Neural Networks with Python and TensorFlow

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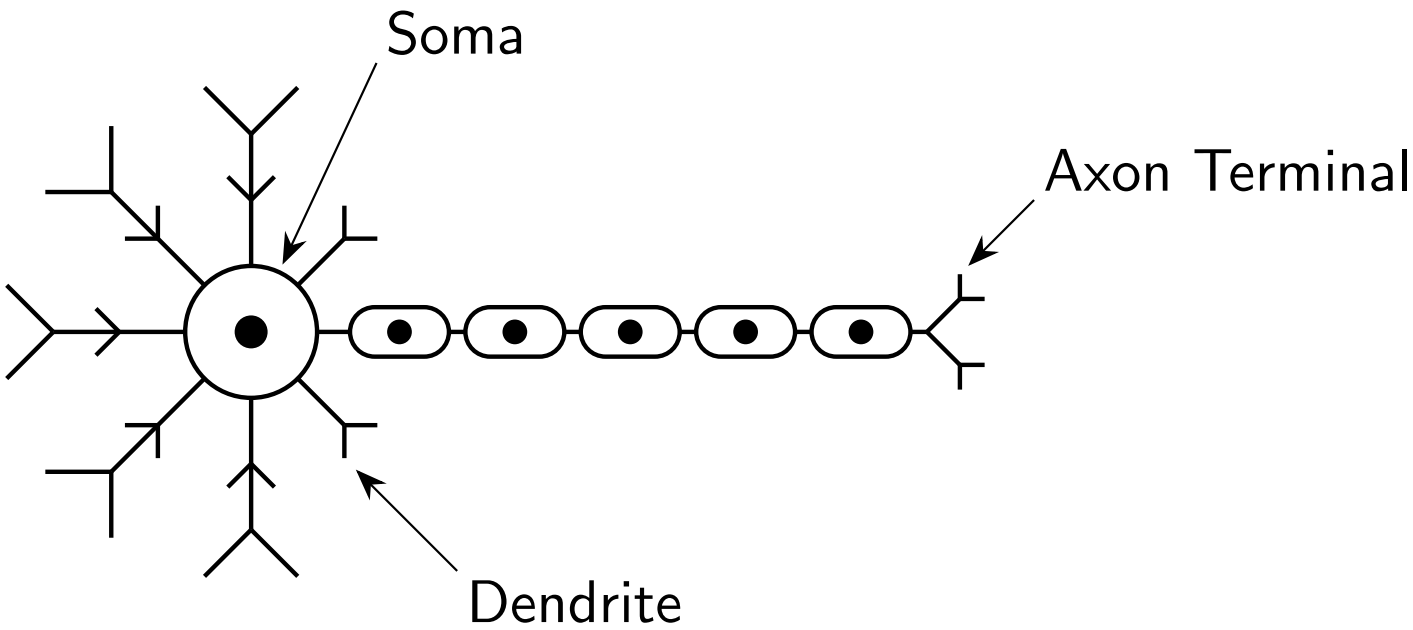
Aims and Objectives

- Provide an introduction to a variety of neural network architectures.
- Implement the architectures in python using TensorFlow.
- Use neural networks to solve simple problems.

Basis

Biological Neuron:



Receives signals via dendrites and soma, applies threshold, outputs via axon terminal.

Perceptron

$$A_i = \begin{cases} 1, & \sum_j w_{i,j} x_j > \theta \\ 0, & \text{otherwise} \end{cases}$$

Boolean output.
Weights adjusted according to activation and response correctness.

Modern Neural Network

$$y_i = \phi\left(b + \sum_j w_{i,j} x_j\right)$$

Weights adjusted via backpropagation / chain rule.

$$w_i' = w_i + \eta \frac{\partial f}{\partial w_i}$$

Convolutional

Neurons only connect to regions of previous layers.