

Modelling Timeseries Data Using Recurrent Neural Net

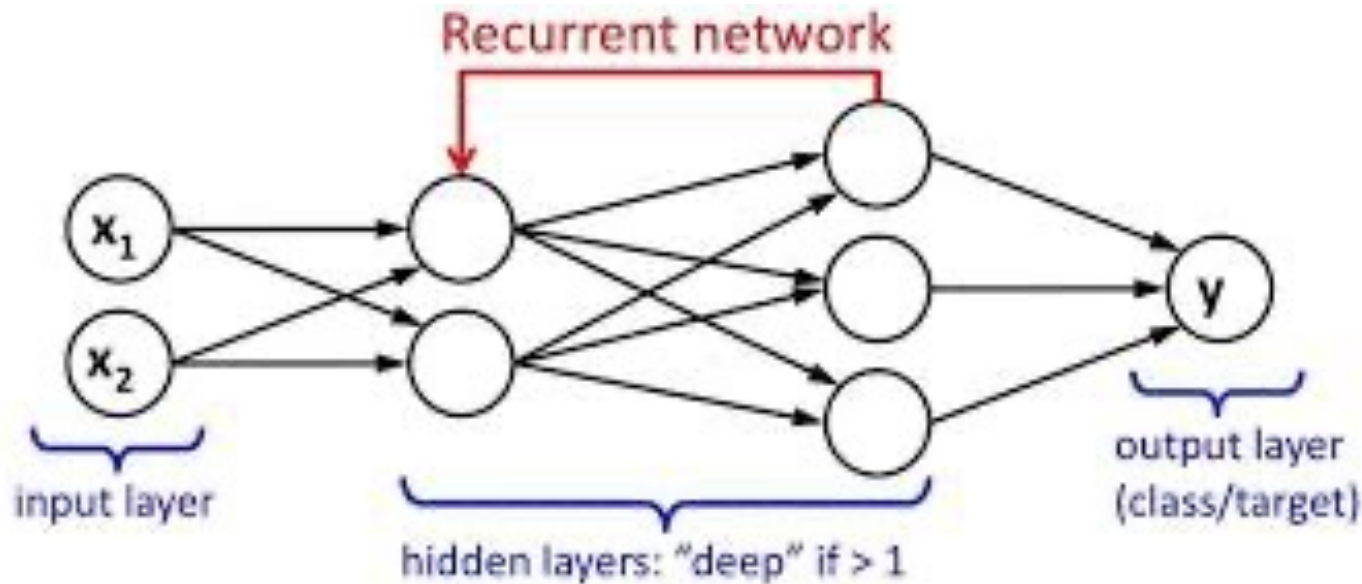
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Introduction



