Course File Contents:

I.COVER PAGE

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING(AIML)

Name of the Subject: Object Oriented Programming Through Java

JNTU CODE : Programme : **UG**

Branch: **CSE(AIML)**	Version No :
Year: **II**	Document Number :**BITS/CSM/**
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4. Date :	**4.** Date :

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2. VISION AND MISSION OF THE DEPARTMENT

Vision: To be a global leader in Artificial Intelligence and Machine Learning research, innovation, and education, driving transformative advancements that empower industries, enhance human capabilities, and contribute to a smarter, more sustainable world.

M1:Innovative Research& Quality Education – To Conduct research on cutting-edge Technologies to address complex real-world problems across diverse domains and provide world-class education and training to equip students with technical expertise, ethical responsibility, and problem-solving skills.

M2: Industry Collaboration & Ethical AI Development –To Foster strong partnerships with industries, academia, and government organizations to develop impactful AI solutions and promote responsible and ethical AI practices that align with societal values and global sustainability.

M3: Entrepreneurship & Innovation – Encourage entrepreneurship and the development of AI-driven start-ups and products that contribute to economic growth.

M4: Community Engagement – Engage with communities to spread AI awareness, inclusivity, and accessibility for societal benefit.

3. PEOs, POs and PSOs

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The objectivesforECEgraduates are to:

- **PEO1:** Graduates shall apply the analytical, decision making and prediction skills in AI & ML to formulate and solve complex intelligent computing and multidisciplinary problems.
- **PEO2**: Graduates will be able to take up higher studies, research & development by acquiring in-depth knowledge in Artificial Intelligence & Machine Learning.
- .**PEO3**: Graduates will be able to exhibit their employability skills and practice the ethics of their profession with a sense of social responsibility..

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES(PSOs)

- **PSO1,** Apply a set of Artificial Intelligence principles, tools, and techniques to model various real-world business problems, analyze them, and suggest a suitable solution by communicating relevant findings and effectively presenting results using appropriate techniques.

- **PSO2,** Apply the skills of Artificial Intelligence and Machine Learning in the areas of Health Care, Education, Agriculture, e-commerce, financial sector, Smart Systems, and Multi-disciplinary areas of AI.

- **PSO3,** Cultivate the ability to work in teams and learn by participating in Technical Events and Social Welfare Programs and develop the attitude for working productively as an individual and in cross- disciplinary teams to become better citizens in multicultural world.

4.Syllabus &Academic calendar

B.TECH.CSE (AI&ML) **R21 Regulations**

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21CS756PC: NEURAL NETWORKS AND DEEP LEARNING

B.Tech. IV Year I Sem.

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Course Objectives:
- To introduce the foundations of Artificial Neural Networks
- To acquire the knowledge on Deep Learning Concepts
- To learn various types of Artificial Neural Networks
- To gain knowledge to apply optimization strategies

Course Outcomes:
- Ability to understand the concepts of Neural Networks
- Ability to select the Learning Networks in modeling real world systems
- Ability to use an efficient algorithm for Deep Models
- Ability to apply optimization strategies for large scale applications

UNIT-I
Artificial Neural Networks Introduction, Basic models of ANN, important terminologies, Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, Back-propagation Network. Associative Memory Networks. Training Algorithms for pattern association, BAM and Hopfield Networks.

UNIT-II
Unsupervised Learning Network- Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks. Special Networks-Introduction to various networks.

UNIT - III
Introduction to Deep Learning, Historical Trends in Deep learning, Deep Feed - forward networks, Gradient-Based learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms

UNIT - IV
Regularization for Deep Learning: Parameter norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised learning, Multi-task learning, Early Stopping, Parameter Typing and Parameter Sharing, Sparse Representations, Bagging and other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, tangent Prop and Manifold, Tangent Classifier

UNIT - V
Optimization for Train Deep Models: Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second- Order Methods, Optimization Strategies and Meta-Algorithms
Applications: Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing

TEXT BOOKS:
1. Deep Learning: An MIT Press Book By Ian Goodfellow and Yoshua Bengio and Aaron Courville
2. Neural Networks and Learning Machines, Simon Haykin, 3rd Edition, Pearson Prentice Hall.

ACADEMIC CALENDAR FOR B.TECH. IV-YEAR FOR THE ACADEMIC YEAR 2024-25

B.Tech-IV-YEAR I Semester

S.No	Description	Date		Duration
		From	To	
1	1st Spell of instructions	30-07-2024	28-09-2024	9 Weeks
2	First Unit Test Examinations	29-08-2024	31-08-2024	3 days
3	First Mid Term Examinations	30-09-2024	03-10-2024	3 days
4	2nd Spell of Instructions (Including Dussera Recess)	04-10-2024	14-12-2024	10 Weeks
5	Dussehra Recess	07-10-2024	12-10-2024	1 week
6	Second Unit Test Examinations	21-11-2024	23-11-2024	3 days
7	Second Mid Term Examinations	16-12-2024	18-12-2024	3 days
8	Preparation Holidays & Practical Examinations	19-12-2024	30-12-2024	1 week
9	End Semester Examinations	31-12-2024	11-01-2025	2 Weeks

5. BRIEF NOTES ON THE IMPORTANCE OF THE COURSE

The Electromagnetic Fields and Transmission Linescourse is important for several reasons. The summary is as follows:

Brief Notes on Neural Networks & Deep Learning

1What is a Neural Network?

A **Neural Network (NN)** is a computational model inspired by the human brain, designed to recognize patterns and relationships in data. It consists of **neurons (nodes)** organized in layers that process and transmit information.

Basic Structure of a Neural Network

- **Input Layer**: Receives raw data (features).
- **Hidden Layers**: Perform computations using weights, biases, and activation functions.
- **Output Layer**: Produces the final prediction or classification.

Mathematical Representation

Each neuron applies:

$y=f(WX+b)y = f(WX + b)$

Where:

- **X** = Input
- **W** = Weights
- **b** = Bias
- **f()** = Activation Function (ReLU, Sigmoid, etc.)

2Deep Learning & Deep Neural Networks

Deep Learning is a subset of machine learning that uses deep neural networks (DNNs) with multiple hidden layers to model complex patterns.

Types of Neural Networks

1. **Feedforward Neural Network (FNN)** – Basic architecture, information flows forward.
2. **Convolutional Neural Network (CNN)** – Used for image recognition & processing.
3. **Recurrent Neural Network (RNN)** – Used for sequential data (e.g., time series, speech).
4. **Generative Adversarial Networks (GANs)** – Used for generating new data (e.g., DeepFake).

3Key Concepts in Deep Learning

◇ **Activation Functions**:

- **Sigmoid**: Converts values to range (0,1) (Used in classification).
- **ReLU**: Rectified Linear Unit, commonly used in hidden layers.
- **Softmax**: Converts values to probability distribution (Used in multi-class classification).

◇ **Loss Functions**:

- **Mean Squared Error (MSE)** – Used in regression tasks.
- **Cross-Entropy Loss** – Used in classification problems.

◇ **Optimization Algorithms**:

- **Gradient Descent** – Updates weights based on error minimization.
- **Adam Optimizer** – Advanced version of gradient descent for faster convergence.

4Applications of Deep Learning

☑**Computer Vision** – Image recognition, object detection, face recognition.
☑**Natural Language Processing (NLP)** – Chatbots, machine translation, sentiment analysis.
☑**Healthcare** – Disease diagnosis, medical imaging analysis.
☑**Autonomous Vehicles** – Self-driving car perception systems.
☑**Finance** – Fraud detection, stock market prediction.

Summary

Neural Networks are inspired by the human brain.
Deep Learning improves learning using multiple hidden layers.
CNNs are best for images, RNNs for sequences, and GANs for data generation.
Used in AI applications like self-driving cars, medical imaging, and NLP.

6. PREREQUISITES

Prerequisites for Learning Neural Networks & Deep Learning

To effectively understand and work with **Neural Networks (NNs) and Deep Learning (DL)**, you should have a solid foundation in the following areas:

1Mathematics & Statistics

Linear Algebra

- Vectors, Matrices, and Matrix Operations
- Eigenvalues & Eigenvectors (useful for Principal Component Analysis - PCA)

Calculus

- Differentiation (Partial Derivatives, Chain Rule)
- Gradient Descent (Optimization Technique)

Probability & Statistics

- Bayes' Theorem
- Probability Distributions (Gaussian, Bernoulli)
- Mean, Variance, Standard Deviation

Optimization Techniques

- Loss Functions (MSE, Cross-Entropy)
- Stochastic Gradient Descent (SGD)
- Adam, RMSprop, Momentum Optimizers

2Programming Knowledge

Python (Preferred Language)

- NumPy (Linear Algebra Computations)
- Pandas (Data Handling & Preprocessing)
- Matplotlib & Seaborn (Data Visualization)

Libraries & Frameworks

- TensorFlow / PyTorch (Building Neural Networks)

- Keras (Simplified Deep Learning)
- OpenCV (For Computer Vision tasks)

Basic Programming Concepts

- Loops, Functions, Object-Oriented Programming (OOP)

3Machine Learning Basics

Supervised Learning

- Linear & Logistic Regression
- Decision Trees, Random Forest
- Support Vector Machines (SVM)

Unsupervised Learning

- Clustering (K-Means, Hierarchical Clustering)
- Dimensionality Reduction (PCA, t-SNE)
- **Feature Engineering & Data Preprocessing**

- Normalization & Standardization
- Handling Missing Data
- One-Hot Encoding (for categorical data)

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4 Deep Learning Fundamentals

- **Perceptron & Multi-Layer Perceptron (MLP)**
- **Activation Functions** (ReLU, Sigmoid, Softmax, Tanh)
- **Backpropagation Algorithm**
- **Convolutional Neural Networks (CNNs)** (for Image Processing)
- **Recurrent Neural Networks (RNNs, LSTMs)** (for Sequential Data)

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5 Real-World Applications & Tools

Big Data Handling – Working with large datasets using TensorFlow Datasets.
Cloud Computing – Google Colab, AWS, or Azure for training deep networks.
Hardware Acceleration – Understanding how **GPUs** (like NVIDIA CUDA) speed up training.

Summary

- **Mathematics** – Linear Algebra, Calculus, Probability.
- **Programming** – Python, TensorFlow, PyTorch, NumPy.
- **Machine Learning** – Supervised & Unsupervised Learning.
- **Deep Learning Basics** – Neural Networks, CNNs, RNNs.
- **Tools & Applications** – Cloud GPUs, OpenCV, Big Data Handling.

7. COURSE OBJECTIVES &OUTCOMESCOURSE OBJECTIVES:

The main objectives ofthe course areTo Understand the basic object-oriented programming concepts and apply them in problemsolving.

