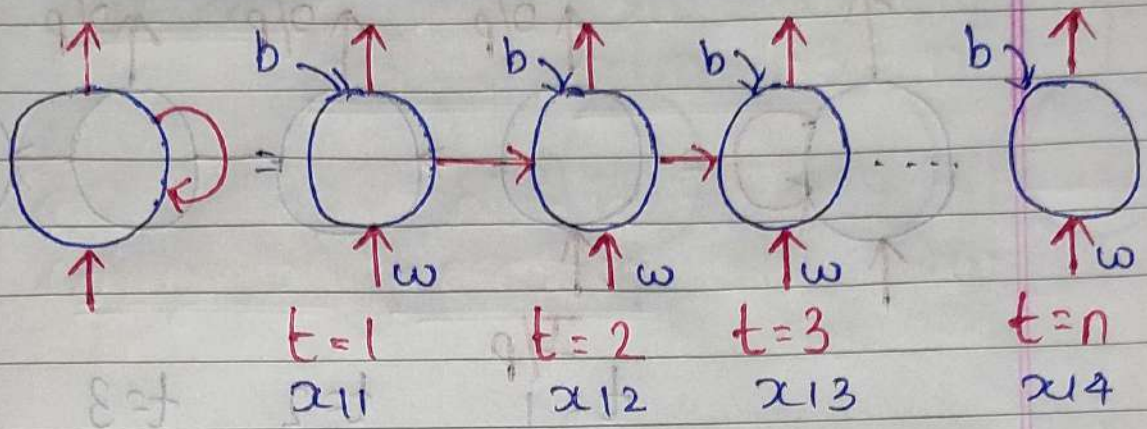
Recurrent Neural Network (RNN)



Example Sentiment Analysis.

O/P

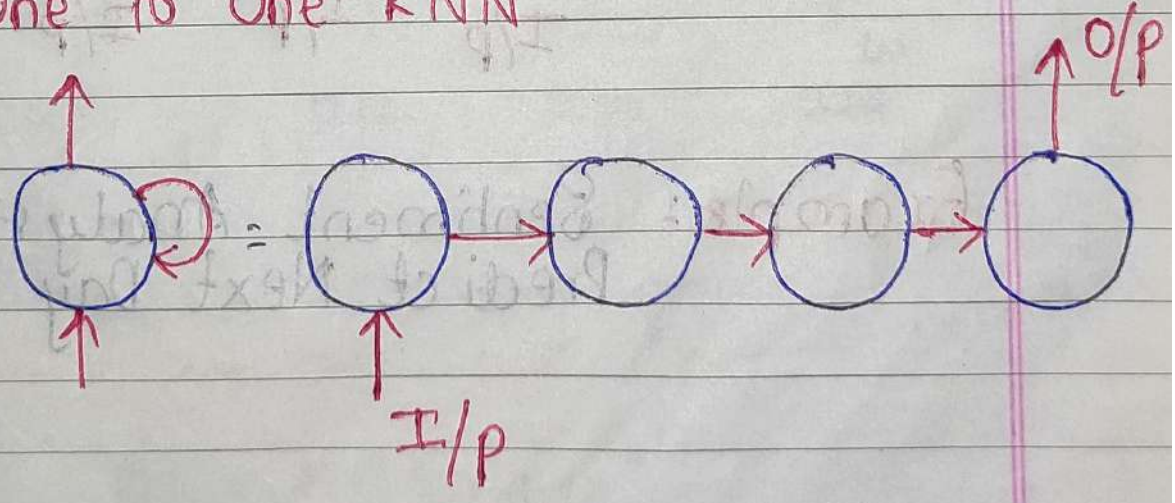
The food is good positive.

