



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Information Technology

Course / Subject Code : ME01000731

Subject Name: Deep Learning

WEF Academic Year:	2024-25
Semester:	1 st Semester
Category of the Course:	PEC

Prerequisite:	Basic Knowledge of Mathematics related to machine learning, Programming, Database management systems and image processing
Rationale:	This course helps the learners to explore deep learning from scratch or broaden their understanding of deep learning. It covers the conceptual and practical, hands-on exploration of topics in deep learning. The learners will be able to build practical intuition about the core ideas of machine learning and deep learning. After learning this course, the learners will have a solid understanding of what deep learning is, when it's applicable, and what its limitations are. They will be also become familiar with the standard workflow for approaching and solving machine-learning problems, and how to address commonly encountered issues.

Course Scheme:

Teaching Scheme			Total Credits	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Practical		
				ESE (E)	PA(M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Course Content:

Sr. No.	Course Content	No. of Hours	% of Weightage
1	Fundamentals of Machine Learning Four branches of machine learning, Evaluating machine-learning models, Data preprocessing, feature engineering, and feature learning, Overfitting and under fitting, The universal workflow of machine learning	6	20
2	Artificial Neural Networks and Deep Neural Networks	11	20



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	A first look at a neural network, Data representations for neural networks, the gears of neural networks: tensor operations, The engine of neural networks: gradient-based optimization, Anatomy of a neural network, Introduction to Keras, Setting up a deep-learning workstation, Classifying movie reviews: a binary classification example, Classifying newswires: a multiclass classification example, Predicting house prices: a regression example.		
3	Deep Learning for Computer Vision Introduction to convnets, The convolution operation, The max-pooling operation, training a convnet from scratch on a small dataset, the relevance of deep learning for small-data problems, Downloading the data, building your network, Data preprocessing, Using data augmentation, Using a pretrained convnet, Feature extraction, Fine-tuning, Visualizing what convnets learn, Visualizing intermediate activations, Visualizing convnet filters, Visualizing heatmaps of class activation	11	20
4	Deep Learning for Text and Sequences Working with text data, One-hot encoding of words and characters, Using word embeddings, Putting it all together: from raw text to word embeddings, Understanding recurrent neural networks, A recurrent layer in Keras, Understanding the LSTM and GRU layers, A concrete LSTM example in Keras, Advanced use of recurrent neural networks, A temperature-forecasting problem, Preparing the data, A common-sense, non-machine-learning baseline, A basic machine-learning approach, A first recurrent baseline, Using recurrent dropout to fight overfitting, Stacking recurrent layers, Using bidirectional RNNs	11	20
5	Recent Trends in Deep Learning Architectures, Residual Network, Skip Connection Network, Fully Connected CNN etc.	6	20
	Total	45	100

Reference Book:

1. Deep Learning- Ian Goodfellow, Yoshua Benjio, Aaron Courville, The MIT Press
2. Deep Learning with Python by Francois Chollet Manning Publications Co., Latest Edition
3. Pattern Classification by Richard O. Duda, Peter E. Hart, David G. Stork John Wiley & Sons Inc

Course Outcomes:

After Completion of the Course, Student will able to :



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No	Course Outcomes	RBT Level*
01	Understand the deep neural networks methodologies	
02	Apply the deep learning methods with parameter tuning on computer vision applications.	
03	Apply the deep learning methods with parameter tuning on text and sequences data.	
04	Analyze different deep learning methods in varying conditions of the applications.	
05	Evaluate the performance of different deep learning methods	

*RM: Remember, UN: Understand, AP: Apply, AN: Analyze, EL: Evaluate, CR: Create

Suggested Course Practical List:

At least 15 practical related to the course must be carried out during semester.

List of Laboratory/Learning Resources Required:

- Python
- Google COLAB
- ANACONDA and Jupiter notebook
- Python libraries for ANN and Deep Learning

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