



BIKANER TECHNICAL UNIVERSITY, BIKANER
बीकानेर तकनीकी विश्वविद्यालय, बीकानेर
OFFICE OF THE DEAN ACADEMICS



**SCHEME & SYLLABUS OF
UNDERGRADUATE DEGREE COURSE
ARTIFICIAL INTELLIGENCE & DATA SCIENCE**

V & VI Semester



Effective for the students admitted in year 2020-21 and onwards.

Office: Bikaner Technical University, Bikaner
Karni Industrial Area, Pugal Road, Bikaner-334004
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B.Tech.: Artificial Intelligence & Data Science
3rd Year - V Semester

THEORY											
S.No.	Category	Course		Contact hrs./week			Marks				Cr
		Code	Title	L	T	P	Exam Hrs.	IA	ETE	Total	
1	ESC	5AD3-01	Mathematics and Statistics	2	0	0	2	20	80	100	2
2	PCC/PEC	5AD4-02	Data Communication & Computer Network	3	0	0	3	30	120	150	3
3		5AD3-03	Operating Systems	3	0	0	3	30	120	150	3
4		5AD4-04	Data Foundation	3	0	0	3	30	120	150	3
5		5AD4-05	Analysis of Algorithms	3	0	0	3	30	120	150	3
6		Professional Elective 1(anyone)	2	0	0	2	20	80	100	2	
			5AD5-11	AI in Healthcare							
		5AD5-12	Human-Computer Interaction								
		5AD5-13	Information Security System								
		5AD5-14	Foundation Of AI								
			Sub Total	16	0	0		160	640	800	16
PRACTICAL & SESSIONAL											
7	PCC	5AD4-21	Network Programming Lab	0	0	2	2	30	20	50	1
8		5AD4-22	Neural Network Lab	0	0	2	2	30	20	50	1
9		5AD4-23	Analysis of Algorithms Lab	0	0	2	2	30	20	50	1
10		5AD4-24	Data Foundation Lab	0	0	2	2	30	20	50	1
11	PSIT	5AD7-30	Industrial Training	0	0	1	-	75	50	125	2.5
12	Anandam	5AD8-00	ANANDAM	-	-	-	-		100	100	2
			Sub- Total	0	0	9		195	230	425	8.5
			TOTAL OF V SEMESTER	16	0	9		355	870	1225	24.5

L: Lecture, T: Tutorial, P: Practical, Cr: Credits ETE: End Term Exam, IA: Internal Assessment



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B.Tech.: Artificial Intelligence & Data Science
3rd Year - VI Semester

THEORY											
S.No.	Category	Course		Contact hrs./week			Marks				Cr
		Code	Title	L	T	P	Exam Hrs.	IA	ETE	Total	
1	ESC	6AD3-01	Digital Image Processing	2	0	0	2	20	80	100	2
2	PCC/PEC	6AD4-02	Introduction to Machine Learning	3	0	0	3	30	120	150	3
3		6AD3-03	Soft Computing	3	0	0	3	30	120	150	3
4		6AD4-04	Cloud Computing	3	0	0	3	30	120	150	3
5		6AD4-05	Data Mining & Predicting Modeling	3	0	0	3	30	120	150	3
6		Professional Elective 1(anyone)	3	0	0	3	30	120	150	3	
		6AD5-11	Business Intelligence & Analytics								
	6AD5-12	Distributed System									
	6AD5-13	Data Mining and Business Intelligence									
	6AD5-14	Artificial Intelligence and Expert Systems									
		Sub Total		17	0	0		170	680	850	17
PRACTICAL & SESSIONAL											
7	PCC	6AD4-21	Machine Learning Lab	0	0	3	2	45	30	75	1.5
8		6AD4-22	Data Mining & Predicting Modeling Lab	0	0	3	2	45	30	75	1.5
9		6AD4-23	Soft Computing Lab	0	0	3	2	45	30	75	1.5
10		6AD4-24	Mobile Application Development Lab	0	0	3	2	45	30	75	1.5
11	Anandam	6AD8-00	ANANDAM	-	-	-	-	-	100	100	2
		Sub- Total		0	0	12		180	220	400	8
		TOTAL OF III SEMESTER		17	0	12		350	900	1250	25

L: Lecture, T: Tutorial, P: Practical, Cr: Credits ETE: End Term Exam, IA: Internal Assessment



**SYLLABUS OF
UNDERGRADUATE DEGREE COURSE
ARTIFICIAL INTELLIGENCE & DATA SCIENCE**

V & VI Semester



Effective for the students admitted in year 2020-21 and onwards.



5AD3-01: Mathematics and Statistics

Credit: 2		Max Marks: 100 (IA :20, ETE:80)
2L+ 0T+ 0P		End Term Exams: 2hr
S.No.	Contents	Hours
1	Introduction: Objective, scope, and outcome of the course	01
2	Introduction: Engineering application of optimization, Statement and classification of the optimization problem, single variable and multivariable optimization with and without constraints.	05
3	Project Scheduling: Project Scheduling by PERT and CPM, Network Analysis. Sequencing Theory: General Sequencing problem n-jobs through 2 machines & 3 machines and 2-jobs through m machines.	06
4	Transportation problem: Introduction, balanced and unbalanced transportation, northwest corner rule, lowest cost entry method, and Vogel's approximation, optimality test, degeneracy in transportation problem. Assignment problem: Introduction, Hungarian method.	06
5	Applied Statistics: Introduction to statistics and data analysis- Mean, Mode, Median, variance and standard deviation. Testing of hypothesis – Introduction-Types of errors, critical region, the procedure of testing hypothesis-Large sample tests- Z test for Single Proportion, Difference of Proportion, mean and difference of means.	06
6	Small sample tests- Students t-test, F-test- chi-square test- the goodness of fit - independence of attributes- Design of Experiments - Analysis of variance – one- and two-way classifications - CRD-RBD- LSD.	06
Total		30

Suggested Books

- Fundamentals of Mathematical statistics- by S. C. Gupta and V. K. Kapoor; S. Chand & sons
- Advanced Engg. Mathematics - by Erwin Kreyszig John; Willey & sons
- Advanced Engg. Mathematics - by R. K. Jain & S. R. K. Iyenger; Narosa publishing House.
- Higher Engg. Mathematics by Dr. B. S. Grewal- Khanna publications



