**Evaluate learning algorithm**

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| 1. **Split data set** |
| 70% of training set, 30% of test set  Example  Logistic Regression    The proportion of wrong label |
| 1. **Select degree of polynomial** |
| List all degree of polynomial, train with each model and select the one that has the best performance on the test set/cross validation set.  60% training set, 20% cross validation, 20% test set   1. Use cross validation set to select the model, get theta 2. Use test set to estimate generalization error |
| 1. **Diagnosing Bias vs Variance** |
| **Bias (underfitting)**  cost function of training set and cross validation set are both high  **Variance(Overfitting):**  Cost function of training set is low, and cross validation set are high |
| 1. **Selecting lambda** |
| Compute theta with different lambda, min J (cv) is the right lambda |
| 1. **Learning curves** |
| When training set size is small, the J(train) is small, J(cv/test) is large  Underfitting;    Add data is not likely to help  Overfitting    Adding data is likely to help |
| **Revise options** |
| 1. Getting more training examples   Fix overfitting   1. Try smaller set s of features   Fix overfitting   1. Try getting additional features   Fix underfitting   1. Try adding polynomial features   Fix underfitting   1. Try decreasing lambda   Fix underfitting   1. Try increasing lambda   Fix overfitting |
| **Neural networks and overfitting** |
| Small #hidden layer = underfitting  High #hidden layer = overfitting |