Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015 'B' Grade (CGPA 2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: Information Technology

Final Year B.Tech with Honors

(Syllabus to be implemented from w.e.f. June- 2023-24)

UNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Structure of Final Year B. Tech. Information Technology
Honors in Artificial Intelligence and Machine Learning
(W.E.F. 2023-2024)
Semester- VII

Course Code	Theory Course Name	Engagement Hours			Credits	FA	SA		
		L	T	P		ESE	ISE	ICA	Total
HN716	Deep Learning	3	--	--	3	70	30		100
	Laboratory:					**OE**			
HN716	Deep Learning	--	--	2	1	--	--	25	25
HN715	Mini Project	--	--	4	2	50	--	50	100
	Grand Total	**3**		**6**	**6**	**110**	**40**	**75**	**225**

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Final Year B.Tech. (Information Technology)

Honors Degree: Artificial Intelligence & Machine Learning

SEMESTER –I

HN716: DEEP LEARNING

Teaching Scheme :	**Examination Scheme :**
Lectures: 3 Hours/Week,3credits	ESE - 70 Marks
Practical: 2 Hour/Week,1credit	ISE - 30 Marks
	ICA - 25 Marks

COURSE OUTCOMES:

At the end of this course, students will be able to

1. Thoroughly understand the fundamentals of Deep Learning.
2. Get familiar with the various Deep Learning techniques currently being used.
3. Design a deep neural network for a given task.
4. Configure deep learning algorithms and learn how to train deep networks.
5. Use various frameworks required for creating neural networks along with their functionalities

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SECTION– I

Unit 1:Neural Network and Deep Learning (7)

Introduction to AI, ML and Deep Learning, Machine Learning basics, Learning algorithms – Supervised and Unsupervised Training, A brief history, Need of Deep Learning, Basics of neural network, Biological Neuron vs. Artificial Neuron, Linear Neurons and their Limitations, Perceptron, Multilayer perceptron, The first example of network with Keras code, Back propagation.

Unit 2:Deep Neural Network Design and Training (7)

Introduction to Simple DNN, Deep Feed Forward Networks , Learning XOR problem, Gradient-Based Learning, Various Activation Functions, Tanh,ReLU, Sigmoid – Loss Functions, Regularization methods for Deep Learning, Early Stopping, Drop Out, Difficulty of training deep neural networks

Unit 3:Tools and Techniques for DNN (8)

What Is Tensor Flow? Introduction, Downloading and installation of Tensor flow, thetensor flow computation graph, Benefits of tensor flow, Keras: introduction, use of keras,installation of keras, creating a Keras Model, PyTorch, Batch normalization,Vanishing Gradient,Exploding Gradient, Hyperparameters tuning for DNN, Deep Learning application with Keras: Diabetes patient classification.

SECTION– II

Unit 4: Convolution Neural Networks (CNN) (6)

Introduction, Convolution Operation, Motivation, Pooling, Normalization, Applications in Computer Vision – ImageNet, Sequence Modeling –VGGNet, Darknet.

Unit 5: Recurrent Neural Networks (RNN) (6)

Sequential data and problems, RNN topologies- Difficulty in Training RNN, Long Short Term Memory, Bidirectional LSTMs, Bidirectional RNNs, Application case study -Handwritten digits recognition using deep learning.

Unit 6 : Basics of Auto encoders and Transfer learning (6)

Auto encoders, Components, Uses of Auto encoders, formulations of auto encoders, training auto encoders, types of auto encoders, transfer learning.

Internal Continuous Assessment (ICA):

Minimum 8 to 10 assignments based on following list requiring students to design, implement and validate deep learning-based machine Learning models using openly available deep learning libraries or any other machine learning toolkits. The assignment's objective should align with course's outcomes and focus on higher order bloom's cognitive levels.

