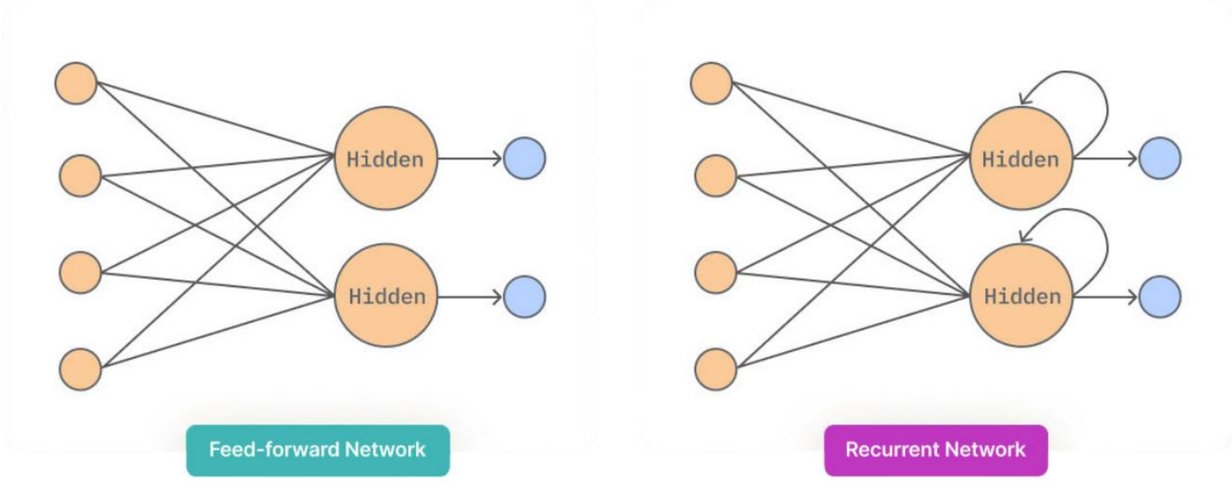
Explaining Neural Network Models

Basic Definitions

- **There are several kinds of artificial neural networks, including:**
  - Feedforward artificial neural networks
  - Perceptron and Multilayer Perceptron neural networks
  - Radial basis function artificial neural networks
  - Recurrent neural networks
  - Modular neural networks

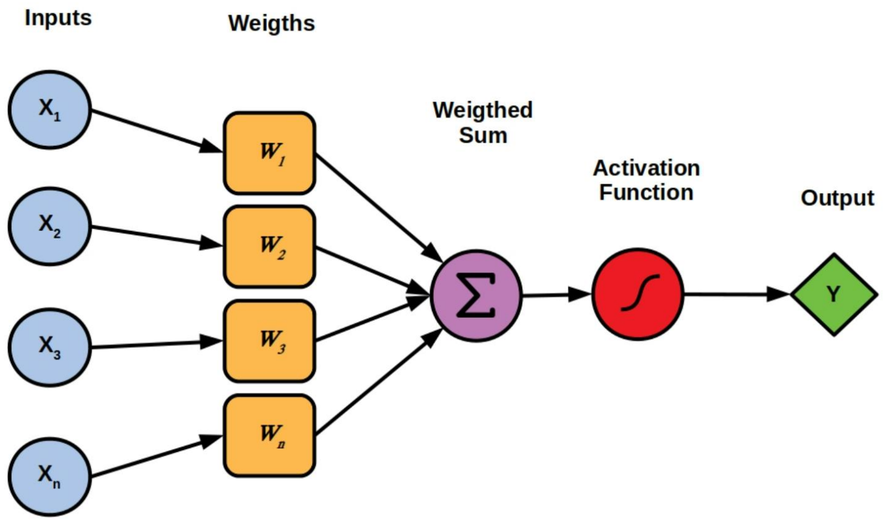
Feedforward artificial neural networks

A feedforward artificial neural network, as its name indicates, is one in which information only flows in one way between input and output nodes. Data doesn't cycle back through the same tiers of nodes; it travels ahead through them.