- To introduce the foundations of Artificial Neural Networks
- To acquire the knowledge on Deep Learning Concepts
- To learn various types of Artificial Neural Networks
- To gain knowledge to apply optimization strategies

COURSE OUTCOMES(COs):

By the end of this course, Students should be able to:

CO Number	Statement
CO1	Ability to understand the concepts of Neural Networks
CO2	Ability to select the Learning Networks in modeling real world systems
CO3	Ability to use an efficient algorithm for Deep Models
CO4	Ability to apply optimization strategies for large scale applications

8. CO-PO, CO-PSO MAPPING& JUSTIFICATION

CO-PO and CO-PSO Mapping table

Name of the Subject: C401 Neural Networks & Deep Learning) Year of study:2023-24												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
C401.1	1	1	2	-	2	-	-	-	-	2	-	3
C401.2	1	1	2	-	2	-	-	-	-	2	-	2
C401.3	3	2	3	3	-	-	-	-	-	-	-	1
C401.4	3	2	3	-	-	-	-	-	-	-	-	-
C401.5	3	2	3	2	-	-	-	2		2	0	1
Average	2.2	1.6	2.6	2.5	2	-	-	2	-	2	0	1.75

JUSTIFICATION FOR COURSE OUTCOMES MAPPING WITH POs AND PSOs

Course Outcome 1: Understanding the Foundations of Artificial Neural Networks

- **PO1 (Engineering Knowledge):** Strong correlation as students learn the fundamental principles of artificial neural networks (ANNs), including perceptron's, activation functions, and network architectures.
- **PO2 (Problem Analysis):** Strong correlation as students analyze different types of ANNs and their suitability for solving various problems.
- **PSO1 (Specialization in AI/ML):** Strong correlation as students build foundational knowledge in ANNs, a crucial component of AI and ML.

Course Outcome 2: Acquiring Knowledge of Deep Learning Concepts

- **PO1 (Engineering Knowledge):** Strong correlation as students explore deep learning fundamentals, including multi-layer perceptrons (MLPs), convolutional neural networks (CNNs), and recurrent neural networks (RNNs).
- **PO3 (Design & Development of Solutions):** Strong correlation as students design and implement deep learning models for various applications.
- **PSO1 (Specialization in AI/ML):** Strong correlation as students develop expertise in deep learning techniques and architectures.

Course Outcome 3: Learning Various Types of Artificial Neural Networks

- **PO1 (Engineering Knowledge):** Strong correlation as students gain exposure to different types of neural networks, such as CNNs, RNNs, and Generative Adversarial Networks (GANs).
- **PO5 (Modern Tool Usage):** Strong correlation as students use deep learning frameworks like TensorFlow and PyTorch to implement different ANNs.
- **PSO1 (Specialization in AI/ML):** Strong correlation as students enhance their understanding of advanced ANN models and their applications.

Course Outcome 4: Applying Optimization Strategies for Neural Networks

- **PO2 (Problem Analysis):** Strong correlation as students study optimization techniques such as gradient descent, backpropagation, and hyperparameter tuning.
- **PO4 (Investigations of Complex Problems):** Strong correlation as students experiment with optimization strategies to improve the accuracy and efficiency of deep learning models.
- **PSO2 (Application of AI/ML in Real-World Problems):** Strong correlation as students apply optimization methods to enhance AI/ML solutions in various domains.

9.CLASS TIME TABLE & INDIVIDUAL TIME TABLE

Day	P1	P2	P3	P4	P5	P6	P7
MON							
TUE							
WED							
THU							
FRI							
SAT							

10. METHOD OF TEACHING

Effective Methods of Teaching Neural Networks & Deep Learning

Teaching **Neural Networks & Deep Learning** requires a **structured approach** that combines theory, coding, hands-on projects, and real-world applications. Below is an **effective teaching methodology** that ensures students grasp concepts deeply.

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1 Blended Learning Approach

Use a mix of **Lectures, Hands-on Coding, Projects, and Case Studies** to enhance understanding.

Component	Method	Tools/Resources
Theory	Lectures, Animated Videos	Whiteboard, Slides (PPT)
Mathematical Foundations	Step-by-Step Calculations	Jupyter Notebooks, Graphing Tools
Coding Implementation	Live Coding Sessions	Python, TensorFlow, PyTorch
Projects & Case Studies	Real-World Examples	Kaggle Datasets, Research Papers
Assessments	Quizzes, MCQs, Coding Assignments	Online Platforms (Google Colab, GitHub)

2Teaching Strategy Based on Learning Stages

Stage 1: Foundational Concepts (Weeks 1-4)

◇ **What to Teach?**

- Introduction to Artificial Intelligence (AI) & Machine Learning (ML)
- Basics of Neural Networks (Perceptron, Activation Functions)
- Linear Algebra, Probability, and Calculus

◇ **Teaching Methods**

Visual Representations: Use diagrams to explain **Neurons, Layers, and Backpropagation**.
Hands-on: Implement a simple **Perceptron in Python**.

Activity: Students build a basic neural network from scratch using NumPy.

Stage 2: Deep Learning Fundamentals (Weeks 5-8)

◇ **What to Teach?**

- Multi-layer Perceptron (MLP)
- Loss Functions & Optimization Techniques
- Overfitting & Regularization

Teaching Methods
Code Walkthroughs: Implement an MLP using TensorFlow/Keras.
Mathematical Derivation: Explain **Gradient Descent** step-by-step.

Project: Students train an **MLP on the MNIST dataset** to recognize handwritten digits.

Stage 3: Advanced Architectures (Weeks 9-12)

◇ **What to Teach?**

- Convolutional Neural Networks (CNNs) – Image Processing
- Recurrent Neural Networks (RNNs) – Time Series & NLP
- Generative Adversarial Networks (GANs) – AI Image Generation

Teaching Methods
Real-World Demos: Show **Image Classification** using CNNs.
Live Projects: Implement **Text Prediction with RNNs (LSTM/GRU)**.
Case Study Discussion: Break down popular AI research papers.

Project: Students build a **CNN-based Image Classifier** using TensorFlow.

Stage 4: Real-World Applications & Deployment (Weeks 13-16)

What to Teach?

- Transfer Learning (Using Pre-trained Models)
- Deployment of AI Models on Cloud
- Ethics & Challenges in Deep Learning

Teaching Methods
Hackathons & Kaggle Competitions: Encourage participation.
Industry Guest Lectures: Invite AI professionals.

Final Project: Students develop and deploy a **Deep Learning Web App** using Flask/Streamlit.

3.Assessment & Evaluation Methods

Assessment Type	Description	Weightage (%)
Quizzes & MCQs	Tests fundamental concepts	20%
Coding Assignments	Hands-on implementation	30%
Mini Projects	Practical applications	25%
Final Project	End-to-end deep learning model	25%

4.Tools & Resources 🛠

Programming: Python, TensorFlow, PyTorch
Platforms: Google Colab, Kaggle, GitHub
Datasets: MNIST, ImageNet, IMDB Reviews
Books: "Deep Learning" by Ian Goodfellow, "Neural Networks and Deep Learning" by Michael Nielsen
Courses: Andrew Ng's Deep Learning Specialization (Coursera)

Summary of Teaching Plan

Start with Basics – Neural Networks, Perceptron, MLP.
Move to Deep Learning – CNNs, RNNs, Transformers.
Hands-on Learning – Python implementation, real-world datasets.
Encourage Projects – Image Classification, Chatbots, GANs.
Final Assessment – Deploy a Deep Learning project.

11.Lesson Plan & Delivery Report

Subject: Neural Networks & Deep Learning (18CS756PC) **Class**: B.Tech. IV CSM

Faculty: Mr. A.Raju **Regulation**: R21

Academic Year: 2023-24 **Commencement of Class Work**:24-08-24

Topics (as per syllabus)	Sub Topics	Lect. No	Scheduled Date	Topic Delivered Date	Remarks
UNIT-1 tificial Neural Networks	• Artificial Neural Networks Introduction	L1	31-07-24		
	• Basic models of ANN	L2	01-08-24		
	• important terminologies	L3	03-08-23		
	• Supervised Learning Networks	L4	05-08-23		
	• Perceptron Networks	L5	07-08-23		
	• Adaptive Linear Neuron	L6	08-08-23		
	• Back-propagation Network	L7	10-08-23		
	• Associative Memory Networks	L8	12-08-24		

	• Training Algorithms for pattern association	L9	14-08-24		
	• BAM and Hopfield Networks	L10	17-08-24		
Topics s per syllabus)	**Sub Topics**	**Lect. No**	**Scheduled Date**	**Topic Delivered Date**	**Remarks**
	• Unsupervised Learning	L11	19-08-24		
	• Network- Introduction	L12	21-08-24		
	• Fixed Weight Competitive Nets	L13	26-08-24		
	• Maxnet	L14	28-08-24		
	• Hamming Network	L15	29-08-24		
	• Kohonen Self-Organizing Feature Maps	L16	31-08-24		
UNIT-II	• Learning Vector Quantization	L17	02-09-24		
supervised Learning	• Counter Propagation Networks	L18	04-09-24		
	• Adaptive Resonance Theory Networks	L19	05-09-24		
	• Special Networks- Introduction to various networks	L20	18-09-24		
Topics s per syllabus)	**Sub Topics**	**Lect. No**	**Scheduled Date**	**Topic Delivered Date**	**Remarks**
	• Introduction to Deep Learning	L21	21-09-24		
	• Deep Learning	L22	24-09-24		
	• Historical Trends in Deep learning	L24	25-09-24		
IIT-III	• Deep Feed - forward networks Gradient-Based learning	L24	30-09-24		
roduction to Deep Learning	• Marks Distribution • Discussion about	L25	2-10-24		

	Paper				
	• Hidden Units	L26	3-10-24		
	• Architecture Design	L27	5-10-24		
	• Back-Propagation	L28	7-10-24		
	• Other Differentiation Algorithms	L29	9-10-24		
Topics s per syllabus)	**Sub Topics**	**Lect. No**	**Scheduled Date**	**Topic Delivered Date**	**Remarks**
UNIT-IV gularization Deep Learning	• Regularization for Deep Learning	L30	10-10-24		
	• Parameter norm Penalties	L31	12-10-24		
	• Norm Penalties as Constrained optimization	L32	14-10-24		
	• Regularization	L33	16-10-24		
	• Under-Constrained Problems	L34	17-10-24		
	• Dataset Augmentation	L35	18-10-24		
	• Noise Robustness	L36	19-10-24		
	• Semi-Supervised learning	L37	20-10-24		
	• Multi-task learning	L38	21-10-24		
	• Early Stopping	L39	30.10.24		
	• Parameter Typing	L40	31.10.24		
	• Parameter Sharing	L41	2.11.24		
	• Sparse Representations	L42	4.11.24		

	• Bagging and other Ensemble Methods	L43	6.11.24		
	• Dropout	L44	7.11.24		
	• Adversarial Training)	L45	9.11.24		
	• Tangent Distance	L46	13.11.24		
	• Tangent Distance example	L47	14.11.24		
	• Tangent Prop and Manifold	L48	16.11.24		
	• Tangent Classifier	L49			
Topics (as per syllabus)	• **Sub Topics**	**Lect. No**	**Scheduled Date**	**Topic Delivered Date**	**Remarks**
UNIT-V Optimization for Train Deep Models	• Optimization for Train Deep Models	L50	**18.11.24**		
	• Challenges in Neural Network Optimization	L51	**20.11.24**		
	• Basic Algorithms	L52	**21.11.24**		
	• Parameter Initialization Strategies	L53	**23.11.24**		
	• Algorithms with Adaptive Learning Rates, Approximate Second Order Methods	L54	**25.11.24**		
	• Optimization Strategies and Meta-Algorithms • Applications: Large-Scale Deep Learning, Computer Vision, Speech Recognition	L55	**28.11.24**		
	• Natural Language Processing	L56	**30.11.24**		
	• Revision I &II Unit	L57	**2.12.24**		

	• Revision III&IV Unit	L58	**4.12.24**		
	• Revision V Unit	L59	**5.12.24**		
	• Marks Distribution • Discussion about Paper	L60	**7.12.24**		

Subject Teacher **HOD**

12.Detailed Notes

UNIT-I: Artificial Neural Networks (ANNs)

1. Introduction to Artificial Neural Networks (ANNs):

Artificial Neural Networks (ANNs) are computational models inspired by the structure and functioning of the human brain. They consist of layers of interconnected nodes (also called neurons) that process information in a way that mimics biological neural networks.

