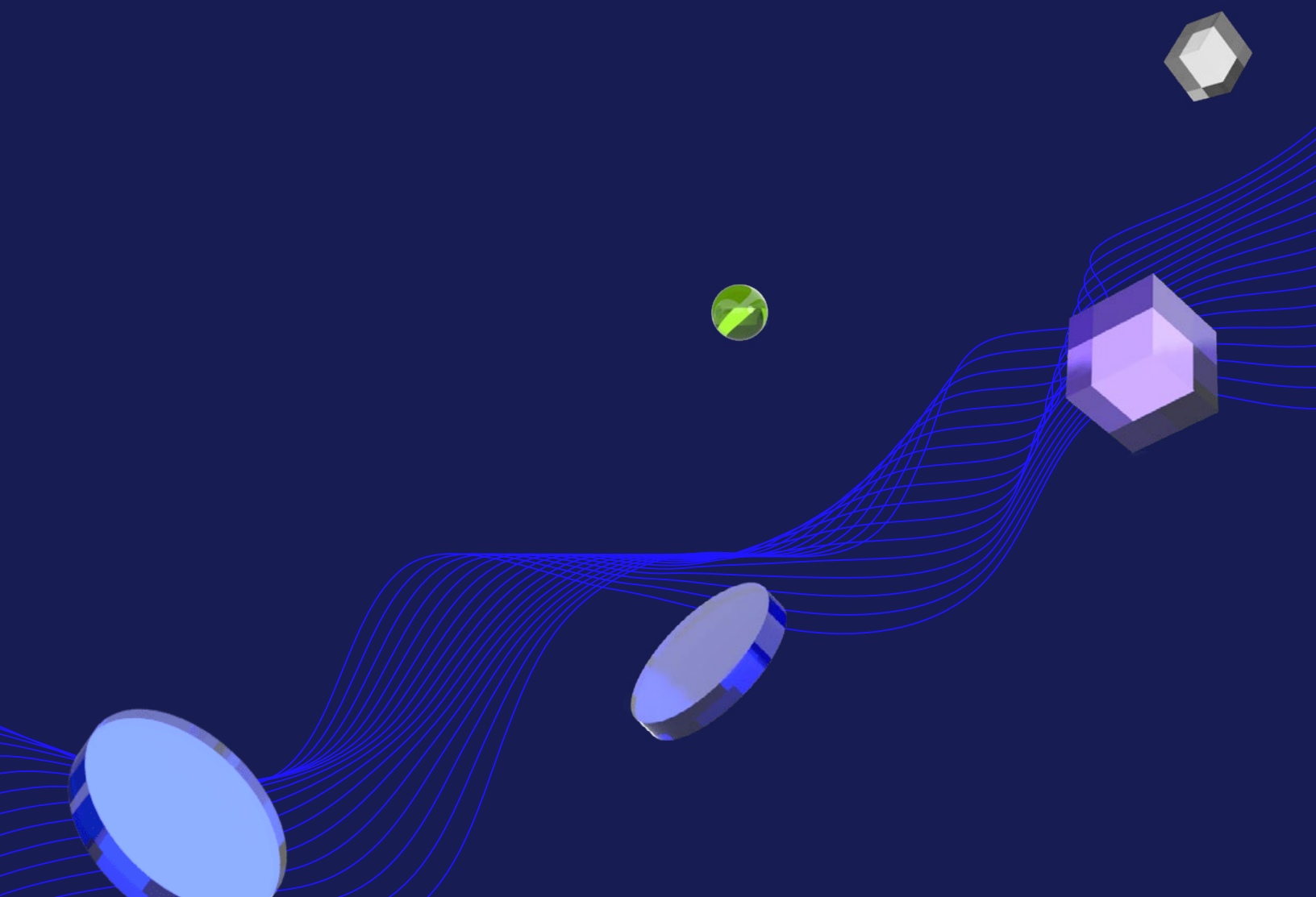
INDIVIDUAL LEARNERS

UDACITY

SCHOOL OF ARTIFICIAL INTELLIGENCE

Machine Learning Engineer with Microsoft Azure

Nanodegree Program Syllabus



Overview

This goal of this Nanodegree program is to enhance learners' skills by building and deploying sophisticated machine learning (ML) solutions using popular open source tools and frameworks such as scikit-learn. Learners will also gain experience in understanding ML models, protecting people and their data, and controlling the end-to-end ML lifecycle at scale.

