Executive Certificate Program in

Applied AI

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

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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.

QS WORLD UNIVERSITY RANKINGS

#1st

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

INDIA TODAY

#5

Ranked Engineering College
*India Today 2020

nirf NATIONAL INSTITUTIONAL RANKING FRAMEWORK

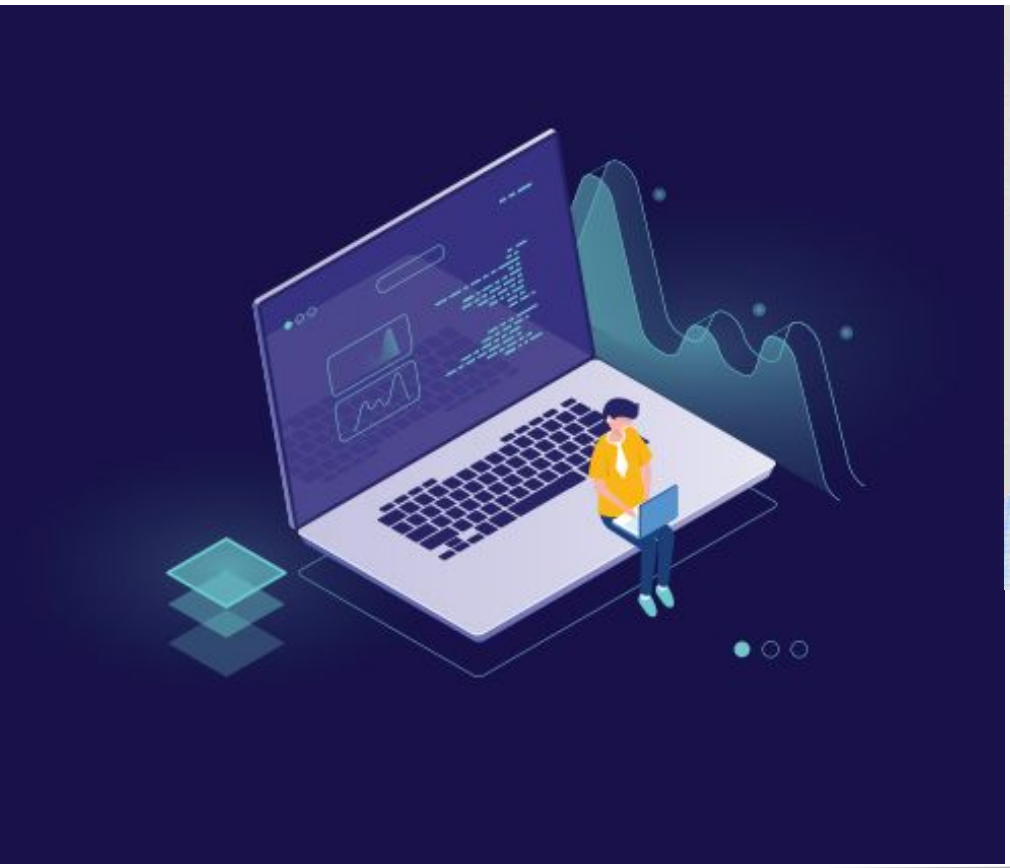
#6

Ranked for IITs
*NIRF 2020

QS WORLD UNIVERSITY RANKINGS

#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

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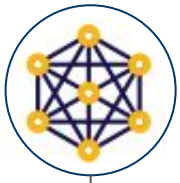
Why CloudxLab & IIT Roorkee

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. Sanjeev Manhas
Faculty ECE Dept,
IIT Roorkee

Course Instructor
Know More

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

Course Developer
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Abhinav Singh
Co-Founder at CloudxLab
Past: Byjus

Course Developer
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Praveen Pavithran
Co-Founder at Yatis
Past: YourCabs, Cypress Semiconductor