x_{11} x_{12} x_{13} x_{14}

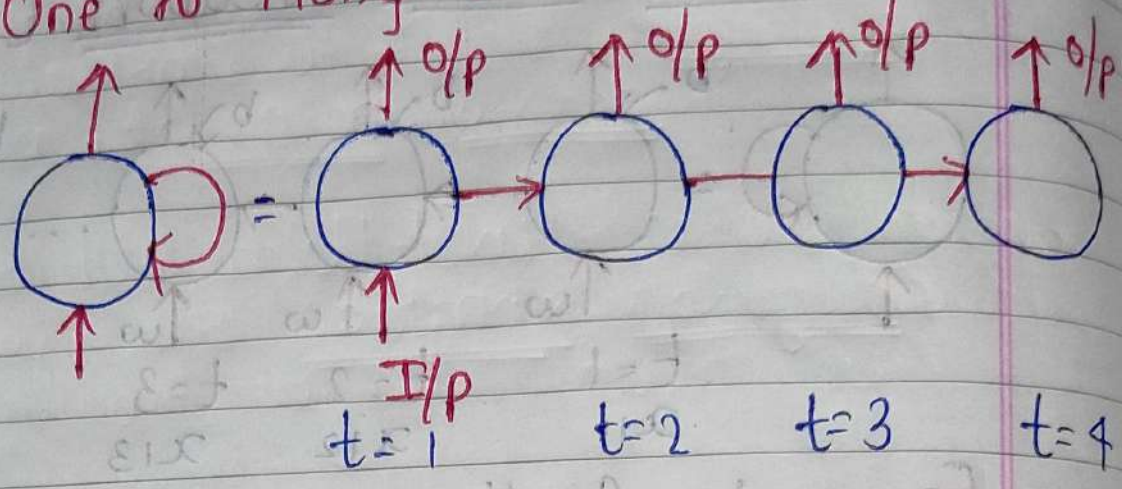
Types of RNN

- One to One RNN
- One to many RNN
- Many to One RNN
- Many to Many RNN

One to One RNN

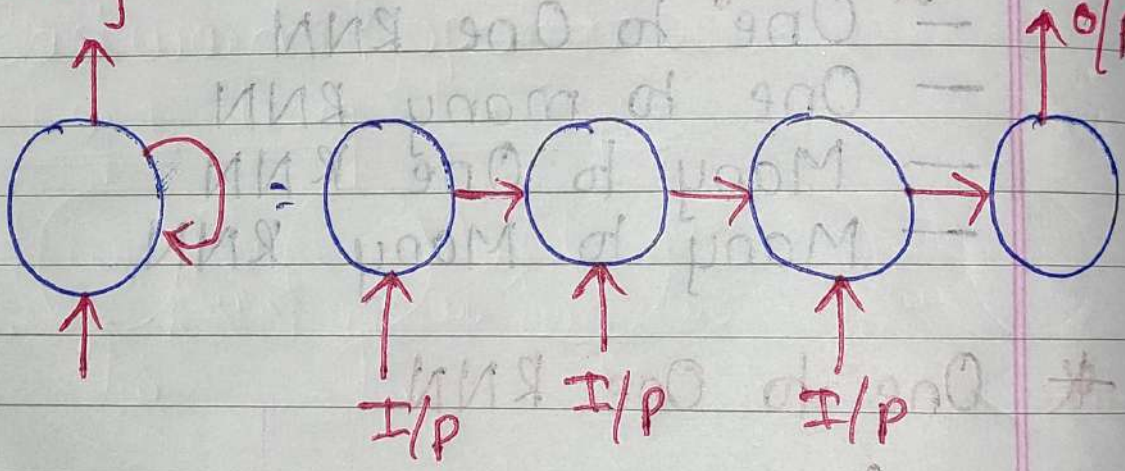


* One to Many RNN.



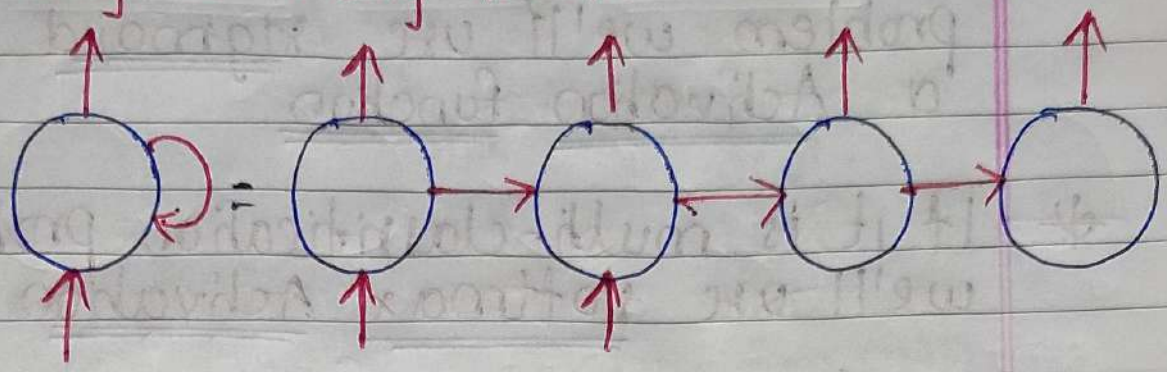
Example : Music Generation.
Google Search Suggestion
Movie Recommendation.

* Many to One RNN.



