B. Tech with

MINOR

in

Computer Science and Engineering

Academic Regulations, Course Structure and Syllabus

Effective from 2023-24 admitted batches

Offered by

Department of Computer Science and Engineering

KSRM College of Engineering (A) – Kadapa

(Approved by AICTE, Accredited by NAAC with A+ Grade and NBA and Affiliated to JNTUA, Anantapuramu)

ELIGIBILITY / REGISTRATION / AWARD OF MINOR

The primary objective of a minor degree is to provide students with a secondary area of study to broaden their knowledge, enhance their skill set, and potentially improve their career prospects. It allows students to explore interests beyond their major, potentially leading to a more well-rounded and competitive profile.

i) Minor degree is introduced by the respective departments offering B. Tech. programs and is applicable to all B.Tech (Regular and Lateral Entry) students admitted in Engineering & Technology.

ii) There is NO minimum CGPA requirement to register for Minor degree program. However, the student shouldn't have any course backlog **up to III Semester in the major degree.**

iii) A student shall earn **additional 18 credits for award of Minor degree** offered by the department other than parent department. This is in addition to 163 credits by a regular student and 123 Credits by a Lateral Entry student for the award of Major degree.

iv) A student is permitted to register for Minor in IV Semester after the results of III Semester are declared. Students shall register and pass in all the courses prescribed and being offered from V semester under the respective Minor degree.

v) Students have to attend classwork for courses under Minor degree beyond regular academic hours meant for major degree. Students can also undergo the courses under Minor through any proctored online platforms with the prior approval of the BoS Chairman and the HoD of the respective department offering Minor degree.

vi) The attendance for the registered courses under Minor and regular courses offered for Major degree in a Semester will be considered separately.

vii) A student shall have an aggregate of 75% attendance in all courses registered under Minor in that particular semester to become eligible for attending Semester-End examinations.

viii) The registration for the Minor will be cancelled, if the student is detained due to lack of attendance in Major.

ix) The registration for the Minor will be cancelled, if the student fails in any course of either Minor / Major in any semester from V to VIII Semester.

x) A student registered for Minor shall pass in all subjects that constitute the requirement for the Minor degree program. No class/division (i.e., second class, first class and distinction, etc.) will be awarded for Minor degree program.

xi) A separate grade sheet will be issued for the Minor degree courses semester-wise..

xii) If a student drops or is terminated from the Minor program, the additional credits so far earned cannot be converted into open or core electives; they will remain extra.

xiii) The Minor will be mentioned in the degree certificate as Bachelor of Technology in Civil Engineering with Minor in Mechanical Engineering.

xiv) There shall be a minimum enrolment of 20% OR 20 enrollments from the list of

eligible students to offer Minor program.

xv) There is no fee for registration of courses for Minor program offered.

xvi) A student can register for either Minor / Honor but not both.

xvii) Student shall submit an application for either Minor / Honor at least one week before the commencement of the V Semester.

MINOR PROGRAMS OFFERED

Offering Department	Title	Who can Register
Civil Engineering	Civil Engineering	B.Tech. EEE / ME / ECE / CSE / AIML / CSE(AIML) / CSE(DS)
Mechanical Engineering	3D Printing	B.Tech. CE / EEE / ECE / CSE / AIML / CSE(AIML) / CSE(DS)
	Industrial Engineering	B.Tech. CE / EEE / ECE / CSE / AIML / CSE(AIML) / CSE(DS)
Electrical and Electronics Engineering	Energy Systems	B.Tech. CE / ME / ECE / CSE / AIML / CSE(AIML) / CSE(DS)
Electronics and Communication Engineering	Embedded Systems	B.Tech. CE / EEE / ME / CSE / AIML / CSE(AIML) / CSE(DS)
Computer Science and Engineering	Computer Science and Engineering	B.Tech. CE / EEE / ME / ECE
	Data Science	B.Tech. CE / EEE / ME / ECE
	Computer Science and Engineering – Artificial Intelligence and Machine Learning	B.Tech. CE / EEE / ME / ECE

