



# Data Analytics, Machine Learning and Generative AI

6-Month Applied Professional Program | Career Grad Institute

This six-month program develops a strong computational and analytical foundation for modern data science and artificial intelligence systems. The curriculum progresses from statistical reasoning and Python programming to data analytics, machine learning engineering, and modern generative AI systems.

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6 Months	6 Capstones	24 Weeks	Industry Ready
Full Program	Real Projects	Structured	Portfolio

Month 1	Month 2	Month 3	Month 4	Month 5	Month 6
Statistics	Python	Data Analysis	ML Eng.	Deep Learning	Gen AI

MONTH 1

## Statistical Thinking for Data

Weeks 1–4

Statistics forms the theoretical basis for understanding data behaviour and uncertainty. Before machine learning models can be constructed, it is necessary to understand sampling processes, probability distributions, and inferential reasoning.

### Capstone Project

*Perform statistical analysis on a real dataset and produce an inference report.*

### Core Topics

- Probability distributions
- Sampling and inference
- Hypothesis testing
- Descriptive statistics & statistical inference
- Sampling theory

MONTH 2

## Python Programming for Data

Weeks 5–8

Python is the primary language used for scientific computing and machine learning development. This module develops programming fluency required to manipulate data and build analytical workflows.

### Capstone Project

*Develop a reusable Python data processing toolkit.*

### Core Topics

- Python data structures
- Functions and modules
- File processing
- Data processing workflows
- Computational scripting

MONTH 3

## Data Analysis and Visualization

Weeks 9–12

Real world data requires transformation and exploration before modelling. This module focuses on the analytical tools used for data science workflows.

### Capstone Project

*Conduct a full exploratory data analysis with statistical visualizations.*

### Core Topics

- Numerical computing with NumPy
- Structured data manipulation with Pandas
- Exploratory data analysis (EDA)
- Visualization using Seaborn and Matplotlib

MONTH 4

## Machine Learning Engineering

Weeks 13–16

Machine learning introduces algorithms capable of learning patterns from data and producing predictive models. Emphasis is placed on model understanding, training procedures, and evaluation metrics.

### Capstone Project

*Develop an end-to-end predictive machine learning system.*

### Core Topics

- Regression models
- Classification algorithms
- Clustering techniques
- Feature engineering
- Model validation using Scikit-learn

MONTH 5

## Deep Learning Systems

Weeks 17–20

Deep learning enables models to learn complex nonlinear representations through neural networks. This stage introduces training workflows and computational frameworks.

### Capstone Project

*Train and evaluate a neural network model on real data.*

### Core Topics

- Neural networks & backpropagation
- Training pipelines
- Convolutional architectures
- TensorFlow and Keras implementation

MONTH 6

## Generative AI Applications

Weeks 21–24

Generative AI systems combine large language models with data pipelines and external tools. This stage introduces architectures used in modern AI applications.

### Capstone Project

*Develop a complete generative AI application integrating models, tools, and data.*

### Core Topics

- Prompt engineering
- LLM pipelines using LangChain
- Workflow orchestration with LangGraph
- Model deployment using HuggingFace
- Multimodal processing workflows

## Program Outcome

### Comprehensive Expertise

Upon completion, participants develop a comprehensive understanding of the modern data science and artificial intelligence ecosystem. The curriculum builds capability progressively — from statistical reasoning and computational foundations, through practical data analysis and machine learning, to the design and development of generative AI systems.

### Practical Implementation

Participants gain the ability to work with real-world datasets, perform exploratory analysis, construct predictive models, and deploy AI-driven solutions. Learners not only understand theoretical principles but can translate them into functional software systems and analytical tools.

### End-to-End Capability

Graduates can design end-to-end data workflows — from raw data acquisition and preprocessing, through analytical modelling and machine learning experimentation, to advanced AI applications powered by large language models and deep learning architectures.

### Career Pathways

Participants can pursue roles such as Data Analyst, Machine Learning Engineer, AI Developer, or Applied Data Scientist across industries including finance, healthcare, climate science, logistics, technology platforms, and research institutions.

### Portfolio Outcomes

Graduates leave with a portfolio of six capstone projects demonstrating analytical reasoning, machine learning engineering, and generative AI system development — tangible evidence of their ability to design and implement modern AI solutions.

### Tools & Technologies

Python	NumPy	Pandas	Scikit-learn	TensorFlow
LangChain	LangGraph	HuggingFace	Seaborn	Matplotlib