Artificial Intelligence and Machine Learning for Industry (Batch 04)

6 Months | Starts 8th December, 2024 | Live Online Lectures

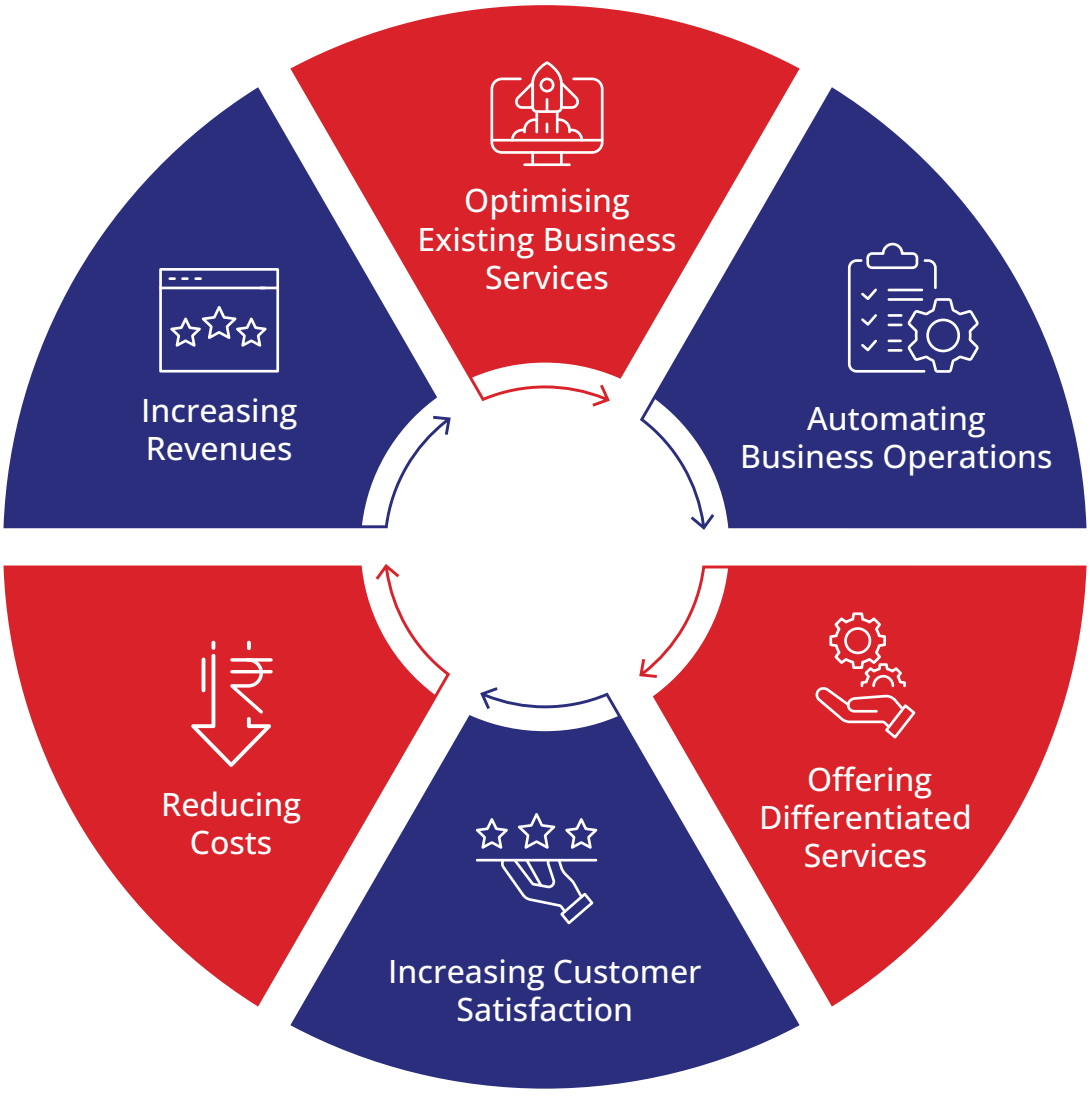
Programme offered by Continuing Education Programme (CEP), IIT Delhi

