Unit 11 - Week 8

Assignment 8

The due date for submitting this assignment has passed. **Due on 2019-09-25, 23:59 IST.**
As per our records you have not submitted this assignment.

An induction motor is used to generate electromagnetic torque and it is one of the most critical components in industrial processes.However, the mechanical degradation with natural aging process, coupled with the fact that motors are often exposed to multifarious harsh environments, makes motors vulnerable to various sorts of faults.Suppose we want to use deep learning for motor fault diagnosis. Under uniform operation conditions, we have acceleration data of three faulty motors: M_1, M_2 and M_3 suffering from three different fault types namely F_1 : rotor misalignment, F_2 : faulted bearings and F_3 : rotor unbalance. On the basis of data sets given below, answer Q1 to Q3 given below

t	a_x	a_y	a_z
0	0.93	0.81	0.54
0.5	0.12	0.29	0.26
...	...	...	...
50	0.82	0.01	0.84

t	a_x	a_y	a_z
0	0.71	0.63	0.71
0.5	0.97	0.44	0.03
...	...	...	...
100	0.64	0.21	0.34

t	a_x	a_y	a_z
0	0.95	0.45	0.55
0.5	0.34	0.70	0.05
...	...	...	...
150	0.27	0.02	0.55

Table 1: Dataset 1 (L to R: M_1, M_2, M_3)

t	a_x	a_y
0	0.93	0.81
0.5	0.12	0.29
...	...	...
100	0.82	0.01

t	a_x	a_z
0	0.63	0.71
0.5	0.44	0.03
...	...	...
100	0.21	0.34

t	a_x	a_z
0	0.95	0.55
0.5	0.34	0.05
...	...	...
100	0.27	0.55

Table 2: Dataset 2 (L to R: M_1, M_2, M_3)

t	a_x	a_y	a_z
0	0.93	0.81	0.54
0.5	0.12	0.29	0.26
...	...	...	...
50	0.82	0.01	0.84

t	a_x	a_y	a_z
0	0.71	0.63	0.71
1.0	0.97	0.44	0.03
...	...	...	...
100	0.64	0.21	0.34

t	a_x	a_y	a_z
0	0.95	0.45	0.55
0.33	0.34	0.70	0.05
...	...	...	...
33	0.27	0.02	0.55

Table 3: Dataset 3 (L to R: M_1, M_2, M_3)

1) RNNs are considered appropriate for a problem with variable sized input. Among the datasets shown above, which of the following will be the most appropriate choice for a RNN ? **1 point**

- Dataset 1
- Dataset 2
- Dataset 3

No, the answer is incorrect.
Score: 0
Accepted Answers:
Dataset 1

2) Suppose we select dataset 3 for training our RNN and encode the faults with one hot vectors as follows: $F_1 = [0, 0, 1]^T$. $F_2 = [0, 1, 0]^T$. $F_3 = [1, 0, 0]^T$. We represent our input vector with $\boldsymbol{x}$. For example,the first input for M_1 is $\boldsymbol{x}_1 = [0.93, 0.81, 0.54]^T$.The schematic diagram of our RNN is given below **1 point**

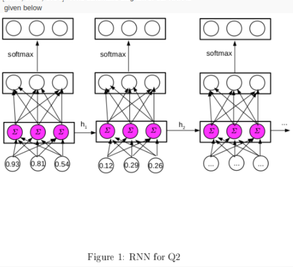

Figure 1: RNN for Q2

If we know that $\boldsymbol{h}_i = \boldsymbol{W}\boldsymbol{h}_{i-1} + \boldsymbol{U}\boldsymbol{x}_i$, what will be the sizes of $\boldsymbol{W}$ and $\boldsymbol{U}$?

- 3x3, 3x3
- 3x3, 3x1
- 1x3, 3x3
- 1x3, 1x3

No, the answer is incorrect.
Score: 0
Accepted Answers:
3x3, 3x3

3) If we train our RNN for 500 time instances, the number of parameters to be learnt will be: **1 point**

- 12
- 18
- 6000
- 9000

No, the answer is incorrect.
Score: 0
Accepted Answers:
18

4) Which of the following statements are true with regard to the activation function? **1 point**

- The activation function does the linear transformation to the input making it capable to learn and perform simpler tasks
- The activation function does the non-linear transformation to the input making it capable to learn and perform more complex tasks
- The Rectified Linear unit (ReLU) is an example of a linear activation function
- A single neuron with activation function can be considered as a linear regression function

No, the answer is incorrect.
Score: 0
Accepted Answers:
The activation function does the non-linear transformation to the input making it capable to learn and perform more complex tasks

5) Which of the statements are true with regard to the weight initialization process during the training of neural networks? **1 point**

- The neural networks can be easily trained by initializing all the weights to zeros
- The bias terms of the neural networks can be initialized with zeros
- The vanishing and exploding gradients problems are not observed for bias terms
- Xavier initialization of neural network weights saturates neuron activation function

No, the answer is incorrect.
Score: 0
Accepted Answers:
The bias terms of the neural networks can be initialized with zeros
The vanishing and exploding gradients problems are not observed for bias terms

6) Select the correct statements below: **1 point**

- The main use of batch-normalization is for the purpose of regularization
- Batch-normalization layer has no learnable weights
- For gradient-based learning algorithms, data normalization improves the convergence speed
- During testing of neural network with batch normalization layers,the mean and variance are generally estimated from the population statistics derived from the training set rather than estimating from mini-batches of the testing data

No, the answer is incorrect.
Score: 0
Accepted Answers:
For gradient-based learning algorithms, data normalization improves the convergence speed
During testing of neural network with batch normalization layers,the mean and variance are generally estimated from the population statistics derived from the training set rather than estimating from mini-batches of the testing data

7) A company is trying to automate case reports for ultrasound scans.The scans are videos of a beating heart at a particular cross-section(slice). **1 point**

The automatic report is supposed to generate medical diagnosis information describing the heart condition and location of any associated abnormalities detected.

The videos are of 50 frames each. Each frame is a $640x540$ grayscale image. Which is the most appropriate classification for the type of RNN to be used for this problem?

- One to One
- One to Many
- Many to One
- Many to Many

No, the answer is incorrect.
Score: 0
Accepted Answers:
Many to Many

8) to previous question, if we are to use the full, unprocessed video as the input to the RNN, which of the following are true? **1 point**

- The unrolled RNN will have a depth of 50 in time
- There are 50 sequential inputs to the RNN each of size 640x540
- There is only 1 non-sequential input to the RNN of size 640x540x50
- The RNN can be a deep RNN with 50 CNN like units

No, the answer is incorrect.
Score: 0
Accepted Answers:
The unrolled RNN will have a depth of 50 in time
There are 50 sequential inputs to the RNN each of size 640x540
The RNN can be a deep RNN with 50 CNN like units

9) While training a vanilla RNN, the ML engineer finds that the weights keep growing with each epoch. Which of the following could be the possible reasons and solutions: **1 point**

- High learning rate. Try lowering learning rate
- Not enough data. Get more training data
- Bad architecture. Use LSTM
- Exploding gradients. Try clipping gradient

No, the answer is incorrect.
Score: 0
Accepted Answers:
High learning rate. Try lowering learning rate
Exploding gradients. Try clipping gradient

10)What common property of AlexNet, LSTMs and ResNet helps in training? **1 point**

- The number of their layers
- The number of parameters
- They have multiple pathways for gradient backflow which helps in backprop
- All of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
They have multiple pathways for gradient backflow which helps in backprop