COURSE STRUCTURE

for

MINOR

in

COMPUTER SCIENCE AND ENGINEERING

S.No	COURSE CODE	COURSE TITLE	Semester Offered	L	T	P	IM	EM	CR
1	2305571M	Introduction to Machine Learning	V	3	0	0	30	70	3
2	2305572M	Design and Analysis of Algorithms	V	3	0	0	30	70	3
3	2305573M	Machine Learning Lab	V	0	0	3	30	70	1.5
4	2305671M	Cloud Computing	VI	3	0	0	30	70	3
5	2305672M	Data Mining	VI	3	0	0	30	70	3
6	2305673M	Data Mining Lab	VI	0	0	3	30	70	1.5
7	2305771M	Deep Learning	VII	3	0	0	30	70	3
			Total	**15**	**0**	**6**	**210**	**490**	**18**

2333571M	MINOR IN COMPUTER SCIENCE AND ENGINEERING INTRODUCTION TO MACHINE LEARNING (CE,ME,ECE,EEE)	L	T	P	C
		3	0	0	3

Pre-Requisites: NIL.

Course Outcomes:

On successful completion of the course, student will be able to

CO1. Explain the types, applications, and importance of data quality and preprocessing in machine learning.
CO2. Apply feature engineering and performance evaluation techniques to improve model interpretability and accuracy.
CO3. Implement and compare classification algorithms such as k-NN, Decision Trees, Random Forests, and SVM.
CO4. Analyze and apply regression techniques to solve predictive modeling problems and optimize accuracy.
CO5. Design unsupervised learning models using clustering and association rule mining for pattern discovery.

SYLLABUS:

UNIT - I: INTRODUCTION TO MACHINE LEARNING &PREPARING TO MODEL (06 Periods)

Introduction: What is Human Learning? Types of Human Learning, what is Machine Learning? Types of Machine Learning, Problems Not to Be Solved Using Machine Learning, Applications of Machine Learning, State-of-The-Art Languages/Tools in Machine Learning, Issues in Machine Learning.
Preparing to Model: Introduction, Machine Learning Activities, Basic Types of Data in Machine Learning, Exploring Structure of Data, Data Quality and Remediation, Data Pre-Processing

UNIT - II: MODELING AND EVALUATION &BASICS OF FEATURE ENGINEERING (07 Periods)

Introduction, selecting a Model, training a Model (for Supervised Learning), Model Representation and Interpretability, Evaluating Performance of a Model, Improving Performance of a Model Basics of Feature Engineering: Introduction, Feature Transformation, Feature Subset Selection.

UNIT - III: BAYESIAN CONCEPT LEARNING & SUPERVISED LEARNING: CLASSIFICATION (10 Periods)

Bayesian Methods are Important? Bayes' Theorem, Bayes' Theorem and Concept Learning, Bayesian Belief Network.Supervised Learning: Classification: Introduction, Example of Supervised Learning, Classification Model, Classification Learning Steps, Common Classification Algorithms-k-Nearest Neighbour (kNN), Decision tree, Random forest model, Support vector machines.

UNIT - IV: SUPERVISED LEARNING: REGRESSION (10 Periods)

Introduction, Example of Regression, Common Regression Algorithms-Simple linear regression, Multiple linear regression, Assumptions in Regression Analysis, Main Problems in Regression Analysis, Improving Accuracy of the Linear Regression Model, Polynomial Regression Model, Logistic Regression, Maximum Likelihood Estimation.

UNIT - V: UNSUPERVISED LEARNING (11 Periods)

Introduction, Unsupervised vs Supervised Learning, Application of Unsupervised Learning, Clustering – Clustering as a machine learning task, Different types of clustering techniques, Partitioning methods, K-Medoids: a representative object-based technique, Hierarchical clustering, Density-based methods-DBSCAN Finding Pattern using Association Rule- Definition of common terms, Association rule, Theapriori algorithm for association rule learning, Build the a priori principle rules.

Total Periods: 44

TEXT BOOKS:

T1. Machine Learning, Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, Pearson, 2019.