5AD4-02: Data Communication & Computer Network

Credit: 3		Max Marks: 150 (IA :30, ETE:120)
3L+ 0T+ 0P		End Term Exams: 3hr
S.No.	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Introductory Concepts: Network hardware, Network software, topologies, Protocols and standards, OSI model, TCP model, TCP/IP model, Physical Layer: Digital and Analog Signals, Periodic Analog Signals, Signal Transmission, Limitations of Data Rate, Digital Data Transmission, Performance Measures, Line Coding, Digital Modulation, Media and Digital Transmission System	07
3	Data Link Layer: Error Detection and Correction, Types of Errors, Two dimensional parity check, Detection verses correction, Block Coding, Linear Block Coding, Cyclic Codes, Checksum, Standardized Polynomial Code, Error Correction Methods, Forward Error Correction, Protocols: Stop and wait, Go-back-N ARQ, Selective Repeat ARQ, Sliding window, Piggy backing, Pure ALOHA, Slotted ALOHA, CSMA/CD, CSMA/CA	09
4	Network Layer: Design issues, Routing algorithms: IPV4, IPV6, Address mapping: ARQ, RARQ, Congestion control, Unicast, Multicast, Broadcast routing protocols, Quality of Service, Internetworking	08
5	Transport Layer: Transport service, Elements of transport protocols, User Datagram Protocol, Transmission Control Protocol, Quality of service, Leaky Bucket and Token Bucket algorithm	08
6	Application Layer: WWW, DNS, Multimedia, Electronic mail, FTP, HTTP, SMTP, Introduction to network security	07
Total		40

Suggested Books

- Andrew S. Tanenbaum, David J. Wetherall, “Computer Networks”, 5th Edition, Pearson Education, 2013.
- James Kurose, Keith W. Ross, “Computer Networking: A Top-Down Approach Featuring the Internet”, 3rd Edition, Pearson Education.
- William Stallings , “Data and Computer Communications”, 8th edition, Pearson Education.
- Behrouz A. Forouzan , “Data Communications and Networking”, 5th Edition, McGraw Hill Education.
- Larry Peterson and Bruce Davie , “Computer Networks: A Systems Approach”, 4th Edition, Morgan Kaufmann Publishers | Elsevier.



5AD4-03: Operating Systems

Credit: 3		Max Marks: 150 (IA :30, ETE:120)
3L+ 0T+ 0P		End Term Exams: 3hr
S.No.	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Introduction and History of Operating systems: Structure and operations; processes and files Processor management: inter-process communication, mutual exclusion, semaphores, wait and signal procedures, process scheduling, and algorithms, critical sections, threads, multithreading	08
3	Memory management: contiguous memory allocation, virtual memory, paging, page table structure, demand paging, page replacement policies, thrashing, segmentation, case study	08
4	Deadlock: Shared resources, resource allocation, and scheduling, resource graph models, deadlock detection, deadlock avoidance, deadlock prevention algorithms Device management: devices and their characteristics, device drivers, device handling, disk scheduling algorithms, and policies.	10
5	File management: file concept, types and structures, directory structure, cases studies, access methods and matrices, file security, user authentication	07
6	UNIX and Linux operating systems as case studies; Time OS and case studies of Mobile OS	06
Total		40

Suggested Books

- Silberschatz, P. B. Galvin and G. Gagne, Operating System Concepts (9 ed.), John Wiley, 2012. ISBN 978-1118063330.
- Tanenbaum, Modern Operating Systems (3 ed.), Prentice Hall India Learning Private Limited, 2019. ISBN 978-8120339040.
- W. Stallings, Operating Systems Internals and Design Principles (7 ed.), Prentice-Hall, 2013. ISBN 978-9332518803
- Operating Systems – William Stallings, Pearson Education Asia (2002)
- Operating Systems - Nutt, Pearson Education Asia (2003)



5AD4-04: Data Foundation

Credit: 3		Max Marks: 150 (IA :30, ETE:120)
3L+ 0T+ 0P		End Term Exams: 3hr
S.No.	Contents	Hours
1	Introduction Overview of Data: Definition - Types of data – Quantitative and Qualitative (Nominal, Ordinal, Discrete and Continuous) Big Data: Structured, Unstructured and semi-structured - Metadata: Concepts of metadata – Types of metadata – Uses Data Source: Enterprise Data Source, Social Media Data Source, Public Data Source – Web Scrapping- Basic Concepts of Data Warehouse and Data Mining – Distributed File System.	08
2	Data Process Overview Defining Goals- Data Acquisition – Sources of acquiring the data - Data preprocessing- Imputation of Missing values - Data cleaning - Data Reduction, Data Transformation and Data Discretization. Exploratory Data Analysis (EDA) – Philosophy of EDA - The Data Science Process. Significance of EDA in data science - Basic tools (plots, graphs and summary statistics) of EDA.	08
3	Data Organization Data Structures: Basics – stack, Queue, Linked List, Tree, Graph - Data Organizational Models- Centralized Model-Embedded Model- Hybrid Model-The Three-Layered structure-Centre of Excellence Model – Roles and Responsibilities- Data Governance- Data Privacy-Data Quality- Data Extraction-Extraction and ETL(Extract, Load, Transform)-Types- Physical -Logical-Data extraction with SQL.	08
4	Data Analysis & Visualization Spreadsheets: Data Manipulations- Sort, filter, remove duplicates-text and math functions-pivot table-lookup functions-Data visualizations for quantitative and qualitative data- charts-Excel Modelling- forecast models using advanced lookup and data validation tools. Tableau: Creating Visualizations in Tableau-Data hierarchies, filters, groups, sets, calculated fields-Map based visualizations- Build interactive dashboards-Data Stories.	08
5	Ethics And Recent Trends Data and Business Insights- Data Science Engineering: - Need of Data Science - Ethics – Doing good data science – Natural Language Processing – Machine Learning Model- Valuing Data privacy – Getting informed consent - The Five Cs – Diversity – Inclusion – Future Trends	08
Total		40

Suggested Books

- Introducing Data Science, Davy Cielen, Arno D. B. Meysman, Mohamed Ali, Manning Publications Co., 1st edition,2016.
- Ethics and Data Science, D J Patil, Hilary Mason, Mike Loukides, O’ Reilly, 1st edition, 2018.
- Introduction to Machine Learning with Python-A Guide for Data Scientists, by Andreas C. Mueller, Sarah Guido, O’Reilly; 1st edition, October 2016.
- Getting Started with Tableau 2019.2 (Second Edition),Tristan Guillevin, Packt Publishing; 2nd edition June, 2019.



