

MODULE 1- INTRODUCTION TO MACHINE LEARNING LANGUAGE

Part- A (2 marks)

1. Enumerate the different types of learning
2. List out four applications of Machine Learning?
3. Differentiate supervised and unsupervised learning
4. Classify the types of supervised learning
5. Elucidate regression analysis in machine learning
6. List out the important assumptions required to build a linear regression model
7. Mention any four applications of linear regression
8. Recall the term underfitting and overfitting in regression analysis

Part-B (6 marks)

1. Enumerate the types of learning and distinguish each with example
2. Differentiate any six points between supervised and unsupervised learning
3. Elucidate about single linear regression model with an example
4. Assuming “y” is the independent variable, model a linear regression for the given data in Table

x	1	2	3	4	5
y	1.00	2.00	1.30	3.75	2.25

5. Fit a multiple linear regression model to the following data

x ₁	1	1	2	0
x ₂	1	2	2	1
y	3.25	6.5	3.5	5.0

6. Enlighten the concepts of (i) Cost function (ii) Gradient Descent Algorithm (iii) Best Fit Line (iv) Residuals

Part-C (10 marks)

1. Interpret the simple linear regression in machine learning with example
2. Interpret the ways to find the best fit line in linear regression

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3. For the given matrix apply normal equation to find linear regression equation

$$X = \begin{bmatrix} 1 & 1 \\ 1 & 2 \\ 1 & 3 \end{bmatrix} \quad Y = \begin{bmatrix} 3 \\ 2 \\ 4 \end{bmatrix}$$

4. Explain the multi variable linear regression with a suitable example

5. Describe gradient descent algorithm and compute the mean squared error function that is used to minimize the error.

MODULE 2- LOGISTIC REGRESSION AND NEURAL NETWORKS

Part- A (2 marks)

1. Sketch the model representation of neural network
2. Elucidate Biological Neuron
3. List out the properties of artificial neural networks
4. Sketch the artificial neuron model
5. Enumerate the types of logistic regression with examples
6. Signify the importance of log loss function in logistic regression
7. Express the equation for logistic function used in logistic regression
8. Comment on cost function in logistic regression

Part-B (6 marks)

1. Enlighten the following (i) Properties of ANNs (ii) artificial Neuron model (iii) application of ANN
2. Sketch the architecture of Back propagation Network and list out its merits and demerits
3. Describe about the Biological Neuron
4. Derive the decision boundary for the following logistic regression hypothesis
 - (i) $h_{\theta}(x) = g(\theta^T x)$
 - (ii) $h_{\theta}(x) = g(-6 + x_1 + x_2)$
 - (iii) $h_{\theta}(x) = g(-4 + x_1^2 + x_2^2)$
5. Interpret multiclass logistic regression with neat sketch and example
6. Explicate the problem of overfitting in machine learning and with neat sketch explain how to overcome the overfitting in supervised learning

Part-C (10 marks)

1. Elucidate training algorithm of back propagation network with flow chart
2. Enlighten the following in logistic regression (i) logistic function (ii) Hypothesis representation (iii) Simplified cost function and Gradient descent

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3. Classify the types of logistic regression and elucidate multinomial logistic regression with neat sketch
4. Interpret multiclass logistic regression with neat sketch and example
5. Articulate the problem of overfitting in machine learning and with neat sketch explain how to overcome the overfitting in supervised learning

MODULE 3- SUPPORT VECTOR MACHINES AND UNSUPERVISED LEARNING

Part- A (2 marks)

1. Signify the role of kernel in support vector machines (SVM)
2. Recall the term distance measures in clustering.
3. Classify the different types of methods to determine number of clusters in K-means algorithm
4. Enlighten the pros and cons of K- mean algorithm
5. Remember the type of recommendation system is used in Netflix
6. Differentiate Content-based and collaborative filtering recommendation systems
7. Mention the objective of an optimization algorithm in machine learning
8. Signify the importance of vectorization during pre-processing

Part-B (6 marks)

1. Enlighten the concept of regularization and gamma tuning parameters in support vector machines
2. Articulate the methods followed to determine the optimal number of clusters in K-Means clustering
3. Expound about types of connectivity-based clustering algorithm with neat sketch
4. With neat sketch elaborate hybrid approach recommendation system
5. Discuss in detail the content boosted collaborative filtering recommendation system
6. Detail the various text vectorization strategies

Part-C (10 marks)

1. With neat sketch explicate the margin tuning parameter of support vector machines
2. Interpret the support vector machine algorithm in detail with its tuning parameters
3. Describe the steps followed in k-means clustering algorithm with neat sketch and appropriate examples

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4. Sketch the flow chart for k-means clustering and enumerate the step involved with example
5. List out the merits and demerits of content based and collaborative based recommendation system. Then detail the content boosted collaborative filtering recommendation system.

