Title: Recurrent Neural Network (RNN)

Objective: To study and understand RNN by dung analysis and designing predictions,

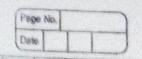
problem Statement: Use the Google stock prices dotaset and design a time series analysis and prediction system using RNN.

RNN is a type of Neural Network where the output from the previous step is feed as input to the wrient step. In truditional neural networks call the inputs and outputs are independent of each other, but in coses like when it is required to predict the next word of a sentence, the previous words are required and hence there is a need to remember the previous words, Thus RNN come into existen which solved this issue with the help of a Hidden Layer The main and most important feature is Hidden state, which remembers some information about a sequence.

RNN have a "memory" which remembers all information about what has been calculated. This reduces the complexity of parameters, unlike other neural networks,

The working of an RNN/can be understood with the help of the below example.

Example: Suppose there is a deeper network with one input layer, three hidden layers and one output layer.



Then like other neural networks, each hidden lower will have its own set of weights and biases, let's say, for hidden lower I the weights and biases are (w1, b1), (w2, b2) for the second hidden layer and (w3, b3) for the third hidden lower. This means that each of these byers, is independent of the other, i.e. they do not memorize the previous outputs

Now the RNN do the following:

RNN converts the independent activations into dependont activations by providing the same weights and biases to all the layers, thus reducing the complexity of increasing parameters and memorizing each previous output by giving each output as input to the next hidden layer.

Hence these three layers can be joined together such that the weights and bias of all the hidden layers are

the same in a single recurrent layer.

The formula for calculating current state; where ht = f(ht-1,xt)

his current state his previous state

formula for applying Activation function (tanh): where he = tanh (Wnnhit + Wxnxt) who is weight at recurrent neuron.

want weight at input neuron.

The formula for labelating actput:

fraining through RNN. by single-time step of the internet is provided to the Then calculate its current state using a set of cornect input and previous state. s. The current ht becomes he for the next time step were can go as many time steps according to the problem and join the information from all the previous states. some all the time steps one completed the final among state is used to calculate the output. 8. The autput is then compared to the actual output se the torget output and the error is generated. 1. The error is then back-propagated to the network to update the weights and hence the (RNN) is Advantages of RNN. 1) Remembers each and every piece of information, It is useful in time series prediction only because of feature 2) Used for effective pixel neighbor hood. Disadvantages of RNN: Discovered vanishing and exploding problems, Discioling an RNN is a very difficult task.

Diamet process long sequences using tahk or relea. Conclusion: We have successfully implemented a RNN to create a / classifier.