SEMESTER – III

Course Code	UDS21301J	Course Name	INTRODUCTION TO DEEP LEARNING	Course Category	C	Professional Core Course	L	T	P	C
							4	0	2	5

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications		Data Book / Codes/Standards	Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning
CLR-1 :	Understand Deep Learning througly from academic and Industry perspective	
CLR-2 :	Give an exposure to working of neural networks, its architecture, components and related technologies	
CLR-3 :	Learn Deep world Real world applications across Industries	
CLR-4 :	Deeply understand the Deep Learning workflow, architecture and frameworks involved	
CLR-5 :	Get to know all the deep learning models involved in build deep learning applications	
CLR-6 :	Work on an end to end deep learning usecase	

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Program Learning Outcomes (PLO)														
					Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1 :	Get Hands-on Knowledge, Skills and Expertise to define deep learning from both the academic and industry perspective and all the related concepts.	2	85	80	H	H	H	H	H	H	M	H	H	H	M	H	L	H	H
CLO-2 :	Get a good understanding of all the real-world deep learning applications across different industry verticals	3	85	80	H	H	H	H	H	H	M	H	H	H	M	H	L	H	H
CLO-3 :	Solve the deep learning problems of classification, Regression, Image Detection, Image Recognition etc.	3	85	80	H	H	H	H	H	H	M	H	H	H	M	H	L	H	H
CLO-4 :	Understand all the data software, hardware requirements for building deep learning models	3	85	80	H	H	H	H	H	H	M	H	H	H	M	H	L	H	H
CLO-5 :	Adopt the best strategies for deep learning data collection, pre-processing and model engineering tasks	3	85	80	H	H	H	H	H	H	M	H	H	H	M	H	L	H	H
CLO-6 :	Get Hands-on Knowledge, Skills and Expertise on a real world usecase implementation	3	85	80	H	H	H	H	H	H	M	H	H	H	M	H	L	H	H

Note: All our curriculum, study materials, assignments, quizzes, lab works, and learning resources are personalized and dynamically generated using machine learning models based on the learner's learning ability. Users can review our learning curriculum only through our intelligent learning management platform (iLMSP), and our learning resources and lab infrastructures are available only in the digital form on our cloud infrastructures.

Duration (hour)		18	18	18	18	18
S-1	SLO-1	**Unit 1: Deep Learning Defined - Academic and Industry Perspective**	Adding Another input	Model Validation	Popular deep learning frameworks ✓ TensorFlow ✓ Keras ✓ PyTorch ✓ Apache MXnet ✓ Sonnet ✓ DL4J	Benefits
	SLO-2	What is Deep Learning?	Adding more layers	Model Test	**Unit 7: Deep Learning - Neural Networks an Overview**	Challenges
S-2	SLO-1	Deep Learning defined from Academic perspective	Advanced deep learning concepts	Model Outcome	Motivation for Neural Networks	High level decisions
	SLO-2	Deep Learning defined from Industry perspective	**Unit 3: Deep Learning in Real World Applications**	Model Accuracy	Biological Neural Networks	Choosing the hardware components (GPU, TPU)
S-3	SLO-1	Functions of a deep learning system	Deep learning in healthcare	Tune Hyperparameters	Artificial Neural Networks ✓ Neurons ✓ Connections and weights ✓ Propagation functions ✓ Learning rule	Building a Deep learning Hardware system
	SLO-2	What does a deep learning system do?	Deep learning in Retail	Deploy Model	Deep Neural Networks	Benefits
S-4	SLO-1	How a business uses deep learning	Deep learning in Energy	Monitor Predictions	Classification ✓ Classification Models ✓ Convolutional neural networks ✓ Long Short Term Memory ✓ Gated recurrent units	Challenges
	SLO-2	How deep learning works?	Deep learning in Oil & Gas	Manage your models	Regression ✓ Regression Models ✓ Artificial Neural Networks ✓ Deep Neural Networks	High level decisions