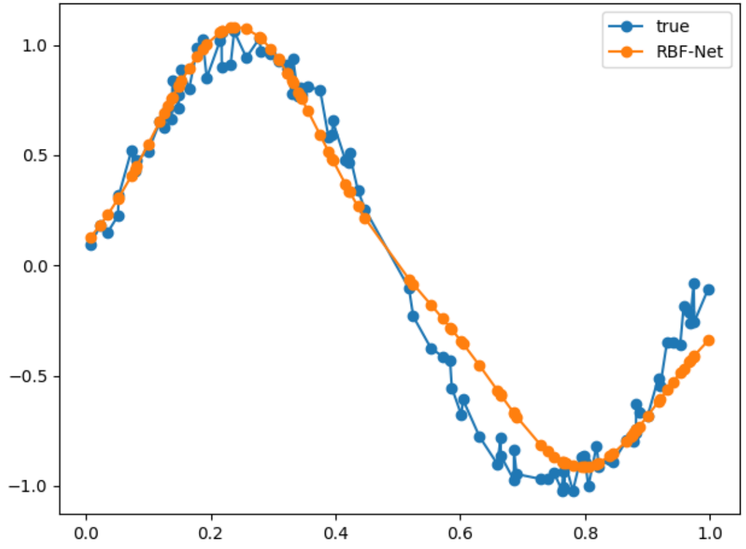
Neural networks such as the Perceptron and Multilayer Perceptron

One of the oldest and simplest models of a neuron is the perceptron. A Perceptron model may be thought of as a two-way data splitter—a binary classifier. One of the basic types of artificial neural network, it takes the form of a linear model.



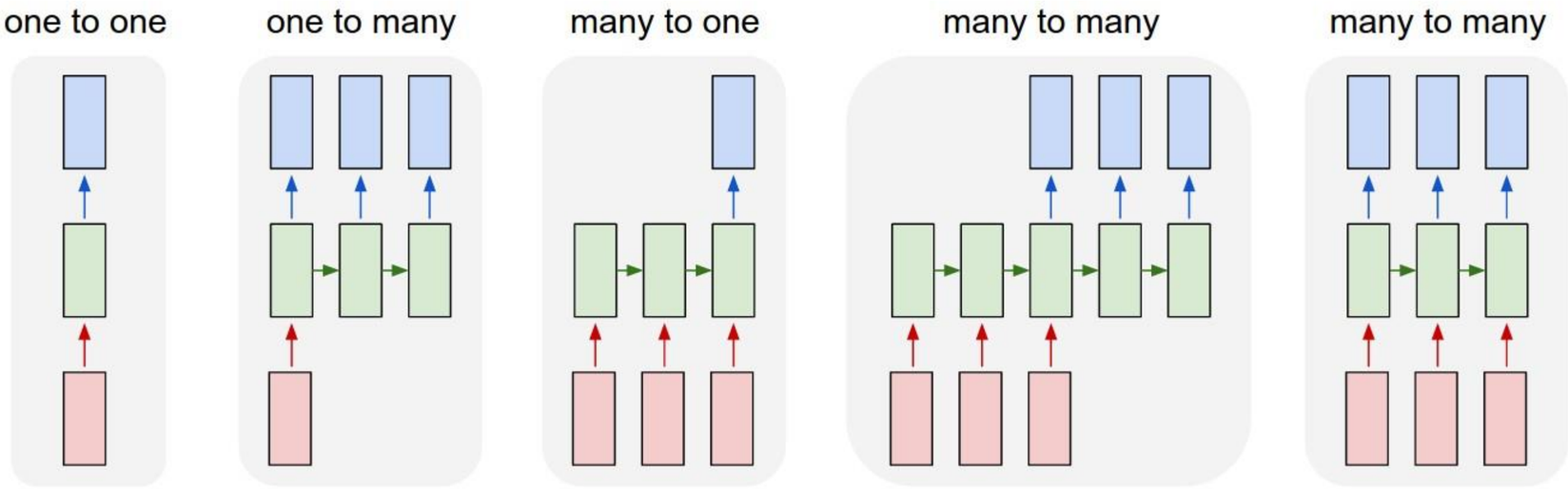
Radial basis function

A typical neural network structure consists of an input layer, a layer with nodes representing various radial basis functions, and an output layer. Systems may be controlled and classified with the use of models, and time series regression can also be modeled.