5AD4-05: Analysis of Algorithms

Credit: 3		Max Marks: 150 (IA :30, ETE:120)
3L+ 0T+ 0P		End Term Exams: 3hr
S.No.	Contents	Hours
1	Introduction: Objective, scope, and outcome of the course.	01
2	Background: Review of Algorithm, Complexity Order Notations: definitions and calculating complexity. Divide And Conquer Method: Binary Search, Merge Sort, Quick sort, and Strassen's matrix multiplication algorithms.	06
3	Greedy Method: Knapsack Problem, Job Sequencing, Optimal Merge Patterns, and Minimal Spanning Trees. Dynamic Programming: Matrix Chain Multiplication. Longest Common Subsequence and 0/1 Knapsack Problem.	09
4	Branch And Bound: Traveling Salesman Problem and Lower Bound Theory. Backtracking Algorithms and queens' problem. Pattern Matching Algorithms: Naïve and Rabin Karp string matching algorithms, KMP Matcher and Boyer Moore Algorithms.	08
5	Assignment Problems: Formulation of Assignment and Quadratic Assignment Problem. Randomized Algorithms- Las Vegas algorithms, Monte Carlo algorithms, a randomized algorithm for Min-Cut, randomized algorithm for 2- SAT. Problem definition of Multicommodity flow, Flow shop scheduling, and Network capacity assignment problems.	08
6	Problem Classes Np, Np-Hard, And Np-Complete: Definitions of P, NP-Hard and NP-Complete Problems. Decision Problems. Cook's Theorem. Proving NP-Complete Problems - Satisfiability problem and Vertex Cover Problem. Approximation Algorithms for Vertex Cover and Set Cover Problem.	08
Total		40

Suggested Books

- T.H. Cormen, C.E. Leiserson, R.L. Rivest "Introduction to Algorithms", PHI.
- Sedgewich, Algorithms in C, Galgotia
- Berman. Paul, "Algorithms, Cengage Learning".
- Richard Neopolitan, Kumar SS Naimipour, "Foundations of Algorithms"
- Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006
- E. Horowitz, S. Sahni, and S. Rajsekar, "Fundamentals of Computer Algorithms," Galotia Publication



5AD5-11: AI in Healthcare

Credit: 2		Max Marks: 100 (IA :20, ETE:80)
2L+ 0T+ 0P		End Term Exams: 2hr
S.No.	Contents	Hours
1	Introduction: Objective, scope, and outcome of the course.	01
2	Course Overview,: Introduction to Module, Operationalizing Consumerism Using AI, Operationalizing a New Supply Chain, Machine Learning, Artificial Intelligence, and Decision Support.	07
3	Journey Mapping and Pain Points, Patient Monitoring, Differential Diagnosis, Care Management, Preventive Screening, Avoidable Readmissions, Disease Burden as a Predictor of Cost, Data Sourcing, Data Enrichment.	06
4	Provider Taxonomies and Relationships, Predictive Modeling Process, Analytic Maturity Model, Identifying Historic Addressable Opportunity, Predicting Addressable Opportunity, Measuring Predictive Accuracy, Making Recommendations	05
5	A review of the state of AI in health care, A review of the pending research and development CDS open problems, A review of important AI data mining technologies and their application to medicine,	05
6	A description of BDA and its application to health care, The use of technology underneath, Summary of important issues of AI in health care. Physician point of view and case studies on Radiology and Physiological Tests	06
	Total	30

Suggested Books

- Prashant Natarajan, John C. Frenzel, and Detlev H. Smaltz Demystifying Big Data and Machine Learning for Healthcare (1 ed.), CRC Press, 2017. ISBN 978-1138032637.
- Arjun Panesar, Machine Learning and AI for Healthcare: Big Data for Improved Health Outcomes (1 ed.), Apress, 2019. ISBN 978-1484237984.
- Raghupathi W, Raghupathi V., Big data analytics in healthcare: promise and potential, Health info science and syst.,2014.
- Chen Y, Argentinis E, et al., Clinical therapeutics, IBM Watson: how cognitive computing can be applied to big data challenges in life sciences research. 2016.



5AD5-12: Human-Computer Interaction

Credit: 2		Max Marks: 100 (IA :20, ETE:80)
2L+ 0T+ 0P		End Term Exams: 2hr
S.No.	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Historical evolution of the field, Interactive system design, Concept of usability -definition and elaboration, HCI and software Engineering, GUI design and Aesthetics, Prototyping techniques.	02
2	Model-based Design and evaluation: Basic idea, introduction to different types of models, GOMS family of models (KLM and CMN- GOMS), Fitts' law and Hick-Hyman's law, Model-based design case studies.	04
3	Guidelines in HCI: Schneiderman's eight, golden rules, Norman's seven principles, Norman's model of interaction, Nielsen's ten heuristics with examples of its use Heuristic evaluation, Contextual inquiry, Cognitive walkthrough.	05
4	Empirical research methods in HCI: Introduction (motivation, issues, research question formulation techniques), Experiment design, and data analysis (with an explanation of one-way ANOVA).	06
5	Task modeling and analysis: Hierarchical task analysis (HTA), Engineering task models and Concur Task Tree (CTT), Introduction to formalism in dialog design, design using FSM (finite state machines) Statecharts and (classical) Petri Nets in dialog design.	07
6	Introduction to CA, CA types, the relevance of CA in IS design Model Human Processor (MHP), OOP- Introduction OOM- Object-Oriented Modeling of User Interface Design.	05
Total		30

Suggested Books

- Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, —Human-Computer Interaction, 3rd Edition, Pearson Education, 2004 Brian Fling, —Mobile Design and Development, First Edition, O'Reilly Media Inc., 2009)
- Bill Scott and Theresa Neil, —Designing Web Interfaces, First Edition, O'Reilly, 2009. (



5AD5-13: Information Security System

Credit: 2		Max Marks: 100 (IA :20, ETE:80)
2L+ 0T+ 0P		End Term Exams: 2hr
S.No.	Contents	Hours
1	Introduction: Objective, scope, and outcome of the course.	01
2	Introduction to security attacks: services and mechanism, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stream and block ciphers.	05
3	Modern block ciphers: Block Cipher structure, Data Encryption Standard (DES) with an example, the strength of DES, Design principles of block cipher, AES with structure, its transformation functions, key expansion, example, and implementation. Multiple encryption and triple DES, Electronic Code Book, Cipher Block Chaining Mode, Cipher Feedback mode, Output Feedback mode, Counter mode.	06
4.	Public Key Cryptosystems with Applications: Requirements and Cryptanalysis, RSA cryptosystem, Rabin cryptosystem, Elgamal cryptosystem, Elliptic curve cryptosystem.	05
5	Cryptographic Hash Functions, their applications: Simple hash functions, its requirements and security, Hash functions based on Cipher Block Chaining, Secure Hash Algorithm (SHA). Message Authentication Codes, its requirements and security, MACs based on Hash Functions, Macs based on Block Ciphers. Digital Signature, its properties, requirements and security, various digital signature schemes (Elgamal and Schnorr), NIST digital Signature algorithm.	07
6	Key management and distribution: symmetric key distribution using symmetric and asymmetric encryptions, distribution of public keys, X.509 certificates, public key infrastructure. Remote user authentication with symmetric and asymmetric encryption, Kerberos Web Security threats and approaches, SSL architecture and protocol, Transport layer security, HTTPS, and SSH.	06
Total		30

