SHREE MUTHUKUMARASWAMY COLLEGE CHENNAI-118

DEPARTMENT OF COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

UNIVERSITY OF MADRAS

SEMESTERS SYLLABUS

III B.SC (CS with AI) – SEMESTER-VI

SUBJECT : MACHINE LEARNING

Year: III **Semester: VI**

Machine Learning	**326C6A**
Credits 4	**Lecture Hours:6 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To understand basic concepts of machine learning
- Understand how to evaluate models generated from data
- Discover how to build machine learning algorithms, prepare data, and use different techniques using Python

Course Outcomes: (for students: To know what they are going to learn) **CO1:** Implement different machine learning algorithm techniques.
CO2: Apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.
CO3: Apply appropriate data sets to the Machine Learning algorithms.
CO4: Identify and apply Machine Learning algorithms to solve real world problems.

Units	Contents
I	**Introduction:** Machine Learning Foundations – Overview – Design of a Learning System – Types of Machine Learning – Supervised Learning and Unsupervised Learning – Applications of Machine Learning – Tools Overview for ML.
II	**Supervised Learning – I:** Simple Linear Regression – Multiple Linear Regression – Polynomial Regression – Ridge Regression – Lasso Regression – Evaluating Regression Models – Model Selection – Bagging – Ensemble Methods.
III	**Supervised Learning – II:** Classification – Logistic Regression – Decision Tree Regression and Classification – Random Forest Regression and Classification – Support Vector Machine Regression and Classification - Evaluating Classification Models.
IV	**Unsupervised Learning:** Clustering – K-Means Clustering – Density-Based Clustering – Dimensionality Reduction – Collaborative Filtering.
V	**Association Rule Learning :** Association Rule Learning – Concepts related to ARL – ARL Algorithms - Apriori – Eclat – Concepts and Algorithms.

Learning Resources:

TEXT BOOK:

1. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.

REFERENCE BOOK:

1. Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press, Third Edition, 2014.
2. Tom Mitchell, "Machine Learning", McGraw-Hill, 1997.
3. Sebastian Raschka, Vahid Mirjilili,” Python Machine Learning and deep learning”, 2nd edition, kindle book, 2018
4. Carol Quadros,” Machine Learning with python, scikit-learn and Tensorflow”, Packet Publishing, 2018
5. Gavin Hackeling,” Machine Learning with scikit-learn”, Packet publishing, O'Reilly, 2018

WEB REFERENCES:

1. Stanford Lectures of Prof. Andrew Ng on Machine Learning

SUBJECT: MACHINE LEARNING LAB

Year: III **Semester: VI**

Machine Learning Practical	**326C61**
Credits 4	**Lecture Hours:6 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)
Understand the mathematical and statistical perspectives of machine learning algorithms through python programming.
Understand the basic concepts of deep neural network models and design the same.

Course Outcomes: (for students: To know what they are going to learn)

CO1: Design and evaluate the unsupervised models through python in built functions.

CO2: Evaluate the machine learning model algorithms by python programming.

CO3: Design and apply various reinforcement algorithms to solve real time complex problems.

CO4: Design and develop the code for the recommender system using Natural Language processing.

Contents

1. Write a program to implement the Simple and Multiple Linear Regression
2. Write a program to implement the Polynomial Regression
3. Write a program to implement the Bagging Technique
4. Write a program to implement the Adaboost Methods
5. Write a program to implement Logistic Regression algorithm
6. Write a program to demonstrate the workflow of Decision Tree Classification
7. Write a program to implement the Random Forest Classification
8. Write a program to implement the SVM Classification
9. Write a program to perform the K Means Clustering
10. Write a program to perform the Density based Clustering
11. Write a program to implement the Apriori algorithm for market basket analysis
12. Write a program to compare the Supervised Machine Learning algorithms.

Learning Resources:

1. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.
2. Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press, Third Edition, 2014.
3. Tom Mitchell, "Machine Learning", McGraw-Hill, 1997.
4. Sebastian Raschka, Vahid Mirjilili,” Python Machine Learning and deep learning”, 2nd edition, kindle book, 2018
5. Carol Quadros,” Machine Learning with python, scikit-learn and Tensorflow”, Packet Publishing, 2018
6. Gavin Hackeling,” Machine Learning with scikit-learn”, Packet publishing, O'Reilly, 2018

SUBJECT : FUZZY LOGIC

Year: III **Semester: VI**

Fuzzy Logic	**326C6B**
Credits 4	**Lecture Hours:6 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To familiarize various components of soft computing like fuzzy logic
- To give an overview of fuzzy Logic and to understand the concepts and terminologies offuzzy systems

Course Outcomes: (for students: To know what they are going to learn)

CO1: Identify and describe soft computing techniques and their roles in building intelligent Machines.

CO2: Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems

CO3: Recognize the feasibility of applying a soft computing methodology for a particular Problem.

