MACHINE LEARNING ENGINEER
Become an ML-Practitioner

ML

iZen

Certificate Program

OVERVIEW: AI-ML LANDSCAPE

The world is undergoing significant digital-transformations, drastically changing the way we conduct business and carry out daily transactions. We are in the cognitive era. Enterprises and even nations are vying for a leadership position in AI/ML technology and applications.

With a great deal of attention given to Machine Learning (ML) and a wide spectrum of applications in real life, many are beginning to seek a better understanding of Machine Learning and the many benefits it offers to organizations globally. Machine Learning (ML) and Deep Learning (DL), and Natural Language Processing (NLP) – are at the forefront of major innovations, some examples being image identification, marketing campaign customization, genomics, self-driving car navigation, and thousands of other applications from every possible domain.

HIGH DEMAND
Corporations are aggressively adapting to AI wave and hence hiring a large number of ML engineers.

HUGE SUPPLY GAP
Demand for qualified ML engineers far exceeds supply. That means less competition and more pay for trained-experts.

BRIGHT FUTURE
According to World Economic Forum, automation will generate 133 million new jobs by 2022 and these jobs are not going away.

This is an "Outcome-based training" with a focus on employability. At the end of this course, you should be able to build scalable applications in multiple areas using Machine Learning (ML). We aim to help you build a solid foundation and technical expertise to develop solutions that address real-life problems for human empowerment. We need to align our skills with the changing world.

BENEFITS OF THIS PROGRAM

✓ Kick-start or re-ignite your career by completing this course. The salaries of ML Engineers will only keep rising as the world can't keep up with the enormous demand

✓ Learn ML from a world-class professor with decades of experience teaching at the University of California, added with industry experience of building successful start-ups

✓ Learn by doing:
   – Get hands-on experience by doing several industry-specific projects
   – Access our "AI-Experience-Lab" on the cloud to learn by doing
   – Learn by watching interviews with several experts in various sub-domains of AI-ML

✓ Real-life case-studies and use-cases to give you practical insights.

✓ Get a certificate as "Machine Learning Engineer"

WHO IS THIS PROGRAM FOR?

- ✓ If you are a student seeking employment to kickstart your career, this is a great opportunity for you to learn ML and build a rewarding, future-proof, and meaningful career

- ✓ If you are already employed but are trying to rekindle your career in the exciting world of AI/ML, this program is perfect for you

- ✓ Regardless of your background, this program can give you thought leadership in machine learning adoption, tools, techniques, and hands-on implementation

PREREQUISITES:
- ✓ Basic knowledge of programming
- ✓ Basic understanding of statistics would be helpful, though not mandatory

WHAT WILL YOU LEARN?

Machine Learning (ML) has become a foundational tool for building the next generation of applications in industries starting from healthcare to financials to retail. No industry or sector is untouched by the potential of Machine Learning algorithms and tools. This course is an in-depth practitioner's program in Machine-Learning (ML).

- ✓ This course will train students in ML algorithms and tools

- ✓ The course will expose students to a wide variety of ML applications and how they can be implemented using different ML algorithms and tools

- ✓ The emphasis will be on how the students can engineer ML applications and systems, analyze them, and improve their performance

- ✓ This is a very hands-on course in that students will build several ML applications as a part of course projects, using Python

- ✓ Upon completing this course, you'll be ready for an ML-Engineer job and to apply your knowledge for using ML in your organization:

  - You will know how to collect, prepare and analyze data for building ML applications

  - Based on data and application characteristics, you will be able to select a suite of algorithms that is suitable for your application

  - You will know how to use ML-tools to implement these algorithms

  - You will be able to analyze your implementation for its performance, and iteratively improve

MODULE 1 — Introduction to AI

1. Natural Intelligence and Artificial Intelligence
2. Natural Learning and Machine Learning
3. Machine Learning vs. Traditional systems

MODULE 2 — Fundamentals and Applications of ML

Machine Learning enables predictions based on data. This module will provide an overview of Machine Learning, the different forms of predictions and associated applications, classes of algorithms, and software architecture of different Machine Learning systems and applications.

1. Machine Learning: From Data to Predictions
2. Machine Learning Applications: Healthcare, Financials, Crypto, Robotics, Retail, Advertisement, HR, Blockchain, Industrial IoT, …
3. Software Architecture and Workflow of Machine Learning Systems
   – CRISP-DM Model
   – Machine Learning Pipeline
4. Classification of Machine Learning Algorithms: Supervised, Unsupervised, Semi-supervised, Reinforcement, Batch, Online, Instance-based, and Model-based
5. Course Work: Exercises and Quizzes

MODULE 3 — Data and Feature Engineering

Data is the driving force behind ML algorithms. It is critical that a practitioner has both a broad and deep understanding of what data is, how it is collected, stored, transformed, analyzed, and visualized.

