Course Overview
Course Logistics
Course Outline
Grading Rubric
Machine Learning Review
Artificial Intelligence
1 Artifical Intelligence Overview
1.0.1 AI Paradox
Artifical Narrow Intelligence (ANI) vs Artificial General Intelligence (AGI)

- Problems difficult for humans are easy for AI
- Problems easy for humans are difficult for AI

1.1 Knowledge-Based AI
- AI that is provided explicity rules
- People struggle to formalize these rules

1.1.1 Machine Learing Approach
- Allows computers to learn from experience
- Learns to map features to outputs

1.1.2 Supervised vs Unsupervised Learning
- Dataset: Collection of unlabeled examples $\{x_i\}_{i=1}^N$
- Goal: Create a model tha ttakes x as input and either transform it into another vector or into a value that can be used to solve a practical problem

Note: Training a pretrained model for with a training and test set is considered semi-supervised learning

1.1.3 Reinforcement Learning
Input: State-action pairs
Goal: Learn a good sequence of decisions to maximize a reward

2 Preliminaries
2.0.1 Data Manipulation
- A tensor represents a (possibly multi-dimensional) array of numerical values
  - With one axis, a tensor is called a *vector*
  - With two axes, a tensor is called a *matrix*
  - With $n > 2$ axes, we just call it a tensor

```
# Library import
import torch
# Assign x to an array with 12 floats
x = torch.arange([12, dtype=torch.float])
```

2.0.2 Linear Algebra
2.0.3 Calculus
2.0.4 Automatic Differentiation
2.0.5 Probability and Statistics
3 Linear Neural Networks for Regression
4 Multiple Layer Perceptron (MLP)
You must have a general understanding of the following ML algorithms

- Linear Regression

- KNN
- K-means Clustering
- Linear SVM (**Important for Interviews**)
- SVM with gaussian kernel for non-linear SVM
- Naive Bayes Classifier
- Principal Component Analysis (PCA)

You must understand the following performance metrics

- ROC
- AUC
- F1 Score
- Precision
- Recall
- Accuracy

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