REFERENCE BOOKS:

R1 Introduction to Machine Learning, EthernAlpaydin, MIT Press, 2004.
R2 Machine Learning -An Algorithmic Perspective, Stephen Marsland, CRC Press.
R3 Machine Learning and Pattern Recognition Series, Chapman and Hall, CRC Press, 2014.
R4 Introduction to Machine Learning with Python: A Guide for Data Scientists, Andreas C. Müller and Sarah Guido, Oreilly.

WEB RESOURCES:

1. https://nptel.ac.in/courses/106105152
2. https://nptel.ac.in/courses/106106139
3. https://onlinecourses.nptel.ac.in/noc23_cs18/preview

2305572M	MINOR IN COMPUTER SCIENCE AND ENGINEERING DESIGN AND ANALYSIS OF ALGORITHMS (CE,ME,ECE,EEE)	L	T	P	C
		3	0	0	3

Pre-Requisites: Programming fundamentals, Data Structures, Discrete Mathematics and Graph theory.

Course Outcomes:

On successful completion of the course, student will be able to

CO1. Prove the correctness and analyze space and time complexity of an algorithm.
CO2. Understand different algorithm design strategies.
CO3. Analyze & Apply standard algorithms.
CO4. Understand Graph/Tree bases applications and appropriate techniques.
CO5. Current trends in Non-Deterministic concepts.

SYLLABUS:

UNIT - I: INTRODUCTION (08 Periods)

What is an algorithm? Algorithm Specification, **Performance Analysis:** Space complexity, Time Complexity. **Asymptotic Notations:** Big-Oh notation (O), Omega notation (Ω), Theta notation (Θ), **Brute Force Method:** Sequential Search, Selection Sort, Bubble Sort.

UNIT - II: DIVIDE AND CONQUER (10 Periods)

General method, Binary search, Merge sort, Quick sort, Strassen's Matrix multiplication.
Greedy Method: General method, Knapsack Problem, Job sequencing with deadlines. **Minimum cost spanning trees:** Prim's Algorithm, Kruskal's Algorithm.

UNIT - III: DYNAMIC PROGRAMMING (09 Periods)

General method, Multistage Graphs, All Pairs Shortest Paths, Single Source Shortest Path, Optimal Binary Search Trees,0/1Knapsack problem, Travelling Sales Person problem.

UNIT - IV: SEARCH AND TRAVERSAL TECHNIQUES (09 Periods)

Techniques for Binary tree, Technique for Graphs, connected components and spanning tree, Bi-connected components.

Backtracking: General method, N-Queens problem, Sum of sub sets problem, Graph coloring, Hamiltonian cycles.

UNIT - V: BRANCH AND BOUND **(09 Periods)**

Travelling Sales Person problem, 0/1Knapsack problem: LC Branch and Bound solution, FIFO Branch and Bound solution.
NP-Complete and NP-Hard problems: Basic concepts, non-deterministic algorithms, P, NP, NP- Complete, and NP-Hard classes.

Total Periods: 45

TEXT BOOKS:

T1. Fundamentals of Computer Algorithms, Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Galgotia Publications,
T2. Introduction to the design & analysis of algorithms, Levitin, Anany, Pearson Education, 2008.

REFERENCE BOOKS:

R1 Algorithms Design and Analysis, Udit Agarwal, Dhanpath Rai & Co,2017.
R2 Algorithms, Sedgewick Robert and Kevin Wayne, Pearson Education, Fourth Edition.
R3 Design and Analysis of Algorithms, Parag H.Dave Himanshu B.Dave, " Pearson Education 2008.
R4 The Design and Analysis of Computer Algorithms, Aho, Hopcroft, Ulman, Pearson Education, 2000.