Units	Contents
I	**Introduction, Classical Sets and Fuzzy Sets:** Background, Uncertainty and Imprecision, Statistics and Random Processes, Uncertainty in Information, Fuzzy Sets and Membership, Chance versus Ambiguity. Classical Sets - Operations on Classical Sets, Properties of Classical (Crisp) Sets, Mapping of Classical Sets to Functions Fuzzy Sets - Fuzzy Set operations, Properties of Fuzzy Sets. Sets as Points in Hypercubes
II	**Classical Relations and Fuzzy Relations:** Cartesian Product, Crisp Relations- Cardinality of Crisp Relations, Operations on Crisp Relations, Properties of Crisp Relations, Composition. Fuzzy Relations - Cardinality of Fuzzy Relations, Operations on Fuzzy Relations, Properties of Fuzzy Relations, Fuzzy Cartesian Product and Composition, Non-interactive Fuzzy Sets. Tolerance and Equivalence Relations - Crisp Equivalence Relation, Crisp Tolerance Relation, Fuzzy Tolerance and Equivalence Relations. Value Assignments - Cosine Amplitude, Max-min Method, Other Similarity methods
III	**Fuzzy-to-Crisp Conversions, Fuzzy Arithmetic:** Lambda-Cuts for Fuzzy Sets, Lambda-Cuts for Fuzzy Relations, Defuzzification Methods Extension Principle - Crisp Functions, Mapping and Relations, Functions of fuzzy Sets – Extension Principle, Fuzzy Transform (Mapping), Practical Considerations, Fuzzy Numbers Interval Analysis in Arithmetic, Approximate Methods of Extension - Vertex method, DSW Algorithm, Restricted DSW Algorithm, Comparisons, Fuzzy Vectors
IV	**Classical Logic and Fuzzy Logic:** Classical Predicate Logic – Tautologies, Contradictions, Equivalence, Exclusive OR and Exclusive NOR, Logical Proofs, Deductive Inferences. Fuzzy Logic, Approximate Reasoning, Fuzzy Tautologies, Contradictions, Equivalence and Logical Proofs, Other forms of the Implication Operation, Other forms of the Composition Operation

V	**Fuzzy Rule- Based Systems:**Natural Language, Linguistic Hedges, Rule-Based Systems - Canonical Rule Forms, Decomposition of Compound Rules, Likelihood and Truth Qualification, Aggregation of Fuzzy Rules, Graphical Techniques of Inference

Learning Resources:

Text Book:

1. Lin C. T. and C.S. G. Lee, Neural Fuzzy Systems, Prentice Hall, 1996 **References:**
    1. Ibrahim A. M., Introduction to Applied Fuzzy Electronics, PHI, 2013
    2. J. Yen and R. Langari, Fuzzy Logic, Intelligence, Control and Information, Pearson Education
    3. K.H.Lee, First Course on Fuzzy Theory and Applications, Springer-Verlag

SUBJECT ; MOBILE AD-HOC NETWORK

Year: III **Semester: VI**

Mobile Ad-hoc Network Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**326E6A**
Credits 3	**Lecture Hours: 5 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.
- To introduce students to artificial neural networks and fuzzy theory from a theoretical perspective

Course Outcomes: (for students: To know what they are going to learn)

CO1: Understand the basic concepts ad-hoc networks and ad-hoc mobility models.

CO2: Acquire knowledge about Medium access protocols and standards like IEEE 802.11a and HIPERLAN.

CO3: Identify the significance of Routing protocols and analyze about routing Algorithm.

CO4: Understand about the applications of end-end delivery and security issues in ad-hoc networks

CO5: Analyze and understand the concept of cross-layer design and parameter optimization techniques.

Units	**Contents**
I	Introduction: Introduction to ad-hoc networks – definition, characteristics features, applications. Characteristics of wireless channel, ad-hoc mobility models indoor and out-door models.
II	Medium Access Protocol: MAC Protocols: Design issues, goals and classification. Contention based protocols – with reservation, scheduling algorithms, protocols using directional antennas. IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN.
III	Network Protocols : : Routing Protocols: Design issues, goals and classification. Proactive Vs reactive routing, unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, energy aware routing algorithm, hierarchical routing, QoS aware routing.
IV	End – end delivery and security: Transport Layer: Issues in designing – Transport layer classification, ad-hoc transport protocols. Security issues in ad-hoc networks: issues and challenges, network security attacks, secure routing protocols.

V	CROSS -LAYER DESIGN: Need for cross layer design, cross layer optimization, parameter optimization techniques, cross layer cautionary perspective. Integration of ad-hoc with Mobile IP networks.

Learning Resources:

Recommended Texts

1. C. Siva Ram Murthy and B. S. Manoj, Ad hoc Wireless Networks Architecture and Protocols II edition, Pearson Edition, 2007.
2. Charles E. Perkins, Ad hoc Networking, Addison – Wesley, 2000.