Example: Sentiment Analysis
Predict Next Day Sales

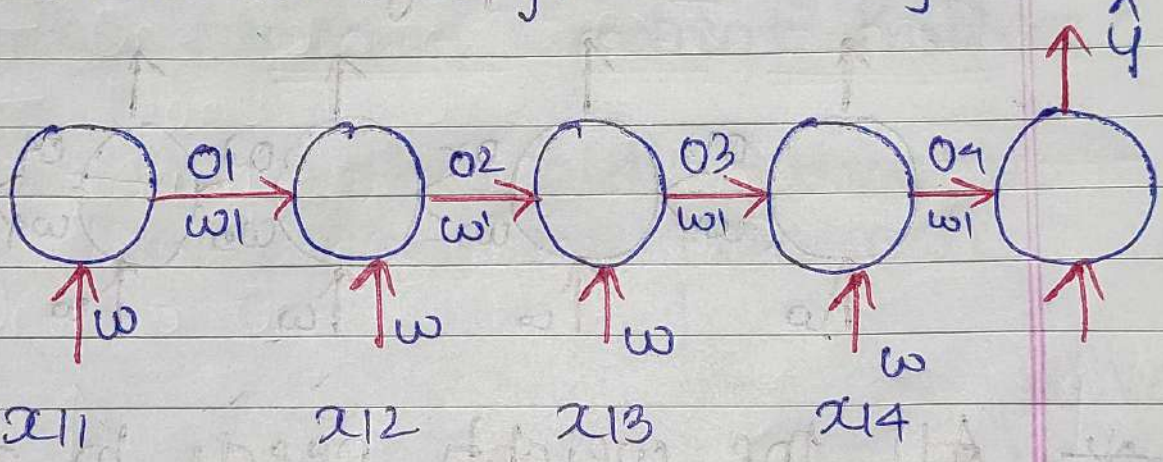
* Many to Many RNN



Example: Language Translation.
Question Answer
Chatbot

* forward Propogation in RNN

Sentiment Analysis → Many to One



The food is very good — O/P positive

x_{11} x_{12} x_{13} x_{14} x_{15}

$$O_1 = f(x_{11} + w)$$

$$O_2 = f(x_{12} * w + O_1 * w_1)$$

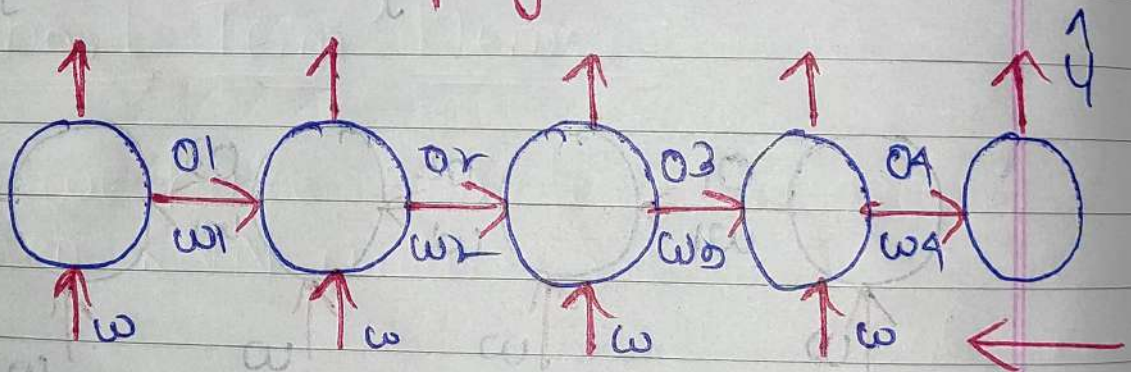
$$O_3 = f(x_{13} * w + O_2 * w_1)$$

* If it is binary classification problem we'll use sigmoid as a Activation function

* If it is multi-classification problem we'll use softmax Activation

* The Sigmoid Activation function is commonly used in binary classification problem because it maps the input value between 0 and 1.

* Backword Propogation:



* All the weights needs to get updated in Back Propogation

* Weight Updation formula.

$$w^1_{new} = w^1_{old} - \eta \frac{\partial L}{\partial w^1}$$

* Chain Rule.

$$\frac{\partial L}{\partial w} = \frac{\partial L}{\partial \hat{y}} * \frac{\partial \hat{y}}{\partial O_4} * \frac{\partial O_4}{\partial w}$$

* In Back Propogation what kind of issue may we con face?

→ Vanishing Gradient Problem

Q. Why Vanishing Gradient Problem?

→ It we use Sigmoid Activation function it output between 0 to 1

But it we calculate the derivative of sigmoid output will be 0 to 0.25

when our oput will range 0 to 0.25 as we go backword there is a chance this value will become small.

It the value is smaller than weight

updation will be negligible. So all the time there will be some weights.

* In Order to fix this Issue we will use another kind of neural network which is called as ?

→ LSTM RNN

* Long Short Term Memory Recurrent Neural Network. (LSTM RNN).

* RNN can only ~~rem~~ remember Short Term Memory

* If we have shorter Sentences then RNN will work well.