WEB RESOURCES:

1 https://nptel.ac.in/courses/106106131
2 https://nptel.ac.in/courses/106105157

2305573M	MINOR IN COMPUTER SCIENCE AND ENGINEERING MACHINE LEARNING LAB (CE,ME,ECE,EEE)	L	T	P	C
		0	0	3	1.5

Pre-Requisites: Python Programming

Course Outcomes:

On successful completion of the course, student will be able to

CO1. Apply statistical techniques and data visualization to understand central tendencies, dispersion, and data distributions.
CO2. Perform data preprocessing tasks including handling missing values, attribute selection, discretization, and outlier elimination.
CO3. Implement and evaluate supervised machine learning algorithms such as KNN, Decision Trees, Naïve Bayes, SVM, and Logistic Regression for classification and regression.
CO4. Analyze and apply ensemble methods such as Random Forest for improving predictive performance in classification and regression.
CO5. Develop and assess linear and logistic regression models for predictive modeling on real-world data.
CO6. Apply unsupervised learning techniques like K-Means clustering and assess their performance using appropriate metrics.

LIST OF EXERCISES/ LIST OF EXPERIMENTS:

Minimum Ten experiments are to be conducted.

1 Compute Central Tendency Measures: Mean, Median, Mode Measure of Dispersion: Variance, Standard Deviation.
2 Apply the following Pre-processing techniques for a given dataset.
3 Attribute selection
4 Handling Missing Values
5 Discretization
6 Elimination of Outliers
7 Apply KNN algorithm for classification and regression.
8 Demonstrate decision tree algorithm for a classification problem and perform parameter tuning for better results.
9 Demonstrate decision tree algorithm for a regression problem.
10 Apply Random Forest algorithm for classification and regression.
11 Demonstrate Naïve Bayes Classification algorithm.
12 Apply Support Vector algorithm for classification.
13 Demonstrate simple linear regression algorithm for a regression problem.

14 Apply Logistic regression algorithm for a classification problem.
15 Implement the K-means algorithm and apply it to the data you selected. Evaluate performance by measuring the sum of the Euclidean distance of each example from its class center. Test the performance of the algorithm as a function of the parameters K.

REFERENCE BOOKS/LABORATORY MANUALS:

R1 Machine Learning, Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, Pearson, 2019.
R2 Introduction to Machine Learning with Python, Andreas C. Müller, Sarah Guido, O'Reilly Media, 2016.
R3 Practical Statistics for Data Scientists, Peter Bruce, Andrew Bruce, Peter Gedeck, O'Reilly Media, 2nd Edition, 2020.

WEB RESOURCES:

1 https://www.udemy.com/course/practical-
2 https://www.coursera.org/learn/practical-machine-learning

2305671M	MINOR IN COMPUTER SCIENCE AND ENGINEERING CLOUD COMPUTING (CE,ME,ECE,EEE)	L	T	P	C
		3	0	0	3

Pre-Requisites: Computer Networks, Data Structures and Algorithms, Operating Systems, Database Management Systems, Software Engineering

Course Outcomes:

On successful completion of the course, students will be able to

CO1. Summarize different Computing Paradigms and overview of cloud computing.
CO2. Explain the Computing Architecture, network connectivity and cloud migration strategy.
CO3. Classify and characterize different cloud deployment models, service models and virtualization.
CO4. Describe Programming models and Software Development in Cloud Computing.
CO5. Understand Cloud Service Providers Google Web Services, AWS and Microsoft cloud Services.

SYLLABUS:

UNIT - I: COMPUTING PARADIGMS (10 Periods)

High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Biocomputing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing, Network Computing.

Cloud Computing Fundamentals:

Motivation for Cloud Computing: The Need for Cloud Computing. Defining Cloud Computing: NIST Definition of Cloud Computing, Computing Is a Service, Cloud Computing Is a Platform. Principles of Cloud computing: Five Essential Characteristics, Four Cloud Deployment Models, Three Service Offering Models, Cloud Ecosystem, Requirements for Cloud Services, Cloud Application, Benefits and Drawbacks.

UNIT - II: CLOUD COMPUTING ARCHITECTURE AND MANAGEMENT (07 Periods)

Cloud Architecture, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications on the Cloud, Managing the Cloud, Migrating Application to Cloud.

UNIT - III: CLOUD DEPLOYMENT MODELS (12 Periods)

Private Cloud, Public Cloud, Community Cloud, Hybrid Cloud

Cloud Service Models: Infrastructure as a Service, Platform as a Service, Software as a Service, Other Cloud Service Models.