Artificial Intelligence and Machine Learning

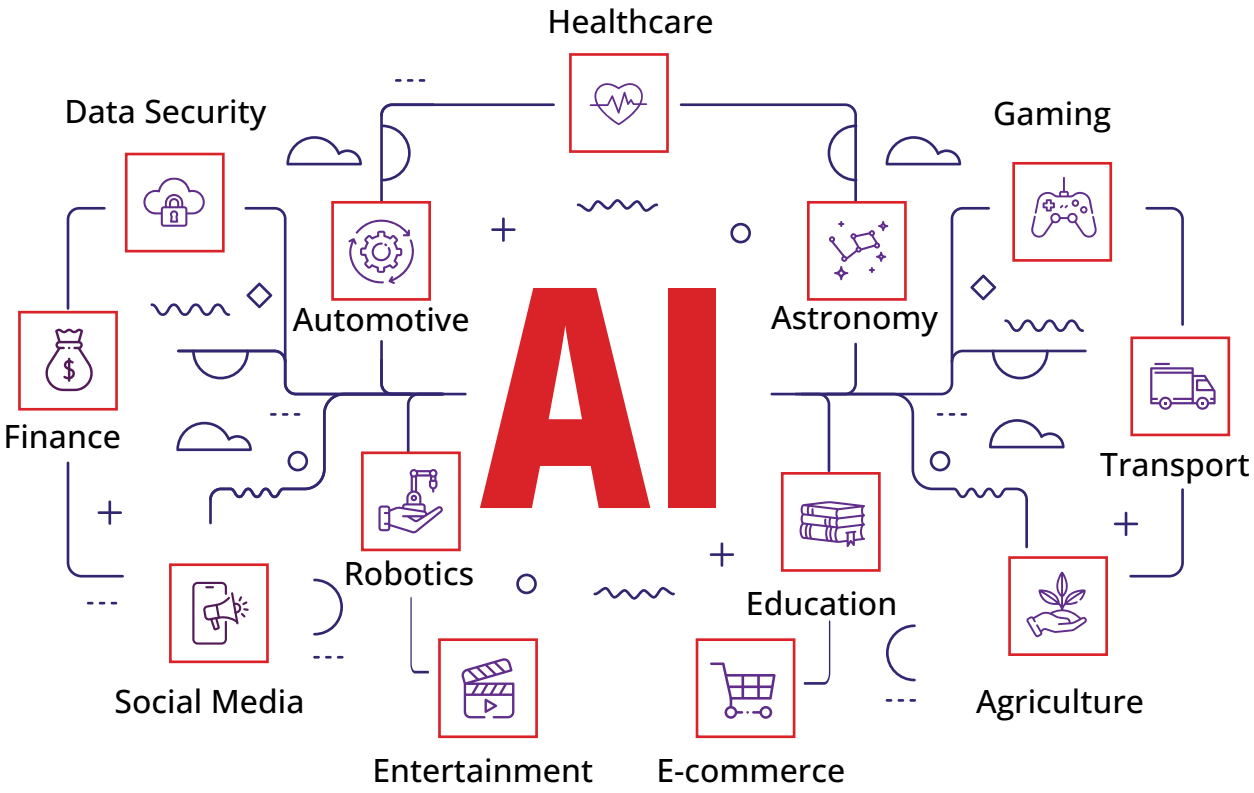
Artificial Intelligence (AI) and Machine Learning (ML) are a significant evolution in computer science and data processing that is not only rapidly revolutionising industries and businesses, but also spawning new business processes and models. As industries and businesses adapt and adopt technology and undergo digital transformation, they generate a humongous amount of data, the value of which can only be unlocked by properly collecting, processing, and analysing it to gain insights and drive decisions. Enter AI and ML.

AI and ML: Driving Business Transformation

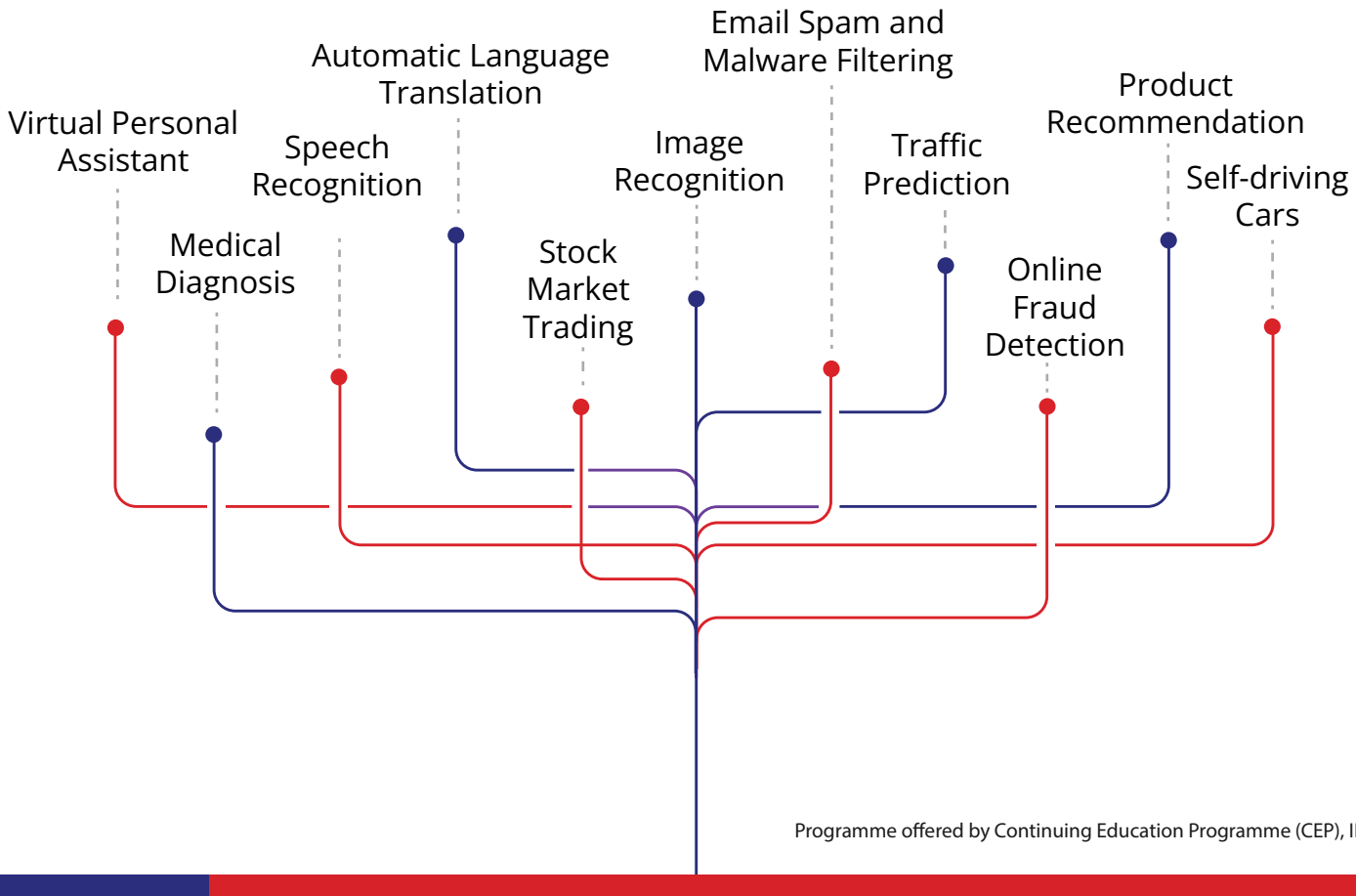
AI and ML applications enable organisations to extract value out of the data they collect, delivering business insights, automating tasks, and advancing system capabilities. AI/ML has the potential to transform all aspects of a business by helping them achieve measurable outcomes including:



