



Indian Institute of Science
भारतीय विज्ञान संस्थान

Build, Develop and Deploy AL/ML Applications at Scale

PG Level Advanced Certification
Programme in

AI and MLOps

1

Growing Demand

Rapid Industry Adoption •
High-Growth Career Path

2

High Impact Format

Cohort Based • Experiential Learning
Campus Immersion • Mentor Support

3

IISc Edge

#1 Research University • Top Faculty
• Globally Recognised Certification

Program Partner



1. The Growing Demand

MLOps, a discipline that unifies AI and ML Systems development and deployment to streamline the continuous delivery of high-performing models in production.

MLOps market expected to reach **US\$4 billion** by 2025

60% enterprises to operationalize workflows with MLOps by 2024

73% of enterprises consider ML adoption as a competitive edge

MLOps professionals command upto **₹1 Cr** packages

2. High Impact Format



Interactive LIVE Sessions

With expert faculty from IISc



Hands-on Labs

Apply concepts with real data



Mini Projects

Mentor support by industry professionals



Capstone Projects

Supported by IISc faculty and industry mentors



One-on-One Office Hours

With IISc faculty and industry mentors



Experience IISc campus

Two campus visits of 2 days each

3. IISc Edge

World's #1* Research University



#1 World's Top Research University



#1 University (2016, 2020 and 2022) Research University (2022)



#1 Times Higher Education University in India (2020)



2 Bharat Ratna Awardees (1954, 2014)



RUR World #62(2020)

*Based on metric Citations per Faculty

The PG Level Advanced Certification Programme in AI and MLOps will be delivered by IISc's Centre for Continuing Education (CCE). CCE delivers courses suitably designed to meet the requirements of various target groups, eg: research & development (R&D) laboratories and industries, research scientists and engineers, to enable them to grow into competent managers of technology-intensive and data-driven organizations. For more information, visit <http://cce.iisc.ac.in>

Expert Faculty

Learn from accomplished IISc Faculty with research credentials from world renowned institutions



Prof. Sashikumaar Ganesan

Ph.D., Computational Mathematics,
OvGU Germany

Chairman of the Department of Computational and Data Sciences at IISc. He co-founded ZenteiQ EdTech, a Higher-Ed focused EdTech startup incubated at SID-IISc. He also worked as a Postdoc Research Associate at Imperial College London, WIAS Berlin, and OvGU Magdeburg (Germany). He authored academic books - Finite Elements: Theory and Algorithms and Finite Element Methods on Moving Meshes for Free Surface and Interface Flows. His research interests include Finite Element Analysis, Parallel Algorithms, Data-Driven Modeling, ML/NN for CFD.



Programme Coordinator

Prof. Deepak Subramani

Ph.D., Massachusetts Institute of Technology (MIT), USA

Assistant Professor in the Department of Computational and Data Sciences, IISc. An alumnus of MIT and IIT Madras, he is the Founder of ZenteiQ EdTech, a Higher-Ed focused EdTech startup incubated at SID, IISc Bangalore. His research interests include ML/AI for Environmental Forecasting, Data-Driven Routing of Autonomous Vehicles, Bayesian Learning and Data Assimilation, Uncertainty Quantification, and Computational Optimization.



Prof. Yogesh Simmhan

Ph.D., Computer Science,
Indiana University, USA

Associate Professor in the Department of Computational and Data Sciences, IISc, and Coordinator for IISc's Knowledge and E-Learning Network (I-KEN). Earlier he worked as a Research Faculty at University of Southern California (USC), Los Angeles. He also worked as a Senior/Postdoc Research Associate at USC and Microsoft Research, San Francisco/Los Angeles. He is a recipient of IEEE TCSC Award for Excellence in Scalable Computing (Mid Career Researcher) in 2020. He is a member of the Editorial Board for various reputed journal publications. His research explores scalable software platforms, algorithms and applications on distributed systems. These span Cloud and Edge Computing, Temporal Graph Processing, and Distributed storage and machine learning to support emerging Big Data and Internet of Things (IoT) applications.