Suggested Books

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



5AD5-14: Foundation Of AI

Credit: 2		Max Marks: 100 (IA :20, ETE:80)
2L+ 0T+ 0P		End Term Exams: 2hr
S. No.	Contents	Hours
1	AI problems, foundation of AI and history of AI intelligent agents Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.	03
2	Searching Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A* ,AO* Algorithms, Problem reduction, Game Playing-Adversarial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions.	07
3	Knowledge representation issues predicate logic- logic programming, semantic nets- frames and inheritance, constraint propagation, representing knowledge using rules, rules based deduction systems. Reasoning under uncertainty, review of probability, Baye’s probabilistic interferences and dempstershafer theory.	07
4	First order logic Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, Learning from observation Inductive learning, Decisiontrees, Explanation based learning, Statistical Learning methods ,Reinforcement Learning.	06
5	Expert systems Introduction, basic concepts, structure of expert systems, the human element in expert systems how expert systems works, problem areas addressed by expert systems, expert systems success factors, types of expert systems, expert systems and the internet interacts web, knowledge engineering, scope of knowledge, difficulties, in knowledge acquisition methods of knowledge acquisition, machine learning, intelligent agents, selecting an appropriate knowledge acquisition method, societal impacts reasoning in artificial intelligence, inference with rules, with frames: model based reasoning, case based reasoning, explanation & meta knowledge inference with uncertainty representing uncertainty.	07
Total		30

Suggested Books

- Artificial Intelligence by Elaine Rich, Kevin Knight and Shivashankar B Nair, Tata McGraw Hill.
- Introduction to Artificial Intelligence and Expert Systems by Dan W. Patterson, Pearson Education.
- Artificial Intelligence: A Modern Approach by S. Russell and P. Norvig, Prentice Hall.



5AD3-21: Network Programming Lab

Credit: 1		Max Marks: 50 (IA :30, ETE:20)
0L+ 0T+ 2P		End Term Exams: 2hr
S. No.	Content	
1	Study of Different Type of LAN& Network Equipment.	
2	Study and Verification of standard Network topologies i.e. Star, Bus, Ring etc.	
3	LAN installations and Configurations.	
4	Write a program to implement various types of error correcting techniques.	
5	Write a program to implement various types of framing methods.	
6	Write two programs in C: hello_client and hello_server a. The server listens for, and accepts, a single TCP connection; it reads all the data it can from that connection, and prints it to the screen; then it closes the connection b. The client connects to the server, sends the string "Hello, world!", then closes the connection	
7	Write an Echo_Client and Echo_server using TCP to estimate the round-trip time from client to the server. The server should be such that it can accept multiple connections at any given time.	
8	Repeat Exercises 6 & 7 for UDP.	
9	Repeat Exercise 7 with multiplexed I/O operations.	
10	Study and basic TCP/UDP traffic implementation in NS3.	
11	Simulate Bellman-Ford Routing algorithm in NS3.	

Suggested Books

- W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, "Unix Network Programming Volume 1: The Sockets Networking API - Vol. 1", 3rd edition, Pearson Education India
- Andrew S. Tanenbaum, David J. Wetherall, "Computer Networks", 5th Edition, Pearson Education, 2013.
- James Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet", 3rd Edition, Pearson Education.
- William Stallings, "Data and Computer Communications", 8th edition, Pearson Education.
- Behrouz A. Forouzan, "Data Communications and Networking", 5th Edition, McGraw Hill Education.
- Larry Peterson and Bruce Davie, "Computer Networks: A Systems Approach", 4th Edition, Morgan Kaufmann Publishers | Elsevier.



5AD4-22: Neural Networks Lab

Credit: 1		Max Marks: 50 (IA :30, ETE:20)
0L+ 0T+ 2P		End Term Exams: 2hr
S.No.	List of Experiments	
1	Write a program to implement Perceptron	
2	Write a program to implement Multilayered feedforward neural Network	
3	Implement Binary Classification Using neural network	
4	To study Convolutional Neural Network and Recurrent Neural Network	
5	Implement Multi-Class Classification using Neural network	
6	Implement Binary Classification Using CNN	
7	Implement Multi-Class Classification Using CNN	
8	Implement traveling salesperson problem (tsp) using Self Organizing maps	
9	Write a program to implement Classification using Back-Propagation	
10	To study and implement the Weighted machine problem	

Suggested Books

- Neural Networks a Comprehensive Foundations, Simon Haykin, PHI edition.
- B. Yegnanarayana - Artificial neural network PHI Publication
- Satish Kumar, "Neural Networks: A classroom approach", Tata McGraw Hill, 2004.
- Robert J. Schalkoff, "Artificial Neural Networks", McGraw-Hill International Editions, 1997.
- Neural Networks in Computer Intelligence, Li-Min Fu MC GRAW HILL EDUCATION 2003
- Kevin L. Priddy, Paul E. Keller – Artificial neural networks: An Introduction - SPIE Press, 2005



5AD4-23: Analysis of Algorithms Lab

Credit: 1		Max Marks: 50 (IA :30, ETE:20)
0L+ 0T+ 2P		End Term Exams: 2hr
S. No.	List of Experiments	
1	Sort a given set of elements using the Quicksort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.	
2	Implement a parallelized Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.	
3	a. Obtain the Topological ordering of vertices in a given digraph. b. Compute the transitive closure of a given directed graph using Warshall's algorithm.	
4	Implement 0/1 Knapsack problem using Dynamic Programming.	
5	From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.	
6	Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.	
7	a. Print all the nodes reachable from a given starting node in a digraph using the BFS method. b. Check whether a given graph is connected or not using the DFS method.	
8.	Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.	
9.	Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.	
10	Implement N Queen's problem using Backtracking.	

