Decision Trees

**Candidate-Elimination Algorithm** – Outputs a description of the set of all hypotheses consistent with the training examples. It performs poorly when given noisy training data.

Neural Networks

Instance Based Learning (KNN)

*Background*

Previously, we’ve been looking at algorithms that calculate a function based on data points and what their behavior was (i.e., linear, parabola, etc.) That would determine estimated answers.

With IBL, we take all of the training data and we put it in a database. When we are looking for some new x, we just look it up in the database and we match the x and y pair. No learning or finding the appropriate function is required. The function is to just look up X. This turns out to be very reliable, conceptually simple, and efficient (i.e., very fast).

However, there are still some underlying issues. There is a problem when the function cannot find an equivalent match and, subsequently, no point will be return. IBL is very conservative in this way. Thus, there is no generalization. On a similar note, this method will be highly susceptible to noise. This can lead to overfitting because if the learner believes in corrupt data, the function will return a misleading value. Lastly, the lookup function returns, not just one, but all cases of X, which is problematic when trying to find the target concept.

*K-NN*

K represents some domain knowledge in that it shows how many neighbors you think you should have.

The algorithm itself is very simple. This is because a lot of the decisions are left for:

1. The distance metric
2. The number k
3. How you’re going to break ties
4. How you’re going to implement voting (e.g., you can have weighted count as opposed to a simple vote count).
5. How you choose to implement the mean operation (e.g., you can have a weighted mean/average that the y values corresponds to x values that are closer to the query point have more of an influence on the mean) to figure out.

Ensemble Learning (Boosting)

Kernel Methods & SVMs

Computational Learning Theory

VC Dimensions

Bayesian Learning

Bayesian Inference

Randomized Operations