- **Neurons:** Basic units that process input data.
- **Synapses:** Connections between neurons, represented by weights.
- **Activation Function:** Determines the output of a neuron based on the input.

2. Basic Models of ANN:

- **Perceptron Network:**
  - **Definition:** A single-layer neural network used for binary classification tasks.
  - **Working Principle:** Receives inputs, applies weights, sums them, and uses an activation function to output a decision.
- **Multi-layer Perceptron (MLP):**

    - Composed of input, hidden, and output layers.
    - Uses backpropagation for learning by minimizing the error between the actual and predicted outputs.
- **Adaptive Linear Neuron (ADALINE):**
    - A single-layer neural network model using linear activation.
    - It employs the least mean square (LMS) algorithm for adjusting weights based on the error.
- **Backpropagation Network:**
    - A supervised learning algorithm used to train multi-layer networks.
    - It adjusts the weights based on the gradient of the loss function with respect to each weight.

3. Important Terminologies in ANN:

- **Weights:** Parameters representing the strength of the connection between two neurons.
- **Bias:** An additional parameter used to shift the activation function.
- **Activation Function:** Determines whether a neuron should be activated based on the input.
    - Common activation functions: Sigmoid, ReLU, Tanh.

4. Associative Memory Networks:

- **Definition:** Networks that store and retrieve patterns based on the input, typically used for pattern recognition.
- **Bidirectional Associative Memory (BAM):** A type of associative memory with bidirectional connections between neurons.
- **Hopfield Network:** A recurrent neural network with binary threshold units used for associative memory.

5. Training Algorithms for Pattern Association:

- **Hebbian Learning:** A learning rule based on the principle of "cells that fire together, wire together."
- **Gradient Descent:** A method to minimize the error by updating weights in the opposite direction of the gradient of the loss function.

UNIT-II: Unsupervised Learning Networks

1. Introduction to Unsupervised Learning:

Unsupervised learning involves training a model without labeled data. The system tries to learn the underlying structure of the data.

2. Types of Unsupervised Learning Networks:

- **Fixed Weight Competitive Networks:** Neurons compete to represent the input pattern, and only one neuron is activated for each input.
- **Maxnet:** A competitive network used to choose the maximum input among several neurons.
- **Hamming Network:**
    - A network used for pattern classification based on a threshold mechanism.
    - The network compares the input pattern with stored patterns to classify the input.
- **Kohonen Self-Organizing Maps (SOM):**
    - A type of neural network that organizes input data into a lower-dimensional grid, maintaining topological relationships.
- **Learning Vector Quantization (LVQ):**
    - A competitive learning network used for classification.
    - The network assigns input vectors to the closest prototype vector, and the prototypes are adjusted during training.
- **Counter Propagation Networks:**

    - A hybrid network that combines supervised and unsupervised learning.
    - Used for pattern recognition and classification.
- **Adaptive Resonance Theory (ART) Networks:**
    - A class of neural networks used for stable learning in dynamic environments, preventing catastrophic forgetting by preserving old knowledge while learning new patterns.

UNIT-III: Introduction to Deep Learning

1. Historical Trends in Deep Learning:

- **Early Days:** Neural networks initially had limited success due to computational constraints and lack of data.
- **Resurgence:** Advances in hardware (GPUs), large datasets, and new algorithms (like backpropagation) led to the growth of deep learning.
- **Breakthroughs:** Techniques like CNNs (Convolutional Neural Networks) and RNNs (Recurrent Neural Networks) enabled deep learning to achieve state-of-the-art results in computer vision, speech recognition, and NLP.

2. Deep Feedforward Networks:

- A deep feedforward network is a type of artificial neural network where the data moves in one direction: from input to output. It consists of an input layer, multiple hidden layers, and an output layer.

3. Gradient-Based Learning:

- **Gradient Descent:** The most common method for training neural networks, where weights are updated to minimize the error by following the negative gradient of the loss function.
- **Stochastic Gradient Descent (SGD):** A variation where the weights are updated using a small random sample of data.

4. Hidden Units:

- Hidden units (or neurons) are the layers between the input and output layers. They help in transforming the input data into a form that the output layer can understand.

5. Architecture Design:

- The design of a deep neural network includes decisions such as the number of layers, neurons per layer, and the type of activation function.

6. Backpropagation and Differentiation Algorithms:

- **Backpropagation:** A supervised learning algorithm that computes the gradient of the loss function with respect to each weight by applying the chain rule of differentiation.

UNIT-IV: Regularization for Deep Learning

1. Parameter Norm Penalties:

- Techniques like L1 and L2 regularization help to prevent overfitting by adding penalties based on the magnitude of the weights.

2. Regularization and Under-Constrained Problems:

- **Under-constrained Problems:** Occur when the model is too complex for the available data.
- Regularization reduces the complexity of the model to avoid overfitting.

3. Dataset Augmentation:

- Artificially increasing the size of the dataset by applying transformations like rotation, flipping, and scaling to the original data.

4. Noise Robustness:

- Techniques to make the model more robust to noisy or corrupted input data, such as adding noise during training.

5. Semi-Supervised Learning:

- Combines a small amount of labeled data with a large amount of unlabeled data for improved model training.

6. Multi-task Learning:

- A model learns to solve multiple related tasks at once, which helps in leveraging shared representations.

7. Early Stopping:

- A regularization technique to stop training when the model starts to overfit on the validation set.

8. Parameter Typing and Sharing:

- Involves using shared parameters across different layers or tasks to improve efficiency.

9. Sparse Representations:

- Learning models that use a small number of active features, which reduces overfitting and increases interpretability.

10. Ensemble Methods (Bagging, Boosting):

- Combining predictions from multiple models to improve accuracy and reduce variance.
- **Dropout:** A regularization technique where neurons are randomly "dropped" during training to prevent overfitting.

UNIT-V: Optimization for Training Deep Models

1. Challenges in Neural Network Optimization:

- Issues like local minima, vanishing gradients, and poor generalization can hinder optimization.

2. Basic Optimization Algorithms:

- **Gradient Descent (GD):** Basic optimization algorithm for minimizing loss.
- **Stochastic Gradient Descent (SGD):** Variation of GD using random subsets of data.
- **Mini-batch Gradient Descent:** A compromise between GD and SGD that uses small batches.

3. Parameter Initialization Strategies:

- Proper initialization of network weights is crucial for faster convergence.
- **Xavier Initialization:** A method to initialize weights based on the number of input and output neurons.

4. Adaptive Learning Rates:

- **Adam Optimizer:** A popular adaptive learning rate optimization method.
- **RMSprop, AdaGrad:** Optimizers that adapt learning rates based on the gradient.

5. Approximate Second-Order Methods:

- Techniques like **L-BFGS** provide approximations to second-order optimization for faster convergence.

6. Optimization Strategies and Meta-Algorithms:

- Advanced optimization techniques like momentum, learning rate schedules, and meta-learning strategies to improve convergence.

Applications of Deep Learning

1. Large-Scale Deep Learning:

- Training deep models on large datasets using distributed computing frameworks like TensorFlow, PyTorch, and GPUs.
-

2. Computer Vision:

- Deep learning is used for tasks like image classification, object detection, and facial recognition.

3. Speech Recognition:

- Deep learning models convert speech into text and are widely used in virtual assistants and transcription systems.

4. Natural Language Processing (NLP):

- Deep learning has revolutionized NLP tasks like language translation, text generation, and sentiment analysis.

13. ADDITIONAL TOPICS

Here are some **additional topics** that are relevant to **Neural Networks and Deep Learning (NNDL)**:

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1. Convolutional Neural Networks (CNNs)

- **Overview:** CNNs are specialized for processing data with grid-like topology, such as images. They are extensively used in computer vision tasks.
- **Key Components:**
  - **Convolution Layers:** Apply filters to input data to detect local patterns.
  - **Pooling Layers:** Reduce the spatial dimensions to make the computation more efficient.
  - **Fully Connected Layers:** Connect every neuron in one layer to every neuron in the next.
  - **Activation Functions:**TypicallyReLU is used to introduce non-linearity.
- **Applications:** Image classification, object detection, facial recognition, etc.

2. Recurrent Neural Networks (RNNs)

- **Overview:** RNNs are designed to process sequential data, making them ideal for tasks such as time-series forecasting, language modeling, and speech recognition.
- **Key Features:**
  - **Memory:** RNNs maintain an internal state to capture information from previous time steps.
  - **Vanishing Gradient Problem:** As sequences get longer, gradients can diminish, making it hard for RNNs to learn long-term dependencies.
- **Variants:**
  - **Long Short-Term Memory (LSTM):** An architecture designed to address the vanishing gradient problem.
  - **Gated Recurrent Units (GRUs):** A simpler variant of LSTM with fewer parameters.
- **Applications:** Language translation, speech recognition, text generation, etc.

---

3. Generative Adversarial Networks (GANs)

- **Overview:** GANs consist of two networks, a **generator** and a **discriminator**, which are trained together to generate data that is indistinguishable from real data.
- **Key Components:**
  - **Generator:** Tries to create fake data.
  - **Discriminator:** Evaluates whether the generated data is real or fake.
- **Training:** The two networks are trained simultaneously in a competitive process, leading to the generator learning to create increasingly realistic data.
- **Applications:** Image generation, style transfer, data augmentation, etc.

4. Autoencoders

- **Overview:** Autoencoders are unsupervised neural networks designed to learn efficient representations of data.
- **Architecture:**
  - **Encoder:** Compresses the input data into a lower-dimensional representation.
  - **Decoder:** Reconstructs the original input from the compressed representation.
- **Applications:** Dimensionality reduction, denoising, anomaly detection, and image compression.

---

5. Transfer Learning

- **Overview:** Transfer learning involves using a pre-trained model on one task and fine-tuning it for another related task, reducing the need for large datasets and training time.
- **Pre-trained Networks:** Popular models like VGG, ResNet, and Inception can be used as starting points for various tasks.
- **Applications:** Used extensively in image classification, object detection, and NLP tasks.

---

6. Attention Mechanisms

- **Overview:** Attention mechanisms allow the model to focus on specific parts of the input sequence when making predictions, improving the performance of sequence-to-sequence models.
- **Key Components:**
  - **Self-Attention:** Computes attention scores within the input itself (used in transformers).
  - **Global vs Local Attention:** Determines which parts of the input are relevant for a given task.
- **Applications:** Neural machine translation, speech recognition, and image captioning.

---

7. Transformers

- **Overview:** Transformers are deep learning models that rely entirely on attention mechanisms and are highly efficient for sequential data processing.
- **Key Components:**
  - **Multi-Head Attention:** Allows the model to focus on multiple aspects of the input sequence at once.
  - **Positional Encoding:** Since transformers don't have inherent recurrence, positional encoding is used to maintain the order of the sequence.
  - **Feedforward Neural Networks:** Positioned after the attention layers.
- **Applications:** Natural language processing, machine translation (e.g., GPT, BERT, T5).

