EEE511 Artificial Neural Computation

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The Growing Trend of the Fast-Developing Field of Machine Learning

Machine learning is preferred approach to

- Speech recognition, Natural language processing
- Computer vision (ID, surveillance, automation, …)
- Medical diagnosis and outcomes analysis
- Robot control
- Computational biology (protein unfolding, …)
- And many more…

This trend is accelerating

- Improved machine learning algorithms
- Improved data capture, networking, faster computers
- Software too complex to write by hand
- New sensors / IO devices
- Demand for self-customization to user, environment
- …

About EEE511 – your needs

- Motivation
- Background
- Logistics
- Grades
- …

About EEE511 – my perspective

- Provide a solid foundation on machine learning.
  - We should use equations as much as we can (to be concise)
- Cover key concepts of machine learning to include loss/cost function, local gradient, information/gradient flow, probabilistic inference, deep networks, convolution, recurrence, and more.
  - We will have some individual assignments and an exam/quizzes

- Students learn a comprehensive and state-of-the-art technical skills to effectively use machine learning to solve problems (how to prepare data, how to determine the impact of features, how to select models and learning algorithms, and finally and importantly, how to diagnose a learning process).
  - We achieve this partly by working on the final project, and supplemental projects

- Require hands-on based on state-of-the-art tools (Kaggle.com, PyTorch, TensorFlow, Keras, Google Colab, and more…).

- Appreciate significant applications in broad areas that have direct impact on our life.

Prerequisites

- Calculus (derivatives, integrals, infinite series, chain rule)
- Linear algebra and matrix theory (eigenvalues and eigenvectors, inverses, SVD)
- Probability and statistics (random variable, pdf, estimators, Bayes rule, inference, hypothesis testing)
- Python/Matlab programming (although students are given the flexibility to choose their tool)