Mohamed Sameh Saafan

**Recurrent Neural Network (RNN)**

A Recurrent Neural Network (RNN) is a type of artificial neural network that is specially designed to handle sequential or time-based data. This means it works well with data where the order of the information is important, such as text, speech, or time series. Unlike traditional neural networks, which treat each input independently, RNNs have a special feature called a hidden state that allows them to remember information from previous inputs. This memory helps the network make better predictions because it takes into account what has already happened in the sequence. For example, when analyzing a sentence, an RNN can use the earlier words to understand the meaning of the current word. RNNs process one element of the sequence at a time, updating the hidden state at each step. This makes them useful for many applications, such as text classification, language translation, speech recognition, handwriting recognition, and even predicting stock prices or weather trends. However, RNNs can sometimes face problems with long sequences, where earlier information gets lost or has less influence. To solve this, advanced versions like Long Short-Term Memory (LSTM) and Gated Recurrent Units (GRU) were developed. These models improve the memory of RNNs and help them learn long-term patterns more effectively. Overall, RNNs are a powerful tool for tasks that involve patterns over time or in sequences.