---

8. Reinforcement Learning (RL) in Deep Learning

- **Overview:** Reinforcement learning is a type of machine learning where agents learn by interacting with the environment and receiving feedback in the form of rewards or punishments.
- **Key Components:**
  - **Agent:** The learner or decision maker.
  - **Environment:** The system the agent interacts with.
  - **Reward:** Feedback signal received from the environment.
  - **Policy:** A strategy used by the agent to determine actions based on observations.
- **Deep Reinforcement Learning (DRL):** Combines deep learning with reinforcement learning to solve complex problems like game playing and robotic control (e.g., AlphaGo, Deep Q-Learning).

---

9. Capsule Networks (CapsNets)

- **Overview:** Capsule Networks are a novel type of neural network that attempts to solve some limitations of CNNs, particularly with respect to handling spatial hierarchies and pose variations in images.
- **Key Concept:**
  - **Capsules:** Groups of neurons that represent specific properties of objects, like their pose, deformation, or orientation.
  - **Dynamic Routing:** A process by which capsules send their outputs to other capsules in the network, depending on their agreement.
- **Applications:** Image recognition, especially in complex and varied scenarios.

10. Neural Architecture Search (NAS)

- **Overview:** NAS refers to the process of automating the design of neural network architectures. It allows machines to search for the most efficient architecture for a given task.
- **Methods:**
  - **Reinforcement Learning-Based NAS:** Using RL to search for the best architecture.
  - **Evolutionary Algorithms:** Evolving the network structure through genetic algorithms.
  - **Gradient-Based NAS:** Using gradient-based optimization techniques to find optimal architectures.
- **Applications:** Automated design of neural networks for tasks like image classification, object detection, etc.

---

11. Graph Neural Networks (GNNs)

- **Overview:** GNNs are designed to process data represented as graphs. They learn to encode graph-structured data, where nodes represent entities, and edges represent relationships between entities.
- **Key Concepts:**
  - **Node Embeddings:** Representing the features of nodes in the graph.
  - **Message Passing:** Nodes pass information to their neighbors to update their embeddings.
- **Applications:** Social network analysis, protein interaction networks, recommendation systems.

---

12. Neural Network Interpretability and Explainability

- **Overview:** As neural networks, especially deep learning models, become more complex, understanding how they make decisions is critical for transparency, trust, and accountability.
- **Methods:**
  - **Saliency Maps:** Visualizations that highlight the most important features influencing a model's prediction.
  - **LIME (Local Interpretable Model-agnostic Explanations):** A technique to explain the predictions of any classifier by approximating it with an interpretable model in the vicinity of a prediction.
  - **SHAP (Shapley Additive Explanations):** A method to assign each feature an importance value for a given prediction.

---

13. Federated Learning

- **Overview:** Federated learning is a distributed machine learning technique where the model is trained on decentralized data across multiple devices, ensuring data privacy.
- **Key Concept:** Only model updates (not data) are shared, ensuring privacy and security.
- **Applications:** Health data analysis, mobile device-based learning, and any application where data privacy is critical.

14. Few-Shot Learning

- **Overview:** Few-shot learning refers to the ability of a model to learn a new task with only a few examples.
- **Techniques:**
  - **Meta-Learning:** A method where models learn how to learn efficiently from a few examples.
  - **Siamese Networks:** A type of neural network that learns to differentiate between classes using very few samples.
- **Applications:** Image classification with limited data, natural language understanding, etc.

These additional topics offer a deeper dive into the field of **Neural Networks and Deep Learning (NNDL)**, covering advanced concepts, techniques, and applications that are shaping the future of AI and machine learning. If you need more detailed explanations or examples for any of these topics, feel free to ask!

14.Mid exam question Papers- Theory and quiz

MID-1 Examination, SEP-2024
Course: B. Tech, Branch-CSM IV Year Semester-I
Subject: NEURAL NETWORKS & DEEP LEARNING
Faculty: RAJU A
SET-1

1. Explain about Basic models of ANN?
2. Write about Kohonen Self-Organizing Feature Maps?
3. Define deep learning and Write its applications?

SET-2

1. Write about important terminologies in Neural Networks?
2. Discuss about Fixed Weight Competitive Nets with examples?
3. What is mean by deep learning? Write about Historical Trends in Deep learning?

SET-3

1. Discuss about BAM and Hopfield Networks with suitable examples?.
2. Explain about Learning Vector Quantization?
3. What is mean by deep learning? Write the challenges?

NNDL Objective Type Questions

Fill in the Blanks:

Unit-1

1. Neurons are connected in_____
2. A perception is a_____
3. BAM full form is …….
4. Back propagation is a_____ learning.
5. Three-layered multilayer neural network with two-layer(middle) is_____ neurons.
6. Training Algorithms for Pattern Association _____ and _____
7. _____is the connection between the axon and other neuron dendrites.
8. In Adaptive Linear Neuron calculate the error using _____
9. In a hetero-associate memory, the training input and the target output vectors are _____ and, In the auto associative memory network, the training input vector and training output vector are the _____
10. The Hopfield network is commonly used for _____ and _____

UNIT-2

1. Self-Organizing Feature Maps are principally _____learning.
2. In Unsupervised learning, the learning is performed without the help of _____
3. _____is a neural net based on competition that can be used as a subnet to choose the neuron whose activation is the largest.
4. SOM may be considered a nonlinear generalization of_____.
5. In competitive learning when a training example is fed to the network, its Euclidean distance to all weight vectors is _____.
6. Full form of CPN_____
7. _____is a prototype-based supervised classification algorithm.
8. In CPN layers are_____
9. The Hamming network is a_____ for classification of binary bipolar n-tuple input vectors
10. Full form of KSOFM_____

UNIT-3

1. The Deep Learning first layer is called the? _____.
2. RNNs stands for_____
3. Deep Learning is a subset of _____that uses mathematical functions to map the input to the output.
4. Who is father of deep learning? _____.
5. CNN is mostly used_____

Multiple Choice Questions

UNIT-1

1. Axons are_____. [ ]

a) Parts of the cell body
b) Connections between dendrites
c) Neuron inputs
d) Neuron outputs

2. Perceptions are suitable for_____[ ]

a) Single layer only
b) Multi-layer only
c) Single and multi layer
d) Single neuron only

3. What is back propagation? [ ]

a) It is another name given to the curvy function in the perceptron
b) It is the transmission of error back through the network to adjust the inputs
c) It is the transmission of error back through the network to allow weights to be adjusted so that the network can learn
d) None of the mentioned

4. What is back propagation?[ ]

a) It is another name given to the curvy function in the perceptron
b) It is the transmission of error back through the network to adjust the inputs
c) It is the transmission of error back through the network to allow weights to be adjusted so that the network can learn
d) None of the mentioned

5. The fundamental unit of network is
    a) brain
    b) nucleus
    c) neuron
    d) axon
6. The fundamental unit of network is [ ]
    a) brain
    b) nucleus
    c) axon
    d) neuron

7. What is shape of dendrites like[ ]

a) oval
b) round
c) tree
d) rectangular

8. Supervised learning is _____[ ]
   a) Always possible
   b) Not always possible
   c) Partial
   d) Both

9. Weighted sums in ANNs are referred to as _____?[ ]
a) Input
b) Output
c) Activation
d) Link
10. What are the various layers present in ANN? [ ]
a) Input Layer
b) Hidden Layer
c) Output Layer
d) All Mentioned Above
11. In what type of learning labelled training data is used [ ]
a) unsupervised learning
b) supervised learning
c) reinforcement learning
d) active learning

UNIT-2

1. Example of a unsupervised feature map?[ ]
   a) text recognition
   b) voice recognition
   c) image recognition
   d) none of the mentioned

2. What is unsupervised learning? [ ]
   a) features of group explicitly stated
   b) number of groups may be known
   c) neither feature & nor number of groups is known
   d) None
3. What are the various types of learning algorithms? [ ]
   a) Supervised Learning
   b) Unsupervised Learning
   c) Reinforcement Learning
   d) All of the above
4. Automated vehicle is an example of _____. [ ]
   a) Supervised learning
   b) Unsupervised learning
   c) Active learning
   d) reinforcement learning

5. Stochastic neural networks is a_____ [ ]
a) Back Propagation Algorithm
b) Security Algorithm
c) NN Algorithm
d) Feed forward Algorithm

6. What is Hebb's rule of learning? [ ]
   a) The system learns from its past mistakes
   b) The system recalls previous reference inputs and respective ideal outputs
   c) The strength of neural connection get modified accordingly
   d) none
7. Hetero associative memory can be an example of which type of network?[ ]
   a) Group of instars
   b) Group of out star
   c) Either group of instars or out stars
   d) both group of instars or out stars
8. Error based learning algorithms comes under[ ]
a) Supervised learning
b) Unsupervised learning
c) Active learning
d) Reinforcement learning
9. _____An ability to learn how to do tasks based on the data given for training or initial experience. [ ]
a) Self-organization
b) Fault tolerance
c) Adaptive learning
d) None

10. Difference between Adaline and perceptron model? [ ]
    A. Wights are compared with output
    B. Sensory units result is compared with output
    C. Along activation value is compared with output
    D. None

UNIT-3

1. Gradient Descent optimization algorithms to train [ ]
   a) feedforward
   b) backpropagation
   c) activation function
   d) hidden layer

2. ReLu Stands for [ ]

   a) Rectified link unit
   b) Rectified large unit
   c) Rectified layer unit
   d) Rectified linear unit

3. Facial recognition, speech recognition, and image classification are applications of [ ]
   a) NLP
   b) Deep Learning
   c) BNN
   d) None
4. CNN stands for…….
   a) Convey Network Node
   b) Convolutional Neural NODE
   c) Convolutional Neural Network
   d) Convolutional Normal Network
5. Which of the following is/are Limitations of Deep Learning?[ ]
   a) Data Labeling
   b) Obtain Huge Training Datasets
   c) Both A and B
   d) None of the above

MID-2 Examination, DEC-2024
Course: B. Tech, Branch-CSM IV Year Semester-I
Subject: NEURAL NETWORKS & DEEP LEARNING
Faculty: A RAJU

SET-1

1. What is gradient-based learning, and why is it important in training neural networks?
2. Write about Adversarial Training,?
3. Explain the application of second-order methods to the training of deep networks?

SET-2

1. What are hidden units in a neural network? Why are they important?
2. What is mean by Bagging? List out the advantages and disadvantages?
3. Discuss the role of deep learning in computer vision, speech recognition, and NLP.

SET-3

1. Explain about Back-Propagation and Other Differentiation Algorithms?
2. Describe the dropout technique and its significance.
3. Discuss the application of second-order methods to the training of deep networks.?