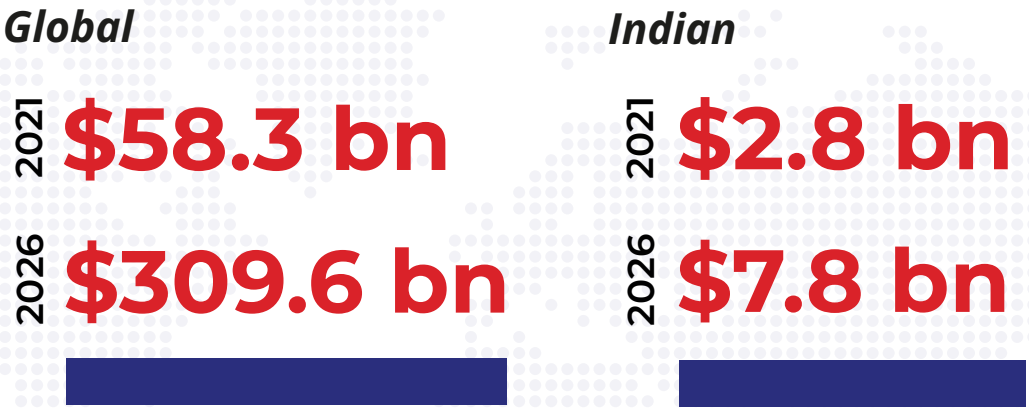
Applications of AI



Applications of ML



AI and ML: Market Size and Projection



In today's data and technology-driven world, data is a highly treasured resource and now it's cheaper than ever to capture and store it due to cutting-edge technologies. For some businesses, AI and ML helps in improving operational efficiency and decision-making, while for others it assists by eliminating losses and increasing revenue. Upskilling yourself in this domain through a well-curated programme from a premier institute will equip you to intelligently apply AI and ML techniques of complex real-world problems.

Job Roles

Below are the job roles you can explore in this field:

• AI Architect:

Designs and oversees the implementation of AI solutions, ensuring they align with organisational goals and integrate seamlessly with existing systems.

• Machine Learning Engineer:

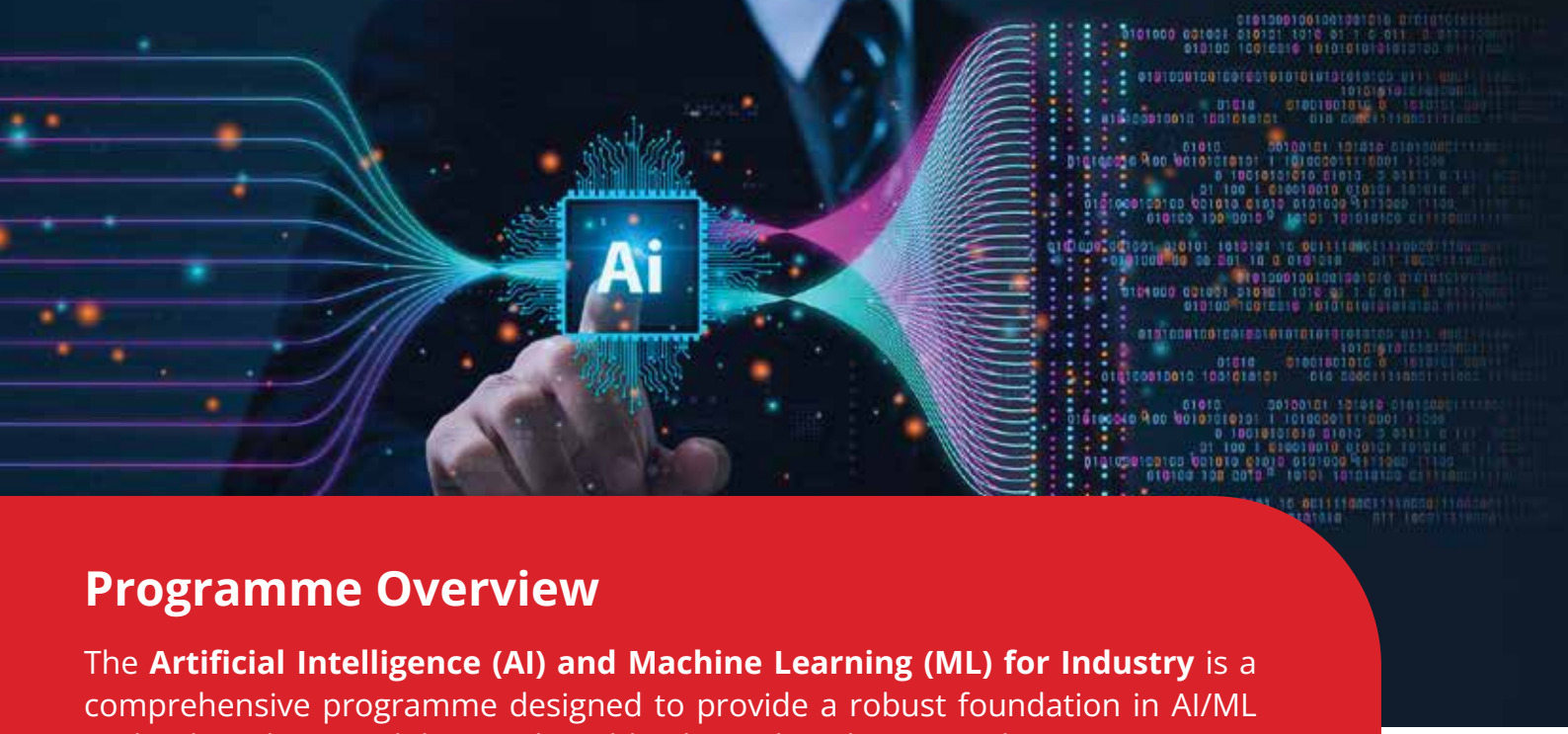
Develops and deploys machine learning models, focusing on optimising algorithms and managing data pipelines for model training and evaluation.

