



Executive Certificate Program in Applied AI

3- Months Program | Certificate by E&ICT, IIT Roorkee



About IIT Roorkee & EICT

IIT Roorkee (IITR) has been ranked the best among IITs, as per the QS World Best Universities Ranking 2019. E&ICT-IITR provides certification courses with emphasis on hands-on learning in basic and advanced topics and emerging technologies in Electronics and ICT. It is sponsored by the Ministry of Electronics and Information Technology, Govt. of India.



#1st

Among the IITs in the
'Citations per Faculty'
parameter
*QS World Rankings



#5

Ranked Engineering College
*India Today 2020



#6

Ranked for IITs
*NIRF 2020



#12

Ranked Best Global
Universities in India
*QS World Rankings



Prof. Sanjeev Manhas

Coordinator E-Learning Centre
IIT Roorkee

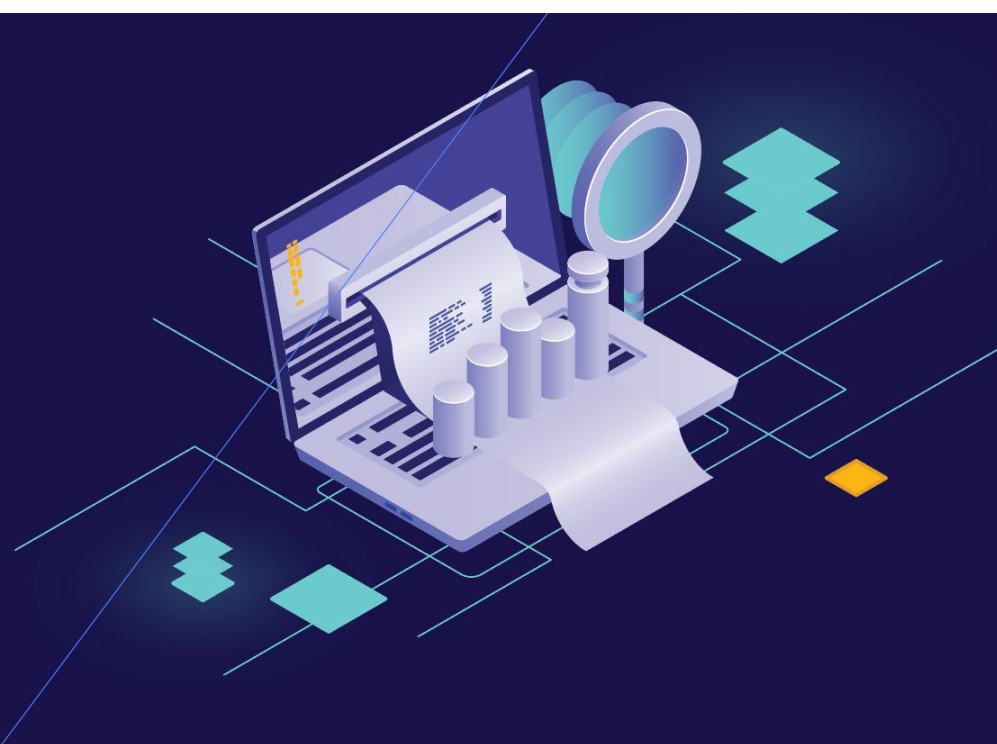
CloudxLab & Course

Cloudxlab is a team of developers, researchers, and educators who create gamified learning experiences for users. The company upskills engineers in deep tech to make them employable & future-ready. Cloudxlab is proud to collaborate with EICT-IITR to empower learners to solve complex problems with this Data Science course.

Our Students Work At



and more!



Sandeep Giri

Founder at CloudxLab

Why CloudxLab & IIT Roorkee



Earn certificate from IIT Roorkee.



Learn, Gen AI, Agentic concepts from IIT Roorkee professor and industry experts and become expert in AI domain



Online cloud lab for hands-on for real-world experience



Best-in-class support Throughout your learning journey



Lifetime course access



Work on real-world projects.



Interact with the international community of peers via the discussion forum.