NNDL Objective Type Questions

Fill in the Blanks:

Unit-3

1. If you increase the number of hidden layers in a Multi Layer Perceptron, the classification error of test data always decreases.(True/ False)_____

2. _____ is a subset of Machine Learning that uses mathematical functions to map the input to the output.
3. Rectified linear units are an excellent default choice of _____ layer.
4. Sigmoid and tanh activation functions cannot be with many layers due to the _____ problem.
5. _____ function overcomes the vanishing gradient problem, allowing models to learn faster and perform better

UNIT-4

1. Higher the dropout rate, lower is the regularization(True/ False)._____
2. Noise applied to inputs is a _____
3. L2 regularization is also known as _____
4. The _____ regularization which pushes the value of weight to zero.
5. _____ is a way to improve generalization by the examples arising out of several tasks.
6. The algorithm terminates when no parameters have improved over the best recorded validation error for some pre-specified number of iterations, This strategy is known as _____
7. _____ is a technique for reducing generalization error by combining several models
8. In machine learning, _____ is way to prevent over-fitting.
9. Tangent propagation is closely related to_____
10. Bagging means_____

UNIT-5

1. Optimization algorithms that use the entire _____set are called batch or deterministic
2. gradient methods.
3. Optimization algorithms that use only a ___ example at a time are sometimes called stochastic and sometimes online methods.
4. Empirical risk minimization is prone to_____
5. Speech Recognition is the application of_____

6. Computer Vision is used for? _____.
7. CNN is mostly used_____
8. Full form of ASR_____
9. Zero Initialization, Random Initialization are _____
10. 9.Expand LVSR_____
11. The goal of Optimization in Deep learning_____

Multiple Choice Questions

UNIT-3

1. For a binary classification problem, which of the following activation function is used? [ ]

a. ReLu
b. Softmax
c. Sigmoid
d. None

2. Types of Cost Function _____[ ]

a. Regression Cost Function
b. Multi-class Classification Cost Function.
c. Binary Classification cost Functions
d. All of the above

3. What does a gradient descent algorithm do?? [ ]

a. Tries to find the parameters of a model that minimizes the cost function

b. Adjusts the weights at the input layers
c. Both A and B
d. None of the mentioned

4. What is gradient descent??[ ]
a. Activation function
b. Loss function
c. Optimization algorithm
d. None of the mentioned
6. The fundamental unit of network is
a. a) brain
b. b) nucleus
c. c) neuron
d. d) axon
5. Which of the following loss function is used in regression? [ ]
a. Mean squared error
b. Logarithmic loss
c. Cross entropy
d. None

15.University Question papers of previous years

R16

Code No: 138DU

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech IV Year II Semester Examinations, September - 2020
NEURAL NETWORKS AND DEEP LEARNING
(Common to CSE, IT)

Time: 2 Hours **Max. Marks: 75**

Answer any Five Questions
All Questions Carry Equal Marks

- - -

1. List and explain the various activation functions used in modeling of artificial neuron. Also explain their suitability with respect to applications. [15]

2. Describe the Characteristics of Continuous Hopfield memory and discuss how it can be used to solve Traveling salesman Problem. [15]

3. Explain the architecture and algorithm of full CPN with diagram. [15]

4. Give the Architecture of kohenen self-organizing and explain how it is used cluster the input vectors. [15]

5. Give an example of learning XOR function to explain a fully functioning feed forward network. [15]

6. Explain in detail about the concept of gradient based learning. [15]

7. Write an early stopping meta-algorithm for determining the best amount of time to train. [15]

8. Discuss the application of second-order methods to the training of deep networks. [15]

---ooOoo---

16.Unit-wise quiz questions

UNIT-1

1. Explain the concept of classes, objects and methods in OOP?
2. List and explain the Java buzzwords in detail?
3. Define constructor? Explain different types with suitable example program?
4. Define data type? Explain various data types in Java?
5. Explain about control statements and operators in Java?
6. Explain about type conversion and casting with example?
7. Discuss about inner classes in Java with suitable example?
8. Discuss about following with suitable examples?
   a)this b)super c)final

UNIT-2

1. What is inheritance? Explain different types of inheritances?
2. Explain about Exploring java.io?
3. Explain how Packages are created and accessed?
4. Demonstrate with an example method overriding?
5. Explain the concept of implement the interface with an example program?
6. What is abstract class ?Explain with suitable program?

UNIT-3

1. What is an exception? Explain the exception in handling java?
2. Summarize the differences between thread-based multitasking and process-based multitasking?
3. Develop a program that includes a try block and a catch clause which processes the arithmetic exception generated by division-by-zero error.
4. Discuss about following with suitable examples? a)Enumerations b)autoboxing
5. Write a short note on thread life cycle?
6. Write about inter thread communication?
7. What is mean by generic ? Explain with suitable program?
8. Write a short note on any two string handling functions?

UNIT-4

1. What is an adapter class? Demonstrate its role in event handling?
2. With the help of a neat diagram, explain the AWT class architecture?
3. Explain about Delegation event model?
4. Discuss the following user interface components a)canvas b)scrollbars, text components

a)check box b)checkbox groups c)choices

5. Write short note on scroll pane, dialogs, menu bar?
6. Discuss about Layout manager with suitable examples?

UNIT-5

1.What is Applet ?Explain about Applet lifecycle with diagram?
2.Write the differences between applet program and application program.
3.Write the limitations of AWT?
With the help of a neat diagram, explain the Swing architecture.
4.Explain MVC architecture with suitable diagram?
5.Explain the swing components JApplet, JFrame and Jcomponent with suitable program?

17.Tutorial problems with blooms mapping

1. Remember (Knowledge Recall)

Problem 1: Define the basic components of a neural network.

Bloom's Taxonomy Level: Remember

Key Focus: Basic understanding of neural networks, their components, and terminologies.

Problem 2: List the different types of activation functions used in neural networks.

Bloom's Taxonomy Level: Remember

Key Focus: Recognition and recall of fundamental neural network concepts like activation functions (Sigmoid, Tanh, ReLU, etc.).

Problem 3: What is a Perceptron? How is it different from a Multi-layer Perceptron (MLP)?

Bloom's Taxonomy Level: Remember

Key Focus: Basic concepts of the Perceptron and its difference from an MLP.

---

2. Understand (Comprehension)

Problem 1: Explain the process of training a neural network using backpropagation.

Bloom's Taxonomy Level: Understand

Key Focus: Understanding how the backpropagation algorithm updates weights during training and why it's important for neural network learning.

Problem 2: What is the purpose of dropout in deep neural networks?

Bloom's Taxonomy Level: Understand

Key Focus: Understanding the concept of dropout as a regularization technique in neural networks.

Problem 3: Explain the difference between Supervised and Unsupervised Learning with examples from deep learning.

Bloom's Taxonomy Level: Understand

Key Focus: The ability to explain and differentiate between supervised and unsupervised learning paradigms in deep learning.

---

3. Apply (Practical Application)

Problem 1: Implement a simple single-layer perceptron for a binary classification problem using Python (or a deep learning framework like TensorFlow or PyTorch).

Bloom's Taxonomy Level: Apply

Key Focus: Practical implementation of a basic neural network model for solving real-world problems like classification.

Problem 2: Train a Convolutional Neural Network (CNN) on a sample dataset (e.g., MNIST) and evaluate its performance.

Bloom's Taxonomy Level: Apply

Key Focus: Hands-on experience in applying CNNs for image classification, using frameworks like TensorFlow or Keras.

Problem 3: Apply transfer learning to fine-tune a pre-trained network for a new dataset.

Bloom's Taxonomy Level: Apply

Key Focus: Using pre-trained models (e.g., VGG, ResNet) for a new task and applying transfer learning techniques.

---

4. Analyze (Breakdown into Components)

Problem 1: Analyze the learning curves of a neural network. How would you identify overfitting or underfitting from these curves?

Bloom's Taxonomy Level: Analyze

Key Focus: Analyzing training and validation loss curves to identify common issues such as overfitting and underfitting in neural networks.

Problem 2: Analyze the effect of changing the learning rate on the convergence of a neural network during training.

Bloom's Taxonomy Level: Analyze

Key Focus: Understanding the impact of the learning rate on the training process and convergence of neural networks.

Problem 3: Compare the performance of a neural network with different activation functions (ReLU, Sigmoid, Tanh) on a classification problem.

Bloom's Taxonomy Level: Analyze

Key Focus: Breaking down and comparing how different activation functions influence the learning

process and performance of a neural network.

---

5. Evaluate (Judgment and Decision Making)

Problem 1: Evaluate the advantages and disadvantages of using deep learning for image classification compared to traditional machine learning methods.

Bloom’s Taxonomy Level: Evaluate

Key Focus: Ability to critically evaluate the strengths and limitations of deep learning approaches (e.g., CNNs) against traditional machine learning models (e.g., SVM, Decision Trees).

Problem 2: Critique the use of a particular optimization algorithm (e.g., Adam, SGD) for training deep neural networks in terms of convergence speed and accuracy.

Bloom’s Taxonomy Level: Evaluate

Key Focus: Analyzing the trade-offs between different optimization algorithms and providing an informed evaluation of their strengths and weaknesses for deep learning tasks.

Problem 3: Evaluate the performance of a trained neural network model on a test dataset and recommend improvements.

Bloom’s Taxonomy Level: Evaluate

Key Focus: Assessing a model's performance on unseen data and suggesting strategies to improve the model (e.g., tuning hyperparameters, data augmentation).

retrieval.

18.Assignment questions with blooms mapping

Here's a set of **assignment questions** for **Neural Networks and Deep Learning (NNDL)**, mapped to **Bloom's Taxonomy** levels. This mapping can guide you through designing assignments that address all cognitive levels of learning, from recall of knowledge to the ability to create new models.

1. Remember (Knowledge Recall)

Assignment Question 1:

- **Question:** Define the term "activation function" and describe the role of activation functions in a neural network. List three commonly used activation functions and explain how each of them works.
- **Bloom's Taxonomy Level:** Remember
- **Objective:** Assessing students' ability to recall fundamental concepts like activation functions and to identify common examples.

Assignment Question 2:

- **Question:** What is the difference between **supervised learning** and **unsupervised learning**? Provide examples of each in the context of deep learning.
- **Bloom's Taxonomy Level:** Remember
- **Objective:** Testing the student's ability to recall key learning paradigms and examples in deep learning.

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2. Understand (Comprehension)

Assignment Question 1:

- **Question:** Explain the backpropagation algorithm in neural networks. Why is it necessary for training deep learning models, and how does it improve the model over time?
- **Bloom's Taxonomy Level:** Understand
- **Objective:** Evaluate the student's understanding of how backpropagation works and why it is important for training neural networks.

Assignment Question 2:

- **Question:** Describe the concept of overfitting in a deep learning model. How does **regularization** (like dropout) help in mitigating this problem?
- **Bloom's Taxonomy Level:** Understand
- **Objective:** Check understanding of overfitting and regularization techniques used to address it.

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3. Apply (Practical Application)

Assignment Question 1:

- **Question:** Implement a **Perceptron** for a binary classification problem (e.g., classifying whether an image contains a cat or not). Use Python and a framework like **TensorFlow** or **PyTorch**.
- **Bloom's Taxonomy Level:** Apply
- **Objective:** This problem tests the ability to apply the theoretical knowledge of perceptrons to build a functional neural network.

Assignment Question 2:

- **Question:** Apply a Convolutional Neural Network (CNN) to classify the **MNIST** dataset. Implement the CNN using **TensorFlow** or **Keras** and evaluate the performance.
- **Bloom's Taxonomy Level:** Apply
- **Objective:** To assess the ability to practically implement CNNs for real-world image classification tasks and evaluate model performance.