• Data Scientist:

Analyses and interprets complex data sets to extract actionable insights, using statistical techniques and machine learning to make informed business decisions.

• AI Engineer:

Builds and maintains AI systems and applications, combining expertise in software engineering and machine learning to develop functional AI-driven products.



Programme Overview

The **Artificial Intelligence (AI) and Machine Learning (ML) for Industry** is a comprehensive programme designed to provide a robust foundation in AI/ML tools, algorithms, and their real-world industrial applications. This course equips you with the essential knowledge and practical skills to effectively deploy AI/ML techniques to solve complex challenges across diverse sectors, from sales and marketing to medical diagnostics and sports analytics.

The curriculum strikes a perfect balance between theory and hands-on practice, making it particularly accessible for learners from non-computer science backgrounds. With a focus on contemporary industry case studies, the course offers practical sessions that allow you to experience the application of advanced AI/ML techniques as used by top global companies such as Google, Amazon, Coca-Cola, Flipkart, and various think tanks, engineering firms, power companies, and government agencies.

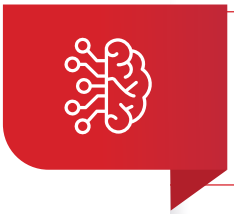
Programme Highlights

- Sessions on Generative AI and LLM Models
- 80 hours of live online sessions by IIT Delhi faculty
- Contemporary case studies and hands-on practice sessions
- International guest lectures by industry experts
- Doubt clearing sessions
- Campus visit at IIT Delhi
- E-Certificate issued by CEP, IIT Delhi

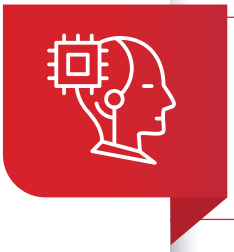
Who should attend?

- Fresh graduates from science or engineering background seeking a career in the AI/ML domain.
- Professionals in the IT industry seeking to gain AI/ML expertise and become AI/ML specialists.
- Professionals seeking to upskill themselves and apply it in their strategic decision-making.

Learning Outcomes



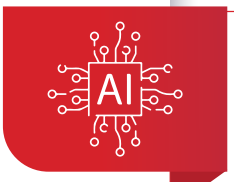
Master machine learning tools, algorithms, and their industrial applications



Gain hands-on experience with advanced ML techniques through case studies and exercises

Understand neural networks and learn to design and implement them using various tools

Develop the skills to apply AI and ML techniques across diverse real-world scenarios



Explore cutting-edge topics like Generative AI

Programme Curriculum

Self-Paced Module: Practical Python for Industry Professionals

Foundations of Python Programming

Module 1: Mathematical Foundations for AI/ML

- **Motivations and Introduction to Different ML Paradigms**
- **Linear Algebra for ML**
  - Vectors and Matrices
  - Vector Space and Subspace
  - System of Linear Equations
  - The Concept of Rank and Independent Vectors
  - Inner Product Space
  - Norms
  - Positive Definite Matrix
  - Matrix Factorisation (EVD, SVD, QR, LR, etc.)
  - Projection and Orthogonality
- **Probability and Statistics for Data Science**
  - Random Variables
  - Distribution and Density Functions
  - Conditional Probability
  - Bayes' Theorem
  - Joint Distribution
  - Concept of Independence Covariance and Correlation
  - Introductory Statistical Inference (Likelihood, MAP, etc.)
  - Concept of Entropy
  - Mutual Information and KL Divergence
- **Optimisation**
  - Function and Derivatives
  - Gradient Descent
  - Stochastic Gradient Descents
  - Convex Optimisation
  - Formulation and Optimality Conditions
  - ADAM Optimiser
- **Hands-on Demo 1: Linear Algebra using NumPy**
  - Concepts of Linear Algebra and Probability Basics
  - Optimisation with Practical ML Applications

Learning Outcome:

Learners will develop a comprehensive understanding and application of linear algebra concepts, probability and statistics, and optimisation in real-world machine learning tasks.

