National Institute of Electronics and Information Technology
राष्ट्रीय इलेक्ट्रॉनिकी एवं सूचना प्रौद्योगिकी संस्थान

NIELIT KOLKATA

Certificate Course in Machine Learning and Deep Learning

ADMISSION OPEN

Objective of the Course:

To enrich the participants in the area of AI, Machine learning, Deep learning, Computer Vision and Natural Language Processing.

Learning Outcomes:

The course focuses at helping the participants gain expertise and knowledge in the field of Machine learning, Deep Learning, Computer Vision and Natural Language Processing. The participants will get to learn several open-source tools and hands on experience with python programming and python libraries in Data Science. Also, they will get an opportunity to work on real life Industry Level Projects in Data Science.

Course Syllabus:

APPLY NOW LIMITED SEATS

Day	Topics Name	Theory (Hrs)	Practical (Hrs)
	DAY WISE TRAINING PROGRAM		
1	**Basic Introduction to AI:** • Need of AI • Turing Test • Mini max algorithm	1	–
2	**Introduction to basic Python programming**	1	3
3	**Introduction to python libraries for data handling and preprocessing :** • NumPy • Pandas • sciPy • SKlearn	–	5
4	**Introduction to Statistical concepts**	4	
	Data preprocessing techniques	1	3
6	**Feature engineering**	2	2
7	**Introduction to Data Visualization (EDA)**	1	2
8	**Introduction to various data visualization libraries :** • Matplotlib • Seaborn	1	3
9	**Supervised Learning (Regression/Classification) :** •Basic methods: Distance-based methods, Nearest-Neighbors, Decision Trees, Naive Bayes •Linear models: Linear Regression, Logistic Regression, Generalized Linear Models, Polynomial regression • Support Vector Machines, Nonlinearity and Kernel Methods •Beyond Binary Classification: Multi-class/Structured Outputs, Ranking	10	10
10	**Unsupervised Learning:** • Clustering: K-means/Kernel K-means • Dimensionality Reduction: PCA and kernel PCA, ICA • Matrix Factorization and Matrix Completion • Introduction to Generative Models (mixture models and latent factor models)	7	5
11	**Evaluating Machine Learning algorithms and Model Selection:** • Confusion matrix • Accuracy • Precision • F1 score	2	2
12	**Introduction to Statistical Learning Theory**	2	–
13	Ensemble Methods: • Boosting • Bagging • Random Forests	2	3
14	**Recent trends in various learning techniques of machine learning and classification methods:** • XGboost • Gradient boost • Adaboost	3	2
15	**Introduction to deep learning:** • Various paradigms of learning problems • Perspectives and Issues in deep learning framework • Review of fundamental learning techniques • Introduction to the concept of neurons	5	–
16	**Introduction to activation functions :** • Linear activation function • Sigmoid activation function • Hyperbolic tangent activation function • Rectified linear unit (ReLU) • Leaky ReLU • Parametric ReLU • Softmax Activation function	2	3

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NIELIT KOLKATA — रा. इ. सू. प्री. सं

Day	Topics Name	Theory (Hrs)	Practical (Hrs)
	DAY WISE TRAINING PROGRAM		
17	**Feed forward neural network:** • Artificial Neural Network (ANN) • Multi-layer neural network • Cardinality • Operations • Properties of fuzzy relations.	3	1

18	**Training Neural Network:**
	• **Risk minimization**
	• **Loss function**
	    o Mean squared loss/quadratic loss
	    o Root mean squared loss function
	    o Cross entropy /log loss
	    o Hinge loss
	    o Mean absolute loss/L1 loss
	    o Log-cosh loss
	    o Huber loss
	• **Back propagation : mathematical derivation in ANN**
	• **Regularization:**
	    o lasso regularization
	    o ridge regularization
	    o dropout
	    o elastic net
	• **Model selection**
	• **Optimization.**
		6	6

19	**Conditional Random Fields:** • Linear chain, partition function • Markov network • Belief propagation • Training CRFs • Hidden Markov Model • Entropy.	2	–
20	**Deep Feed Forward network, regularizations, training deep models, dropouts**	–	2
21	**Convolutional neural network (CNN)** • Architecture • Layers • Mathematical model	4	2
22	**Recurrent Neural Network (RNN)** • Architecture • Layers • Mathematical model	4	2
23	**Object recognition, sparse coding, optical character recognition**	1	4
24	**Computer vision:** • Introduction to object detection • Image pre-processing	2	3
25	**Natural language processing:** • Vectorization • Tokenization • Bag of words • Word2vec	2	3
26	**Brief introduction to state-of-the-art model for computer vision:** • Residual Net • AlexNet • U net • Inception net v3 • efficient net • YOLO	10	15
27	**Introduction to NLP state of the art models:** • Transformers • BERT • GPT • Llama2	2	–
28	**Project Work 1**		20
29	**Project Work 2**		20

Eligibility: 10+2

Duration (in hours): 200Hrs (10 am – 1 pm, Monday to Friday)

Course Start Date: 15th April 2024,
Last Date for Admission: 12th April 2024

Course Fee: INR 15000/- + GST

CONTACT US

Course Co-ordinator: Shri Bhaskar Banerjee, Scientist-D
Phone No. : 9073304896 / 033-2414-6054/6081

Address: Unit-I :
NIELIT- Jadavpur University Campus, Kolkata - 700032
यादवपुर विश्वविद्यालय परिसर, कोलकाता 700032

Unit-II :
Block - BF267, Sector - I, Salt Lake, Kolkata - 700064
साल्ट लेक कैंपस, बीएफ-267, सेक्टर-I, साल्ट लेक, कोलकाता – 700064