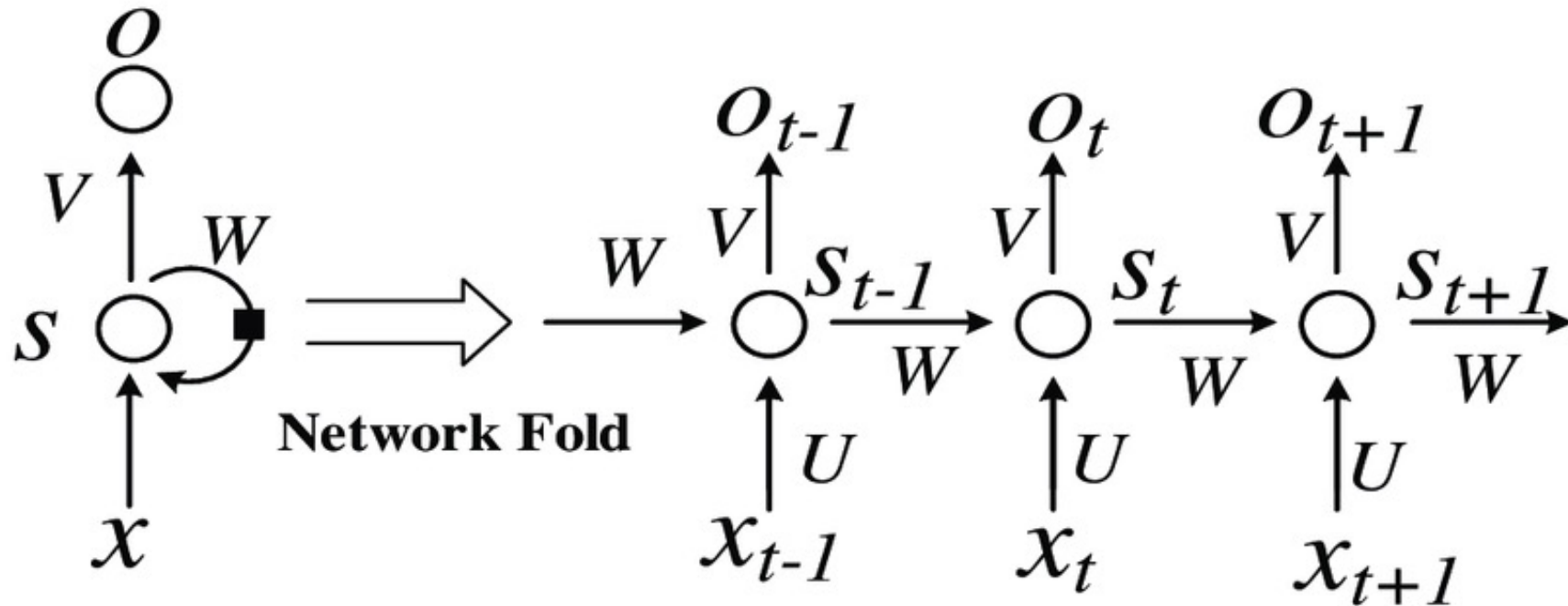
- We have an input layer, a hidden layer, and an output layer. The input layer takes the input, activations functions are applied to the hidden layer, and finally, we receive the output.
- In a deep neural network where multiple hidden layers are present. Each hidden layer is known by its weights and biases.

Introduction

- The weights and biases of these hidden layers are different. Hence each of these layers behaves differently/independently and so that we can't combine them together.
- We should have the same weights and biases for these hidden layers to bind these hidden layers together.
- Now we can combine these layers together because the weights and bias of all the hidden layers are the same now. All these hidden layers can be bound together in one single recurrent layer.

What are RNNs?

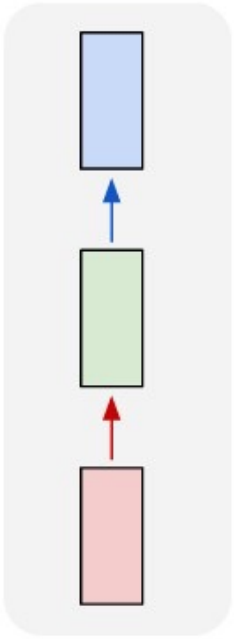
- A series of feed-forward neural networks in which the hidden nodes are connected in series.
- **RNN** has multiple series predictions, unlike CNN.



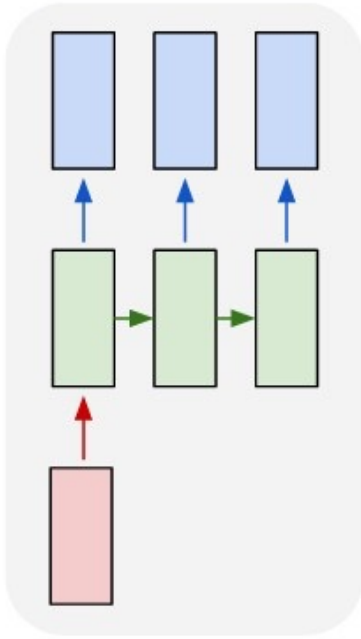
Types of RNNs

- One to One: This is also called Vanilla Neural Network. It is used in such machine learning problems where it has a single input and single output
- One to Many: It has a single input and multiple outputs. An example is Music Generation
- Many to One: RNN takes a sequence of inputs and produces a single output. The examples are Sentiment classification, prediction of the next word.
- Many to Many: RNN takes a sequence of inputs and produces a sequence of outputs. For example, Language Translation.

