**Machine Learning**

**Announcements**

**Prediction**

**Regression**

Given a set of \((x, y)\) pairs, find a function \(f(x)\) that returns good \(y\) values.

\[
\text{pairs} = \{(1656, 215.0), (896, 105.0), (1329, 172.0), \ldots\}
\]

Square feet

Price (thousands)

Data from home sales records in Ames, Iowa

Measuring error: \(|y-f(x)|\) or \((y-f(x))^2\) are both typical.

Over the whole set of \((x, y)\) pairs, we can compute the mean of the squared error.

Squared error has the wrong units, so it’s common to take the square root.

The result is the “root mean squared error” of a predictor \(f\) on a set of \((x, y)\) pairs.

(Demo)

**Critical Points**

Maxima, minima, and inflection points of a differentiable function occur when the derivative is 0.

The global minimum of convex functions that are (mostly) twice-differentiable can be computed numerically using techniques that are similar to Newton’s method.

(Demo)

**Multiple Linear Regression**

Given a set of \((x, y)\) pairs, find a linear function \(f(xs)\) that returns good \(y\) values.

A linear function has the form \(w \cdot xs + b\) for vectors \(w\) and \(xs\) and scalar \(b\).

(Demo)

Note: Root mean squared error can be optimized through linear algebra alone, but numerical optimization works for a much larger class of related error measures.