---

4. Analyze (Breakdown into Components)

Assignment Question 1:

- **Question:** Given the learning curves (accuracy and loss) of a neural network, analyze whether the model is overfitting, underfitting, or performing well. Suggest potential improvements based on your analysis.
- **Bloom's Taxonomy Level:**Analyze
- **Objective:** Test the student's ability to analyze performance curves and understand model behavior.

Assignment Question 2:

- **Question:** Compare and analyze the performance of two different neural network models (e.g., a **Multilayer Perceptron (MLP)** vs **CNN**) on a classification task. Which model would you prefer and why?
- **Bloom's Taxonomy Level:**Analyze
- **Objective:** Assess the student's ability to analyze different neural network architectures and make reasoned judgments about which is better for a given task.

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5. Evaluate (Judgment and Decision Making)

Assignment Question 1:

- **Question:** Evaluate the performance of two optimization algorithms (e.g., **SGD** and **Adam**) in training a neural network on a dataset of your choice. Justify which one would be better for a real-world deep learning task and explain why.
- **Bloom's Taxonomy Level:** Evaluate
- **Objective:** This question tests students' ability to critically evaluate optimization techniques and apply them to real-world problems.

Assignment Question 2:

- **Question:** Evaluate the effectiveness of **transfer learning** using a pre-trained model like **ResNet50** or **VGG16** on a new dataset. Discuss the benefits and limitations of using transfer learning in deep learning tasks.
- **Bloom's Taxonomy Level:** Evaluate
- **Objective:** Assess the student's judgment in evaluating transfer learning and its impact on model performance.

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6. Create (Synthesis and Innovation)

Assignment Question 1:

- **Question:** Design and implement a **Generative Adversarial Network (GAN)** for generating realistic images of handwritten digits (similar to MNIST). Evaluate the generated images' quality and suggest improvements to the model architecture.
- **Bloom's Taxonomy Level:** Create
- **Objective:** This question encourages students to innovate by implementing a GAN, designing it, and analyzing the generated output.

Assignment Question 2:

- **Question:** Create a deep neural network model for **sentiment analysis** on movie reviews. Explain your choice of architecture, data preprocessing steps, and how you handle class imbalances.
- **Bloom's Taxonomy Level:** Create
- **Objective:** This task allows students to innovate and design a complete model for a natural language processing task.

Assignment Question 3:

- **Question:** Design a **deep reinforcement learning model** to play a simple game (like **CartPole**) using **Deep Q-Networks (DQN)**. Explain the modifications and improvements you made to the original DQN architecture.
- **Bloom's Taxonomy Level:** Create
- **Objective:** This problem encourages students to design and implement a reinforcement learning algorithm, addressing a real-time dynamic problem.

Summary of Bloom's Mapping for Assignment Questions:

Bloom's Level	Assignment Questions
Remember	Define and describe activation functions, supervised vs unsupervised learning
Understand	Explain backpropagation and regularization techniques like dropout
Apply	Implement a Perceptron and CNN, apply transfer learning to a new dataset
Analyze	Analyze learning curves, compare and analyze different neural network architectures
Evaluate	Evaluate optimization algorithms and transfer learning performance
Create	Design a GAN, create a deep neural network for sentiment analysis, design a reinforcement learning model

---

19.List of Students

21C31A6601	ABUL FATAH MOHAMMED AFFANULLAH
21C31A6602	ADDAGUDURU KRISHNA KOUSHIK
21C31A6603	ALUGOJU SARASWATHI
21C31A6604	AMANCHA VIVEK
21C31A6605	ANNARAPU VINAY
21C31A6606	ARENDRA DHARANI
21C31A6607	BAJJURI MAMATHA
21C31A6608	BHUKYA THRISHA
21C31A6609	BODDULA RAHUL
21C31A6610	BOLLA USHASREE
21C31A6611	BOLLOJU ANUSHA
21C31A6612	BUSIREDDY MADHURI
21C31A6613	CHALLURI DINESH KUMAR
21C31A6614	CHALLURI RAHUL
21C31A6615	CHELPURI RADHIKA
21C31A6616	CHITTHALURI ANUDEEP

21C31A6617	DEEKONDA CHANDU
21C31A6618	DENABOINA PRAVALIKA
21C31A6619	DUPATI SRICHARAN
21C31A6620	ENAGANTI MANOJ
21C31A6621	FAISAL SYED
21C31A6622	GANDI GOUTHAM
21C31A6623	GATTIKOPPULA AJAY
21C31A6624	GUDURU SAI RAJ
21C31A6625	GUMMADIRAJU REVATHI
21C31A6626	JADALA RAM SAGAR
21C31A6627	KALLEPELLY ARCHANA
21C31A6628	KOMURAVELLI SHIVA KUMAR
21C31A6629	KORRA KAVYA
21C31A6630	KOYYADA CHANDAN RAJ
21C31A6631	KUCHANA RACHANA
21C31A6632	KUKKALA RAVI KIRAN
21C31A6633	KYATHAM ROHITH
21C31A6634	LADE KAVYASRI
21C31A6635	LAKAVATH VENKANNA
21C31A6636	MADIPELLY MUKTHA NANDHINI
21C31A6637	MOHAMMED ABDUL RAHAMAN
21C31A6638	MOHAMMED RAJJU
21C31A6639	MOHAMMED SAMEER
21C31A6640	MOHAMMED YAKUB FARAZ KHAN
21C31A6641	MUNIGALA POORNACHANDER
21C31A6642	MUNIGANTI AKHIL
21C31A6643	NALLA ADITHYA
21C31A6644	NALLA LAXMI PRASANNA
21C31A6645	NARUGULA RAKESH
21C31A6646	NAVEEN ADEPU
21C31A6647	NUNAVATH BALARAJU
21C31A6648	PARUNANDHI PAVAN WESLY
21C31A6649	PILLALAMARRI SUDHEER
21C31A6650	PILLI HARSHASRI
21C31A6651	PITTA ARAVIND
21C31A6652	SABBANI RAKSHITHA
21C31A6653	SHAIK SALMAN
21C31A6654	SHANIGARAPU JHANSY
21C31A6655	SILUVERU PRINCE
21C31A6656	SINGARAPU SRAVANI
21C31A6657	SRIRAMULA SRILEKHA
21C31A6658	TAKKALLAPALLY KANISHKA
21C31A6659	THADAKA SRI POOJA
21C31A6660	THATIKONDA NARESH
21C31A6661	VALLAKATLA TEJA
21C31A6662	VELPURI NIHARIKA
21C31A6663	YARRAM SAI DATH

22C35A6601	AKULA ROHITH
22C35A6602	CHINDAM SHIVA KUMAR
22C35A6603	GADE SUSHMA SRI
22C35A6604	MOHAMMAD AVEZ
22C35A6605	MADHUKAR
22C35A6606	RAVIRAKULA SANDEEP

20.Scheme and solution of internal tests.

In CIE, for theory subjects, during a semester, there shall be two mid-term examinations. Each Mid-Term examination consists of two parts i) **Part – A** for 10 marks, ii) **Part – B** for 20 marks with a total duration of 2 hours as follows:

Mid Term Examination for 30 marks:

a. Part - A : Objective/quiz paper for 10 marks.
b. Part - B : Descriptive paper for 20 marks.

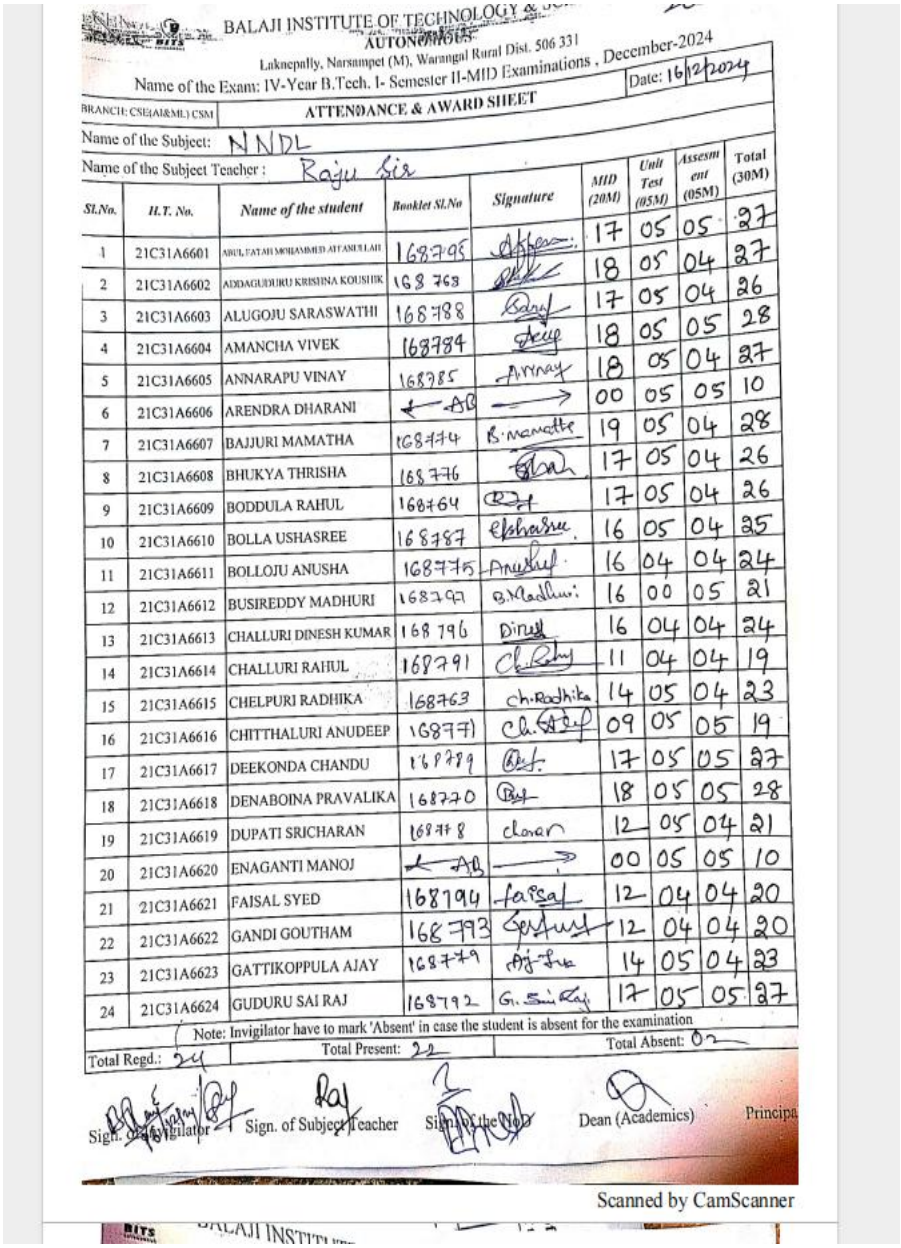
The objective/quiz paper is set with multiple choice, fill-in the blanks and match the following type of questions for a total of 10 marks. The descriptive paper shall contain 6 full questions out of which, the student has to answer 4 questions, each carrying 5 marks. The **average of the two Mid Term Examinations** shall be taken as the final marks for Mid Term Examination (for 30 marks).

