

CS444

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Kinds of Learning

- Supervised...
- Unsupervised...
- Reinforcement...

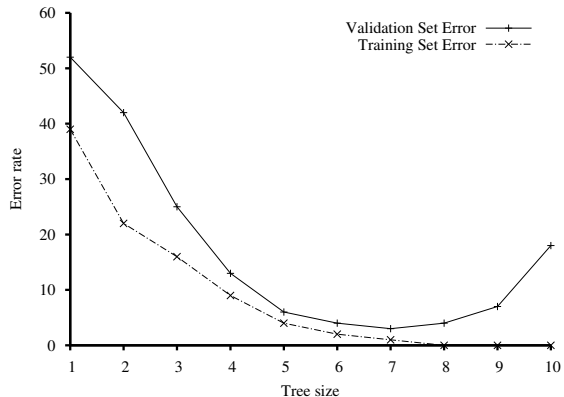
Supervised Learning

- Stationarity Assumption...
- Data is i.d.d.
 - Independent and identically distributed.
- Goal is to minimize loss on unobserved data from the same distribution.

Evaluating Learning

- Training Set / Test Set
- Validation Set

Using A Validation Set



Not Enough Data?

- K-fold cross-validation
- Leave-one-out cross-validation

Model Selection vs. Optimization

- Model selection - Defines the hypothesis space.
- Optimization - Finding the best hypothesis in that space.

Regularization

- Sort of like addressing the model selection problem through optimization.
- Change your loss metric to penalize complexity...

$$E(\mathbf{w}) = \sum_j (y_j - \mathbf{w}^T \mathbf{x}_j)^2 + \frac{\lambda}{2} \|\mathbf{w}\|^2$$

Solution:

$$\mathbf{w}^* = (X^T X + \lambda I)^{-1} X^T \mathbf{y}$$