**Prof. Sundeep
Prabhakar Chepuri**

Ph.D. TU Delft, Netherlands

Assistant Professor at the Department of Electrical Communication Engineering, IISc. He is an elected member of the IEEE SPS Society's Sensor Array and Multichannel Technical Committee (SAM TC), IEEE SPS Society's Signal Processing Theory and Methods (SPTM TC) and EURASIP Signal Processing for Multisensor Systems' Special Area Team (SPMuS TAC). His research interests include Mathematical Signal Processing, Statistical Inference for Data and Network Sciences, Network Sciences, and Computational Imaging, Signal Processing and ML for Wireless Communications



Prof. Shashi Jain

PhD Applied Mathematics,
TU Delft, Netherlands

Assistant Professor at the Department of Management Studies, IISc. An alumnus of IIT Madras, before joining IISc he worked as a Quantitative analyst at ING, Amsterdam. He also worked as Researcher for a few Netherland based organisations like Centrum Wiskunde & Informatica (CWI) and NRG. His research interests include Quantitative Finance, Investment Decisions related to Energy and Environmental Sectors and Real options.

Curriculum

You will learn to build, deploy and scale AI/ML models at scale, which will be taught through the state-of-the-art curriculum, designed by distinguished IISc Faculty.

Module 0: Brushing up of mathematics and python

- ▶ Probability & Stats
- ▶ Variables & Linear Algebra (Tensors)
- ▶ Python, TensorFlow (Tensor operations)
- ▶ Data Munging (Tabular Data)

Module 1: Foundations of Machine Learning and Artificial Intelligence

- ▶ The ML Process: How to solve a problem using data and algorithms?
- ▶ What are the problems solvable by ML/AI? & What cannot be solved?
- ▶ Data Types and State of the Art Models
 - a. Tabular Data - Gradient Boosted Models
 - b. Image Data - Convolutional Neural Networks
 - c. Sequential and Time Series Data - Recurrent Neural Networks
 - d. Text Data - Transformers
 - e. Cool Applications - Generative Models, GANs
 - f. Robotics and other niche areas - Reinforcement Learning
- ▶ Decision Tree and Gradient Boosted Models: State of the Art for Tabular Datasets
- ▶ The first neural network - A very shallow sigmoidal NN (or Logistic Regression)
- ▶ The Mathematics of ML and AI - Empirical Risk Minimization, Gradient Descent and Back Propagation
- ▶ A Deep Neural Network: Neurons, Layers, Activation Function, Loss Function, Weights and Biases, Minibatch, Training Algorithms (Momentum, AdaGrad, ADAM), Weight Initialization
- ▶ Keras: Finding data, building a model, training a model, model evaluation
- ▶ Deep Dive into model selection, evaluation and fine-tuning

Module 2: Computer Vision

- ▶ Essential Tasks in Computer Vision
- ▶ Convolutional Operation - kernels, padding, feature maps
- ▶ Pooling Operation
- ▶ CNN for Image Classification
- ▶ Transfer Learning
- ▶ Residual Connection, Batch Normalization for training deeper networks
- ▶ Depthwise Separable Convolution and Xception
- ▶ Object Localization and Detection Algorithms - YOLO
- ▶ Image Segmentation - UNet and DeepLab

Module 3: Natural Language Processing

- ▶ Recurrent Neural Network Basics
- ▶ Solving a time series problem with RNNs:
 - a. Modeling
 - b. Issues and solutions
 - c. Common sense baselines and model evaluation
- ▶ LSTM and GRU for long time series
- ▶ Essential Tasks in NLP
- ▶ Data Preprocessing:
 - a. Text Vectorization Layer
 - b. Standardization, Vocabulary Indexing
 - c. Embedding Word Vectors
 - d. TF-IDF
- ▶ Bag of Words Model and Sequential Models
- ▶ Full range of Bag of Words Models - Naive Bayes to Deep Neural Networks
- ▶ Attention Mechanism
- ▶ Transformer Encoder and Decoder for Neural Machine Translation

Module 4: Representation Learning, Generative Models and Research Trends

- | | |
|---|--|
| ▶ Representation Learning:
The core of modern AI | ▶ Generative Adversarial Networks |
| ▶ Autoencoders | ▶ Generative Large Language Models |
| ▶ Variational Autoencoders | ▶ Research Trends: Introduction to
Reinforcement Learning |

Module 5: Parallel Computer Architecture and Programming Models

- ▶ Computer Architectures, Pipelining and super-scalar processor, SIMD vectorization, Caches
- ▶ Multicore architectures, GPUs, Data access optimization,
- ▶ Shared Memory Programming basics, Shared memory programming with OpenMP
- ▶ Message-passing, MPI, CUDA, MapReduce

Module 6: Machine Learning at Scale

- ▶ Automatic parallelization with Numba, Dask
- ▶ PySpark
- ▶ Distributed training with TensorFlow