Suggested Books

- T.H. Cormen, C.E. Leiserson, R.L. Rivest "Introduction to Algorithms", PHI.
- Sedgewich, Algorithms in C, Galgotia
- Berman. Paul, "Algorithms, Cengage Learning".
- Richard Neopolitan, Kumar SS Naimipour, "Foundations of Algorithms"
- Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006
- E. Horowitz, S. Sahni, and S. Rajsekar, "Fundamentals of Computer Algorithms," Galotia Publication



5AD4-24: Data Foundation Lab

Credit: 1		Max Marks: 50 (IA :30, ETE:20)
0L+ 0T+ 2P		End Term Exams: 2hr
S. No.	List of Experiments	
1	Load the data in excel file and apply the following operations: a. Find Number of rows and columns b. Add and Delete a new column c. Hiding the column d. Filtering the column e. Find Quantitative and Qualitative values	
2	Load the data in Excel sheet and apply Pivot operation and understand the data set.	
3	Apply different Arithmetic operations (sum, aggregate, average etc.) in the data and report the result.	
4	Apply statistics operations and find the central tendency (Mean, Mode, Median, Standard Deviation, and Variance) of the data set	
5	Apply different data formatting commands. (Ex. Changing date format)	
6	Perform sorting and Replace operations based on selected columns (Practice Ascending and Descending order)	
7.	Perform different ANOVA test to find the relationship between the features (Column).	
8.	Perform operations to find the missing value and impute the NULL values using different imputation methods such as mean, mode, median etc.,	
9.	Load the file which has categorical data and encode it.	
10.	Perform normalization in the data.	

Suggested Books

- Introducing Data Science, Davy Cielen, Arno D. B. Meysman, Mohamed Ali, Manning Publications Co., 1st edition, 2016.
- Ethics and Data Science, D J Patil, Hilary Mason, Mike Loukides, O' Reilly, 1st edition, 2018.
- Introduction to Machine Learning with Python-A Guide for Data Scientists, by Andreas C. Mueller, Sarah Guido, O'Reilly; 1st edition, October 2016.
- Getting Started with Tableau 2019.2 (Second Edition), Tristan Guillevin, Packt Publishing; 2nd edition June, 2019.



6AD3-01: Digital Image Processing

Credit: 2		Max Marks: 100 (IA :20, ETE:80)
2L+ 0T+ 0P		End Term Exams: 2hr
S. No.	Contents	Hours
1	Introduction: Objective, scope, and outcome of the course.	01
2	Introduction to Image Processing: Digital Image representation, Sampling & Quantization, Steps in image Processing, Image acquisition, color image representation.	04
3	Image Transformation & Filtering: Intensity transform functions, histogram processing, Spatial filtering, Fourier transforms, and its properties, frequency domain filters, color models, Pseudo coloring, color transforms, Basics of Wavelet Transforms.	06
4	Image Restoration: Image degradation and restoration process, Noise Models, Noise Filters, degradation function, Inverse Filtering, Homomorphism Filtering.	07
5	Image Compression: Coding redundancy, Interpixel redundancy, Psychovisual redundancy, Huffman Coding, Arithmetic coding, Lossy compression techniques, JPEG Compression.	05
6	Image Segmentation & Representation: Point, Line, and Edge Detection, Thresholding, Edge and Boundary linking, Hough transforms, Region-Based Segmentation, Boundary representation, Boundary Descriptors.	05
Total		28

Suggested Books

- Rafael C Gonzalez, Richard E Woods, "Digital Image Processing," 4th Edition, Pearson, 2018.
- Kenneth R. Castleman, Digital Image Processing Pearson, 2006.
- Anil K.Jain, "Fundamentals of Digital Image Processing," Person Education, 2003.



6AD4-02: Introduction to Machine Learning

Credit: 3		Max Marks: 150 (IA :30, ETE:120)
3L+ 0T+ 0P		End Term Exams: 3hr
S. No.	Contents	Hours
1	Introduction to Machine Learning What is machine learning – Types of Machine learning Techniques-security with deep learning - -Reinforcement learning- Logistic Regression-hypothesis- Logistic regression models- Decision boundary- Cost function-Dimensionality Reduction- Principal Component	08
2	Predictive Analytics Linear regression-with one variable-with multiple variable--Multiple Linear regression-Non linear regression-Regression analysis- Predictive models - prediction using logistics regression.	08
3	Classification and Clustering Techniques Support vector Machine- Decision Tree-Naïve Bayes-Random Forest- Density-Based Clustering Methods-Hierarchical Based clustering methods-Partitioning methods- Grid based methods-K means clustering - pattern based with deep learning.	08
4	Ensembling Models Need of Ensembling- Applications of Ensembling - Types of Ensembling- Techniques of Ensembling- Bagging-Boosting – Stacking-Blending-AdaBoost -informatics with deep learning	08
5	Model Evaluation, Model Selection, And Algorithm Selection Statistical tests - validation Techniques-Cross validation -Nested Cross validation- Essential Model Evaluation Terms and Techniques - Bootstrapping and Uncertainties -Cross-validation and Hyperparameter Optimization - Algorithm Comparison - Testing the Difference of Proportions - Comparing Two Models with the McNemar Test - The F-test for Comparing Multiple Classifiers - Comparing Algorithms - optimizing deep learning hyper parameters by evolutionary algorithm.	08
Total		40

Suggested Books

- Introduction to Machine Learning with Python: A Guide for Data Scientists by Andreas C. Müller, Sarah Guido, Publisher(s): O'Reilly Media, Inc., ISBN: 9781449369415
- Ensemble Methods: Foundations and Algorithms by Zhi-Hua Zhou , CRC Press, 2012
- <https://machinelearningmastery.com/stacking-ensemble-machine-learning-with-python>



6AD4-03: Soft Computing

Credit: 3		Max Marks: 150 (IA :30, ETE:120)
3L+ 0T+ 0P		End Term Exams: 3hr
S.No	Contents	Hours
1	Introduction: Objective, scope, and outcome of the course.	01
2	Introduction to Soft Computing & Neural Networks: Brief Review of Neural Network, Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics	06
3	Fuzzy Logic: Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making. Applications of Fuzzy Set,	07
4	GENETIC ALGORITHMS: Main Operators- Genetic Algorithm Based Optimization-Principle of Genetic Algorithm- Genetic Algorithm with Directed Mutation- Comparison of Conventional and Genetic Search Algorithms Issues of GA in practical implementation. Introduction to Particle swarm optimization-PSO operators-GA and PSO in engineering applications. Machine Learning Approach to Knowledge Acquisition.	09
5	New trends in Evolutionary Algorithms: Ant Colony Optimization: Ant system, MM-AS, Ant Miner, Snake-Ant Algorithm. Artificial Bee Colony, Cuckoo Search Algorithm. Co-evolution, Plasticity and lifetime learning, Lamarckian learning, the “No free lunch” theorem.	06
6	Matlab/Python Lib: Introduction to Matlab/Python, Arrays and array operations, Functions and Files, Study of neural network toolbox and fuzzy logic toolbox, Simple implementation of Artificial Neural Network and Fuzzy Logic	09
Total		38