Course Developer
Know More

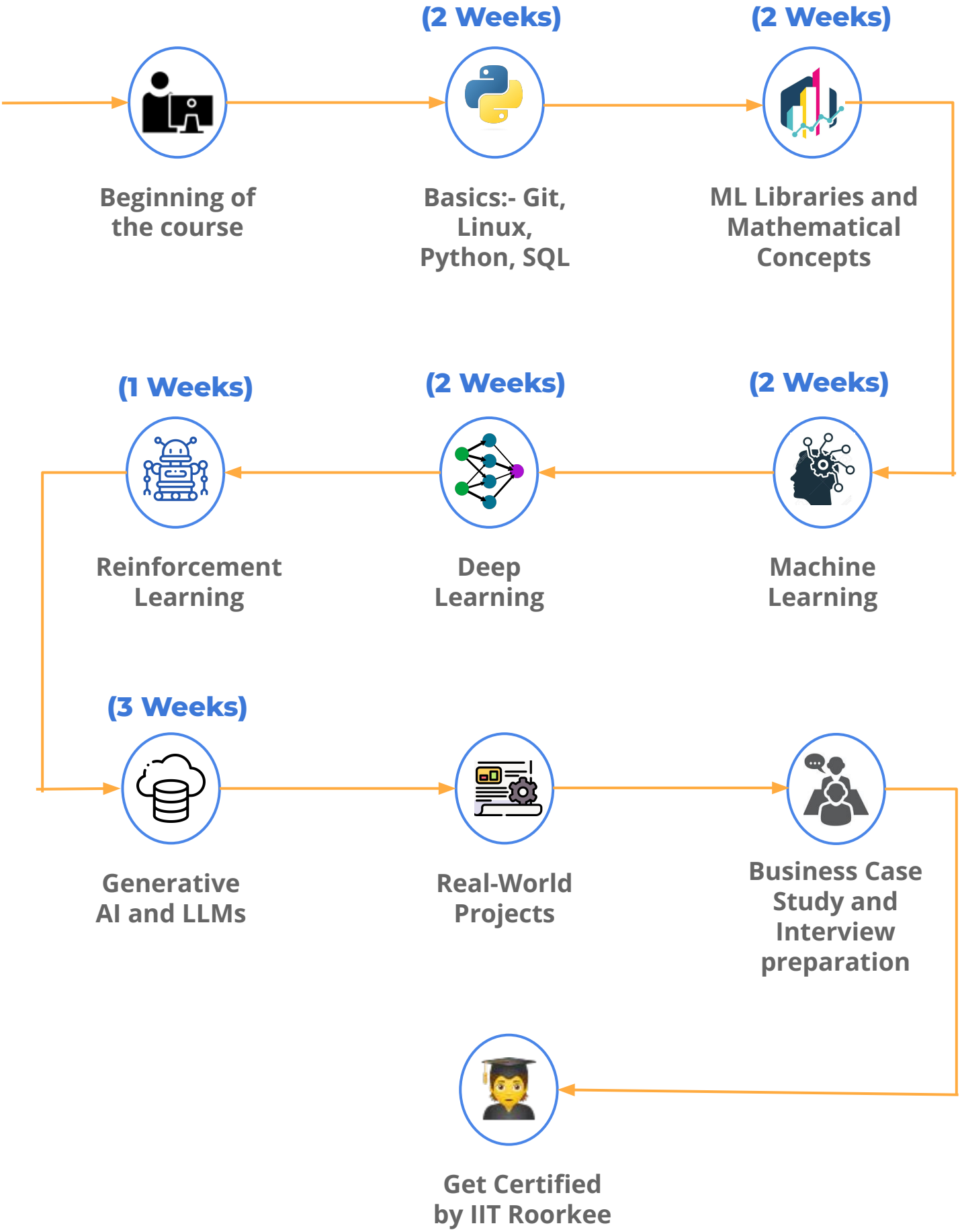
Venkat Karun
Staff Software Engineer
Google

Course Advisor
Know More

Shubh Tripathi
ML Engineer
CloudxLab

Course Instructor
Know More

Learning Path



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 Chatbot from Your Website Data using OpenAI, Langchain and Vector Database (Optional)**
4. **Python for Generative AI**
    - Core Python Concepts
        - Variables & data types
        - Lists, tuples, dictionaries (most common structures used by AI-generated code)

- 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

5. Data Types, Databases & SQL

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

- 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
- Common Beginner Blockers
  - Frequent issues when handling data
  - Practical solutions to overcome them

6. Basic Analytics

- 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)

        - 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

7. Machine Learning Types

    - 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

- 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)

