Machine Learning
Assignment 6

Q1. What is the Vanishing gradient problem in deep learning and how it can be mediated?

Ans. The Vanishing gradient problem is a situation when the gradient of the Network's output with respect to the weights (parameters) becomes extremely small in the initial hidden layers of the network. In other words, even an extremely large change in the parameters of hidden layer will not result in any significant change in the output. This is because of mapping of large input to small ranges, this is why the problem intensifies when using many hidden layers.

This problem can be avoided by using activation functions that do not map the input to small range. for example ; autoencoders and ReLU activation.

Q2. What is the result when convolving the array A with the filter B without padding?

$$A = \begin{bmatrix} 0 & 0 & 0 & 2 \\ 2 & 1 & 0 & 0 \\ 2 & 1 & 0 & 2 \\ 2 & 2 & 2 & 1 \end{bmatrix} \qquad B = \begin{bmatrix} 2 & 0 & 1 \\ 0 & 0 & 0 \\ 2 & 0 & 1 \end{bmatrix}$$

Result :

$$\begin{bmatrix} 4 & 6 \\ 10 & 7 \end{bmatrix}$$

Q3. What is Pooling operation in convolutional neural network. and why is it important?

Ans. Pooling operation is taking an average or maximum ar any other quantity of certain areas in the filtered image. It is used after the convolution layer in order to learn a higher level representation of the filtered image, like nodes that represent class labels. these nodes do not depend on individual pixels rather represent highly compressed summary of the image.

Q4. What is a gated recurrent network? Name an example of such a network.

Ans. Gated Recurrent Network as Recurrent Neural Networks in which gates are used to hold information in form of memory and only feed the information when ever they are needed. (at a later stage of processing).
one of such network that uses gates is
LSTM (Long Short term memory)

Q5 In reinforcement learning, what is a policy?

Sol. It is a function that specifies which action, a to take from each state.

$$\text{Policy}: \quad a_t = \pi(s_t)$$

When the agent is looking for a change in current state and wants to know which state to move to next. It looks for the next action to take in the policy of that state.
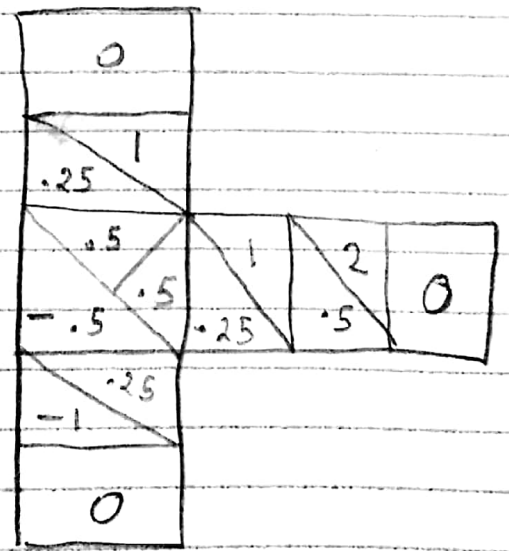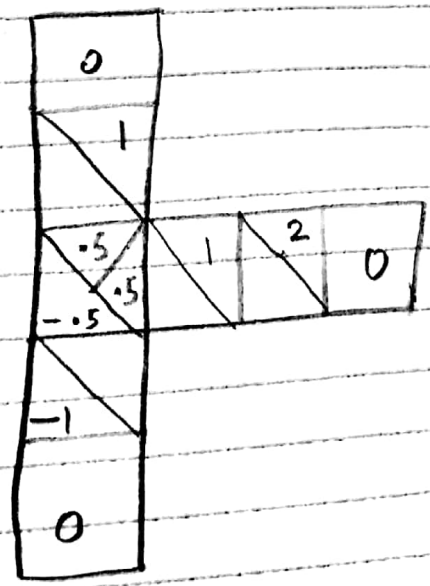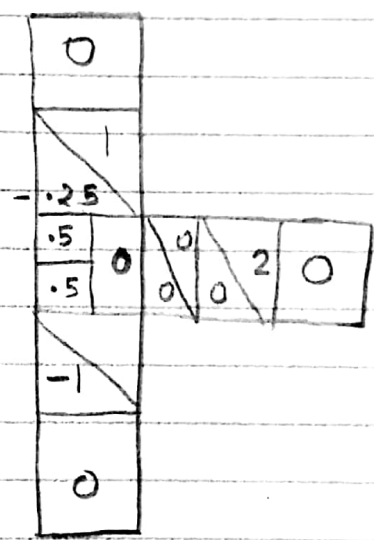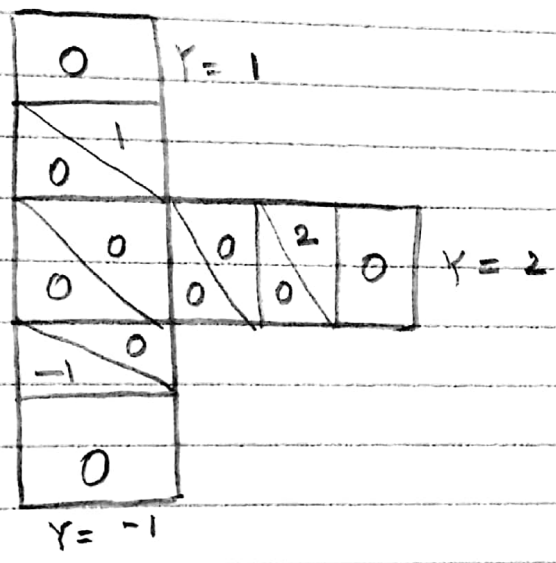
Q6 Explain the difference between SARSA and Q-learning!

Ans. SARSA stands for State-Action-Reward-Action. In this algorithm, the agent updates the values of actions performed in previous state, before moving on to the next state.
While in Q-learning, an agent looks for maximum award for all the next possible states and updates the action value for its current state before moving on to next state greedily.

Q7. Briefly explain "dropout" and why it is used in deep learning?

Ans   Dropout is a regularization technique in which we eliminate some neurons from hidden layer (may be visible too). drop out is done to prevent overfitting of the model on data.

gamma = 0.5

Y = 1

0

0 | 1

0 | 0 | 0 | 2 | 0   Y = 2
0 | 0 | 0

-1 | 0

0

Y = -1

0

1

-.25
.5   0 | 0 | 2 | 0
.5

-1

0

0

1

.5 | 1 | 2 | 0
.5
-.5

-1

0

0

.25 | 1

.5 | 1 | 2 | 0
-.5 | .5 | -.25 | .5

-1 | .25

0

Solution