This program is comprised of 2 courses and 3 projects. Each project will be an opportunity to demonstrate what students have learned in the lessons. Their completed projects will become part of a career portfolio that will demonstrate their acquired skills in machine learning engineering with Microsoft Azure.

Learning Objectives

A graduate of this program will be able to:

- Analyze how to manage data.
- Run complex machine learning tasks using Azure labs.
- Identify use cases for automated machine learning.
- Use the Azure ML SDK to design, create, and manage machine learning pipelines in Azure.
- Analyze model interpretations.

Program information

Estimated Time

3 months at 10hrs/week*

Skill Level

Intermediate

Prerequisites

A well-prepared learner should have:

- Basic Python programming skills.
- Basic familiarity with fundamental machine learning concepts.
- An understanding of the basics of Azure and Docker/Container experience.
- A background in beginning level statistics is helpful.

Required Hardware/Software

None

*The length of this program is an estimation of total hours the average student may take to complete all required coursework, including lecture and project time. If you spend about 5-10 hours per week working through the program, you should finish within the time provided. Actual hours may vary.

Course 1

Using Azure Machine Learning

Machine learning is a critical business operation for many organizations. Learn how to configure machine learning pipelines in Azure. Identify use cases for automated machine learning. Use the Azure ML SDK to design, create, and manage machine learning pipelines in Azure.

Course Project

Optimizing an ML Pipeline in Azure

Throughout the course, we cover many different ways to work with data and machine learning. It can be quite challenging to decide what method to use—building one's own machine learning pipeline, leveraging AutoML, hyperparameter tuning, and so on. In this project, use scikit-learn, Hyperdrive, and AutoML to understand the costs and benefits of each methodology. First, construct a pipeline from scikit-learn using the Azure ML SDK to import data from a URL. Then, configure a Hyperdrive run for their scikit-learn pipeline to find the optimal hyperparameters. Use the same dataset for an AutoML run to find an optimal model and set of hyperparameters. Finally, write a README documenting findings and comparing the differences, costs, and benefits of the different methods used.

Lesson 1

Introduction to Azure ML

- Understand why one should do ML in the cloud.
- Understand when one should do ML in the cloud.
- Analyze the customers of ML.

Lesson 2

Workspaces & the Azure ML Studio

- Interpret the Azure ML platform.
- Explain how to manage and choose compute resources.
- Summarize the key components of Workspaces and Notebooks.

Lesson 3

Datastores & Datasets

- Interpret the Azure ML Platform.
- Explain how to manage and choose compute resources.
- Summarize the key components of Workspaces and Notebooks.

Lesson 4

Training Models in Azure ML

- Experiment with the Designer.
- Develop and manage pipelines.
- Organize and run hyperparameter experiments.

Lesson 5

The AzureML SDK

- Utilize data with the SDK.
- Create pipelines.
- Organize experiments.

Lesson 6

AutoML & Hyperparameter

- Design solutions with AutoML and the SDK.
- Analyze model interpretation experiments.
- Create portable ML models with ONNX.

Course 2

Machine Learning Operations

Operationalizing machine learning is a set of best practices that are mostly inherited by the DevOps movement. In the past few years, it has become clear that shipping models into production in a reliable, reproducible, and automated way with a constant feedback loop is crucial. This is where all the DevOps principles come into play and is exactly what this course covers in detail.

Course Project

Operationalizing Machine Learning

MLOps and its core features have been covered in this course in detail. This project will apply all the principles from the lessons to get a model trained with AutoML and deployed into a production environment.