Suggested Books

- Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, S.Rajasekaran, G. A. Vijayalakshami, PHI.
- Genetic Algorithms: Search and Optimization, E. Goldberg.
- L.Fausett, Fundamentals of Neural Networks, Prentice Hall
- T.Ross, Fuzzy Logic with Engineering Applications, Tata McGraw Hill



6AD4-04: Cloud Computing

Credit: 3		Max Marks: 150 (IA :30, ETE:120)
3L+ 0T+ 0P		End Term Exams: 3hr
S.No.	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Introduction: Objective, scope and outcome of the course. Introduction Cloud Computing: Nutshell of cloud computing, Enabling Technology, Historical development, Vision, feature Characteristics and components of Cloud Computing. Challenges, Risks and Approaches of Migration into Cloud. Ethical Issue in Cloud Computing, Evaluating the Cloud's Business Impact and economics, Future of the cloud. Networking Support for Cloud Computing. Ubiquitous Cloud and the Internet of Things	06
3	Cloud Computing Architecture: Cloud Reference Model, Layer and Types of Clouds, Services models, Data centre Design and interconnection Network, Architectural design of Compute and Storage Clouds. Cloud Programming and Software: Fractures of cloud programming, Parallel and distributed programming paradigms-Map Reduce, Hadoop, High-level Language for Cloud. Programming of Google App Engine.	10
4	Virtualization Technology: Definition, Understanding and Benefits of Virtualization. Implementation Level of Virtualization, Virtualization Structure/Tools and Mechanisms, Hypervisor VMware, KVM, Xen. Virtualization: of CPU, Memory, I/O Devices, Virtual Cluster and Resources Management, Virtualization of Server, Desktop, Network, and Virtualization of data-Centre.	09
5	Securing the Cloud: Cloud Information security fundamentals, Cloud security services, Design principles, Policy Implementation, Cloud Computing Security Challenges, Cloud Computing Security Architecture. Legal issues in Cloud Computing. Data Security in Cloud: Business Continuity and Disaster Recovery, Risk Mitigation, Understanding and Identification of Threats in Cloud, SLA-Service Level Agreements, Trust Management	07
6	Cloud Platforms in Industry: Amazon web services, Google AppEngine, Microsoft Azure Design, Aneka: Cloud Application Platform -Integration of Private and Public Clouds Cloud applications: Protein structure prediction, Data Analysis, Satellite Image Processing, CRM	07
Total		40

Suggested Books

- Dan C Marinescu, Cloud Computing, Theory and Practice, MK Elsevier
- Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Cloud Computing: Principles and Paradigms, Wiley
- Barrie Sosinsky, Cloud Computing Bible, Wiley
- Jim Smith, Ravi Nair, Virtual Machines: Versatile Platforms for Systems and Processes, MK Elsevier



6AD4-05: Data Mining & Predicting Modeling

Credit: 3		Max Marks: 150 (IA :30, ETE:120)
3L+ 0T+ 0P		End Term Exams: 3hr
S.No.	Contents	Hours
1	Data Warehousing And Online Analytical Processing Basic of Data Warehouse - Data Warehouse Modeling: Data Cube and OLAP - Data Warehouse Implementation - Data Generalization by Attribute-Oriented Induction - Data Cube Computation - Data Cube Computation Methods - Processing Advanced Kinds of Queries by Exploring Cube Technology - Multidimensional Data Analysis in Cube Space.	09
2	Introduction, Data Preprocessing And Mining Frequent Patterns And Association Introduction to data mining – kinds of data – Kinds of patterns to be mined – Technologies – applications – issues in mining – Data objects and attribute types – statistical distribution of data – data visualization – Measuring Data similarity and dissimilarity – Need for preprocessing – Data cleaning – Data Integration – Data reduction - Data Transformation and Data Discretization - Frequent Itemset, Closed Itemset, and Association Rules - Frequent Itemset Mining Methods.	08
3	Classification Basics – Decision tree Induction – Baye’s Classification - Rule-Based Classification - Model Evaluation and Selection - Techniques to Improve Classification Accuracy - Bayesian Belief Networks - Classification by Backpropagation - Support Vector Machines - Classification Using Frequent Patterns- Lazy Learners (or Learning from Your Neighbors) - Other Classification Methods.	08
4	Clustering Basics - Partitioning Methods - Hierarchical Method - Density-Based Methods - Grid-Based Methods- Evaluation of Clustering - Clustering with Constraints - Outliers and Outlier Analysis - Outlier Detection Methods - Statistical Approaches - Proximity-Based Approaches - Clustering-Based Approaches.	09
5	Data Mining Trends And Research Frontiers Mining Complex Data Types - Other Methodologies - Data Mining Applications - Data Mining and Society – Data Mining Trends – Real world applications – Data Mining Tool study.	08
Total		42

Suggested Books

- Han, M.Kamber, “Data Mining: Concept and Techniques”, Academic Press, Morgan Kaufmann.
- Alex Berson and Stephen J. Smith. “Data Warehousing, Data Mining & OLAP”, Tata McGraw Hill, 2016.
- Pieter Adrians, Dolf Zantinge. “Data Mining”, Addison Wesley, 2000.



6AD5-11: Business Intelligence & Analytics

Credit: 3		Max Marks: 150 (IA :30, ETE:120)
3L+ 0T+ 0P		End Term Exams: 3hr
S. No.	Contents	Hours
1	Introduction To Business Intelligence Introduction to Business Intelligence – Designing Business Intelligence Application-Requirements Gathering, Establishing the Technical Architecture, Designing a Business Intelligence Solution , Designing Dimensional Models , Designing the Physical Databases	06
2	Descriptive Analysis Data Warehousing- Definitions and Concepts -- Data Warehousing Architectures - Data Integration and the Extraction, Transformation, and Load (ETL) Processes - Transaction processing- Data Warehouse Development Approaches - Data Warehousing Implementation Issues - Data Warehouse Administration, Security Issues, and Future Trends- Business Reporting, Visual Analytics, and Business Performance Management	08
3	Predictive Analytics Data Mining Concepts- Definitions, Characteristics, and Benefits - How Data Mining Works - Data Mining Versus Statistics Data Mining Process - Data Mining Methods - Data Mining and Privacy Issues - Regression – Classification – Association Rules – clustering -Techniques for Predictive Modeling – ANN- SVM	08
4	Text Analysis and Text Mining : Text Analytics, Text Mining, and Sentiment Analysis - Natural Language Processing - Text Mining Process- tools - Sentiment Analysis -Overview, Process, Applications - Speech Analytics – Rule based, Multi, Layer, Hybrid Sentimental analysis – Machine Learning in Sentiment analysis	09
5	Web Analytics and Web Mining Web Mining Overview - Web Content and Web Structure Mining - Search Engines - Search Engine Optimization - Web Analytics Technologies, metrics - Web Analytics Maturity Model and Web Analytics Tools	09
Total		30

Suggested Books

- Paczkowski, Walter R. Business Analytics: Data Science for Business Problems. Springer Nature, 2022.
- Shmueli, Galit, et al. Data mining for business analytics: concepts, techniques and applications in Python. John Wiley & Sons, 2019.