Module 2: Regression Methods

- Simple and Multiple Linear Regression
- Hands-on Demo 2: SLR/MLR
- Least Squares Approach
- Moving Beyond Linearity: Non-linear Regression
- Hands-on Demo 3: NLR

Model Selection

Model Selection, Regularisation, and Bias-Variance Trade-off

Project: Regression application

Learning Outcome:

Learners will master simple and multiple linear regression, non-linear regression, and the least squares approach, gaining practical experience through hands-on demos. They will also learn model selection, regularisation, and the bias-variance trade-off, culminating in a regression application project discussion.

Module 3: Classification Methods

Motivation and Introduction to Classification Problems

Logistic Regression

- Logistic Regression
- Hands-on Demo 4: Logistic Regression

Decision Tree

- Introduction to Decision Trees
- Random Forests, Bagging, and Boosting
- Hands-on Demo 5: Random Forests
- Interpretability of Machine Learning Models

Hyperplanes

- Concept of Hyperplane Classifier

SVM

- Support Vector Machines, Kernel SVM
- Hands-on Demo 6: SVM
- Multi-class Classifiers

Clustering

- Clustering Methods
- Hands-on Demo 7: Clustering

Project: Classification Application

Learning Outcome:

Learners will develop expertise in logistic regression, decision trees, random forests, and support vector machines, gaining practical experience through hands-on demos. They will also learn clustering methods and the interpretability of machine learning models, culminating in a classification application project discussion.

Module 4: Deep Learning

Neural Networks

- Fundamentals of Neural Network and Feedforward Network
- Concept of Training and Backpropagation
- Hands-on Demo 8: ANN

Convolutional Neural Networks

- Fundamentals of Convolution
- Convolutional Neural Network Architecture
- Hands-on Demo 9: CNN

Recurrent Neural Networks/LSTM

- Introduction to Time Series and Sequential Data
- Introduction to Language Modelling and NLP
- Recurrent Neural Network and LSTM/GRU
- Hands-on Demo 10

Graph Neural Networks

- Introduction to Graph Data
- Graph Neural Network Architecture
- Hands-on Demo 11

Transformers

- Concept of Transformers and its Application to NLP

Generative AI

- Introduction to Generative AI and LLM Models

Project: Deep Learning Application

Learning Outcome:

Learners will master the fundamentals of neural networks, including feedforward networks, training, and backpropagation, with practical experience through hands-on demos. They will also learn advanced topics such as convolutional neural networks, recurrent neural networks, graph neural networks, transformers, and generative AI, applying these concepts to real-world applications.

Projects

1. Linear Regression Lab

Is there a connection between sales and different types of ad expenditure? In this lab, we try to forecast the sales of a product assuming ad sales are available.

2. Logistic Regression Lab

Sentiment analysis of consumers. Can we directly infer the quality of any product based on its reviews?

3. Decision Tree, Random Forest, XGBoost

In-depth analysis of algorithms on benchmark datasets.

4. Support Vector Machines

Image classification on fashion MNIST dataset, intuition of soft margin, hard margin, solving SVM using CVXPY.

5. Neural Networks

- Basic understanding and implementation of each layer of NN. Writing and understanding gradient descent/backpropagation algorithm in Python.
- Comparison of Neural Networks and SVM on image classification datasets.

6. Convolutional Neural Network (CNN)

- Ever wondered how computers identify faces? We will see how CNN has revolutionised the field of computer vision.
- Understanding layers, visualisation of the learning process, occlusion, and GRADCAM.

7. Sequential Model (Recurrent Neural Network/Long Short-Term Memory)

Implementation of RNN/LSTM. Hands-on implementation for caption/summary generation from images/videos.

8. Understanding and implementation of Variational AutoEncoder on MNIST dataset. We will see how to encode images in a latent space of lower dimensions

9. Is it possible to generate new images which never existed? Understanding and implementation of Generative Adversarial Networks on benchmark datasets

10. Graph Neural Networks (GNN)

- Are you ready to take your machine learning to the next level? Whether you want to build a recommender system for social media platforms or do drug prediction in biomedical, GNN has your back. We will see the extension of Deep Learning on Graphs (GNN).
- Introduction to several GNN variants like, GCN, GraphSage, etc.

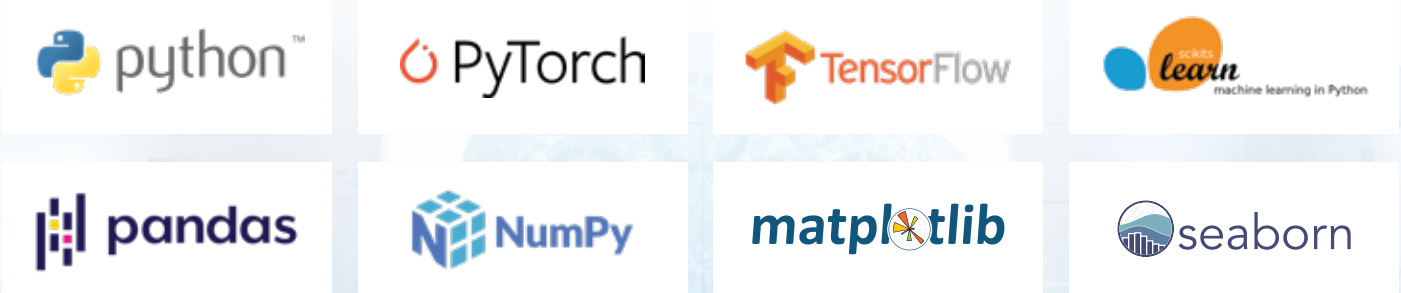
11. Natural Language Processing

Text summarisation.