This project covers a lot of the key concepts of operationalizing machine learning, from selecting the appropriate targets for deploying models, to enabling Application Insights, identifying problems in logs, and harnessing the power of Azure's Pipelines. All these concepts are part of core DevOps pillars that will allow one to demonstrate solid skills for shipping machine learning models into production.

Lesson 1

Enabling Security

- Create a service principal account for different types of roles.
- Determine what the differences are in various forms of authentication.
- Use a specific type of authentication when selecting deployment settings.

Lesson 2

Deploy a ML Model

- Use a production environment for deployment.
- Enable authentication in the deployment cluster.
- Discover the differences between container-based deployment and kubernetes.

Lesson 3

ML Endpoints

- Use a proven tool to find what a baseline for performance is.
- Gather information about an endpoint input to interact with it.
- Find what potential issues can happen with incorrect input.

Lesson 4

Pipeline Automation

- Create a pipeline to further automation when training models.
- Enable a REST API for the pipeline, so other services can interact with it.
- Use the Python SDK to publish a pipeline and enable the endpoint.

Capstone Project

The program capstone gives learners the opportunity to use the knowledge they have obtained from this Nanodegree program to solve an interesting problem. Learners will have to use Azure's Automated ML and HyperDrive to solve a task. Finally, learners will have to deploy the model as a web service and test the model endpoint.

Capstone Project

Training & Deploying a Machine Learning Model in Azure

Use both the hyperdrive and automl API from azureml to build this project. Choose the model to train and the data to use. However, the data used needs to be external and not available in Azure's ecosystem. Import the dataset into the workspace. Subsequently, train a model on that dataset using automated ML and then train a custom model whose hyperparameters tuned using HyperDrive. The type of model used is not important. Use ML models through Scikit-learn or deep learning models like ANNs and CNNs through Keras, TensorFlow, or PyTorch for this part of the project.

After trainingboth the models, compare their performance, deploy the best model as a web service, and test the model endpoint.

This project will demonstrate one's ability to use an external dataset in the workspace and train a model using the different tools available in the AzureML framework as well as the ability to deploy the model as a web service.

Meet your instructors.

Noah Gift

Teacher & Consiltant

Noah Gift teaches and consults at top universities and companies globally, including Duke and Northwestern. His areas of expertise are machine learning, MLOps, A.I., data science, machine learning, and cloud architecture. Noah has authored several bestselling books, including Python for DevOps.

Alfredo Deza

Software Engineer

Alfredo Deza is a passionate software engineer, avid open source developer, Vim plugin author, photographer, and former Olympic athlete. He has rebuilt company infrastructure, designed shared storage, and replaced complex build systems, always in search of efficient and resilient environments.

Erick Galinkin

Hacker & Scientist

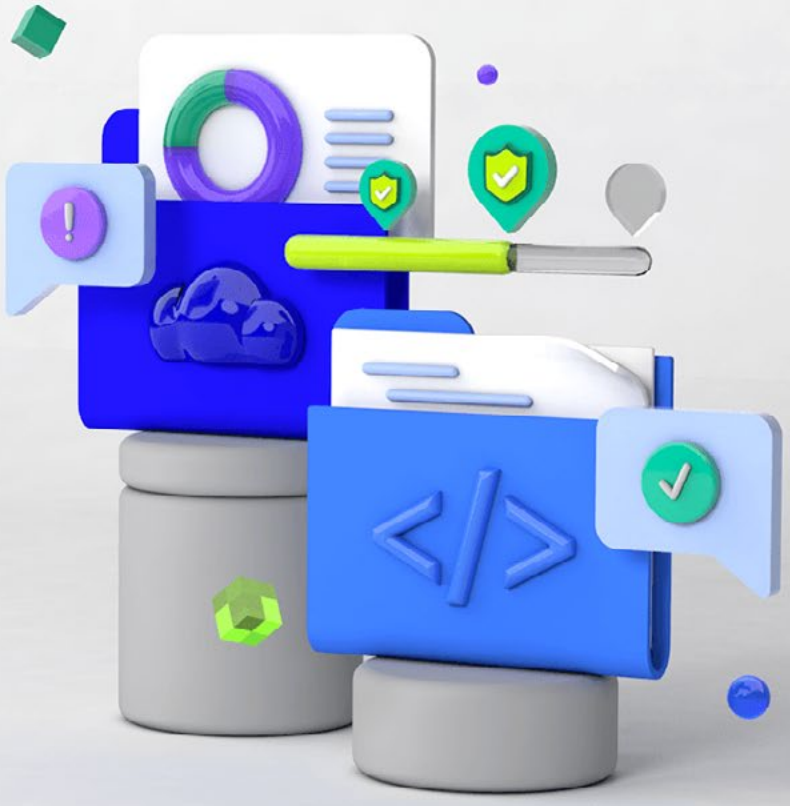
Erick Galinkin is a hacker and scientist specializing in applying artificial intelligence to cybersecurity problems and the Theory of Machine Learning. He is also a researcher at the Montreal AI Ethics Institute focusing on applying DevOps principles to the security and ethics of machine learning systems.