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6AD5-12: Distributed System

Credit: 3		Max Marks: 150 (IA :30, ETE:120)
3L+ 0T+ 0P		End Term Exams: 3hr
S.No.	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Distributed Systems: Features of distributed systems, nodes of a distributed system, Distributed computation paradigms, Model of distributed systems, Types of Operating systems: Centralized Operating System, Network Operating Systems, Distributed Operating Systems & Cooperative Autonomous Systems, design issues in distributed operating systems. Systems Concepts and Architectures: Goals, Transparency, Services, Architecture Models, Distributed Computing Environment (DCE). Theoretical issues in distributed systems: Notions of time and state, states & events in a distributed system, time, clocks & event precedence, recording the state of distributed systems.	08
3	Concurrent Processes and Programming: Processes and Threads, Graph Models for Process Representation, Client/Server Model, Time Services, Language Mechanisms for Synchronization, Object Model Resource Servers, Characteristics of Concurrent Programming Languages (Language not included). Inter-process Communication and Coordination: Message Passing, Request/Reply and Transaction Communication, Name and Directory services, RPC, and RMI case studies.	08
4	Distributed Process Scheduling: A System Performance Model, Static Process Scheduling with Communication, Dynamic Load Sharing and Balancing, Distributed Process Implementation. Distributed File Systems: Transparencies and Characteristics of DFS, DFS Design and implementation, Transaction Service and Concurrency Control, Data and File Replication. Case studies: Sun network file systems, General Parallel file System and Window's file systems. Andrew and Coda File Systems	08
5	Distributed Shared Memory: Non-Uniform Memory Access Architectures, Memory Consistency Models, Multiprocessor Cache Systems, Distributed Shared Memory, Implementation of DSM systems. Models of Distributed Computation: Preliminaries, Causality, Distributed Snapshots, modelling a Distributed Computation, Failures in a Distributed System, Distributed Mutual Exclusion, Election, Distributed Deadlock handling, Distributed termination detection.	08
6	Distributed Agreement: Concept of Faults, failure and recovery, Byzantine Faults, Adversaries, Byzantine Agreement, Impossibility of Consensus and Randomized Distributed Agreement. Replicated Data Management: concepts and issues, Database Techniques, Atomic Multicast, and Update Propagation. CORBA case study: Introduction, Architecture, CORBA RMI, CORBA Services.	08
Total		41

Suggested Books

- Andrew S. Tannenbaum & Maarten Van Steen, Distributed Systems: Principles and Paradigms, Pearson
- George Coulouris, Jean Dollimore, Tim Kindberg, and Gordon Blair, Distributed Systems: Concepts and Design, Addison Wesley

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- P. K. Sinha, Distributed Operating Systems: Concepts and Design, IEEE press
- M. Singhal and N. G. Shivaratri, Advanced Concepts in Operating Systems,, McGraw-Hill

6AD5-13: Data Mining & Business Intelligence

Credit: 3		Max Marks: 150 (IA :30, ETE:120)
3L+ 0T+ 0P		End Term Exams: 3hr
S.No.	Contents	Hours
1	Introduction: Objective, scope, and outcome of the course.	01
2	Introduction - Evolution and importance of Data Mining-Types of Data and Patterns mined Technologies-Applications-Major issues in Data Mining. Knowing about Data- Data Preprocessing: Cleaning– Integration–Reduction–Data transformation and Discretization.	08
3	BI- Data Mining & Warehousing: Basic Concepts-Data Warehouse Modeling-OLAP and OLTP systems - Data Cube and OLAP operations–Data Warehouse Design and Usage-Business Analysis Framework for Data Warehouse Design- OLAP to Multidimensional Data Mining. Mining Frequent Patterns: Basic Concept – Frequent Item Set Mining Methods – Mining Association Rules – Association to Correlation Analysis.	09
4	Classification and Prediction: Issues - Decision Tree Induction - Bayesian Classification – Rule-Based Classification – k-Nearest mining Classification. Prediction –Accuracy and Error measures.	07
5	Clustering: Overview of Clustering – Types of Data in Cluster Analysis – Major Clustering Methods.	07
6	Introduction to BI -BI definitions and concepts- BI Framework-Basics of Data integration Introduction to Business Metrics and KPI - Concept of the dashboard and balanced scorecard. Tool for BI: Microsoft SQL server: Introduction to Data Analysis using SSAS tools Introduction to Data Analysis using SSIS tools- Introduction to Reporting Services using SSRS tools- Data Mining Implementation Methods.	08
Total		40

Suggested Books

- Han, M. Kamber, “Data Mining Concepts and Techniques”, Morgan Kaufmann
- M. Kantardzic, “Data mining: Concepts, models, methods and algorithms, John Wiley & Sons Inc
- Paulraj Ponnian, “Data Warehousing Fundamentals”, John Willey.
- M. Dunham, “Data Mining: Introductory and Advanced Topics”, Pearson Education.
- G. Shmueli, N.R. Patel, P.C. Bruce, “Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XLMiner”, Wiley India



6AD5-14: Artificial Intelligence and Expert Systems

Credit: 3		Max Marks: 150 (IA :30, ETE:120)
3L+ 0T+ 0P		End Term Exams: 3hr
S.No.	Contents	Hours
1	Introduction Overview of Artificial Intelligence, History, Approaches, Search techniques, State-space representations Depth-first, breadth-first, and heuristic search Planning and game playing, Genetic algorithms.	08
2	Knowledge Representation and Issues Notational systems, Trees, graphs, hierarchies, propositional and predicate logics, frames, semantic networks, constraints, conceptual dependencies, database, knowledge discovery in databases (KDD).	08
3	Logical Reasoning and Probabilistic Reasoning Predicate Calculus resolution, completeness, and strategies Unification, Prolog, monotonic and non-monotonic reasoning, Probabilistic inference networks Fuzzy inference rules, Bayesian rules, Dempster-Shafer Calculus	08
4	Learning Knowledge acquisition, classification rules, self-directed systems. Neural Networks Principles, biological analogies Training (techniques and errors) Recognition.	08
5	Expert Systems Definition – Features of an expert system – Organization – Characteristics – Prospector – Knowledge Representation in expert systems – Expert system tools – MYCIN – EMYCIN	08
Total		40