12. Course Project

Build your own recommender system using any of the discussed techniques (GNN, CNN, LSTM, classical ML, etc.)

Tools



and several popular libraries. The focus of the programme is on the implementation of ML algorithms.

Career Support

Personal Branding	• Introduction to networking platforms • Profile creation on professional networking • platforms like LinkedIn, Lunchclub, etc. • LinkedIn Profile Review • How to create personal brand presence on LinkedIn? • How to increase post engagement on LinkedIn? • Active networking
Business Communication	• Role and importance of effective communication as a leader • The art of providing constructive feedback for successful team • Importance of non-verbal communication • Key elements of executive body language
Job Search Strategy	**Resume Creation** • Importance of creating ATS friendly executive resume • Executive resume sections and structure • Tailoring resumes for different roles and industries • Write a powerful resume that stands out from the competition • Resume Review - Peer to peer review and Q&A
Interview Preparation	**Pre-interview Etiquettes** • Learn about top-down approach for interviews • Pre-interview tips and tricks **In-interview Etiquettes** • Create a self-elevator pitch • Understanding interviewer mindset • Interview grooming sessions and tips and tricks for interview **Post-interview Etiquettes** • Reflecting on interview experience and incorporating the feedback • Relationship building with the recruiter • Learn how to follow up on your job application

Access to Selected Job Opportunities through:

- Curated job opportunities from leading job boards on the TimesPro job portal
- Job openings from TimesPro hiring partners

Note: Career support facility is offered by TimesPro. IIT Delhi is not responsible for the same.

Programme Details

Eligibility Criteria

- Graduates or Postgraduates in science, technology, engineering, mathematical sciences and management

Programme delivery

Live Online Sessions delivered
Direct-to-Device (D2D)

Class Schedule

Saturdays 09:00 a.m. to 12:00 p.m. (IST)

Admission Criteria

Selection based on application review

Duration

6 Months
Learning Hours - 230 hours

- 80 hours of online live sessions
- 30 hours of self-paced Python and Data Analysis bootcamp
- 92 hours quizzes/assignments/projects/recordings
- 10 hours international guest lectures by industry experts
- 12 hours extra doubt clearing sessions
- 6 hours campus immersion (optional)

Evaluation

- 20% - End of module MCQ-based exam
- 20% - End of module projects
- 30% - End of programme MCQ-based exam
- 30% - End of programme project
- Attendance (Grace) – 5%

Campus Immersion

There will be an optional one-day campus immersion for interaction between faculty and learners at IIT Delhi campus.

Glimpses from campus immersion of batch 02

Certification*

- Candidates who score at least 50% marks overall and have a minimum attendance of 50%, will receive a ‘Certificate of Successful Completion’ from CEP, IIT Delhi.
- Candidates who score less than 50% marks overall and have a minimum attendance of 50%, will receive a ‘Certificate of Participation’ from CEP, IIT Delhi.
- The organising department of this programme is Yardi School of Artificial Intelligence, IIT Delhi.

**Only e-certificates will be issued by CEP, IIT Delhi for this programme.*

Programme Coordinators

DR. SANDEEP KUMAR

Assistant Professor

Department of Electrical Engineering & Yardi School of Artificial Intelligence,
and Bharti School of Telecommunication Technology and Management,
Indian Institute of Technology Delhi

Dr. Sandeep Kumar is an assistant professor in the Department of Electrical Engineering, Yardi School of Artificial Intelligence, an associate faculty at Bharti School of Telecommunication Technology and Management at the Indian Institute of Technology Delhi (IIT Delhi), and is honored with the DST Inspire Faculty Fellowship Award and the TCS Doctoral Fellowship. At IIT Delhi, he leads the Machine Intelligence Signals and Networks (MISN) lab. His research explores the intersection of machine learning, graphical models, and deep learning, addressing complex data challenges. Dr. Kumar is deeply committed to nurturing the next generation of AI enthusiasts. He imparts knowledge through an array of courses, including Mathematical Foundations for Machine Learning, Advanced Machine Learning, Software Fundamentals, and Optimisation Methods. Beyond the confines of academia, he champions accessibility to AI education for all, extending his expertise to industry professionals, college students, and government officials through online classes, workshops, and bootcamps. Dr. Kumar's efforts extend beyond the classroom as he spearheads multiple projects funded by government and industry entities. These projects harness the power of AI/ML to address pressing societal issues, spanning domains such as neuroscience, earth sciences, submarine tracking, high-speed object tracking, and social welfare.

DR. MANABENDRA SAHARIA

Assistant Professor

Department of Civil Engineering, and Yardi School of Artificial Intelligence,
Indian Institute of Technology Delhi

Dr. Manabendra Saharia is an Assistant Professor in the Department of Civil Engineering and an Associate Faculty of the Yardi School of Artificial Intelligence at the Indian Institute of Technology Delhi. Previously, he worked in the hydrology labs of the NASA Goddard Space Flight Center and the National Center for Atmospheric Research (NCAR). Dr. Saharia received his Ph.D. in Water Resources Engineering from the University of Oklahoma. At IIT Delhi, his HydroSense research lab focuses on developing physics and AI/ML-based techniques to monitor and mitigate natural hazards such as floods and landslides.