Reference Books

1. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic, Mobile ad-
2. hoc networking, Wiley-IEEE press, 2004.
3. Mohammad Ilyas, The handbook of ad-hoc wireless networks, CRC press, 2002.
4. T. Camp, J. Boleng, and V. Davies "A Survey of Mobility Models for Ad-hoc Network"
5. Research, "Wireless Commn. and Mobile Comp - Special Issue on Mobile Ad-
6. hoc networking Research, Trends and Applications", Vol. 2, no. 5, 2002, pp. 483 – 502.
7. A survey of integrating IP mobility protocols and Mobile Ad-hoc networks, Fekri
8. M. bduljalil and Shrikant K. Bodhe, IEEE communication Survey and tutorials, no:12007.

Web resources

SUBJECT : DATA MINING AND WAREHOUSING

Year: III **Semester: VI**

Data Mining and Warehousing Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**326E6B**
Credits 3	**Lecture Hours: 5 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To provide the knowledge on Data Mining and Warehousing concepts and techniques.
- To study the basic concepts of cluster analysis
- To study a set of typical clustering methodologies, algorithms, and applications

Course Outcomes: (for students: To know what they are going to learn)

CO1: To understand the basic concepts and the functionality of the various data mining and data warehousing component
CO2: To know the concepts of Data mining system architectures
CO3: To analyse the principles of association rules
CO4: To get analytical idea on Classification and prediction methods.
CO5: To Gain knowledge on Cluster analysis and its methods.

Units	Contents
I	Introduction: Data mining – Functionalities – Classification – Introduction to Data Warehousing – Data Pre-processing: Pre-processing the Data – Data cleaning – Data Integration and Transformation – Data Reduction
II	Data Mining, Primitives, Languages and System Architecture: Data Mining – Primitives – Data Mining Query Language, Architecture of Data mining Systems. Concept Description, Characterization and Comparison: Concept Description, Data Generalization and Summarization, Analytical Characterization, Mining Class Comparison – Statistical Measures
III	Mining Association Rules: Basic Concepts – Single Dimensional Boolean Association Rules From Transaction Databases, Multilevel Association Rules from transaction databases – Multi dimension Association Rules from Relational Database and Data Warehouses
IV	Classification and Prediction: Introduction – Issues – Decision Tree Induction – Bayesian Classification – Classification of Back Propagation. Classification based on ConceptsfromAssociationRuleMining–OtherMethods. Prediction – Introduction – Classifier Accuracy.
V	Cluster Analysis: Introduction – Types of Data in Cluster Analysis, Petitioning Methods – Hierarchical Methods-Density Based Methods – GRID Based Method – Model based Clustering Method

Learning Resources:

Recommended Texts

1. Han and M. Kamber, "Data Mining Concepts and Techniques", 2001, Harcourt India Pvt. Ltd, New Delhi.

Reference Books

1. K.P. Soman, Shyam Diwakar, V. Ajay "Insight into Data Mining Theory and Practice ",Prentice Hall of India Pvt. Ltd, New Delhi
2. Parteek Bhatia, 'Data Mining and Data Warehousing: Principles and Practical Techniques',Cambridge University Press, 2019

Web resources: Web resources from NDL Library, E-content from open-source libraries

SUBJECT: INFORMATION SECURITY

Year: III **Semester: VI**

Information Security Common for B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**326E6F**
Credits 3	**Lecture Hours:5 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

Learn fundamentals of cryptography and its application to network security.

- Understand network security threats, security services, and countermeasures.
- Understand vulnerability analysis of network security.

Course Outcomes: (for students: To know what they are going to learn)

CO1: Understand and explain the risks faced by computer systems and networks.
CO2: Identify and analyse security problems in computer systems and networks.
CO3: Explain how standard security mechanisms work.
CO4: Develop security mechanisms to protect computer systems and networks.
CO5: Write programs that are more secure.
CO6: Use cryptography algorithms and protocols to achieve computer security.

Units	Contents
I	Introduction to Information Security : Attacks, Vulnerability, Security Goals, Security Services and mechanisms
II	Conventional Cryptographic Techniques : Conventional substitution and transposition ciphers, One-time Pad, Block cipher and Stream Cipher, Steganography
III	Symmetric and Asymmetric Cryptographic Techniques :DES, AES, RSA algorithms Authentication and Digital Signatures : Use of Cryptographyfor authentication, Secure Hash function, Key management – Kerberos
IV	Program Security : Nonmalicious Program errors – Bufferoverflow, Incomplete mediation, Time-of-check to Time-of- use Errors, Viruses, Trapdoors, Salami attack, Man-in-the- middle attacks, Covert channels
V	Security in Networks : Threats in networks, Network SecurityControls – Architecture, Encryption, Content Integrity, StrongAuthentication, Access Controls, Wireless Security, Honeypots, Traffic flow security, Firewalls – Design andTypes of Firewalls, Personal Firewalls, IDS, Email Security – PGP,S/MIME

Learning Resources:

1. Security in Computing, Fourth Edition, by Charles P. Pfleeger, Pearson Education
2. Cryptography And Network Security Principles And Practice, Fourth or Fifth Edition, William Stallings, Pearson
3. Modern Cryptography: Theory and Practice, by Wenbo Mao, Prentice Hall.
4. Network Security Essentials: Applications and Standards, by William Stallings. Prentice Hall.