6.867 Machine Learning
List of topics, problems, concepts, and methods

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Recommended prerequisits

The course assumes some basic knowledge of probability theory and linear algebra; for example, you should be somewhat familiar with

- Joint and marginal probability distributions

- Normal (Gaussian) distribution

- Expectation and variance

- Statistical correlation and statistical independence

Problems, concepts, methods, and tools

Listed here are important topics we intend to cover in the course. The list is not all inclusive.

Problems:

- Regression and classification

- Active learning

- Feature selection

- Density estimation

- Clustering

- Model selection

- Inference

Concepts:

- Estimation, bias, variance, loss

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- Empirical risk, maximum likelihood

- Generalization, overfitting

- Regularization

- Capacity, VC-dimension

- Generative/discriminative models

- Representation, model structure

- Minimum description length

Models and methods:

- linear regression, additive models

- Generalized Linear Models

- Neural networks

- Support Vector Machine (SVM)

- Boosting

- Mixture models, mixtures of experts

- Kernel density estimation ,

- Markov chain/processes

- Hidden Markov Models (HMM) , ,

- Belief networks, Markov random fields ,

Tools:

- Cross-validation

- Gradient descent

- Quadratic programming ,

- EM algorithm ,

- Forward-backward algorithm ,

- Junction tree algorithm

- Gibbs sampling