REFNO056139

Roll No. .....

Ph.D. COURSE WORK SEMESTER I EXAMINATION 2022-23

COMPUTER SCIENCE

CS - 322 : Deep Learning

Time : Three hours **Max. Marks : 70**

(WRITE YOUR ROLL NO. AT THE TOP IMMEDIATELY ON THE RECEIPT OF THIS QUESTION PAPER)

NOTE : ANSWER ANY FIVE QUESTIONS. THE FIGURES IN THE RIGHT-HAND MARGIN INDICATE MARKS.

1. (a) Define and give one suitable example of each of the following: [10]
   (I) System of linear equations
   (II) Linear dependency & independency
   (III) Basis & rank
   (IV) Types of errors, and
   (V) Bias & variance.

   (b) What is hypothesis analysis? Explain different types of hypothesis analysis with a suitable example. [4]

2. (a) What is a Recurrent Neural Network (RNN)? What are the types of RNN? [5]

   (b) Explain the Long short term memory (LSTM) architecture. [4]

   (c) How does LSTM solve the problem of vanishing gradients and exploding gradients? [5]

3. (a) What is Eigenvalue and Eigenvector? Explain the procedure to find the Eigenvalue and Eigenvector for given matrix B. Explain each step clearly. [7]

$$\mathbf{B} = \begin{pmatrix} 3 & 3 & 4 \\ 1 & 8 & -4 \\ 8 & 3 & 6 \end{pmatrix}$$

   (b) Find the Singular Value Decomposition (SVD) of matrix $\mathbf{A}$, where $\mathbf{A} = \begin{pmatrix} 3 & 2 & 2 \\ 2 & 3 & -2 \end{pmatrix}$. Explain each step clearly. [7]

4. (a) Explain Maximum Likelihood Estimation (MLE) and Logistic Regression (LR). Explain, with a suitable example, how MLE is useful in LR. [7]

   (b) Explain Principal Component Analysis (PCA) step-by-step with the help of a suitable example. [7]

P.T.O.

5. (a) What is filtering and different pooling operations in Convolutional Neural Networks? [5]

(b) Define the architecture of any two of the following ConvNets: [9]

1. AlexNet
2. VGG16
3. ResNet

6. (a) What do you understand by Deep Reinforcement Learning (DRL)? Explain the working model of DRL. [5]

(b) Explain the term Autoencoders. [3]

(c) Write short notes on the following :- [6]

1. Denoising
2. Word embedding

7. (a) What do you mean by Perceptron? What are the different types of Perceptrons? Explain each of them. [4]

(b) Explain the Perceptron Learning Algorithm. [4]

(c) What is Backpropagation in Artificial Neural Network? Explain with an example. [6]

********** The End **********

OBE

REFNO044808

M.C.A. III SEMESTER/M.C.A. (Two Year) III SEMESTER/ M.Sc. III SEMESTER EXAMINATION 2021-22

COMPUTER APPLICATIONS/ COMPUTER SCIENCE

CS – 322 : Deep Learning

Time : 4.30 hours **Max. Marks : 70**

Instructions

1. **The Question Paper contains 08 questions out of which you are required to answer any 04 questions. The question paper is of 70 marks with each question carrying 17.5 marks.**

   प्रश्नपत्र में आठ प्रश्न पूँछे गये हैं जिनमें से 4 प्रश्नों का उत्तर देना है। प्रश्नपत्र 70 अंकों का है, जिसमें प्रत्येक प्रश्न 17.5 अंक का है।

2. The total duration of the examination will be **4.30 hours** (Four hours and thirty minutes), which includes the time for downloading the question paper from the Portal, writing the answers by hand and uploading the hand-written answer sheets on the portal.

   परीक्षा का कुल समय 4.30 घंटे का है जिसमें प्रश्नपत्र को पोर्टल से डाउनलोड करके पुनः हस्तलिखित प्रश्नों का उत्तर पोर्टल पर अपलोड करना है।

3. For the students with benchmark disability as per Persons with Disability Act, the total duration of examination shall be **6 hours** (six hours) to complete the examination process, which includes the time for downloading the question paper from the Portal, writing the answers by hand and uploading the hand-written answer sheets on the portal. .