8. Machine Learning Process

- 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

- 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

9. ML Projects using Generative AI

- Sentiment Analysis
  - Sentiment Analysis in Hive Using Terno AI
  - Building a Sentiment Classifier using Python and IMDB Reviews with Terno-AI
- Customer Segmentation (Unsupervised Learning)
  - Customer Clustering for E-commerce Behaviour
  - User Segmentation for Targeted Marketing Campaigns
- Sales & Demand Forecasting (Time Series)
  - Monthly Sales Forecasting Using Terno AI

- Demand Prediction for Inventory Planning

- Churn Prediction (Classification)
  - Subscriber Churn Prediction Dashboard
  - Customer Retention Analysis with Feature Insights

10. AI Constructs (Optional)

- Core AI Constructs
  - Ensemble Learning
  - Convolutional Neural Networks (CNNs)
  - Recurrent Neural Networks (RNNs)
  - LSTM & GRU (as improved RNNs)
  - Reinforcement Learning
- Applied Examples

11. 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

Course Curriculum

- How Terno Works (Inside the Tool)
  - Workflow of Terno
  - How Terno interprets queries, runs analysis, and returns results
  - Understanding Terno's strengths, limitations, and best practices

12. 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

13. Build Your Own GPT (No-Code)

Projects

1. **Building end-to-end Machine Learning Project**
    - In this project we will build a machine learning model to predict housing prices using California Housing data.. We will learn various data manipulation, visualization and cleaning techniques using various libraries of Python like Pandas, Scikit-Learn and Matplotlib. This project covers building a Machine Learning project end-to-end.
2. **Performing Sentiment Analysis with LLMs**
    - In this project, we will use **OpenAI embeddings** to conduct sentiment analysis on customer reviews. By exploring the capabilities of LLMs, we aim to extract nuanced sentiment from textual data, providing valuable insights for businesses to enhance customer satisfaction and decision-making.
3. **Building your own GPT from scratch using Tensorflow**
    - In this project we will build our GPT from scratch. Then we will train it on the **Shakespear** data. The result will be a language model capable of generating text with a distinctive Shakespearean flair.
4. **Building a RAG based chat agent with Langchain and OpenAI**
    - 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.

Projects

5. **Building a RAG based chat agent web app using Flask**
    - Create a user-friendly web application using Flask that integrates our RAG-based chat agent that we created in the previous project. Users can interact with the chat agent directly on the web, asking questions and receiving responses generated by advanced language models.
6. **Building a Text to SQL Query Generator using Langchain**
    - This project enables the generation of SQL queries from natural language prompts. By providing the database schema and the user's query, the system utilizes GPT to generate SQL queries tailored to the user's needs. Execute the generated queries on your MySQL database effortlessly, simplifying the process of retrieving data through intuitive natural language interactions.
7. **Developing a Voice-Controlled RAG Chat Agent App**
    - This project extends our existing RAG-based chat agent to incorporate voice commands. By integrating **text-to-speech** and **speech-to-text** functionalities, users can engage in voice conversations with the chat agent. Enhance user experience and accessibility by enabling intuitive voice interactions, fostering seamless communication between the customer and the chat agent.

Projects

8. **Group mobile app reviews to generate clean actionable insights**
    - This project focuses on **clustering** mobile app reviews to extract meaningful insights. Through clustering techniques, we'll organize reviews into groups, allowing us to identify key areas for improvement or action. By analyzing these insights, our company can prioritize enhancements and address user concerns effectively, fostering continual improvement and enhancing user satisfaction with our mobile app.
9. **Building an OpenAI agent to automate daily tasks**
    - Build your own **OpenAI-powered assistant** to tackle daily tasks. Choose routines, train on your language, and watch it streamline your life. Ideal for busy professionals and AI enthusiasts.
10. **Building a QR Code AI Art Generator**
    - This project aims to generate QR codes with artistic designs. By leveraging the **Midjourney** and **DALL-E** APIs, we'll infuse creativity into QR code generation, transforming them into visually appealing artworks.
11. **Building an image editor to edit images using text**
    - This project focuses on creating an application for editing images using natural language commands. Leveraging the Midjourney and DALL-E APIs, users can manipulate images through text input, enabling intuitive editing processes.

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

Our Esteemed Customers

For Further Details

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