The remaining 10 marks of Continuous Internal Evaluation are distributed as:

1. **Assignment for 5 marks. (Average of 2 Assignments each for 5 marks)**
2. **Subject Viva-Voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject for 5 marks.**

While the first mid-term examination shall be conducted on 50% of the syllabus, the second mid-term examination shall be conducted on the remaining 50% of the syllabus. Five (5) marks are allocated for assignments (as specified by the subject teacher concerned). The first assignment should be submitted before the conduct of the first mid-term examination, and the second assignment should be submitted before the conduct of the second mid-term examination. The average of the two assignments shall be taken as the final marks for assignment (for 5 marks). Subject Viva-Voce/PPT/Poster Presentation/ Case Study on a topic in the subject concerned for 5 marks before II Mid-Term Examination.

22.Markssheet.



BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
AUTONOMOUS
Laknepally, Narsampet (M), Warangal Rural Dist. 506 331

Name of the Exam: IV-Year B.Tech. I- Semester II-MID Examinations , December-2024

Date: 16/12/2024

BRANCH: CSE(AI&ML) CSM

ATTENDANCE & AWARD SHEET

Name of the Subject: NNDL

Name of the Subject Teacher : Raju Sir

Sl.No.	H.T. No.	Name of the student	Booklet Sl.No	Signature	MID (20M)	Unit Test (05M)	Assesment (05M)	Total (30M)
1	21C31A6601	ABUL FATAH MOHAMMED AT ANSULAH	168795		17	05	05	27
2	21C31A6602	ADDAGUDURU KRISHNA KOUSHIK	168763		18	05	04	27
3	21C31A6603	ALUGOJU SARASWATHI	168788		17	05	04	26
4	21C31A6604	AMANCHA VIVEK	168784		18	05	05	28
5	21C31A6605	ANNARAPU VINAY	168785		18	05	04	27
6	21C31A6606	ARENDRA DHARANI	← AB	→	00	05	05	10
7	21C31A6607	BAJJURI MAMATHA	168774		19	05	04	28
8	21C31A6608	BHUKYA THRISHA	168776		17	05	04	26
9	21C31A6609	BODDULA RAHUL	168764		17	05	04	26
10	21C31A6610	BOLLA USHASREE	168787		16	05	04	25
11	21C31A6611	BOLLOJU ANUSHA	168775		16	04	04	24
12	21C31A6612	BUSIREDDY MADHURI	168797		16	00	05	21
13	21C31A6613	CHALLURI DINESH KUMAR	168796		16	04	04	24
14	21C31A6614	CHALLURI RAHUL	168791		11	04	04	19
15	21C31A6615	CHELPURI RADHIKA	168763		14	05	04	23
16	21C31A6616	CHITTHALURI ANUDEEP	168771		09	05	05	19
17	21C31A6617	DEEKONDA CHANDU	168789		17	05	05	27
18	21C31A6618	DENABOINA PRAVALIKA	168770		18	05	05	28
19	21C31A6619	DUPATI SRICHARAN	168778		12	05	04	21
20	21C31A6620	ENAGANTI MANOJ	← AB	→	00	05	05	10
21	21C31A6621	FAISAL SYED	168794		12	04	04	20
22	21C31A6622	GANDI GOUTHAM	168793		12	04	04	20
23	21C31A6623	GATTIKOPPULA AJAY	168779		14	05	04	23
24	21C31A6624	GUDURU SAI RAJ	168792		17	05	05	27

Note: Invigilator have to mark 'Absent' in case the student is absent for the examination

Total Regd.: 24 | Total Present: 22 | Total Absent: 02

Sign. of Invigilator | Sign. of Subject Teacher | Sign. of the HOD | Dean (Academics) | Principal

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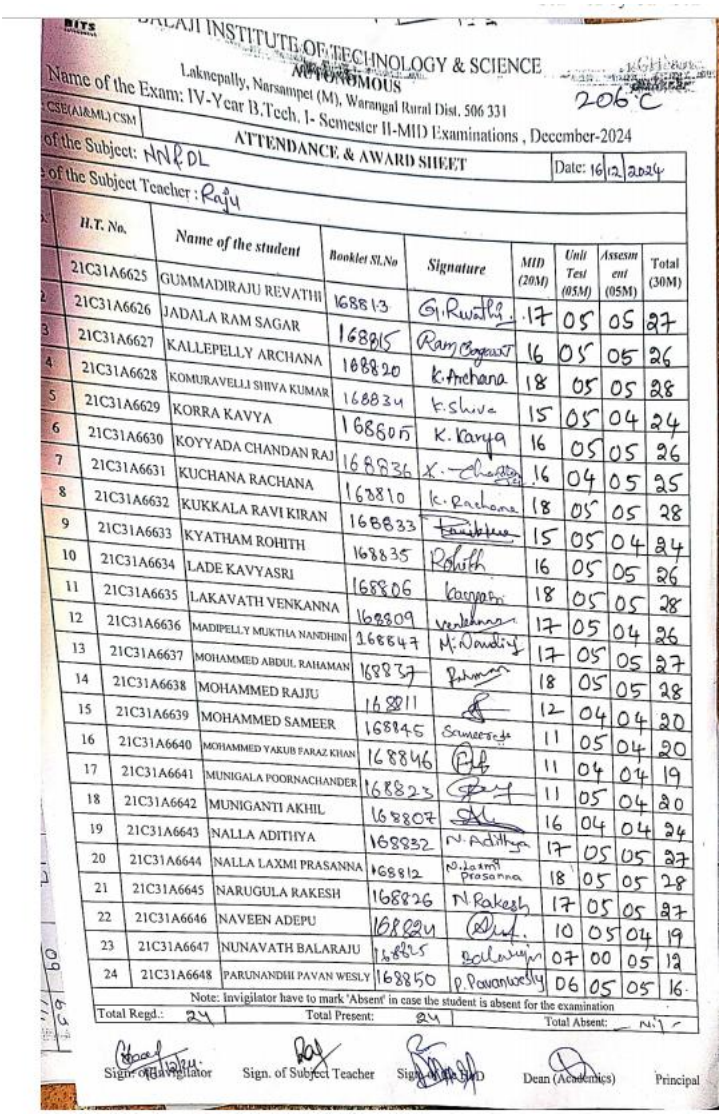


BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
AUTONOMOUS
Laknepally, Narsampet (M), Warangal Rural Dist. 506 331

206 C

Name of the Exam: IV-Year B.Tech. I- Semester II-MID Examinations , December-2024

CSE(AI&ML) CSM

ATTENDANCE & AWARD SHEET

Date: 16/12/2024

of the Subject: NNL & DL

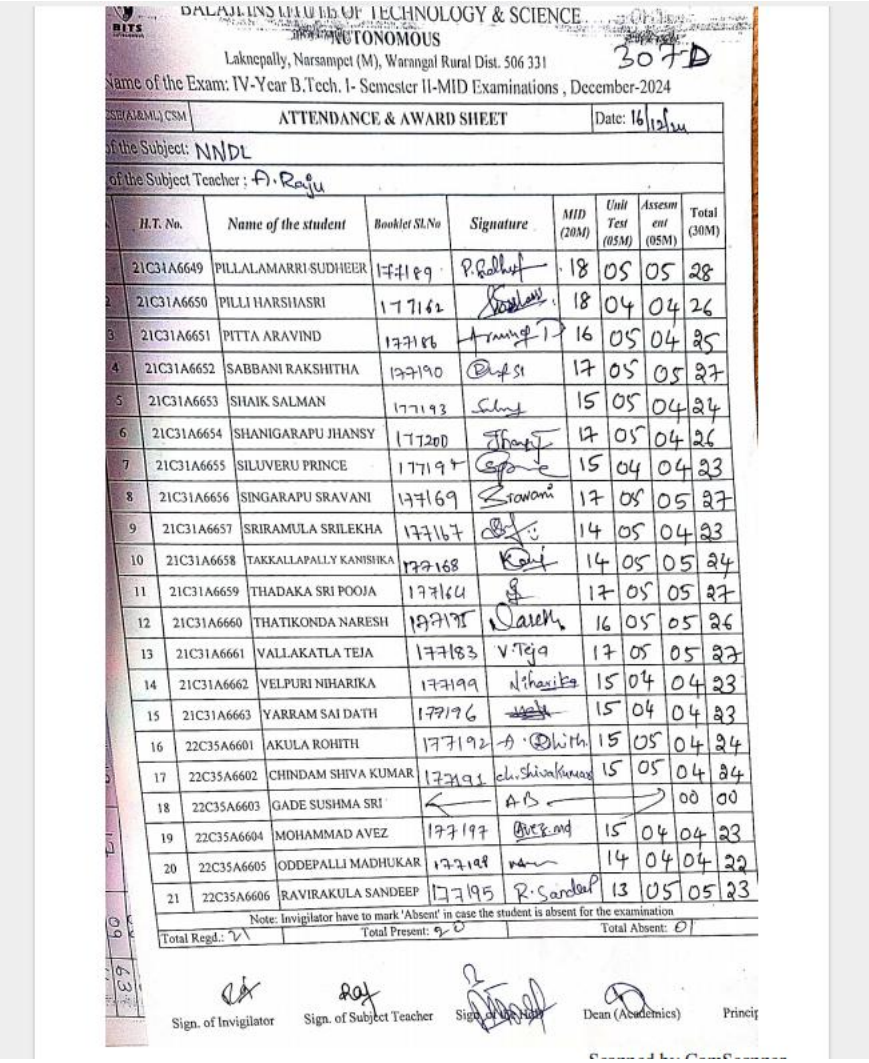
e of the Subject Teacher : Raju

	H.T. No.	Name of the student	Booklet Sl.No	Signature	MID (20M)	Unit Test (05M)	Assesment (05M)	Total (30M)
1	21C31A6625	GUMMADIRAJU REVATHI	168813	G.Revathi	17	05	05	27
2	21C31A6626	JADALA RAM SAGAR	168815	Ram Sagar	16	05	05	26
3	21C31A6627	KALLEPELLY ARCHANA	168820	K.Archana	18	05	05	28
4	21C31A6628	KOMURAVELLI SHIVA KUMAR	168834	K.Shiva	15	05	04	24
5	21C31A6629	KORRA KAVYA	168805	K. Kavya	16	05	05	26
6	21C31A6630	KOYYADA CHANDAN RAJ	168836	K. Chandan	16	04	05	25
7	21C31A6631	KUCHANA RACHANA	168810	K. Rachana	18	05	05	28
8	21C31A6632	KUKKALA RAVI KIRAN	168833		15	05	04	24
9	21C31A6633	KYATHAM ROHITH	168835	Rohith	16	05	05	26
10	21C31A6634	LADE KAVYASRI	168806	Kavyasri	18	05	05	28
11	21C31A6635	LAKAVATH VENKANNA	168809	venkanna	17	05	04	26
12	21C31A6636	MADIPELLY MUKTHA NANDHINI	168847	M. Nandini	17	05	05	27
13	21C31A6637	MOHAMMED ABDUL RAHAMAN	168837	Rahaman	18	05	05	28
14	21C31A6638	MOHAMMED RAJJU	168811		12	04	04	20
15	21C31A6639	MOHAMMED SAMEER	168845	Sameer	11	05	04	20
16	21C31A6640	MOHAMMED YAKUB FARAZ KHAN	168846		11	04	04	19
17	21C31A6641	MUNIGALA POORNACHANDER	168823		11	05	04	20
18	21C31A6642	MUNIGANTI AKHIL	168807		16	04	04	24
19	21C31A6643	NALLA ADITHYA	168832	N. Adithya	17	05	05	27
20	21C31A6644	NALLA LAXMI PRASANNA	168812	N. Laxmi Prasanna	18	05	05	28
21	21C31A6645	NARUGULA RAKESH	168826	N. Rakesh	17	05	05	27
22	21C31A6646	NAVEEN ADEPU	168824		10	05	04	19
23	21C31A6647	NUNAVATH BALARAJU	168825	Balaraju	07	00	05	12
24	21C31A6648	PARUNANDHI PAVAN WESLY	168850	P. Pavan Wesly	06	05	05	16