1. Create a deep learning model with MNIST dataset to predict the handwritten digits.
2. Build a CNN classification model for Flower classification using Tensorflow Keras.
3. Build a CNN classification for multi-class classification using CIFAR100 dataset. Dataset is inbuilt in TensorFlow Keras:tf.keras.datasets.cifar100.load_data().
4. Build a deep learning model for multi-class classification using Fashion-MNIST, dataset of fashion articles with 10 classes and each image is 28*28 pixel.
5. You are given a news aggregator dataset which contains news headlines, URLs, and categories for 422.937 news stories collected by a web aggregator. These news articles must be categorized into business, science and technology, entertainment, and health.
   Objective: Perform multiclass classification using LSTM.
   Note: Use uci-news-aggregator.csv for the above task.
6. Use of LSTM for sentimental analysis in keras: The motive of your company behind building a sentiment analyzer is to determine employee concerns and to develop programs to help improve the likelihood of employees remaining in their jobs.
   Objective: Use LSTM to perform sentiment analysis in Keras.
   Note: Use the inbuilt dataset imdb from sklearn. datasets for this task.
7. Build an autoencoder model to regenerate the objects of the given MNIST dataset.
   Objective: Regenerate the objects of MNIST dataset using autoencoder model.
8. Implementation of transfer learning
9. Build the deep learning model for diabetes disease prediction Use the dataset from: https://www.kaggle.com/uciml/pima-indians-diabetes-database
10. Hyperparameter tunning using grid search technique for improving performance of deep learning model.

Textbooks:

1. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press.
2. Machine Learning A Probabilistic Perspective by Kevin P. Murphy, MIT Press.
3. Deep Learning Methods and Applications by Li Deng and Dong Yu, NOW Publishers.
4. Keras: The Python deep learning API https://keras.io/ (eResource)

Reference Books:

1. Deep Learning by Rajiv Chopra, 2nd edition, Khanna Publishing.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Final Year B.Tech. (Information Technology)

Honors Degree: Artificial Intelligence & Machine Learning

SEMESTER –I

HN715 –Mini Project

Teaching Scheme:
Practical- 4 Hours / week, 2 Credits

Examination Scheme :
ESE- 50 Marks
ICA- 50 Marks

The mini project in Artificial Intelligence and Machine Learning is designed to provide students with practical experience in applying Artificial Intelligence and Machine Learning techniques and tools to solve real-world problems. Students will work in teams to select a project area, identify relevant data sources, and develop and implement model. The work will cover topics such as statistical analysis, Artificial Intelligence, and machine learning. Students will also develop communication and project management skills through regular presentations and team meetings.

Course Prerequisite: The student shall have undergone a course on Computational Statistics, Artificial Intelligence, and Machine Learning. Also, students must be familiar with python programming and its libraries.

Course Objectives:

1. To enable students to gain hands-on experience in designing and implementing a solution using large data sets, also undergoing various steps.
2. To enhance students' skills in testing and debugging a project to ensure it meets the desired specifications.
3. To prepare students for future Artificial and Machine Learning based projects, where they will need to manage a large amount of data, communicate results effectively, and implement a project to meet specific goals.
4. To promote critical thinking, problem-solving, and creativity in the context of a practical in AI & ML related projects.

Course Outcomes:

After completing this course, a student shall be able to –

1. Define and analyze a real-world problem in Artificial Intelligence and Machine Learning.
2. Apply appropriate statistical and machine learning techniques to develop a model that solves the problem.
3. Evaluate the performance of the model and identify potential improvements.
4. Communicate the findings and results effectively through written reports and oral presentations.
5. Collaborate effectively with team members and manage project timelines and milestones.

Project Guidelines:

- Students are expected to Identify and define a real-world problem in Artificial Intelligence and Machine Learning, with the help of an allocated guide/supervisor.
- Select appropriate data sources and collect relevant data. One can use online sources such Kaggle, UCI, NSE or offline sources such as Educational Institute, University, Business etc.
- Apply appropriate statistical and machine learning techniques to develop a model that solves the problem.
- Evaluate the performance of the model and identify potential improvements. Communicate the

findings and results effectively through written reports and oral presentations.

- Students should collaborate effectively with team members and manage project timelines and milestones.

Project Area:

The project area can be chosen from various domains such as education, healthcare, finance, retail, social media, etc.

ICA Assessment Guidelines:

A group of 3 students shall be formed in the first week of semester and supervisor will be allocated. Students shall meet for minimum 4 hours in every week and carry out the steps given in the project guidelines.

ESE Assessment Guidelines:

Supervisors and a team of evaluators will assess the project work and give appropriate weightage for various stages of the project life cycle such as – Concept/Idea, Data Source and Collection, Visualization technique applied, Algorithm used for model building, Presentation skills and result reporting.