MODULE 4- FUNDAMENTALS AND SEARCH TECHNIQUES

Part- A (2 marks)

1. List out the task domains of AI
2. Recall the term operationalization in AI
3. Enumerate the components of production system
4. “The state space representation forms the basis for most of the AI methods.” – Justify the statement
5. Comment on the artificial intelligence problem of state search
6. Enumerate the types of searching algorithm
7. Compare the breadth first and depth first algorithm
8. Compare forward representation mapping and reverse representation mappings in knowledge representation

Part-B (6 marks)

1. Enumerate the components of Production systems in AI
2. Summarize the components and features of the production system
3. Describe the Breadth-First search algorithm with suitable example
4. List out the advantages in Breadth-first search algorithm with neat sketch
5. Elucidate Depth-First search algorithm with suitable diagram and its advantages
6. Specify the properties required by the system for the representation of knowledge

Part-C (10 marks)

1. Explicit the use of artificial intelligence technique with various program to play Tic-Tac-Toe
2. Elucidate the below define problem in detail with production rules?
You are given two jugs, a 4- gallon one and 3-gallon one. Neither has any markers on it. There is a pump that can be used to fill the jugs with water. How can you get exactly 2-gallons of water into the 4- gallon jug?
3. Sketch the state space diagram for Hill climbing algorithm and explain it in detail

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4. With example explicate the Best first search algorithm
5. Explain in detail about the various approaches for the representation of knowledge

MODULE 5- PREDICATE LOGIC,KNOWLEDGE RULES AND SYMBOLIC LOGIC

Part- A (2 marks)

1. Remember simple relational knowledge representation
2. Differentiate declarative and procedural representations of knowledge
3. List out the approaches of knowledge representation
4. Summarize resolution in predicate logic
5. Elucidate backward chaining rule system
6. State the four factors to choose reason forward or reason backward in solving of problem
7. Summarize the concept of nonmonotonic symbolic reasoning
8. Mention the rule for default logic that is used to perform default-based reasoning.

Part-B (6 marks)

1. Elaborate procedural and declarative knowledge with example
2. With use of examples explicate simple facts in propositional logic
3. Elucidate the algorithm of resolution in predicate logic with an example
4. Explain the three basic approaches that addresses the problem of conflict resolution in a production system
5. Differentiate PROLOG program from logic programming with an example

Part-C (10 marks)

1. Interpret Semantic network in knowledge representation with an example
2. Consider the following set of sentences
 - i).Marcus was a man
 - ii). Marcus was a Pompeian
 - iii).All Pompeian were Romans
 - iv). Caesar was a ruler
 - v). All romans were either loyal to Caesar or hated him

vi). Everyone is loyal to someone

vii). People only try to assassinate rulers they are not loyal to

viii). Marcus tried to assassinate Caesar

Apply those sentences as set of well-formed formulas (wff's) in predicate logic

3. Consider the following set of well-formed formulas in predicate logic:

- i) Man (Marcus)
- ii) Pompeian (Marcus)
- iii) $\forall x : \text{Pomeian}(x) \rightarrow \text{Roman}(x)$
- iv) Ruler (Caesar)
- v) $\forall x: \text{Roman}(x) \rightarrow \text{loyalto}(x, \text{Caesar}) \vee \text{hate}(x, \text{Caesar})$
- vi) $\forall x: y \text{ loyalto}(x, y)$
- vii) $\forall x: \forall y \text{ Man}(x) \wedge \text{Ruler}(y) \wedge \text{tryassassinate}(x, y) \rightarrow \text{loyalto}(x, y)$
- viii) Tryassassinate (Marcus, Caesar)

Convert these into clause form and prove that hate (Marcus, Caesar) using resolution proof.

4. Elaborate forward versus backward reasoning with an example

5. Elucidate default reasoning in detail with an example