Soham Chatterjee

Intel Software Innovator

Soham is an Intel® Software Innovator and a former deep learning researcher at Saama Technologies. He is currently a Master of Research student at NTU, Singapore. His research is on edge computing, IoT and neuromorphic hardware.

Udacity's learning experience



Hands-on Projects

Open-ended, experiential projects are designed to reflect actual workplace challenges. They aren't just multiple choice questions or step-by-step guides, but instead require critical thinking.

Quizzes

Auto-graded quizzes strengthen comprehension. Learners can return to lessons at any time during the course to refresh concepts.

Knowledge

Find answers to your questions with Knowledge, our proprietary wiki. Search questions asked by other students, connect with technical mentors, and discover how to solve the challenges that you encounter.

Custom Study Plans

Create a personalized study plan that fits your individual needs. Utilize this plan to keep track of movement toward your overall goal.

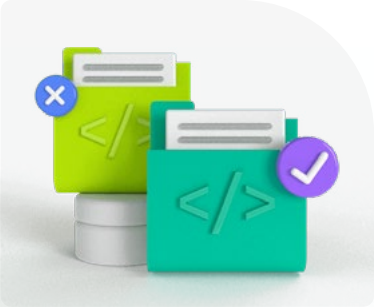
Workspaces

See your code in action. Check the output and quality of your code by running it on interactive workspaces that are integrated into the platform.

Progress Tracker

Take advantage of milestone reminders to stay on schedule and complete your program.

Our proven approach for building job-ready digital skills.



Experienced Project Reviewers

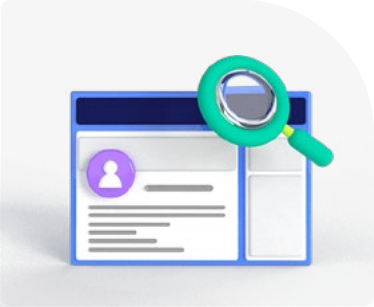
Verify skills mastery.

- Personalized project feedback and critique includes line-by-line code review from skilled practitioners with an average turnaround time of 1.1 hours.
- Project review cycle creates a feedback loop with multiple opportunities for improvement—until the concept is mastered.
- Project reviewers leverage industry best practices and provide pro tips.

Technical Mentor Support

24/7 support unblocks learning.

- Learning accelerates as skilled mentors identify areas of achievement and potential for growth.
- Unlimited access to mentors means help arrives when it's needed most.
- 2 hr or less average question response time assures that skills development stays on track.



Personal Career Services

Empower job-readiness.

- Access to a Github portfolio review that can give you an edge by highlighting your strengths, and demonstrating your value to employers.*
- Get help optimizing your LinkedIn and establishing your personal brand so your profile ranks higher in searches by recruiters and hiring managers.

Mentor Network

Highly vetted for effectiveness.

- Mentors must complete a 5-step hiring process to join Udacity's selective network.
- After passing an objective and situational assessment, mentors must demonstrate communication and behavioral fit for a mentorship role.
- Mentors work across more than 30 different industries and often complete a Nanodegree program themselves.

*Applies to select Nanodegree programs only.

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