1. Data and Data Types: Structured, Unstructured, Semi-structured, Time Series
2. Data issues: Errors, Noise, Bias, Incompleteness, Redundancy
3. Data Wrangling
4. Data Summarization and Analysis: Common statistic parameters
5. Data Visualization: Charts, Bars, Histograms, 2D- and 3D- plots
6. Mathematical Models, and Algebraic and Statistics Operations: Vectors, Matrices, Sequences, Data Frames
7. Case Study in example data sets:
   – Housing data set
   – MNIST image data sets

MODULE 4 — Python Programming and Tools for Machine Learning

Python has become the de facto standard for developing ML applications as it provides a wide array of tools and libraries for developing and analyzing ML applications. This module provides a system- and design-driven view of Python, data analysis, and visualization tools, and the ML learning framework.

1.   Introduction to the Python programming Language

2.   Data representation and manipulation tools: NumPy, PANDAS

     – Representation of data as Matrices, Vectors, Sequences, and DataFrames

     – Data access

     – Transformation operations

     – Read and store data in different formats (CSV, XLS, TXT, JSON, etc.)

3.   Data visualization Tools: Matplotlib, Seaborn, Plotly
     – Charts, Plots, Bar graphs, etc.

     – 2D and 3D plots

4.   ML Framework: SciKit
     – SciKit Framework for ML algorithms

     – SciKit tools for generating data

5.   Case Studies in data sets:
     – Housing data set: Analysis and Visualization using Python Tools

     – MNIST image data sets: Analysis and Visualization using Python Tools

6.   Course Work:
     Programming exercises that will require students to use the tools to read, analyze, and visualize data

MODULE 5 — Prediction Algorithms 1: Supervised Machine Learning using Regression

Discuss the intuition behind regression algorithms, how they enable predictions, and analysis techniques.

1.   Example regression applications and data sets: Analysis and visualization

2.   Regression algorithm design and analysis:
     a) Regression system and cost models
     b) Gradient Descent Algorithm
     c) Linear and Polynomial Regression algorithms
     d) Algorithm analysis for overfitting/underfitting, cost, error, and scalability

3.   Regression Application Development and Analysis:
     a) Regression system and cost models
     b) Gradient Descent Algorithm
     c) Linear and Polynomial Regression algorithms
     d) Algorithm analysis for overfitting/underfitting, cost, error, and scalability

4.   Case Studies in Regression:
     The course will use two examples for building regression-based linear and polynomial models.

5.   Course Work:
     a) Implement a regression application
     b) Quizzes on regression algorithms

Prediction Algorithms 2:
Supervised Learning Algorithms for Classification

Classification algorithms are another class of supervised learning algorithms in which the goal is to classify an output variable into one of the different finite classes. This module will provide both the theoretical foundation for the classification algorithms and how they can be efficiently implemented and analyzed using the Machine Learning tools:

1. Example classification applications and systems:
   a) Classification schemes: Single Class, Multi-Class, Multi-label, and Multi-output classifications
   b) Data sets and Visualization

2. Classification Algorithms:
   a) Logistic Regression Algorithm, Cost Analysis, and Recursive Descent
   b) Random Forests
   c) Support Vector Machines

3. Classification Application Development and Analysis:
   a) Logistic Regression Applications Using SciKit
   b) SVM kernels and tools using Python Tools
   c) Random forest application development using SciKit

4. Case Study in Classifications:

   The course will use two examples from the publicly available data sets for building regression-based linear and polynomial models.

5. Course Work
   a) Quizzes on logistic and random forest algorithms
   b) Implement a logistic regression application and a random forest application

MODULE 7

Prediction Algorithms 3:
Unsupervised Algorithms for Clustering

1. Example clustering applications and systems

2. Clustering Algorithms:
   a) Logistic Regression Algorithm, Cost Analysis, and Recursive Descent
   b) Random Forests
   c) Support Vector Machines

3. Clustering Application Development and Analysis using SciKit

4. Case Study in Clustering:
   a) IRIS Flower data set: Cluster data set into disjoint clusters

5. The course will use two examples of building clustering models

6. Course Work
   a) Implement a clustering application
   b) Quizzes on Clustering algorithms

MODULE 8 — Fine-Tuning ML Application Implementations

This module will provide the techniques and framework for analyzing, testing, and improving the performance of Machine Learning Algorithms.

1. Machine Learning Analysis Framework
2. Data Analysis
3. Feature Engineering
4. Cost and Error Analysis
5. Validation and Testing Framework
6. Hyperparameter Selection and Analysis
7. Deployment Models
8. Course Work:
   a) Fine-tune the previously implemented ML projects
   b) Quizzes on analysis metrics and frameworks

MODULE 9 — Business Case Studies

This module will explore applications of ML in three verticals: Healthcare, Retail, and Finance, in detail.

ML Examples and Projects:

The course will use real-life applications for illustrating the various ML techniques and tools.