Note: Invigilator have to mark 'Absent' in case the student is absent for the examination

Total Regd.: 24 | Total Present: 24 | Total Absent: Nil

Sign. of Invigilator | Sign. of Subject Teacher | Sign. of the HOD | Dean (Academics) | Principal



BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE

BITS AUTONOMOUS

Laknepally, Narsampet (M), Warangal Rural Dist. 506 331

307D

Name of the Exam: IV-Year B.Tech. I- Semester II-MID Examinations , December-2024

CSE(AI&ML), CSM | ATTENDANCE & AWARD SHEET | Date: 16/12/24

Name of the Subject: NNDL

Name of the Subject Teacher : A. Raju

	H.T. No.	Name of the student	Booklet Sl.No	Signature	MID (20M)	Unit Test (05M)	Assesment (05M)	Total (30M)
1	21C31A6649	PILLALAMARRI SUDHEER	177189	P.Sudheer	18	05	05	28
2	21C31A6650	PILLI HARSHASRI	177162	Harshasri	18	04	04	26
3	21C31A6651	PITTA ARAVIND	177186	Aravind	16	05	04	25
4	21C31A6652	SABBANI RAKSHITHA	177190	Rakshitha	17	05	05	27
5	21C31A6653	SHAIK SALMAN	177193	Salman	15	05	04	24
6	21C31A6654	SHANIGARAPU JHANSY	177200	Jhansy	17	05	04	26
7	21C31A6655	SILUVERU PRINCE	177197	Prince	15	04	04	23
8	21C31A6656	SINGARAPU SRAVANI	177169	Sravani	17	05	05	27
9	21C31A6657	SRIRAMULA SRILEKHA	177167	Srilekha	14	05	04	23
10	21C31A6658	TAKKALLAPALLY KANISHKA	177168	Kanishka	14	05	05	24
11	21C31A6659	THADAKA SRI POOJA	177164	Pooja	17	05	05	27
12	21C31A6660	THATIKONDA NARESH	177175	Naresh	16	05	05	26
13	21C31A6661	VALLAKATLA TEJA	177183	V.Teja	17	05	05	27
14	21C31A6662	VELPURI NIHARIKA	177199	Niharika	15	04	04	23
15	21C31A6663	YARRAM SAI DATH	177196	~~Sai~~	15	04	04	23
16	22C35A6601	AKULA ROHITH	177192	A. Rohith	15	05	04	24
17	22C35A6602	CHINDAM SHIVA KUMAR	177191	ch.Shivakumar	15	05	04	24
18	22C35A6603	GADE SUSHMA SRI	←	AB →			00	00
19	22C35A6604	MOHAMMAD AVEZ	177197	Avez	15	04	04	23
20	22C35A6605	ODDEPALLI MADHUKAR	177198	~~Madhukar~~	14	04	04	22
21	22C35A6606	RAVIRAKULA SANDEEP	177195	R.Sandeep	13	05	05	23

Note: Invigilator have to mark 'Absent' in case the student is absent for the examination

Total Regd.: 21 | Total Present: 20 | Total Absent: 01

Sign. of Invigilator | Sign. of Subject Teacher | Sign. of the HOD | Dean (Academics) | Princi

23 Result analysis for internal exams (tests) with respect toCOs-POs.

Q.No.	Answer any two questions.	Marks	Level of Bloom Taxonomy	CO
1	Write about important terminologies in Neural Networks?	5	Understand	CO1
2	Discuss about Fixed Weight Competitive Nets with examples?	5	Understand	CO1
3	What is mean by deep learning? Write about Historical Trends in Deep learning?	5	Understand	CO2

Sl. No.	H.T. No	Marks Awarded			Part - B (Theory)	Part - A (Quiz)	Part - A + B	Unit Test - 1	Assessment	Grand Total
		Q1.	Q2.	Q3						
1	21C31A6601	5		5	10	10	**20**	5	**4**	**29**
2	21C31A6602	5		4	9	10	**19**	5	**4**	**28**
3	21C31A6603	5		5	10	10	**20**	5	**4**	**29**
4	21C31A6604	5	5	5	10	9	**19**	5	**5**	**29**
5	21C31A6605	5		5	10	10	**20**	5	**4**	**29**
6	21C31A6606	3		5	8	10	**18**	5	**4**	**27**
7	21C31A6607	5		5	10	9	**19**	5	**4**	**28**
8	21C31A6608	4		4	8	9	**17**	5	**4**	**26**
9	21C31A6609	5		5	10	10	**20**	5	**4**	**29**
10	21C31A6610	4		4	8	10	**18**	5	**4**	**27**
11	21C31A6611	4		2	6	10	**16**	5	**3**	**24**
12	21C31A6612	5		5	10	10	**20**	5	**4**	**29**
13	21C31A6613	4		3	7	9	**16**	5	**3**	**24**
14	21C31A6614			4	4	10	**14**	5	**4**	**23**
15	21C31A6615	4		4	**8**	**9**	**17**	5	**3**	**25**
16	21C31A6616	1		1	2	9	**11**	5	**4**	**20**
17	21C31A6617	5		5	10	10	**20**	5	**4**	**29**
18	21C31A6618	5		4	9	9	18	5	**4**	**27**
19	21C31A6619	3	4	4	**8**	**9**	**17**	5	**4**	**26**

20	21C31A6620	2			2	10	**12**	5	**4**	**21**
21	21C31A6621	ABSENT						5	**3**	**8**
22	21C31A6622	2			2	10	**12**	5	**4**	**21**
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24	21C31A6624	5		5	10	10	**20**	5	**4**	**29**
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30	21C31A6630	4		4	**8**	**9**	**17**	5	4	**26**
31	21C31A6631	5		5	10	10	**20**	5	4	**29**
32	21C31A6632	1		4	5	9	**14**	5	3	**22**
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38	21C31A6638	2	2		4	10	**14**	5	4	**23**
39	21C31A6639	4		2	6	9	**15**	5	4	**24**
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42	21C31A6642	3		3	6	10	**16**	5	3	**23**
43	21C31A6643	4		5	9	9	**18**	5	4	**27**
44	21C31A6644	5		4	9	10	**19**	5	4	**28**
45	21C31A6645	2		4	6	9	**15**	5	4	**24**
46	21C31A6646			4	4	8	**12**	5	3	**20**
47	21C31A6647	3	3		6	9	**15**	5	4	**24**
48	21C31A6648	1		2	3	9	**12**	5	4	**16**
49	21C31A6649	5		5	10	10	**20**	5	**4**	**29**
50	21C31A6650	5		5	10	10	**20**	5	**4**	**29**
51	21C31A6651	2		3	5	9	**14**	5	**4**	**23**
52	21C31A6652	5		5	10	10	20	5	**5**	**30**
53	21C31A6653	2		3	5	10	**14**	5	**4**	**24**
54	21C31A6654	4		5	9	10	**19**	5	**4**	**28**
55	21C31A6655	4		4	8	10	**18**	5	**3**	**21**
56	21C31A6656	5		5	10	10	**20**	5	**4**	**29**
57	21C31A6657	4		3	7	10	**17**	5	**4**	**26**
58	21C31A6658	5		4	9	10	**19**	5	**4**	**28**
59	21C31A6659	5		4	9	9	**18**	5	**4**	**27**
60	21C31A6660	5		5	10	9	**19**	5	**4**	**28**
61	21C31A6661	5	4		9	10	**19**	5	4	28
62	21C31A6662	5		4	9	10	**19**	5	**5**	**24**
63	21C31A6663	5		4	9	10	**19**	5	**4**	**23**
64	22C35A6601	4		4	8	10	**18**	5	**4**	**27**
65	22C35A6602	3		3	6	10	16	5	**3**	**24**
66	22C35A6603	ABSENT						0	**0**	**0**
67	22C35A6604	5		4	9	10	19	5	**4**	**28**
68	22C35A6605	3		3	8	10	18	5	**3**	**24**

69	22C35A6606	2		3	5	10	15	5	**4**	**24**

25CO and PO attainment sheet

ASSES 'ENT OF COs FOR THE COURSE

COs	Method	value	CO Attainment	Assignments	CO Attainment (Internal - Theory)	CO Attainment (End Exam)	Overall CO Attainment
CO1	M1 Q1	3.0	3.0	3.0	3.0	3.00	3.00
	M1 Q5	3.0					
CO2	M1 Q2	3.0	3.0				
	M1 Q6	3.0					
CO3	M1 Q3	3.0	3.0				
	M1 Q7	3.0					
	M2 Q1	3.0					
	M2 Q4	3.0					
CO4	M2 Q2	3.0	3.0				
	M2 Q5	3.0					
CO5	M2 Q3	3.0	3.0				
	M2 Q6	3.0					

26.References, Journals, websites and E-links if any

Websites and e-Learning Resources:

1. **Coursera - Deep Learning Specialization by Andrew Ng**
   - One of the most popular online learning series for deep learning, covering neural networks, CNNs, RNNs, and much more.
   - Deep Learning Specialization on Coursera
2. **Stanford University's Deep Learning Course (CS231n)**
   - A comprehensive online course from Stanford University focused on Convolutional Neural Networks (CNNs), backpropagation, and other deep learning techniques.
   - CS231n - Stanford
3. **DeepLearning.AI**
   - Offers various courses that focus on deep learning and related topics, such as TensorFlow, neural networks, and AI techniques.
   - DeepLearning.AI Website
4. **Fast.ai**
   - A popular and practical deep learning course that provides tools and techniques to build state-of-the-art neural networks.
   - Fast.ai Website
5. **Towards Data Science**
   - A popular platform that provides accessible and informative articles on deep learning, neural networks, and machine learning.
   - Towards Data Science

Research Papers and Resources:

1. **arXiv.org (Artificial Intelligence section)**
   - arXiv is a repository of preprints where you can find the latest research papers in deep learning, neural networks, and related fields.
   - arXiv: Artificial Intelligence
2. **Google Scholar**
   - Google Scholar allows you to search for academic papers, theses, books, and patents across a wide range of disciplines, including deep learning and neural networks.
   - Google Scholar
3. **Papers with Code**
   - A website that connects research papers with code implementations, helping you replicate the results of deep learning papers.
   - Papers with Code
4. **Distill.pub**
   - A website offering in-depth, visually rich explanations of complex deep learning and machine learning concepts.
   - Distill.pub

Online Communities:

1. **Reddit - r/MachineLearning**
    - A popular subreddit for discussions, research, and tutorials related to machine learning and deep learning.
    - r/MachineLearning
2. **Stack Overflow (Machine Learning Section)**
    - A community where you can ask questions and find solutions related to deep learning programming and neural network implementations.
    - Stack Overflow
3. **Kaggle**
    - A platform for data science competitions where you can practice deep learning through real-world challenges.
    - Kaggle