Mentors / Faculties



Prof. Pravendra Singh

Faculty CSE Dept,
IIT Roorkee

Course Coordinator

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Prof. Sanjeev Manhas

Faculty ECE Dept,
IIT Roorkee

Course Advisor

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Sandeep Giri

Founder at CloudxLab
Past: Amazon, InMobi, D.E.Shaw

Course Developer

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Dr. M.L. Virdi

Senior Research Scientist
Past: NASA

Course Developer

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Praveen Pavithran

Co-Founder at Yatis
Past: YourCabs, Cypress Semiconductor

Course Developer

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Jatin Shah

Technology Executive
Ex-LinkedIn, InMobi, Quikr, PhD Yale
IIT - B

Course Advisor

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Learning Path



Beginning of
the course

(2 Weeks)



Basics:- AI,
ML, Python,
SQL &
Databases

(2 Weeks)



Analytics & ML
Core Concepts

(1 Weeks)



AI Constructs
& Advanced
ML

(2 Weeks)



Generative
& Agentic AI

(2 Weeks)



RAG &
LangChain

(3 Weeks)



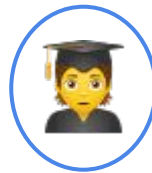
Workflow
Automation



Real-World
Projects



Business Case
Study and
Interview
preparation



Get Certified
by IIT Roorkee

Course Curriculum

1. Brief Introduction to AI, ML & Data Science

- Understanding what AI, ML, and Data Science are - how they differ and work together.
- Understanding the differences through a classic example:
 - Spam-filter evolution: shifting from human-coded rules to machine-learned detection.
- Overview of modern AI landscape:
 - ChatGPT & LLMs (Large Language Models)
 - NLP (Natural Language Processing)
 - Computer Vision
 - Agentic AI
 - RAG (Retrieval-Augmented Generation)(All with clear explanations, theory-focused)

2. Project- Find the Celebrity who Looks like You using Computer Vision (Optional)

3. Project - Building a RAG Pipeline (Optional)

4. Project - Building a RAG Chatbot from Your Website Data using OpenAI, Langchain and Vector Database (Optional)

5. Python for Generative AI

- Core Python Concepts
 - Variables & data types
 - Lists, tuples, dictionaries (most common structures used by AI-generated code)

Course Curriculum

- If-else conditions
- Loops (for, while)
- Functions
- Working With Data in Python (Done using Terno)
 - Reading data from files (CSV, JSON, Excel, Databases)
 - Basic operations on data stores (BigQuery)
 - How Python stores tables, rows, and values
 - Importing libraries (import pandas as pd, etc.)
- Understanding AI-Generated Code with Terno
 - How to read AI-generated analysis snippets
 - Identifying which parts of the code transform, clean, or analyze data
 - Visual walkthroughs in Terno to see how Python logic works
 - Running simple examples to build clarity and connect concepts to real data analysis
- Optional Learning Resources
 - Access to the complete Python course for anyone who wants to go deeper
 - The PyQuest app for extra practice through bite-sized, interactive MCQ-based exercises

6. Data Types, Databases & SQL

- Types of Data:
 - Structured, Semi-Structured, and Unstructured (BDH – self-paced)

Course Curriculum

- Real-world examples for each
- Databases & SQL Basics:
 - ERP database walkthrough using Terno AI
 - 5–6 simple SQL query examples (SELECT, WHERE, GROUP BY, JOIN, etc.)
- Hands-On Data Exploration in Terno
 - Loading and describing JSON, CSV, text files
 - Connecting to a database inside Terno AI

7. Project - Data Handling with Terno AI

8. Basic Analytics (AIM)

- Statistical Foundations
 - Mean, median, mode
 - Probability
 - Variance, standard deviation, IQR
 - Normal distribution
 - Correlation & correlation coefficient
 - Hypothesis testing
- Data Preparation Essentials
 - Quick handling of outliers & missing values
 - Basic cleanup to ensure reliable analysis
- Feature Scaling Techniques
 - Standardisation (Z-score)

Course Curriculum

- Min–Max scaling
- Analytical Intuition & Plot Selection
 - Choosing the right plot based on data type and purpose
 - Learn visuals like treemaps, Pearson correlation heatmaps, histograms, boxplots, scatter plots, etc.
- Applied Examples in Terno
 - Running basic analytics
 - Generating plots and insights directly within Terno
- Generative Pre-Trained Transformers
- Building your own Chat-GPT from scratch
- Applications of LLMs in business automation

9. Machine Learning Types (AIM)

- Supervised Learning
 - Classification vs Regression
 - Real-world examples: spam detection, churn prediction, price prediction
 - How models “learn from labelled data”
- Unsupervised Learning
 - Clustering and segmentation
 - How AI discovers patterns without labels
 - Examples: customer groups, anomaly detection
- Reinforcement Learning
 - Agent–environment concept

Course Curriculum

- Rewards, actions, learning by trial and error
- Examples: robotics, game-playing AI
- How to Interpret AI-Generated ML Results
 - Understanding accuracy, precision, recall, F1-score
 - Interpreting confusion matrices
 - Reading AI explanations of model decisions
 - Identifying when a model is underfitting or overfitting
- Conceptual Exercises
 - Small scenario-based questions
 - Identifying which ML type fits a given problem
 - Interpreting output summaries (no coding)