Suggested Books

- Stuart Russel and Peter Norvig, 'Artificial Intelligence A Modern Approach', Second Edition, Pearson Education, 2003 / PHI.
- Bratko, I., Prolog, 2nd Ed., Addison-Wesley, 1990.
- George F.Luger, 'Artificial Intelligence – Structures and Strategies for Complex Problem Solving', Fourth Edition, Pearson Education, 2002.
- Giarratano, J., and Riley G., Expert Systems Principles and Programming, PWS-KENT, 1989.



6AD4-21: Machine Learning Lab

Credit: 1.5		Max Marks: 75 (IA :45, ETE:30)
0L+ 0T+ 3P		End Term Exams: 2hr
S.No.	List of Experiments	
1	Analysis and implementation using Python /Jupyter Notebook i. Compute the distance travelled by the robot from current position after a sequence of movement and original point. ii. Creation of scatter plot using sepal length and petal width to separate the Species classes	
2	Computation of Statistical details and Complexity i. Calculate the Five Number Summary(Quartiles, IQR) for the attribute(age) of each employee a Tea Factory. ii. Analyze the complexity of Heap sort, applied over different sized random lists.	
3	Preprocessing and construction of a quality dataset i. Preprocess the given data to build good training sets (80%) and test sets (20%) by removing the missing values and imputing them with the mean value. ii. Examine the interrelations among the set of variables using Principal Component Analysis, display the PCA Components and generate Heat map.	
4	Analysis and Interpretation of data i. Manipulate the Twitter Data Set by removing the Punctuation, Numbers, Special Characters and word length ≤ 3 . Tokenize the Words and Stem. ii. Generate a word cloud for the Twitter dataset and retrieve the top 15 positive and negative tags.	
5	Build new models (Classification and Clustering) i. Find core samples of high density and expand clusters from them using DBSCAN Clustering. ii. Split the iris dataset into train and test data(80%-20%) and train or fit the data into the model using K Nearest Neighbor Algorithm.	
6	Evaluate the Performance of Machine Learning algorithms i. Evaluate the performance of Machine Learning algorithms using Confusion Matrix, Accuracy, Sensitivity, Specificity, Precision and Recall. ii. Employ Linear Regression to check the linearity between the a) stock price and interest rate, b)stock price and unemployment rate.	

Suggested Books

- Introduction to Machine Learning with Python: A Guide for Data Scientists by Andreas C. Müller, Sarah Guido, Publisher(s): O'Reilly Media, Inc., ISBN: 9781449369415
- Ensemble Methods: Foundations and Algorithms by Zhi-Hua Zhou , CRC Press, 2012
- <https://machinelearningmastery.com/stacking-ensemble-machine-learning-with-python>



6AD4-22: Data Mining & Predicting Modeling Lab

Credit: 1.5		Max Marks: 75 (IA :45, ETE:30)
0L+ 0T+ 3P		End Term Exams: 2hr
S.No.	List of Experiments	
1	Demonstration of pre-processing on dataset car.arff	
2	Demonstration of pre-processing on dataset diabetes diagnosis.	
3	Demonstration of classification rules process on dataset using ID3 and J48 algorithm.	
4	Implement the classification rules process on car dataset using Naïve Baye's algorithm in Weka explorer.	
5	Demonstration of classification rule process on dataset using simple K-means algorithm in weka explorer.	
6	Build a Neural Network model to process Diabetic diagnosis dataset.	
7	Demonstration of classification on dataset diabetic diagnosis and car using decision table algorithm in weka explorer.	
8	Demonstration of association rule using dataset diabetic diagnosis using apriori algorithm in weka explorer.	
9	Demonstration of classification on dataset diabetic and car.	
10	Demonstration of clustering on dataset diabetic and car.	

Suggested Books

- Ian H. Witten & Eibe Frank, "Data Mining: Practical Machine Learning Tools and Techniques", 2005 Elsevier Inc.



6AD4-23: Soft Computing Lab

Credit: 1.5		Max Marks: 75 (IA :45, ETE:30)	
0L+ 0T+ 3P		End Term Exams: 2hr	
S.No.	List of Experiments (Experiments can be implemented on Matlab)		
1	Create a perceptron with an appropriate number of inputs and outputs. Train it using a fixed increment learning algorithm until no change in weights is required. Output the final weights		
2	Training a feed forward Neural network.		
3	Train Feed Forward neural Network with Back propagation		
4	Building a Linear Regression Neural network		
5	Implementation of Radial basis function network		
6	Implementing crisp partitions for real-life Iris dataset		
7	Implement Union, Intersection, Complement and Difference operations on fuzzy sets.		
8	Create Fuzzy relation by Cartesian product of any two fuzzy sets and perform max-min composition on two fuzzy relations		
9	Write a program to implement Hebb's rule and Delta rule		
10	Implementing SVM (Support Vector Machine) classification by fuzzy concepts.		
11	Implementation of Self-Organizing Map		
12	Implementation of back propagation algorithm for solving face recognition problem		
13	Implementation of Ant Colony Optimization on real life dataset		
14	Implementation of Neuro-Fuzzy-GA methods on real life dataset.		

Suggested Books

- R. Rajasekaran and G. A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic, and Genetic Algorithms: Synthesis and Applications, Prentice Hall of India
- L. Fausett, Fundamentals of Neural Networks, Prentice Hall



6AD4-24: Mobile Application Development Lab

Credit: 1.5		Max Marks: 75 (IA :45, ETE:30)	
0L+ 0T+ 3P		End Term Exams: 2hr	
S.No.	List of Experiments		
1	To study Android Studio and android studio installation. Create “Hello World” application.		
2	To understand Activity, Intent, Create sample application with login module. (Check username and password).		
3	Design simple GUI application with activity and intents e.g. calculator.		
4	Develop an application that makes use of RSS Feed.		
5	Write an application that draws basic graphical primitives on the screen		
6	Create an android app for database creation using SQLite Database.		
7	Develop a native application that uses GPS location information		
8	Implement an application that writes data to the SD card.		
9	Design a gaming application		
10	Create an application to handle images and videos according to size.		