Year - April 2024

MSC - Computer Science

SEM - II

No. of pages - 8

MSc Sem-II

Time : 2 ½ Hours [Total Marks: 60]

N.B: (1) **All questions are compulsory.**
(2) Figures to the **right** indicate full marks.
(3) **Assume additional data if necessary** but state the same clearly.
(4) Symbols have their usual meanings and tables have their usual standard design unless stated otherwise.

Q.1	Attempt **any two** of the following	**(12)**
a)	What is Machine Learning? Why it is used?	**06**
b)	What is underfitting? What are the options available to fix it?	**06**
c)	What is the purpose of a validation set?	**06**
d)	Explain the concept of Unsupervised Learning. List out some important Unsupervised Learning Algorithms	**06**
Q.2	Attempt **any two** of the following	**(12)**
a)	Write a note on Gradient Descent	**06**
b)	What is Ridge Regression?	**06**
c)	Explain the concept of Linear Regression.	**06**
d)	What do you mean by Early Stopping?	**06**
Q.3	Attempt **any two** of the following	**(12)**
a)	What is soft margin classification?	**06**
b)	Explain the CART Training Algorithm.	**06**
c)	What is Gini Impurity? Consider that you have 10 training instances. Out of which 6 are with Positive Trend and 4 are with Negative Trend. Compute Gini Impurity for the same.	**06**
d)	What is SVM? Briefly explain the terms support vectors, hyperplane, and margin with respect to SVM.	**06**
Q.4	Attempt **any two** of the following	**(12)**
a)	What are activation functions? Why are they necessary?	**06**
b)	Explain real-world examples of Timeseries data tensor.	**06**
c)	Write a short note on Stochastic Gradient Descent.	**06**
d)	Explain the stack of software and hardware used in Deep Learning.	**06**
Q.5	Attempt **any two** of the following	**(12)**
a)	What is Multiclass Classification? Five Example	**06**
b)	Write a note on Bias-Variance Trade-Off in Multiple Regression.	**06**
c)	What is regularization? How do you reduce the risk of overfitting of Decision Tree?	**06**
d)	What is Deep Learning?	**06**

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MSC Sem II

Time :2 ½ Hours **[Total Marks: 60]**

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Q.1	Attempt **any two** of the following	**(12)**
a)	With the step wise representation explain all phases of NLP.	**06**
b)	Define noisy channel model. Explain how noisy channel model help in natural language processing.	**06**
c)	Illustrate the concept of language modelling with N- grams.	**06**
d)	How is neural network used in natural language processing to build model language model?	**06**
Q.2	Attempt **any two** of the following	**(12)**
a)	What is POS? How is POS tagging done through Hidden Markov Model?	**06**
b)	Discuss the concept of tagset. Explain the python function used to aaply POS tags from tagset. Also mention the code snippet for implementation.	**06**
c)	Explain Transformation based learning used for POS tagging.	**06**
d)	How is statistical parsing done on the input string using probabilistic CFG? Explain with the help of example.	**06**
Q.3	Attempt **any two** of the following	**(12)**
a)	What is vector semantics? Explain matrices used in vector semantic.	**06**
b)	Illustrate the concept of singular value decomposition.	**06**
c)	List out embedding techniques for semantic analysis. Explain any two techniques.	**06**
d)	State the advantages and disadvantages of skip gram.	**06**
Q.4	Attempt **any two** of the following	**(12)**
a)	Discuss the Tutorial and Authoring system with the help of example.	**06**
b)	What is Pseudo translation? Explain the benefit of using Pseudo translation.	**06**
c)	How does NLP use in sentiment analysis?	**06**
d)	How does customer feedback analysed with NLP techniques?	**06**
Q.5	Attempt **any two** of the following	**(12)**
a)	What are the challenges in NLP? Explain How to deal with any two challenges.	**06**
b)	Explain the concept of treebank.	**06**
c)	Describe the concept of word sense.	**06**
d)	What are the commercial uses of NLP? Discuss any four in detail.	**06**

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MSC - CS - SEM II - NEP2020

Time: 2 Hours [Total Marks: 50]

