STAT 535 Lecture 0
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Introduction to Statistical Learning
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- **What's in a name? Or where does "Machine Learning"/"Statistical Learning" come from?**

- **What's in this sequence?**

  – Data analysis problems (e.g. clustering, classification)

  – Statistical models (e.g. exponential family models, graphical models)

  – Statistical methods (e.g. Support Vector Machines)

  – Algorithms (e.g. message passing, K-means). There is a continuum between algorithms, methods, and some of the other items on this list.

  – Mathematical facts/concepts from: graph theory, convex analysis

  – Theorems (without proofs), lemmas (with proofs)

- **Taxonomies** . . . all of them incomplete

  – Statistical Learning Problems

    * Unsupervised
    * Supervised
    * (Semi-supervised)
    * (Reinforcement)

  – Statistical models

    * Parametric
    * Non-parametric

  – Statistical inference paradigms

    * Bayesian

* Maximum Likelihood (ML)
* Penalized Likelihood
* Maximum A-Posteriori (MAP)

These lists are meant to show that in this course we will not adopt a particular paradigm, but we will touch on most of them.

- **535** "Unsupervised Learning" will have two major topics

  - Graphical probability models, i.e. algorithms for multivariate statistical inference
  - Unsupervised learning, mainly clustering

- **538** "Supervised Learning" will have two major topics

  - Supervised learning (classification, regression)
  - Convexity and convex optimization in statistics