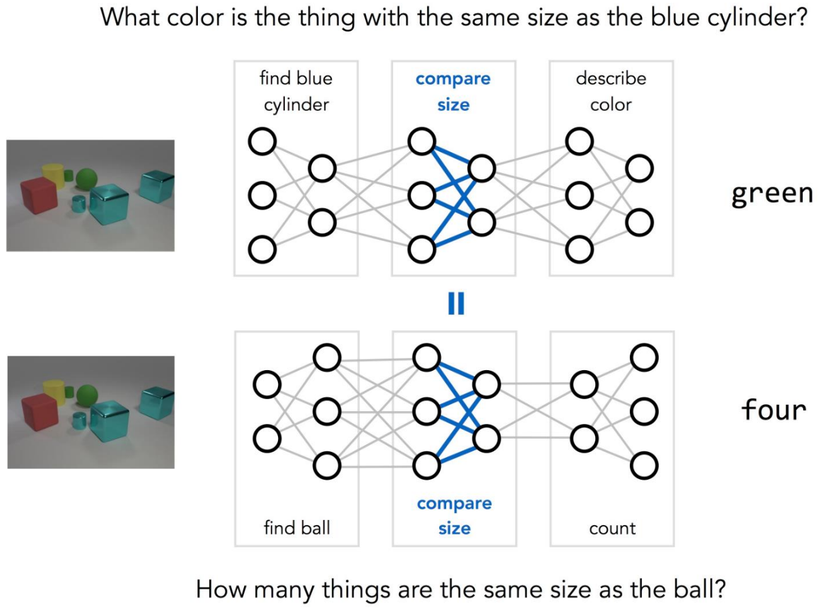
Recurrent neural networks

When building a model for handling sequential data, recurrent neural networks prove to be invaluable. If the model is to accomplish its goal and improve its predictions, it will transfer data forward and loop it back to earlier stages of the artificial neural network.



Modular neural networks

To accomplish a goal, a modular artificial neural network combines many smaller networks or modules that operate autonomously yet in concert with one another. Consequently, it is possible to partition a large project into manageable chunks. When applied to computing or data processing, the speed of these processes will rise since individual components will be able to work together more efficiently.



Deep Learning Neural Network

- Convolutional networks
- RNNs
- LSTM
- Adam
- Dropout
- Batch Norm
- Xavier/He initialization

Probabilistic methods

- Continuous and discrete distributions
- Maximum likelihood
- Cost functions
- Hypotheses and tasks training data
- Maximum likelihood-based cost
- Cross-entropy
- MSE cost feed-forward networks
- Gradient descent
- Recursive chain rule
- Bias-variance tradeoff
- Regularization

