Linear Learning Algorithms.

Feature expansion was a way to use a linear hypothesis on higher dimensional space to get a non-linear hypothesis in the original feature space.

- Using polynomial features
- Gaussian expansion (RBF)

Linear Classification:

Add features by defining them using step functions/linear classifiers:

\[ [x_1, x_2] = x \]

\[ \phi(x)^T = [x_1, x_2, x_3] \quad x_3 = 1 \left[ \theta_1 x_1 + \theta_2 x_2 + \theta_0 > 0 \right] \]

\[ = \text{sign} (\theta_1 x_1 + \theta_2 x_2 + \theta_0) \]

\[ x_4 = 1 \left[ \theta_1' x_1 + \theta_2' x_2 + \theta_0' > 0 \right] \]

\[ \phi(x)^T = [x_1, x_2, x_3, x_4] \quad \text{Classification: } 1 \left( x_3 + x_4 - \frac{1}{4} \right) > 0 \]

Function representation:

Layered structure with pre-activation and activation functions.