The examples of ML applications include the following:

1. Real-estate: predicting home price
2. Image analysis for clustering and classification
3. Sales forecasting
4. Bundle products based on sales data
5. Achieve optimal inventory management
6. Email spam filter
7. Sentiment analysis
8. Fraud detection
9. Disease prediction system
10. Stock prices prediction system
11. Recommendation system for music or movies
12. Retail: product recommendation
13. Travel: Dynamic pricing
14. Finance: Portfolio management
15. HR: Employee attrition
16. Crime prediction

WHO WILL YOU LEARN FROM?

PROGRAM FACULTY

Dr. Raju Pandey is a Professor Emeritus in the Computer Science department at the University of California at Davis, where he developed and taught graduate and undergraduate courses in programming languages, operating systems, distributed systems, Internet of Things, Wireless sensor networks, Web-based systems, and compilers.

He is also the CEO and founder of Thinking Books, a software Infrastructure and Tools company.

Dr. Pandey has a deep interest in math and computer science education and has developed novel interactive methods and tools for teaching both algorithmic and system aspects of Computer Science courses.

- Dr. Pandey's first startup, SynapSense, was a pioneering IoT company, later acquired by Panduit.
- His research and entrepreneurial interests lie in AI, Programming Languages, Blockchain, Internet of Things, Cloud, Security, and Privacy. Specifically, his interests are driven by the need to build software systems that are easier to build, analyze and deploy.
- In this regard, he has developed a novel software platform for building multi-platform AI, Blockchain, Mobile, and IoT applications. The platform includes a next-generation programming language, Ankur, that Dr. Pandey has designed and implemented. The platform will enable development of AI applications in which both algorithm-driven (deterministic) and data-driven (non-deterministic) components of AI applications can be integrated seamlessly.
- In addition, he consults extensively with companies on AI, Blockchain, IoT, Cloud, Mobile Computing, and Distributed Systems.
- He has published 40+ papers in conferences and journals and holds 16+ patents in software, visualization, wireless networks, data analytics, security, and control systems.
- Dr. Pandey holds a B.Tech. degree in Computer Science from IIT (Indian Institute of Technology), Kharagpur, and Ph.D. in Computer Science from the University of Texas at Austin.

GUEST SPEAKERS

Asif Qamar
VP, and Chief Architect, ML/Analytics

Asif is currently working at Cornerstone developing machine-learning and big-data platform for HR/workforce applications. The impact of this work has been widely reported in various magazines, and also found mention in a White House report on employment. He was also instrumental in building predictive analytics and high-performance data-mining at Oracle corporation.

He is a very passionate teacher and taught Computer Science for over 9 years at University of California, Berkeley.

Asif has a Ph.D. in Theoretical Physics (Syracuse University), and an MS in Computer Science (University of Illinois).

LinkedIn Profile: https://www.linkedin.com/in/asifqamar/

Kartik Hegde
Ph.D. Student

Kartik is a computer architect and a Ph.D. student at the University of Illinois, Urbana-Champaign. Before that, he worked with ARM Research on Machine Learning. He is currently exploring the development of accelerators targeted at Deep Learning.

Kartik works on building efficient processors for Machine Learning. He is now selected as a Facebook Fellow, to help them rev up Deep Learning for mobile devices.

LinkedIn profile: https://www.linkedin.com/in/KartikHegde/

Satish Appalautty
CEO, Vistalytics

Satish is a serial entrepreneur in Silicon Valley. He founded Vistalytics, developing an AI-based application to unlock potential in financial data, to shape the strategy for business through reliable and factual insight rather than intuition. Vistalytics has the capability to do in minutes what could take humans months of dedicated research to finish. He also co-founded Encover, which maximizes service sales revenue that was acquired by SYNNEX. He is also a member of the Forbes Technology Council.

LinkedIn Profile: https://www.linkedin.com/in/appalakutty/

HOW WILL YOU LEARN

- ✓ Online using Desktop, Laptop or Mobile devices
- ✓ Learn at your own convenient time, and pace
- ✓ Video lectures delivered from a cloud LMS platform
- ✓ Quizzes online remote
- ✓ Hands-on projects, and industry case studies for the reinforcement of the learning

WHAT IS THE DURATION OF THE PROGRAM?

- ✓ 12 weeks, around 10 hours per week, or a total of 120 hours
- ✓ Rolling enrollment allows you to start any time. The duration can be aligned to your requirements.

ABOUT iZen

iZen is a Talent Empowerment company, offering end-to-end solutions for skill development and employability, leveraging the power of AI and other digital technologies. The company was founded in Silicon Valley, California with a global vision to incubate innovation and to provide a platform that gives access to knowledge, skills, and advisory to empower the next generation workforce and students. iZen brings you internationally recognized standard programs, to set you apart and to future-proof your career.

HOW DO I ENROLL IN THE COURSE?

EMAIL: info@iZen.ai

https://academy.iZen.ai