Continuous and discrete distributions

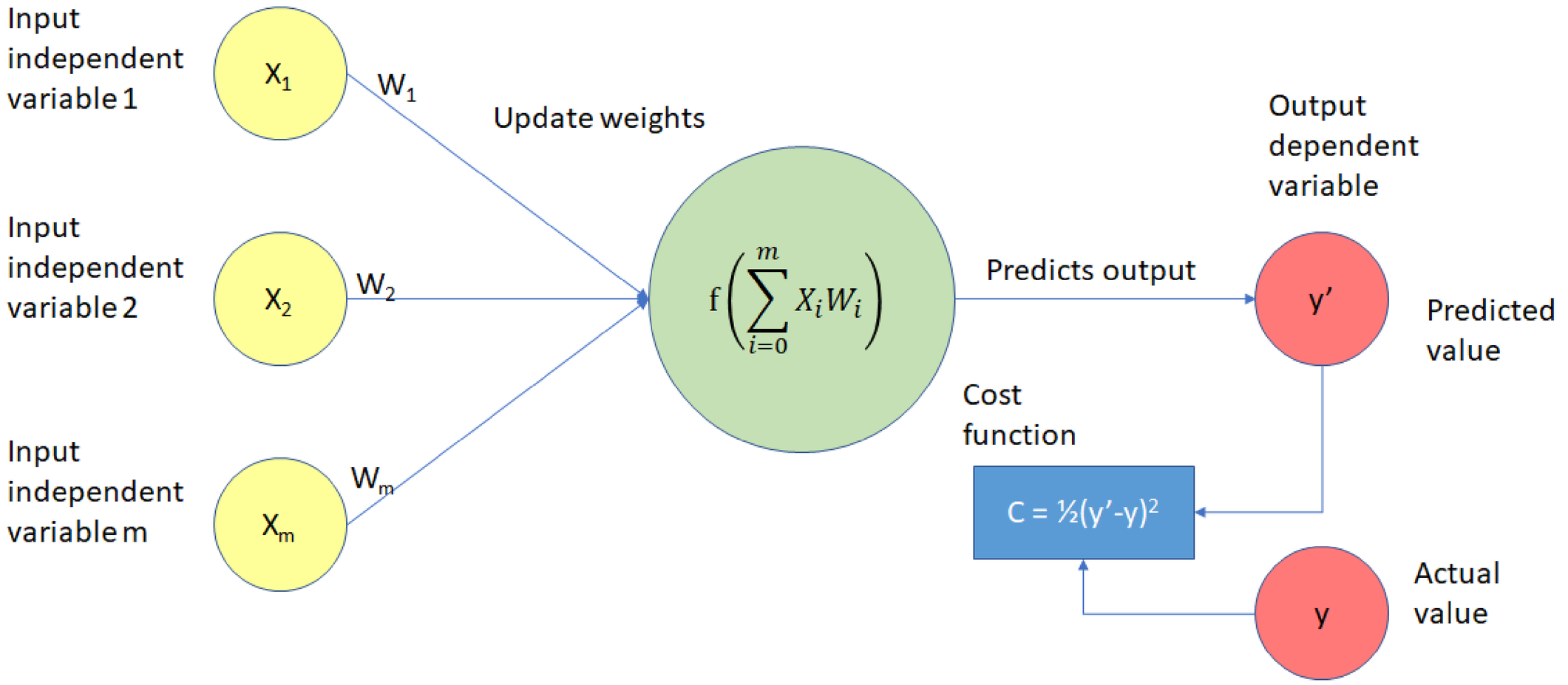
- A discrete distribution is one in which the data may only take on particular values, such as integers. One example of this kind of distribution is the normal distribution.

- One definition of a continuous distribution describes it as one in which the data may take on any value within a certain range (which may be infinite).

Maximum likelihood

The approach of determining the value of one or more parameters for a given statistic that makes the known probability distribution a maximum is the process that is referred to as maximum likelihood. Another name for this method is the maximum likelihood method.

Cost Functions



Loss Function

1.Regression Loss Functions…
2.Mean Squared Error Loss
3.Mean Squared Logarithmic Error Loss
4.Mean Absolute Error Loss

- Binary Classification Loss Functions
    1. Binary Cross-Entropy
    2. Hinge Loss
    3. Squared Hinge Loss

- Multi-Class Classification Loss Functions
    1.Multi-Class Cross-Entropy Loss
    2.Sparse Multiclass Cross-Entropy Loss
    3.Kullback Leibler Divergence Loss

Cost functions

1. Mean Error (ME)
2. Mean Squared Error (MSE)
3. Mean Absolute Error (MAE)
4. Root Mean Squared Error (RMSE)
5. Categorical Cross Entropy Cost Function.
6. Binary Cross Entropy Cost Function.