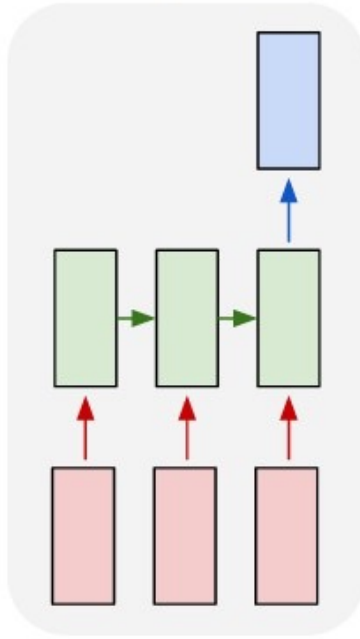
one to one



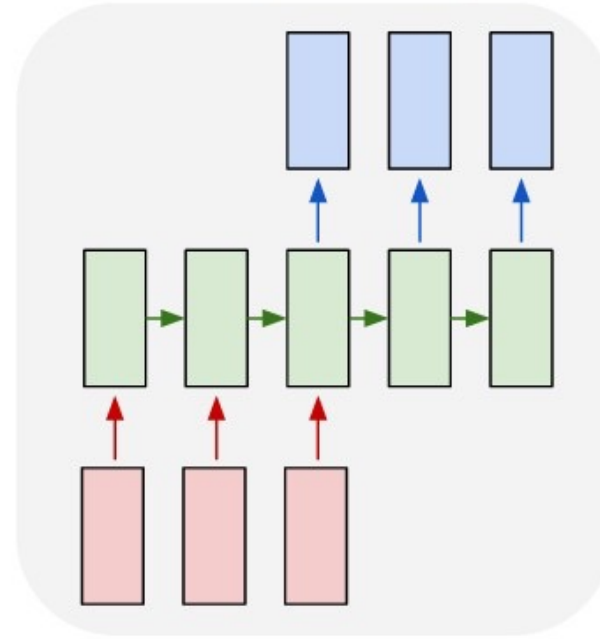
one to many



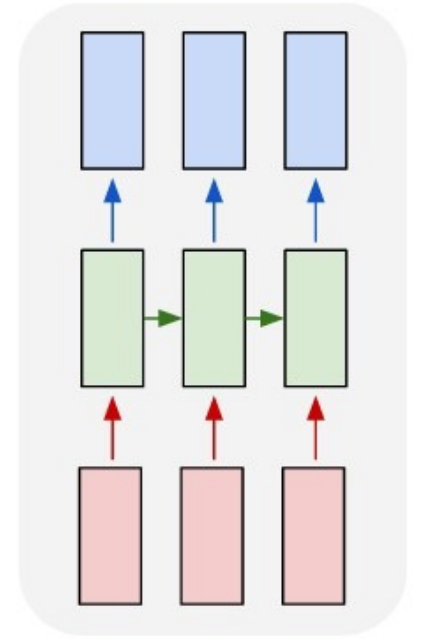
many to one



many to many



many to many



Types of RNNs

- 1-1
- 1-many
- Many-1
- M-M (single output)
- M-M (sequence of output)



Today

- Forecasting timeseries:
 - Given some timestamps, we are interested to predict future timestamp
 - Example: weather, stock prices, human growth etc.
- Datasets:
 - Univariate
 - Multivariate
- Pre-requisite:
 - Python programming, statistics, maths (geometry, linear algebra) and patience.

Tools

- Google Colaboratory:
 - Pre-requisite Google Account
- GPU compute enabled Jupyter notebook:
 - Should work using CPU, but it will take forever.
- Notebooks, dataset and today slides:
 - <https://github.com/faizuddin/workshop>