much data you have
  - Generalization theory
  - Characterize computational performance of algorithms
  - Convergence of optimization methods
  - Concepts of optimality in decision-making and RL
- Classes
  - Parts of the probabilistic modeling classes
  - Parts of 6.867
  - 9.520J : Statistical learning theory
  - 6.231 : Dynamic programming and reinforcement learning
  - 6.246 : Reinforcement learning: foundations and methods
  - 6.881 (temp num) : Optimization in machine learning
  - 6.890 : Learning augmented algorithms

Systems

- Ideas
  - ML-related computations can take advantage of special hardware and software support
  - Probabilistic programming is a new paradigm combining traditional programs and Bayesian inference
  - Program induction is like ML, but where hypothesis class is programs

- Courses
  - 6.887 (temp num) : Machine learning for systems
  - 6.812/825 : Hardware architecture for deep learning
  - 6.885 (temp num) : Probabilistic programming and artificial intelligence
  - 6.s084/6.887 (temp num): Introduction to program synthesis

Applications

- 6.402/6.482 : Modeling with machine learning
- 6.419/6.439 : Statistics, computation, and applications
- 6.345 : Spoken language processing
- 6.802 : Computational systems biology: deep learning in the life sciences
- 6.804 : Computational cognitive science
- 6.806 : Quantitative methods in natural language processing
- 6.819 : Advances in computer vision
- 6.871/HST.956: Machine learning for healthcare
- 6.882 (temp num) : Embodied intelligence
- 6.884 (temp num) : Computational sensorimotor learning

Brain and cognitive science

- 6.804 : Computational cognitive science
- 6.S899 (temp num): Brain algorithms
- 6.881 (temp num): Tissue vs silicon in machine learning

Ethics

- 6.805J : Foundations of information policy
- 6.904J : Ethics for engineers
- Likely to be offering new subject in Fall 21

Have a great summer!