Virtualization: Introduction, Virtualization opportunities, Approaches to Virtualization, Hypervisors, From Virtualization to cloud computing.

UNIT - IV: PROGRAMMING MODELS IN CLOUD (07 Periods)

Cloud Application Development Platforms: Windows Azure, Google App Engine, Force.com, Manjrasoft Aneka

Software Development in Cloud: Introduction, Different perspectives on SaaS development, New challenges, Cloud aware software development using PaaS technology.

UNIT - V: CLOUD SERVICES (09 Periods)

Using Google Web Services – Exploring Google toolkit, Google APIs, Using Amazon Web Services – Understanding AWS, AWS Components and Services, working with the Elastic Compute Cloud (EC2), Amazon Storage Systems, Amazon Database Services, Using Microsoft Cloud Services – Exploring Microsoft Cloud Services, Defining the Windows Azure Platform.

Total Periods: 45

TEXT BOOKS:

T1. K.Chandrasekaran, Essentials of Cloud Computing, CRC Press, 2015.
T2. Barrie Sosinsky, “Cloud Computing Bile” ,Wiley publishing.
T3. Judith Hurwitz, R Bloor, M.Kanfman, F.Halper “Cloud Computing for Dummies”, Wiley India Edition, First Edition.
T4. Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, ”Cloud Computing: Principles and Paradigms”, Wiley Publication,2011.

REFERENCE BOOKS:

R1 Danielle Ruest and Nelson Ruest, “Virtualization: A Beginners’s Guide”, McGraw Hill,2009.
R2 Tom White, “Hadoop: The Definitive Guide”, O’RIELLY Media 2009.
R3 Nikos Antonopoulos, Lee Gillam, Cloud Computing: Principles, Systems and Applications, Springer, 2012.

WEB RESOURCES:

1 https://onlinecourses.nptel.ac.in/noc25_cs107/preview
2 https://www.coursera.org/specializations/cloud-computing
3 https:www.geeksforgeeks.org/cloud-computing/cloud-computing/

2305672M	MINOR IN COMPUTER SCIENCE AND ENGINEERING DATA MINING (CE,ME,ECE,EEE)	L	T	P	C
		3	0	0	3

Pre-Requisites: Data structures, Database Management Systems, Probability & Statistics/Mathematics – III.

Course Outcomes:

On successful completion of the course, student will be able to

CO1. Understand the fundamentals of Data Mining and its Principles.
CO2. Understand different steps followed in Data mining and pre-processing for Datamining.
CO3. Apply appropriate data mining algorithms to find Frequent patterns, Associations, and Correlations.
CO4. Compare and evaluate data mining techniques classification, prediction.
CO5. Cluster the high dimensional data for better organization of the data and to detect the Outliers in the high dimensional data.

SYLLABUS:

UNIT - I: INTRODUCTION (7 Periods)

Why Data Mining? What Is Data Mining? What Kinds of Data Can Be Mined? What Kinds of Patterns Can Be Mined? Major issues in Data Mining.

UNIT - II: DATA PREPROCESSING (9 Periods)

Why Pre-process the Data? Descriptive Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation.

UNIT - III: MINING FREQUENT PATTERNS, ASSOCIATIONS, AND CORRELATIONS: BASIC CONCEPTS AND METHODS (8 Periods)

Basic Concepts, Frequent Itemset Mining Methods, From Association Analysis to Correlation Analysis, Pattern Mining in Multilevel, Multidimensional Space, Constraint- Based Frequent Pattern Mining.

UNIT - IV: CLASSIFICATION AND PREDICTION (9 Periods)

Classification: Basic Concepts, Decision Tree Induction, Baye's Classification Method, Rule-Based Classification

Prediction: Basic concepts, Accuracy and Error measures, Evaluating the accuracy of a classifier or a predictor.

UNIT - V: Cluster Analysis and Outlier Detection **(9 Periods)**

Cluster Analysis: Cluster Analysis basic concepts, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods.