N.B: (1) **All questions are compulsory.**
(2) Figures to the **right** indicate full mark
(3) **Assume additional data if necessary** but state the same clearly.
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Q.1	Attempt **any two** of the following	**(10)**
a)	Explain different types of Machine Learning systems.	**05**
b)	What is overfitting? What are the possible solutions to reduce it?	**05**
c)	Explain the concept of the ROC Curve.	**05**
d)	Consider the classifier's prediction on a test set given below. True Positive (TP) = 60 True Negative (TN) = 15 False Positive (FP) = 15 False Negative (FN) = 10 Calculate Precision and Recall.	**05**
Q.2	Attempt **any two** of the following	**(10)**
a)	Explain the concept of Linear Regression	**05**
b)	What do you mean by Early Stopping?	**05**
c)	Compare and contrast different types of Gradient Descent algorithms.	**05**
d)	Write a note on Mini-Batch Gradient Descent	**05**
Q.3	Attempt **any two** of the following	**(10)**
a)	What is soft margin classification?	**05**
b)	Briefly explain the working of SVM.	**05**
c)	Explain the CART Training Algorithm.	**05**
d)	What is a kernel trick? What are different kernel functions available for SVM classifiers?	**05**
Q.4	Attempt **any two** of the following	**(10)**
a)	Explain different types of data representations for Neural networks.	**05**
b)	What is Deep Learning?	**05**
c)	What is the Activation Function? Why does ANN need them?	**05**
d)	Explain the relationship between the network layers, loss function, and optimizer.	**05**
Q.5	Attempt **any two** of the following	**(10)**
a)	Write a note on Naïve Bayes Classifier	**05**
b)	What is Lasso Regression?	**05**
c)	Explain how decision trees can be used for multiclass classification?	**05**
d)	What is TensorFlow? Why it is necessary?	**05**

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(Reserch) MSc & MSc Sem - II Paper - 1

Time: 2 ½ Hours **[Total Marks: 60]**

N.B: **(1)** All questions are compulsory.
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(3) **Assume additional data if necessary but state the same clearly.**
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Q.1 Attempt **any two** of the following **(12)**

a) What is multiclass classification and how does it differ from binary classification in machine learning? **06**

b) Discuss about reinforcement learning in training intelligent systems and how does it differ from other machine learning approaches? **06**

c) Briefly describe about performance measures such as confusion matrix, precision, and recall utilized in evaluating the effectiveness and accuracy of machine learning models, and what insights can they provide about the model's performance?" **06**

d) Define Machine Learning. Explain different types of Machine Learning. Give examples of each. **06**

Q.2 Attempt **any two** of the following **(12)**

a) Write a note on Linear regression. What is the regression equations for the given data set? **06**

X	1	2	3	4	5
Y	2	5	11	8	14

b) Highlight the significance of Gradient Descent in machin elearning. Briefly describe types of Gradient Descent methods. **06**

c) Compare between ridge regression and lasso regression in terms of regularization techniques and their impact on feature selection **06**

d) Write a note on **(any two)** **06**
i. Cross Entropy
ii. Early Stopping
iii. Logistic Regression

Q.3 Attempt **any two** of the following **(12)**

a) Write a note on linear and non-linear SVM classification. **06**

b) Explain the concept of support vectors, maximum margin and hyperplane in SVM based classification. **06**

c) Write a note on Decsion Tree. Briefly explain the CART training algorithm for making predications and classification. **06**

d) Write a note on **(any two)** **06**

i. Gini Impurity
ii. Entropy
iii. Regularization Hyperparametes.

Q 4 Attempt **any two** of the following **(12)**

a) Briefly explain the components and working of a typical neural network. **06**

b) Define Deep Learning. Highlight the significance of Multi-Layer Perceptron model in Deep Learning. **06**

c) What is the significance of activation functions in neural network? Discuss some popularly used activation functions. **06**

d) Define Tensor. How tensorflow frmework help in implementing deep learning. **06**

Q.5 Attempt **any two** of the following **(12)**

a) What are the challenges in Machine Learning? Explain in detail. **06**

b) Compare between Batch Gradient Descent, Stochastic Gradient Descent, Mini-batch Gradient Descent, **06**

c) Discuss different types of kernels used in SVM. **06**

d) Write note on **06**

i. Rectified Linear Unit(ReLU)
ii. Tensor Operations

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(6)

MSc – CS – Sem II – NEP2020

Time :1 Hours

Total Marks: 25

N.B: (1) All questions are compulsory.
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(4) Symbols have their usual meanings and tables have their usual standarddesign unless stated otherwise.