   दिव्यांग छात्रों के लिये परीक्षा का समय 6 घंटे निर्धारित हैं जिसमें प्रश्नपत्र को पोर्टल से डाउनलोड करना एवं हस्तलिखित उत्तर को पोर्टल पर अपलोड करना है।

4. Answers should be hand-written on a plain white A4 size paper using black or blue pen. Each question can be answered in upto 350 words on 3 (Three) plain A4 size paper (only one side is to be used).
   हस्तलिखित प्रश्नों का उत्तर सादे सफेद A4 साइज के पन्ने पर काले अथवा नीले कलम से लिखा होना चाहिये। प्रत्येक प्रश्न का उत्तर 350 शब्दों तक तीन सादे पृष्ठ A4 साइज में होना चाहिये। प्रश्नों के उत्तर के लिए केवल एक तरफ के पृष्ठ का ही उपयोग किया जाना चाहिए।

5. Answers to each question should start from a fresh page. All pages are required to be numbered. You should write your Course Name, Semester, Examination Roll Number, Paper Code, Paper title, Date and Time of Examination on the first sheet used for answers.
   प्रत्येक प्रश्न का उत्तर नये पृष्ठ से शुरू करना है। सभी पृष्ठों को पृष्ठांकित करना है। छात्र को प्रथम पृष्ठ पर प्रश्नपत्र का विषय, सेमेस्टर, परीक्षा अनुक्रमांक, प्रश्नपत्र कोड, प्रश्नपत्र का शीर्षक, दिनांक एवं समय लिखना है।

Questions

(1)

(1.1) What kind of data can we encounter in real-life? [2.5 marks]

(1.2) What is probability expectation? [2.5 marks]

(1.3) What is the application of probability distribution function in machine learning? [8 marks]

(1.4) Explain relation between Normal and Binomial Distribution & Normal and Poisson Distribution. [4.5 marks]

(2)

(2.1) Define system of linear equations, linear dependency & independency, basis & rank, types of errors and bias & variance with sutable example. [7.5 marks]

(2.2) Explain tradeoff, overfitting, underfitting, and best fiting with a suitable example. [5 marks]

P.T.O.

(2.3) What is hypothesis analysis. Explain different typye of hypothesis analysis with a suitable example. [5 marks]

(3)

(3.1) Explain gradient of vector and matrix with a suitable example. [5.5 marks]

(3.2) Define basis and norm with a suitable example. [4 marks]

(3.3) What is Eigenvalue and Eigenvector? Explain the prodecure to find the Eigenvalue and Eigenvector with a suitable example. [8 marks]

(4)

(4.1) Find the singular value decomposition (SVD) of matrix A, $U\Sigma V^T$, where $A = \begin{pmatrix} 3 & 3 & 4 \\ 2 & 3 & -2 \\ 4 & 5 & 1 \end{pmatrix}$. Explain each step clearly. [9.5 marks]

(4.2) Explain principal component analysis (PCA) step-by-step with the help of suitable example. [8 marks]

(5)

(5.1) What is regression model? Explain liner, multiple and polynomial regression model with suitable exaples. [10 marks]

(5.2) Explain maximum likelihood estimation (MLE) and logistic regression (LR). Explain how MLE is useful in LR with an example. [7.5 marks]

(6)

(6.1) Define neural network (NN). Explain different type of NNs with suitable example. [5 marks]

(6.2) What is perceptron learning algorithm? [5 marks]

(6.3) What is backpropagation in artificial neural network? Exaplin with an example. [7.5 marks]

(7)

(7.1) Explain the working procedure of recurrent neural network (RNN). [4.5 marks]

(7.2) Explain why softmax is useful in RNN. [3.5 marks]

(7.3) Explain the working procedure of long-short term memory (LSTM). [9.5 marks]

(8)

(8.1) Define convolution operation. [3 marks]

(8.2) Define filter or kernal, pooling and strides with examples. [6 marks]

(8.3) Explain the use of different layers of convolution neural network. [8.5 marks]

********* The End *********