Module 7: Cloud Computing Foundations

- ▶ Code Version control, Data version control, ML model version control
- ▶ Devops methodology
- ▶ Cloud Computing Solutions at Scale
- ▶ Cloud Data engineering

Module 8: Cloud Machine Learning Engineering and Operations

- ▶ Introduction to MLOps
- ▶ MLOps for containers
- ▶ Continuous Integration, Continuous Deployment for ML models,
- ▶ CI/CD Integration with Jenkins and Docker.
- ▶ Monitoring, Continuous Training and Feedback

Project 2: Food Image Segmentation

Domain: Food / Wellness industry

Techniques: CNN based Image segmentation

Overview and Problem Statement:

Worldwide, obesity has nearly tripled since 1975. In 2016, more than 1.9 billion adults, 18 years and older, were overweight (WHO sources). In such a situation, documenting dietary calorie intake is crucial to manage weight loss. Food image segmentation is a critical and indispensable task for developing health-related applications such as automated estimation of food calories and nutrients as a means for dietary monitoring. One of the challenges in this area is the improvement of accuracy in dietary assessment by food image analysis. However, how to derive the food information (e.g., food type and portion size) from food images effectively is a challenging task and an open research problem. In this project, a model that can segment the food components present in an input food image will be built and an application that can predict the food class and the food portions from it will be designed.

Project 3: Image super-resolution using a Generative Adversarial Network

Domain: R&D (Computer Vision)

Techniques: Generative Adversarial Network

Overview and Problem Statement:

Estimating a high resolution (HR) image from its low-resolution (LR) counterpart is referred to as super-resolution (SR). Super-resolution is a task concerned with upscaling images from low-resolution sizes such as 90 x 90, into high-resolution sizes such as 360 x 360 (upsampling factor of 4x). Recovering the finer texture details of an image while achieving super resolution at large upscaling factors has received great attention in the computer vision research community. Super-resolution holds great importance in recovering photorealistic details lost to resolution effects and can be applied to a number of real life tasks such as CCTV image enhancement for identification of criminals, restoration of old family photos, medical imaging data enhancement, turning a smartphone camera to an SLR, autonomous vehicle vision enhancement etc. The goal of this study is to

acquire high resolution images from low resolution images by training a super-resolution generative adversarial network (SRGAN) on the CelebA Dataset, that contains images of celebrities.

Project 4: Identification of Quora question pairs with the same intent

Domain: Online Knowledge Platform

Techniques: NLP, Machine Learning

Overview and Problem Statement:

Quora is a platform to gain and share knowledge on any topic. It allows people to ask questions and connect with people who contribute unique insights and quality answers. This equips people to learn from each other and to understand topics in diverse subjects. Over 100 million users visit Quora every month, and a lot of them inadvertently ask replicate questions, worded differently by different users. Multiple questions with the same intent can cause seekers to spend more time finding the best answer to their question. This also leads to an inefficient system for writers, as they spend time on answering multiple versions of the same question. The goal of this project is to use NLP, ML algorithms and create an application to classify whether Quora question pairs are duplicate or not. This will be instrumental in providing high quality answers and an improved experience for Quora writers and seekers.

Project 5: Breast cancer classification from digitized FNA image feature measurements

Domain: Healthcare: Cancer diagnostic

Techniques: Classical Machine Learning, Deep Learning

Overview and Problem Statement:

Breast cancer is the most common cancer among women worldwide, accounting for 25 percent of all cancer cases and has affected 2.1 million people in 2015. Breast cancer can be categorized into (i) Benign (noncancerous, non life-threatening) tumors and (ii) Malignant

Programme Fee

Details	9 months programme
Programme Fee*	₹3,50,000/-

*GST as applicable



12-Month 0% EMI available



Nominate your employees
to avail special benefits



Scholarships Available

- (i) Application Fee of ₹1,000/-, and
- (ii) Campus visit fee will be based on actuals and to be borne by the participants

Fees paid are non-refundable and non-transferable.



Project 7: Anomalous user behavior detection in Information Security Systems

Domain: Information Security Systems

Techniques: ML Engineering

Overview and Problem Statement:

One of the core components of information security systems is the anomalous user behavior detection, that aids in the detection of intrusion, insider threat and authentication system break. Anomalous behavior based alarm to the system administrator can be combined with other information to determine whether it constitutes an unauthorized or malicious use of a resource. The goal of this project is to develop an effective anomalous user behavior detection system by applying the Isolation Forest algorithm to an enterprise dataset.