Q.1	Attempt any two of the following	(10)
a)	Explain microcontroller and microprocessor in detail.	05
b)	What are the challenges in implementation of embedded system.	05
c)	Explain Wireless Sensor Network in detail?	05
d)	What is UART? How does it work?	05
Q.2	Attempt any two of the following	(10)
a)	Describe fundamental characteristics of IoT	05
b)	What are smart things? How do they communicate with gateway?	05
c)	Explain IoT gateway layered architecture.	05
d)	What are benefits of Edge computing?	05
Q.3	Attempt any one of the following	(05)
a)	Explain WSN protocol stack.	05
b)	Explain IoT protocol stack.	05

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Paper / Subject Code: X5[illegible]22 Natural Language Processing

MSC – CS – Sem II – NEP2020

Time :2 Hours

Total Marks: 50

N.B: (1) All questions are compulsory.
(2) Figures to the right indicate full marks.
(3) Assume additional data if necessary but state the same clearly.
(4) Symbols have their usual meanings and tables have their usual standard design unless stated otherwise.

Q.1	Attempt any two of the following	(10)
a)	List and describe phases of NLP.	05
b)	Define smoothing. Give the different types of smoothing technique. Discuss any one of the techniques in detail.	05
c)	How does the noisy channel used for spelling correction?	05
d)	State different types of ambiguities with example.	05
Q.2	Attempt any two of the following	(10)
a)	Explain types of POS tagging.	05
b)	Discuss basic concept of tagset and lemmatization.	05
c)	Explain bottom-up parsing with parse tree construction.	05
d)	Explain the concept of Morphological parsing.	05
Q.3	Attempt any two of the following	(10)
a)	Explain SVD and LSA .	05
b)	Write a short note on: i. Word2vec ii. GloVe	05
c)	What are different approached to represent text to numbers? Explain them.	05
d)	Discuss the concept of word sense disambiguation.	05
Q.4	Attempt any two of the following	(10)
a)	Explain machine translation system.	05
b)	How is the speech recognition system used in NLP?	05
c)	Explain in brief applications of NLP in sentiment analysis.	05
d)	Explain how NLP is use in handling fraud and sms.	05
Q.5	Attempt any two of the following	(10)
a)	Explain in detail application of neural language model in NLP system development.	05
b)	Explain Hidden Markov Model to embed POS tags in inputted text.	05
c)	State the working of Tf-Idf.	05
d)	In short explain the BERT model in NLP.	05

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(8)

MSC – CS – Sem II – NEP2020

Time :1 Hour

Total Marks: 25

N.B: (1) All questions are compulsory.
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(3) Assume additional data if necessary but state the same clearly.
(4) Symbols have their usual meanings and tables have their usual standard design unless stated otherwise.
(5) Use of scientific calculator is allowed.

Q.1	Attempt **any two** of the following	**(10)**
a)	Brief the application of simulation.	**05**
b)	What are the different types of system? Explain briefly.	**05**
c)	Explain the four phase of simulation model building.	**05**
d)	Explain the steady-state behavior of finite-population models and network of Queuing.	**05**
Q.2	Attempt **any two** of the following	**(10)**
a)	Let $m = 102 = 100$, $a = 19$, $c = 50$, and $X_0 = 63$, and generate a sequence 5 random integers using mixed congruential method.	**05**
b)	Explain the inverse transformation technique for generating random variate for exponential distribution with parameter λ.	**05**
c)	What are the tests to test randomness. Explain them.	**05**
d)	Write a note on Calibration and Validation of Models.	**05**
Q.3	Attempt **any one** of the following	**(05)**
a)	State the disadvantages of simulation.	**05**
b)	Brief the properties of random number.	**05**

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