10. Machine Learning Process (AIM)

- End-to-End ML Workflow
 - Problem definition
 - Data collection & understanding
 - Data cleaning and preparation
 - Feature selection & feature importance
 - Model training concept (no coding)
 - Model evaluation and comparison
- Understanding ML Outputs
 - Interpreting metrics for classification & regression

Course Curriculum

- ROC curve
- Feature importance charts
- Residual plots
- Identifying bias, errors, and model limitations
- Concept of Model Deployment
 - What happens after a model is built
 - How predictions are served in real apps
 - Why deployment matters for business outcomes
- ML Process Example in Terno AI
 - Step-by-step conceptual walkthrough of ML in Terno
 - Understanding generated insights, metrics, and charts

11. ML Projects

- Semantic Analysis using Clustering
- Financial Risk Profiling via Anomaly Detection
- Predicting Housing Pricing in California using AzureML
- Breast Cancer Detection using AzureML
- Beginner Friendly ML Project

12. AI Constructs (AIM) (Optional)

- Core AI Constructs
 - Ensemble Learning
 - Convolutional Neural Networks (CNNs)

Course Curriculum

- Recurrent Neural Networks (RNNs)
- LSTM & GRU (as improved RNNs)
- Reinforcement Learning
- Applied Examples

13. Generative & Agentic AI

- ChatGPT & LLM Fundamentals (Optional)
- Prompt Engineering Essentials
 - Writing effective prompts
 - Using chain-of-thought for better reasoning
- Working with APIs & Function Calling
 - How AI tools call functions behind the scenes
 - Conceptual examples of API requests handled by AI
 - When and why function calling is used in data analysis

14. Workflow Automation

- Introduction to Automation Tools
 - What workflow automation means
 - Where automation fits in data and AI processes
- N8N Automation Examples
 - How to automate repetitive data tasks
 - Connecting apps, triggers, and actions visually
 - Real examples of building simple automated workflows with N8N

Projects

1. Financial Risk Profiling via Anomaly Detection

- The objective of this project is to apply Unsupervised Machine Learning to detect fraudulent activity within a financial dataset. We will move beyond simple rule-based filters to implement advanced detection techniques that isolate high-risk anomalies while ensuring a seamless experience for legitimate users.

2. Data Handling with Terno AI

- In this project, you will use Terno AI to explore the HR Employee dataset, extracting specific metrics and processing records to uncover broader workforce trends. By the end of this project, you will know how to efficiently handle, query, and explore tabular data using Terno AI.

3. End to End Project - Regression

- This project provides a complete checklist for building machine learning workflows and walks through creating a housing price prediction model in Azure ML, from data preprocessing and boosted decision tree training to hyperparameter tuning and publishing a live web API.

4. End to End Project - Classification

- This project introduces key classification concepts like confusion matrices and precision-recall tradeoffs, guiding us through building and evaluating a breast cancer prediction model in Azure ML.
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Projects ---

5. End-to-End ML Project- Beginner friendly

- This is a beginner-friendly, end-to-end Machine Learning project designed for people who already know basic Python. The project guides learners through the complete Machine Learning pipeline while explaining the concepts behind each step.

6. Find the Celebrity who Looks like You using Computer Vision

- This project uses Python's face_recognition library to build a celebrity look-alike finder that analyzes an uploaded image and identifies the celebrity who most closely resembles the person in the picture.

7. Semantic Analysis using Clustering

- In this project, we will perform a systematic assessment of a high-volume dataset containing thousands of audience reviews. The goal is to move beyond simple keyword searches and use machine learning to identify thematic trends, evaluate performance, and pinpoint "market gaps", specific audience needs that are currently unaddressed by mainstream content.

8. Working with LLM API & Tool Calling

- Learn how to turn LLMs into autonomous agents by exploring API fundamentals, system prompts, statelessness, and hands-on tool calling in Python to execute real-world function calls.
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9. Building a RAG Chatbot from Your Website Data using OpenAI, Langchain and Vector Database

- In this project, we'll integrate RAG (Retriever-Augmented Generation) with Langchain to develop a sophisticated chat agent. Leveraging Chroma as a vector store, we'll store and retrieve relevant data based on user inquiries. This data will be seamlessly passed to GPT, enabling the generation of accurate and contextually relevant responses to customer queries.

10. Building a RAG Pipeline

- This tutorial walks through building a complete RAG pipeline, covering document chunking, vector embeddings, similarity search with Milvus, and grounding LLM answers in private company data.

Course Details and Fees —

Please find more information about the course and fees here:

<https://cloudxlab.com/course/211/post-graduate-certification-in-applied-data-science-and-ai-iit-roorkee>

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