Project 8: Improving Energy Efficiency using Machine Learning

Domain: Energy

Techniques: ML Engineering

Overview and Problem Statement:

Maintaining optimal energy efficiency is one of the key areas of focus in residential buildings, offices and factories. By considering features like energy prices, equipment maintenance, labor costs and inventory, ML algorithms can schedule the most appropriate time to perform energy-intensive activities. This can enable enterprises to maximize cost savings by running the right processes at the right time. The goal of this project is to develop a machine learning based application to track energy usage patterns over time so as to reduce the amount of wasted energy and thus perform cost savings.

Hands-on Practices & Tools



Capstone Projects

Project 1: Fashion Compatibility Prediction

Domain: E-commerce and Fashion

Techniques: Deep Learning (Bi-LSTM)

Overview and Problem Statement:

The fashion domain is a very important and lucrative application of computer vision. According to a recent study by Statista, the fashion industry's worth was estimated to be \$1.5 trillion in 2020 and it keeps growing, representing a huge market for garment companies, designers, and e-commerce entities. Fashion image retrieval and fashion image attribute learning have been the two main areas of study in this domain. The goal of this project is to compose or predict fashion outfits automatically, working to address challenges in compatibility and aesthetics. Using the Polyvore dataset, learn compatibility relationships among fashion items to facilitate effective fashion recommendation with a bidirectional LSTM (Bi-LSTM) model.

Is this programme ideal for me?

Yes, if you are

- ✓ An AI and Data Science practitioner seeking to build expertise in MLOps
- ✓ A Tech professional looking to transition to MLOps
- ✓ A Tech ops professional aspiring to upgrade to MLOps

Eligibility

- ▶ B.E/B.Tech/ M.E/M.Tech degree with a minimum 50% marks
- ▶ Minimum 1 year of professional experience
- ▶ Basic coding knowledge required

How can I enrol for this programme?



*Selection for the programme will be done by IISc and is strictly based on the education, work experience, and motivation of the participants.

**Scanned copies to be submitted within 7 days 1. Education Certificate 2. Experience Letter/Latest Pay Slip

What is the return on my investment?

Drive business value

for your Organization



Streamline operations,
enhance ROI



Increase reliability,
performance, and
scalability of ML systems

Accelerate growth

of your Career



Design ML models from
scoping to deployment



Identify gaps in creating
and scaling ML models



Evaluate and improve
ML models for projects



```
use_x = False
mirror_mod.use_y = True
mirror_mod.use_z = False
operation == "MIRROR_Z":
    mirror_mod.use_x = False
    mirror_mod.use_y = False
    mirror_mod.use_z = True

    selection at the end -add back the desel
    mirror_ob.select= 1
    mirror_ob.select=1
    mirror_ob.scene.objects.active = modifier_ob
    mirror_ob.select = 0
    mirror_ob.scene.objects[one.name].select = 1

    print("please select exactly two objects,

OPERATOR CLASSES -----

Operator):
    to the selected object""
```

Programme Fee

Details	9 months programme
Programme Fee*	₹3,50,000/-

*GST as applicable



12-Month 0% EMI available



Nominate your employees to avail special benefits



Scholarships Available

- (i) Application Fee of ₹1,000/-, and
- (ii) Campus visit fee will be based on actuals and to be borne by the participants

Fees paid are non-refundable and non-transferable.



About TalentSprint



10 Years Of
Excellence

200K Lacs Empowered
Professionals

95% Completion
Rate

85 Net Promoter
Score

Established in 2010, TalentSprint is a part of NSE group and a global edtech company that brings transformational high-end and deep-tech learning programs to young and experienced professionals. The company's digital learning platform ipearl.ai offers a hybrid onsite/online experience to seekers of deep technology expertise. TalentSprint partners with top academic institutions and global corporations to create and deliver world class programs, certifications, and outcomes. Its programs have consistently seen a high engagement rate and customer delight. It is a leading Innovation Partner for the National Skill Development Corporation, an arm of the Ministry of Skill Development and Entrepreneurship, Government of India. A recipient of various prestigious accolades, TalentSprint was recently honored with the Indian Achievers Award 2022, for its excellence in building deeptech talent in India. For more information about TalentSprint, visit [TalentSprint website](https://www.talentsprint.com).

References: [1](#) [2](#) [3](#) [4](#)





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