Neural Networks

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The general idea behind neural networks is to maintain a **basis function** whose parameters can change during testing. Then the function can know how to perform "better" as the testing goes on.

Previously, we had only considered a linear combination of a fixed basis function, which usually took the form

$$y(x,w) = f\left(\sum_{j=1}^{M} w_j \phi_j(x)\right)$$

$$a_j = \sum_{i=1}^{D} w_{ji}^{(1)} x_i + w_{j0}^{(1)}$$

where a_j is the **activation** value.[1]

We then transform the activation value by another nonlinear function h, and are left with the final result $z_j = h(a_j)$

[1] Remember the activation is the final output of this node. In classification, it determines which class we eventually assign to an input. The (1) superscript indicates they are the first layer of the NN.