He has been recognised for his scientific contributions, having received Young Scientist awards from both the National Academy of Sciences, India (NASI) and the International Society for Energy, Environment and Sustainability (ISEES). He is also a Visiting Scientist at NCAR (USA) and a Global Guest Professor at Keio University (Japan).

Teaching Assistants

DR. ANIL KUMAR

Principal Project Scientist
Department of Civil Engineering,
Indian Institute of Technology Delhi

Dr. Anil Kumar is a Principal Project Scientist at the Department of Civil Engineering, IIT Delhi. With a robust interdisciplinary research background, his expertise includes developing Deep Learning models to study complex Multiphysics processes in geoscience domains. His work has been published in top-tier journals, demonstrating his profound expertise in geophysical signal processing, multiscale data integration, and general machine learning. He holds a joint PhD from Monash University, Australia, and IIT Bombay, India, marking him as a leading researcher in the integration of advanced computational techniques with traditional geoscience methodologies.

DR. EKTA SRIVASTAVA

Postdoctoral Fellow
Department of Electrical Engineering,
Indian Institute of Technology Delhi

Dr. Ekta Srivastava is a postdoctoral fellow actively contributing to the research efforts of the Machine Intelligence Signals and Networks (MISN) Lab at the Department of Electrical Engineering, IIT Delhi. With a diverse background, she is a researcher specialising in advanced signal processing and machine learning. Her expertise extends across various scientific domains, allowing her to apply innovative solutions for impactful problem-solving. Earlier, she was associated with the Intelligent Information System Lab at GIST, South Korea.

MOHIT KATARIA

Ph.D. Scholar
Yardi School of Artificial Intelligence,
Indian Institute of Technology Delhi

Mohit Kataria is a senior research scholar in the Machine Intelligence Signals and Networks (MISN) Lab at the Department of Electrical Engineering, IIT Delhi, under the guidance of Prof. Sandeep Kumar and Prof. Jayadeva. His current research focuses towards Scaling Graph Machine Learning algorithms. Previously, he worked as a backend developer for Octro.Inc for 2 years.

VIPUL KUMAR SINGH

Ph.D. Scholar
Department of Electrical Engineering,
Indian Institute of Technology Delhi

Vipul Kumar Singh is a senior research scholar in the Machine Intelligence Signals and Networks (MISN) Lab at the Department of Electrical Engineering, IIT Delhi, under the guidance of Prof. Sandeep Kumar and Prof. Jayadeva. His current research focuses on theoretical aspects of developing reliable graph ML algorithms. Previously, he was associated with the Biomedical Signal and Image Processing Lab at IIT Patna.

ANAGHA P

Ph.D. Scholar
Department of Electrical Engineering,
Indian Institute of Technology Delh

Anagha P is a senior research scholar in the HydroSense Lab at the Department of Civil Engineering, IIT Delhi, under the guidance of Prof. Manabendra Saharia. She has knowledge and experience in application of deep learning in hydrology. Her work involves developing ensemble or probabilistic-based models for generating precipitation and streamflow products, and classifying hyperspectral images using deep learning algorithms. Formerly, she held the position of Senior Data Analyst at Subex, Banglore.

Testimonials

NEERAJA PADMAN

“I'm delighted to express how this meticulously crafted course has enriched my comprehension of basic and advanced AI and ML algorithms. This structured approach has been pivotal in empowering me to grasp the intricacies of the same.”

SARVESH VERMA

“I’m so thankful to TimesPro for this beautiful collaboration with IIT Delhi. And the learning journey have been so amazing with such talented professors and TAs. Thank you so much for helping us in betterment of our skill set.”

NISHIT

"I have around 16 years of experience in the field of Artificial Intelligence, Machine Learning, and Data Science. Currently, I have a Data Science team that works in the retail and pharma domains. I always wanted to keep myself updated on the current developments in this field, and when this programme came to me through IIT Delhi, I thought this was a great opportunity. The people, the faculty, and the teaching assistants are very knowledgeable and very helpful. They are always there to help you with the technical problems; they support you throughout. Though the classes were on weekends, they were available all the time. This is a great opportunity where you can upskill yourself, and this investment is not in the programme but in yourself on the personal as well as the professional front, where you are abreast of all the tech enhancements."

