Machine Learning and Deep learning

Session No.	Module Name	Layman Understanding about the module	Technical Content which will be	Practical Session which will be covered
1	Introduction	Basics of machine learning	- Definition - Popular use cases - Data: labeled and unlabeled - Supervised and Unsupervised learning - Reinforcement learning	
2	Model creation in machine learning	How to start building a machine learning model	- Train test split - Data preprocessing - Dealing with missing values - Outliers and data cleaning	- Loading data using pandas - isna(), fillna() functions, preprocessing using pandas
3	Regression	Predicting continuous data values	- Linear Regression - Cost Function - Gradient Descent - Learning Rate - Polynomial Regression - Multivariate Regression, Ridge, Lasso	- Implementation of gradient descent using numpy, user defined functions - Implementation of gradient descent using sklearn
4	Classification/Logistic regression	Predicting discrete values/classifying data into categories	- Logistic Regression - Updated Cost Function - Gradient Descent for logistic regression - Effect of learning rate -	- Implementation of logistic regression using user defined functions - Implementation of logistic regression using sklearn - Analyzing effect on output by changing learning rate
5	ML algorithms (supervised)	Different ML algorithms that can be used to solve a problem	- kNN - SVMs - Decision Trees - Random Forest - Naive Bayes	- Implementing all algorithms using sklearn on same dataset and analyzing their performance
6	Unsupervised learning - Clustering	Basic algorithms for clustering	- KMeans - Hierarchical Clustering - Difference between clustering and classification	Implementing kmeans on a toy dataset
7	Introduction to deep learning	Artificial Neural Networks and their working	- Neural networks - neurons, layers - Forward pass - Activation Functions - Sigmoid, tanh, ReLU, LeakyReLU, Softmax - Backpropagation	Programming a neural network without libraries or predefined functions and then with tensorflow 2.0 on MNIST dataset
8	Maths of neural networks and optimizers	w is error reduced in neural networks and how are they traine	Optimizers - Adam - Adamax - SGD - Adadelta Error functions - Cross entropy - categorical, binary	

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9	Layers in Neural Networks	Different layers in neural networks.	Session name - To avoid overfitting: Dropout - Fully connected layer Freezing a neural network and saving weights - Restoring weights.	Making a neural network with and without dropout and comparing performance
10	Convolutional Neural Networks	Using deep learning to classify images	- Convolution operation - Filters - Vertical and Horizontal edge detector, Gaussian filter - Combining filters for complex features - Layers: Conv, Pooling (MaxPool	Making a CNN for MNIST, fashion MNIST and CIFAR-10 datasets
11	Transfer learning and Data augmentation	What to do when you don't have enough training data.	- Data augmentation (Different ways) - Using pretrained model to classify images - Popular architectures: LeNet, AlexNet, GoogleNet/Inception, VGG, ResNet	- Cat and dog classifier usign transfer learning and data augmentation
12	RNNs	Neural Networks with memory to deal with data in series	- RNNs - Vanishing Gradients - LSTMs - GRUs	Using RNNs for stock price prediction
13	Advanced RNNs	RNNs for complex problems	- Bidirectional RNNs - Attention model - RNNs for NLP	Text Summarixzation using attention model
14	Generative Adversarial Networks	Using neural networks to generate data	- Autoregressive models - Variational Autoencoders - GANs - DCGN, StyleGAN	Fake face generator using GANs
15	Introduction to Reinforcement Learning	The third domain of machine learning: reinforcement learning	- Introduction - Use cases - Reward Policy	