					✓ Machine Translation ✓ Language Translation	
S-5 & S-6	SLO-1 SLO-2	**Lab 1:** **Build a simple artificial Neural Networks with 1 layer, with 1 neuron, and the input shape equal to 1, feed some data, use the equaltion y=5x-3, so where x = -2, y=-4 and train the network**	**Lab 4:** **Build a network with at least 3 hidden layers that achieves better than 92% accuracy on validation and test data. You may need to train for more than 10 epochs to achieve this result**	**Lab 7:** **Build a network for classification using the built in MNIST dataset and Use the sigmoid activation function Use the categorical cross entropy loss function.**	**Lab 10:** **Build a Recommendation system using Deep Learning techniques**	**Lab 13:** **Using Generative Adversarial networks perform Image generation**
S-7	SLO-1	What are deep learning promises and challenges?	Deep learning in Automobile	**Unit 5: Deep Learning Architectures**	**Unit 9: Deep Learning Models**	Choosing the software components
	SLO-2	Deep Learning Architecture	**Unit 4: Deep Learning Workflow**	Components of a deep learning solution	Supervised Models ✓ Classic Neural Networks ✓ Convolutional Neural Networks ✓ Recurrent Neural Networks	Choosing the OS
S-8	SLO-1	Deep Learning Libraries	Steps in Deep learning in Implementation	Data Generation	Unsupervised Models ✓ Self – Organizing maps ✓ Boltzmann's Machines ✓ Autoencoders	Adding Packages
	SLO-2	Deep Learning Technologies	Data Collection	Data Collection	**Unit 10: Deep Learning Data Requirements**	**Unit 12: Deep Learning Hands On Lab Work - Build, Test and Deploy ML Models (Consumer 1)**
S-9	SLO-1	Deep Learning Implementation Framework	Public Datasets	Training	Data Collection strategy for ML	Customer Churn
	SLO-2	**Unit 2: Demystifying Artificial Intelligence and Deep Learning**	Existing Databases	Evaluation	How much data is needed	Who is going to churn?
S-10	SLO-1	The core of deep learning: ANN	Web Scraping	Task Orchestration	Is your data good enough?	When the churn will occur
	SLO-2	Role of deep neural networks	Crowd source labelling	Prediction	Data Structure	Why(reason) is the churn occurring

S-11 & S-12	SLO-1 SLO-2	**Lab 2:** **Using Tensorflow Build a network with a single hidden layer and at least 300,000 trainable parameters**	**Lab 5:** **Build a network for classification using the built in MNIST dataset**	Lab 8: **Working Data Collection, Evaluation**	Lab 11:**Working on Deep Learning Data Structures**	Lab 14: **Deep Learning Hands On Lab Work - Build, Test and Deploy ML Models**
S-13	SLO-1	Deep learning and machine learning	Data Preparation	Infrastructure	Data Format	Problem statement
	SLO-2	Deep learning vs Data Science	Cleaning Data	Authentication	Data Type	Problem type
S-14	SLO-1	Linear Transformation	Feature Scaling	Interaction	Source System	Data engineering
	SLO-2	Teaching artificial neurons unknown functions	Handling categorical data & text	Monitoring	Target system	Data pipeline
S-15	SLO-1	Error measurement in neural networks	Model Engineering	Building your deep learning Architecture	Training Data	Model selection
	SLO-2	Gradient descent	Test Train Split	**Unit 6: Deep Learning Implementation Framework**	Validation Data	Model engineering
S-16	SLO-1	Loss functions	Handling Imbalanced Data	What is a deep learning framework?	Test Data	Model outcome, analysis, and optimization
	SLO-2	Learning rates	Model Training	Features of a good deep learning framework	Building a Deep learning Hardware system	Model pipeline, Data Visuzlization and User Interface
S-17 & S-18	SLO-1 SLO-2	**Lab 3:** **3.Using Tensorflow build 3 networks, each with at least 10 hidden layers such that:** o The first model has fewer than 10 nodes per layer. o The second model has between 10-50 nodes per layer. o The third model has between 50-100 nodes per layer.	**Lab 6:** **Build a network for classification using the built in MNIST dataset and Use the sigmoid activation function**	**Lab 9:** **Conduct an expermient on Object detection using Convolution Neural Network**	**Lab 12:** **Use Recurrent Neural network to Perform Sentiment Analysis**	**Lab 15:** **Implemeent Transfer learning to retrain models that have been trained on the ImageNet dataset in order to perform classification on the CIFAR dataset.**

Learning Resources	1. https://deepsphereai.litmos.com/ 2. Deep Learning from Scratch, by Seth Weidman, Released September 2019, Publisher(s): O'Reilly Media, Inc.	3. Introduction to Deep Learning, Book by Eugene Charniak Deep Learning: A Practical Approach, PB Paperback – 1 January 2018 by Rajiv Chopra

Learning Assessment											
	Bloom's Level of Thinking	**Continuous Learning Assessment (50% weightage)**								**Final Examination (50% weightage)**	
		CLA – 1 (10%)		**CLA – 2 (10%)**		**CLA – 3 (20%)**		**CLA – 4 (10%) #**			
		Theory	**Practice**	**Theory**	**Practice**	**Theory**	**Practice**	**Theory**	**Practice**	**Theory**	**Practice**
Level 1	Remember	20%	15%	20%	15%	20%	15%	20%	15%	20%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	15%	10%	15%	10%	15%	10%	15%	10%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	**Experts from Higher Technical Institutions**	**Internal Experts**
Mr.Jothi, Periyasamy , Chief AI Architect DeepSphere.AI, CA, USA	Dr.S.Gopinathan, Associate Professor, University of Madras, Chennai	Dr.S.Albert Antony Raj, SRMIST
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