Deep Learning (Python Level 3)

Lesson	Mini-Topic	Time	Depth
1	Overview of deep learning Historical developments in deep learning **Mini Project : Research and present a historical development in deep learning** **Assessment : Write a brief summary on the development of deep learning**	**1-hour for all topics**	Go over the topics to give a brief idea about the topics, to ensure student attentiveness
2-3	Introduction to AI and ML Neural networks and deep learning **Mini Project : Create a simple neural network to classify handwritten digits from the MNIST dataset** **Assessment : Modify the neural network to improve its accuracy**	**30 mins. 1 hour 30mins from neural networks**	Spend 30 mins on general concepts like introduction to AI and Ml before spending the rest of the 1 hour 30 mins over the next session giving a general idea about the implementation of Fully connected neural nets.
4-5	What is Computer vision? What is Natural language processing What is Speech recognition **Mini-Project (CW): Build a convolutional neural network to recognize facial expressions from images** **Assessment (HW) : Evaluate the performance of the model and propose improvements.**	**30 mins - on NLP and Speech Recognition, 1 hour 30 mins on Computer Vision**	Brief idea about NLP and speech recognition, Brief idea about the process of computer vision and detailed implementation.
6	Artificial neurons and activation functions (Brief Idea) Feedforward neural networks	**1 hour for both**	General idea and implementation of the topics
7-8	Convolutional neural networks	**30 mins for Convolution**	Detailed implementation of CNN

		procedure, 1 hour 30 mins of creation of CNN	
9	Recurrent neural networks	**1 hour**	Implementation of recurrent neural networks
10	**Mini Project : Implement a feedforward neural network to predict the price of a house based on its features** **Assessment : Analyze the results and discuss the limitations of the model**	**1 hour**	Detailed implementation of neural networks to predict the price of the house.
12	Gradient descent Backpropagation	**1 hour**	Brief theory and implementation.
13	Stochastic gradient descent Adam optimizer	**1 hour**	Brief theory and implementation.
14	**Mini Project : Implement stochastic gradient descent to train a neural network for image classification on the CIFAR-10 dataset** **Assessment : Evaluate the performance of the model and compare it with other optimization techniques**	**1 hour**	Detailed implementation
15	Dropout Batch normalization **Mini Project : Implement dropout and batch normalization in a neural network for sentiment analysis** **Assessment : Evaluate the impact of regularization on the model's performance**	**1 hour**	Brief idea of dropout and batch normalisation and detailed implementation in projects.
16	Introduction to image classification Building a deep learning model for image classification **Mini Project : Build a deep learning model to classify different types of food**	**1 hour**	General idea of how classification works and detailed implementation of a cnn for a

	Assessment : Test the model on real-world images and evaluate its performance		classification problem
17	Object detection using YOLO	**1 hour**	General idea
18	Instance segmentation using Mask R-CNN	**1 hour**	General idea
19	**Mini Project : Implement Mask R-CNN to detect and segment different objects in an image** **Assessment : Evaluate the results and propose improvements**	**1 hour**	Implementation and executing the knowledge learnt above
20	Introduction to transfer learning	**1 hour**	Introduction to the concept and the different existing models.
21	Fine-tuning pre-trained models	**1 hour**	Fine tuning the model to serve a different purpose on a custom dataset
22	**Mini Project : Fine-tune a pre-trained model on the ImageNet dataset for a new classification task** **Assessment : Compare the performance of the fine-tuned model with a model trained from scratch**	**1 hour**	Implementation of transfer learning using the projects.
23	MNIST CIFAR-10	**1 hour**	Creation of dataset class and intro to the datasets
24	Introduction to text classification	**1 hour**	How does text classification works?
25	Building a deep learning model for text classification	**1 hour**	Creation of the model from scratch.
26	**Mini Project : Build a deep learning model to classify news articles into different categories** **Assessment : Test the model on real-world news articles and evaluate its performance**	**1 hour**	Creation of the model from scratch.

27	Introduction to sentiment analysis Building a deep learning model for sentiment analysis	**1 hour**	Brief idea of how sentiment analysis Detailed implementation of Neural Networks for sentiment analysis.
28	**Mini Project : Build a deep learning model to predict the sentiment of a movie review** **Assessment : Evaluate the performance of the model and compare it with other sentiment analysis techniques**	**1 hour**	Implementation of sentiment analysis in a real world scenario
29-30	Introduction to language generation Building a deep learning model for language generation **Mini Project : Build a deep learning model to generate captions for images** **Assessment : Evaluate the quality of the generated captions and propose improvements**	**2 hours**	1 hour - brief idea of language generation and its implementation 1 hour - practicing it in projects to enforce the knowledge.
31	IMDB Reviews Reuters News	**1 hour**	Dataset class creation and introduction to different datasets
32	Overview of healthcare and medicine tasks **Mini Project : Research and present a deep learning application in healthcare or medicine** **Assessment : Write a brief summary on the potential benefits and limitations of deep learning in healthcare**	**1 hour**	Idea about the applications of AI in the medical field.
33-34	Medical image analysis using CNNs Disease diagnosis using machine learning **Mini Project : Build a convolutional neural network to classify different types of skin lesions** **Assessment : Evaluate the performance of the**	**2 hours**	Convolutions of medical images brief idea and implementation of a disease detection program from

	model and discuss the challenges of applying deep learning in medical image analysis		scratch
35-36	Chest X-Ray Images MIMIC **Mini Project : Build a deep learning model to predict the risk of heart disease based on medical data** **Assessment : Evaluate the performance of the model and discuss the ethical implications of using deep learning in healthcare**	**2 hours**	Intro to medical datasets, creationof dataset class for medical datasets, implementatio n of Neural Networks for medical datasets.
37	Develop and implement a deep learning project Project presentation Project documentation Peer evaluation Final evaluation and feedback	**1 hour**	Creation of a Final Project incorporating everything that has been taught.
38	**Mini Project : Develop and implement a deep learning project on a topic of your choice** **Assessment : Present the project and discuss the design decisions and challenges faced**	**1 hour**	Project and Assessments