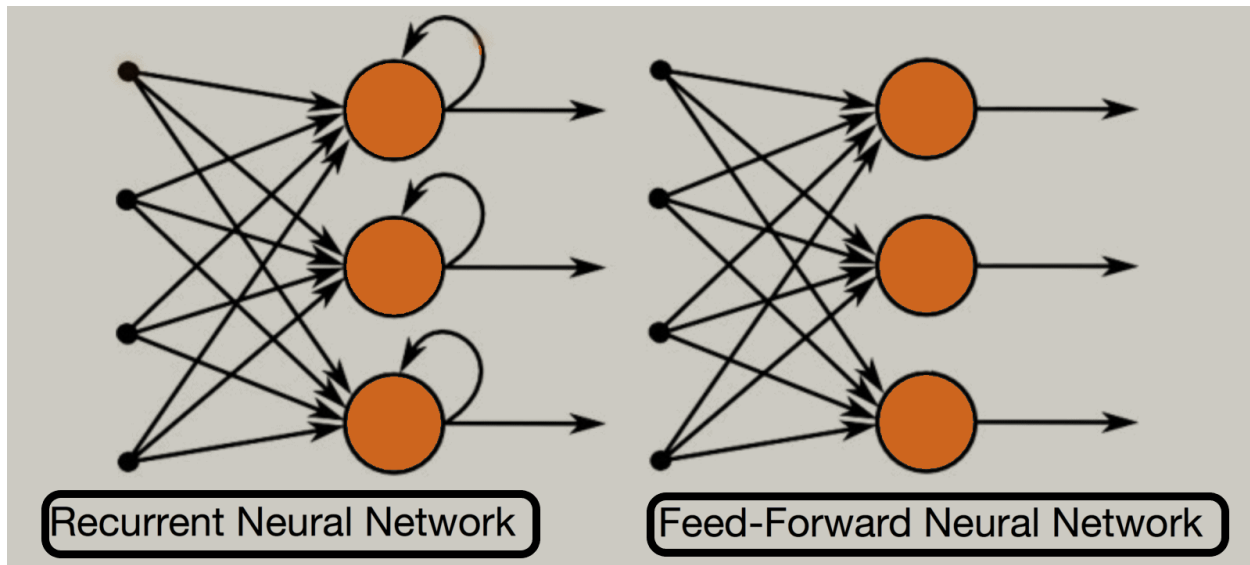


# RNNs



**Recurrent Neural Networks (RNNs)** are a type of neural network specifically designed to handle sequential data, such as time series, text, or speech. As the name suggests it has recurrences built in, which can handle context and draw information from sequences, based on that it can outperform MLPs in tasks which history of previous outputs matter (context). In short MLPs process inputs independently, RNNs maintain a **hidden state** that captures information from previous inputs in the sequence. This allows RNNs to model **temporal dependencies** (relationships between data points that occur at different times in a sequence. In simpler terms, it means that the current data point depends on previous and/or future ones).

## Differences from MLPs:

- **Memory:** RNNs have a "memory" through their hidden states, while MLPs treat all inputs as independent.
- **Weight Sharing:** RNNs use the same weights across all time steps, whereas MLPs use different weights for each layer.
- **Input Handling:** RNNs can take variable-length sequences; MLPs require fixed-size inputs.

## Advantages:

- Capture context over time, making them better at tasks that depend on context or sequences like language modeling, speech recognition, and time series forecasting.
- Handle sequential dependencies, which MLPs cannot do effectively.