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BATCH – 5 (Ai & Ml)

Assignment - 1

1. Define and explain the architecture and working principle of LSTM & Q Learning.

A typical LSTM network is comprised of different memory blocks called cells
(the rectangles that we see in the image). There are two states that are being transferred to the next cell; the cell state and the hidden state. The memory blocks are responsible for remembering things and manipulations to this memory is done through three major mechanisms, called gates. Each of them is being discussed below.

A forget gate is responsible for removing information from the cell state. The information that is no longer required for the LSTM to understand things or the information that is of less importance is removed via multiplication of a filter. This is required for optimizing the performance of the LSTM network

The input gate is responsible for the addition of information to the cell state. Process of adding some new information can be done via the input gate.

All information that runs along the cell state, is fit for being output at a certain time.This job of selecting useful information from the current cell state and showing it out as an output is done via the output gate.

Q-Learning is a Reinforcement learning policy that will find the next best action, given a current state. It chooses this action at random

and aims to maximize the reward. Q-learning is a model-free, off-policy reinforcement learning that will find the best course of action, given the current state of the agent. Depending on where the agent is in the environment, it will decide the next action to be taken.

The objective of the model is to find the best course of action given its current state. To do this, it may come up with rules of its own or it may operate outside the policy given to it to follow. This means that there is no actual need for a policy, hence we call it off-policy Model-free means that the agent uses predictions of the environment's expected response to move forward. It does not use the reward system to learn, but rather, trial and error.

2. What are the application areas of the above two algorithms?
   There are innumerable applications of LSTMs. Some of them are:

   Speech Recognition (Input is audio and output is text) – as done by Google Assitant, Microsoft Cortana, Apple Siri
   Machine Translation (Input is text and output is also text) – as done by Google Translate
   Image Captioning (Input is image and output is text)
   Sentiment Analysis (Input is text and output is rating)
   Music Generation/Synthesis (input music notes and output is music)
   Video Activity Recognition (input is video and output is type of activity)