Outlier Detection - Outliers and Outlier Analysis, Outlier Detection Methods

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Total Periods: 42

TEXT BOOKS:

T1. Data Mining: Concepts and Techniques, Jiawei Han, Micheline Kamber and Jian Pei, Morgan Kaufmann Publishers, Elsevier, Third Edition,2012.

T2. Data Warehousing in the Real world, Sam Aanhory & Dennis Murray, Pearson Education, Asia

T3. Data Mining & Data Warehousing: Principles and Practical Techniques, Parteek Bhatia, Cambridge

REFERENCE BOOKS:

R1 Insight into Data Mining, K.P.Soman, S.Diwakar , V.Ajay, PHI2008.

R2 Data Mining: Introductory and Advanced Topics, Margaret H. Dunhan, Pearson

R3 Data Mining, Vikram Pudi, P. Radha Krishna, Oxford Higher Eduction.

WEB RESOURCES:

1 https://nptel.ac.in/courses/106106139

2 https://www-users.cs.umn.edu/~kumar/dmbook/index.php

3 https://www.coursera.org/learn/data-mining

2305673M	MINOR IN COMPUTER SCIENCE AND ENGINEERING DATA MINING LAB (CE,ME,ECE,EEE)	L	T	P	C
		0	0	3	1.5

Pre-Requisites: Excel/CSV handling, Data Structures and Algorithms, Database Management Systems, Probability and Statistics.

Course Outcomes:

On successful completion of the course, student will be able to

CO1. Understand and identify different types of attributes (categorical and real-valued) in real-world credit datasets.
CO2. Analyze and extract significant features for credit risk evaluation and formulate rule-based systems using knowledge engineering and logical reasoning.
CO3. Design and implement a classification model (Decision Tree) using appropriate data mining tools or libraries.
CO4. Evaluate classification models through training accuracy, identify limitations of overfitting, and explain why 100% accuracy may not be realistic.
CO5. Apply cross-validation techniques to assess the performance of predictive models and justify the improvements in model reliability.
CO6. Demonstrate awareness of ethical, societal, and economic considerations in credit risk modeling and decision-making systems

LIST OF EXERCISES/ LIST OF EXPERIMENTS:

Minimum Ten experiments are to be conducted.

Credit Risk Assessment

Description: The business of banks is making loans. Assessing the credit worthiness of an applicant is of crucial importance. You have to develop a system to help a loan officer decide whether the credit of a customer is good, or bad. A bank's business rules regarding loans must consider two opposing factors. On the one hand, a bank wants to make as many loans as possible. Interest on these loans is the banks profit source. On the other hand, a bank cannot afford to make too many bad loans. Too many bad loans could lead to the collapse of the bank. The bank's loan policy must involve a compromise: not too strict, and not too lenient.

To do the assignment, you first and foremost need some knowledge about the world of credit. You can acquire such knowledge in a number of ways.

1 Knowledge Engineering. Find a loan officer who is willing to talk. Interview her

and try to represent her knowledge in the form of production rules.

2 Books. Find some training manuals for loan officers or perhaps a suitable text book on finance. Translate this knowledge from text form to production rule form.

3 Common sense. Imagine yourself as a loan officer and make up reasonable rules which can be used to judge the credit worthiness of a loan applicant.

4 Case histories. Find records of actual cases where competent loan officers correctly judged when, and when not to, approve a loan application.

The German Credit Data:

Actual historical credit data is not always easy to come by because of confidentiality rules. Here is one such dataset, consisting of 1000 actual cases collected in Germany. credit dataset (original) Excel spreadsheet version of the German credit data (Down load from web).

In spite of the fact that the data is German, you should probably make use of it for this assignment. (Unless you really can consult a real loan officer!)

A few notes on the German dataset

- DM stands for Deutsche Mark, the cents Canadian (but looks and acts like a quarter).
- Owns telephone. German phone rat so fewer people own telephones.
- Foreign here are worker millions of these. Tin Germany (many from Turrkey). It is very hard to get German citizenship if you were not born of German parents.
- There are 20 attributes used in the classify the applicant into one of two categories, good or bad.