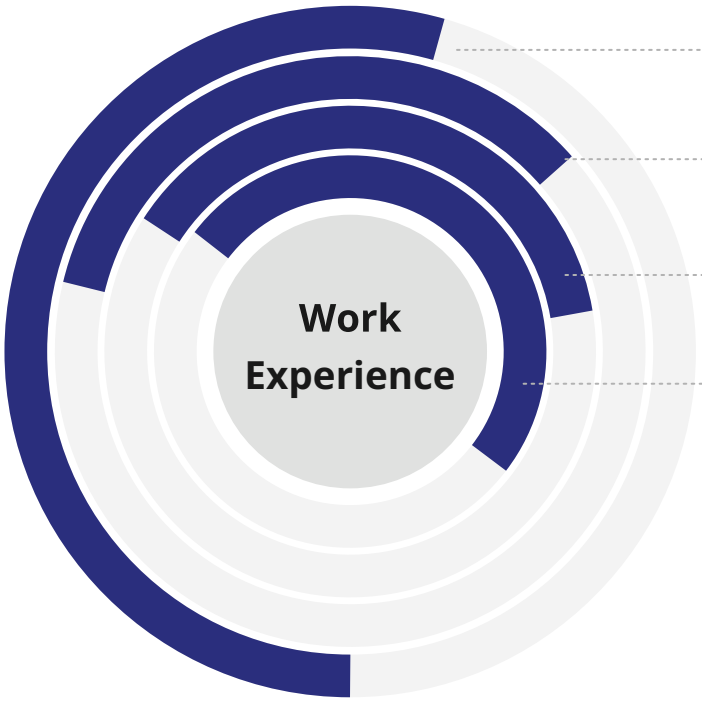
MEGHNA

“I am an engineer. I have been working in SAP for the past 14 years, and I have realised that the Artificial Intelligence and Machine Learning for Industry course from IIT Delhi was the right thing to do. I came across this course through LinkedIn, and I have had a very good experience with TimesPro and IIT Delhi. I have trust in IIT Delhi, and I feel that leaders are born here. So, I feel this is a very good platform and AI is a course which is doing very well."

VIKAS

"It's been 7 years since I graduated, and I wanted to upskill myself in new technologies. Machine Learning, Generative AI, and other emerging fields have been making headlines, and I discovered TimesPro through a LinkedIn post. I enrolled in the CEP course offered by IIT Delhi, which is specifically designed for professionals looking to enhance their knowledge of the working environment. Thanks to this programme, I can now work on various Machine Learning projects, including the detection and classification of breast cancer cells. I would like to express my gratitude to IIT Delhi for providing this opportunity and to TimesPro for facilitating the event."

Past Participants Profile



- **1 to 3 yrs** 27%
- **4 to 7 yrs** 24%
- **8 to 11 yrs** 24%
- **Above 12 yrs** 25%

Industries

49%
IT Services

12%
BFSI

4%
Automotive

4%
Energy

4%
Manufacturing

25%
Others*

*Others includes Consumer Services, E-learning, Healthcare, Telecom, etc.

Programme Fee

Particulars	Amount (in ₹)
Programme Fee	1,69,000
GST @ 18%	30,420
Total Fees	1,99,420

Note:

- All fees should be submitted in the IITD CEP account only, and the details will be shared post-selection.
- The receipt will be issued by the IIT Delhi CEP account for your records.
- Easy EMI options available.
- Loan and EMI Options are services offered by TimesPro. IIT Delhi is not responsible for the same.

Withdrawal & Refund from Programme

- Candidates can withdraw within 15 days from the programme start date. A total of 80% of the total fee received will be refunded. However, the applicable tax amount paid will not be refunded on the paid amount.
- Candidates withdrawing after 15 days from the start of the programme session will not be eligible for any refund.
- If you wish to withdraw from the programme, you must email *cepaccounts@admin.iitd.ac.in* and *icare@timespro.com*, stating your intent to withdraw. The refund, if applicable, will be processed within 30 working days from the date of receiving the withdrawal request.

Instalment Schedule

Instalment	Instalment Date	Amount (in ₹)**
Application Fee*	To be paid at the time of application	1,000
I	Within one-week of offer rollout	71,000
II	22nd January, 2025	49,000
III	8th March, 2025	49,000

Note:

- *Application fee is non-refundable and will not be adjusted in the total programme fee.
- **GST @ 18% will be charged extra in addition to the fee.

Programme Timelines

Last Date to Apply	6th October, 2024
Programme Start Date	8th December, 2024
Programme End Date	June 2025

APPLY NOW

The Indian Institute of Technology Delhi (IIT Delhi) is one of the 5 initial IITs established for training, research, and development in science, engineering, and technology in India. Established as the College of Engineering in 1961, the Institute was later declared an Institution of National Importance under the "Institutes of Technology (Amendment) Act, 1963" and was renamed as "Indian Institute of Technology Delhi". It was then accorded the status of a Deemed University with powers to decide its own academic policy, conduct its own examinations, and award its own degrees. Since its inception, over 48,000 students have graduated from IIT Delhi in various disciplines including Engineering, Physical Sciences, Management, and Humanities & Social Sciences.

For more details, please visit: www.iitd.ac.in

Continuing Education Programme (CEP)

Executive education is a vital need for companies to build a culture that promotes newer technologies and solutions and builds a workforce that stays abreast of the rapidly transforming needs in the technological, business, and regulatory landscape. Committed to the cause of making quality education accessible to all, IIT Delhi has launched Online Certificate Programmes under eVIDYA@IITD (ई-वद्या@IITD), enabling Virtual and Interactive learning for Driving Youth Advancement @IITD for Indian as well as international participants.

These outreach programmes offered by the Indian Institute of Technology Delhi (IIT Delhi) are designed to cater to the training and development needs of various organisations, industries, society, and individual participants at national and international levels with a vision to empower thousands of young learners by imparting high-quality Online Certificate Programmes in cutting-edge areas for their career advancement in different domains of engineering, technology, science, humanities, and management.

For more details, please visit: http://cepqip.iitd.ac.in

2nd in NIRF India Engineering Rankings 2024	**2nd** QS World University Rankings 2024 in India

Programme offered by Continuing Education Programme (CEP), IIT Delhi

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1800-843-1552
admissions@timesgroup.com
www.timespro.com

For any feedback, please write to:
CEP, IIT Delhi at
contactcep@admin.iitd.ac.in

Online Certificate Programmes are offered by the Indian Institute of Technology Delhi under the aegis of Continuing Education Programme (CEP) so that the Institute can realise its vision of serving as a valuable resource for industry and society, and fulfil its mission to develop human potential to its fullest extent so that intellectually capable and imaginatively gifted leaders can emerge in a range of professions.