Subtasks: (Turn in your answers to the following tasks)

1 List all the categorical (or nominal) attributes and the real-valued attributes separately.

2 What attributes do you think might be crucial in making the credit assessment? Come up with some simple rules in plain English using your selected attributes.

3 One type of model that you can create is a Decision Tree - train a Decision Tree using the complete dataset as the training data. Report the model obtained after training.

4 Suppose you use your above model trained on the complete dataset, and classify credit good/bad for each of the examples in the dataset. What % of examples can you classify correctly? (This is also called testing on the training set) Why do you think you cannot get 100 % training accuracy?

5 Is testing on the training set as you did above a good idea? Why or why not?

6 One approach for solving the problem encountered in the previous question is using cross validation? Describe what is cross-validation briefly. Train a Decision Tree again using cross- validation and report your results. Does your accuracy increase/decrease? Why?

REFERENCE BOOKS/LABORATORY MANUALS:

R1 Data Mining: Concepts and Techniques, Jiawei Han, Micheline Kamber and Jian Pei, Morgan Kaufmann Publishers, Elsevier, Third Edition,2012,

WEB RESOURCES:

1 https://www.cs.waikato.ac.nz/ml/weka/

2305771M	MINOR IN COMPUTER SCIENCE AND ENGINEERING DEEP LEARNING (CE,ME,ECE,EEE)	L	T	P	C
		3	0	0	3

Pre-Requisites: NIL

Course Outcomes:

On successful completion of the course, student will be able to

CO1. analyse the neural networks and solve the real time problems
CO2. analyse convolutional nueral network and its architecture
CO3. know about Recurrent Neural Networks and RNN's
CO4. anlyse Deep Learning Supervisied Learning methods
CO5. apply Deep Learning methods in various real time applications

SYLLABUS:

UNIT - I: INTRODUCTION (08 periods)

Feed forward Neural networks, Gradient descent and the back propagation algorithm, Unit saturation, vanishing gradient problem, ways to mitigate it. RelU Heuristics for avoiding bad local minima, Heuristics for faster training, Nestors accelerated gradient descent, Regularization, Dropout.

UNIT - II: CONVOLUTIONAL NEURAL NETWORKS (10 Periods)

Architectures, convolution / pooling layers.

UNIT - III: RECURRENT NEURAL NETWORKS (09 Periods)

LSTM, GRU, Encoder Decoder Architectures Recursive neural network (RNN).

UNIT – IV: DEEP UNSUPERVISED LEARNING (09 Periods)

Auto encoders (standard, sparse, denoising, contractive, etc), Variational Auto encoders, Adversarial Generative Networks, Autoencoder and DBM Attention and memory models, Dynamic memory networks.

UNIT - V: APPLICATIONS OF DEEP LEARNING TO NLP/COMPUTER VISION (09 Periods)

Introduction to NLP and Vector Space Model of Semantics, Word Vector representations: Continuous Skip-Gram Model, Continuous Bag-of-Words model (CBOW), Named Entity Recognition, Opinion Mining using Recurrent Neural Networks, Sentence Classification using Convolutional Neural Networks. Image segmentation, object detection, automatic image captioning, Image generation with Generative adversarial networks, Video to text with LSTM models. Attention models for computer vision tasks.

Total Periods: 45

TEXT BOOKS:

T1. Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning." An MIT Press book. (2015).
T2. Josh Patterson, Adam Gibson, Deep Learning: A Practitioner's Approach, OReilly, 2017.
T3. Jeff Heaton, Deep Learning and Neural Networks, Heaton Research Inc, 2015.
T4. Mindy L Hall, Deep Learning, VDM Verlag, 2011.

REFERENCE BOOKS:

R1 Introduction to Deep Learning, Eugene Charniak, The MIT Press.
R2 Deep Learning, D. Kelleher, The MIT Press.
R3 Dive into Deep Learning, Joanne Quinn, Joanne McEachen, Michael Fullan, Mag Gardner, Max Drummy, Corwin.