UDACITY

NANODEGREE PROGRAM SYLLABUS

Programming for Data Science with Python

Overview

Learn the programming fundamentals required for a career in data science. By the end of the program, you will be able to use Python, SQL, Command Line, and Git.

IN COLLABORATION WITH

MODE

Estimated Time: 3 Months at 10hrs/week

Prerequisites: No Experience Required

Flexible Learning: Self-paced, so you can learn on the schedule that works best for you

Need Help? **udacity.com/advisor** Discuss this program with an enrollment advisor.

Course 1: Introduction to SQL

Learn SQL fundamentals such as JOINs, Aggregations, and Subqueries. Learn how to use SQL to answer complex business problems.

Course Project
Investigate a Database

In this project, you'll work with a relational database while working with PostgreSQL. You'll complete the entire data analysis process, starting by posing a question, running appropriate SQL queries to answer your questions and finishing by sharing your findings.

	LEARNING OUTCOMES	
LESSON ONE	**Basic SQL**	• Write common SQL commands including SELECT, FROM, and WHERE • Use logical operators like LIKE, AND, and OR
LESSON TWO	**SQL Joins**	• Write JOINs in SQL, as you are now able to combine data from multiple sources to answer more complex business questions • Understand different types of JOINs and when to use each type
LESSON THREE	**SQL Aggregations**	• Write common aggregations in SQL including COUNT, SUM, MIN, and MAX • Write CASE and DATE functions, as well as work with NULLs
LESSON FOUR	**Advanced SQL Queries**	• Use subqueries, also called CTEs, in a number of different situations • Use other window functions including RANK, NTILE, LAG, LEAD new functions along with partitions to complete complex tasks

Course 2: Introduction to Python Programming

In this part, you'll learn to represent and store data using Python data types and variables, and use conditionals and loops to control the flow of your programs. You'll harness the power of complex data structures like lists, sets, dictionaries, and tuples to store collections of related data. You'll define and document your own custom functions, write scripts, and handle errors. You will also learn to use two powerful Python libraries - Numpy, a scientific computing package, and Pandas, a data manipulation package.

Course Project
Explore US Bikeshare Data

You will use Python to answer interesting questions about bikeshare trip data collected from three US cities. You will write code to collect the data, compute descriptive statistics, and create an interactive experience in the terminal that presents the answers to your questions.

	LEARNING OUTCOMES	
LESSON ONE	**Why Python Programming**	• Gain an overview of what you'll be learning and doing in the course • Understand why you should learn programming with Python
LESSON TWO	**Data Types and Operators**	• Represent data using Python's data types: integers, floats, booleans, strings, lists, tuples, sets, dictionaries, compound data structures • Perform computations and create logical statements using Python's operators: Arithmetic, Assignment, Comparison, Logical, Membership, Identity • Declare, assign, and reassign values using Python variables • Modify values using built-in functions and methods • Practice whitespace and style guidelines

LESSON THREE	**Control Flow**	• Write conditional expressions using if statements and boolean expressions to add decision making to your Python programs • Use for and while loops along with useful built-in functions to iterate over and manipulate lists, sets, and dictionaries • Skip iterations in loops using break and continue • Condense for loops to create lists efficiently with list comprehensions
LESSON FOUR	**Functions**	• Define your own custom functions • Create and reference variables using the appropriate scope • Add documentation to functions using docstrings • Define lambda expressions to quickly create anonymous functions • Use iterators and generators to create streams of data
LESSON FIVE	**Scripting**	• Install Python 3 and set up your programming environment • Run and edit python scripts • Interact with raw input from users • Identify and handle errors and exceptions in your code • Open, read, and write to files • Find and use modules in Python Standard Library and third-party libraries • Experiment in the terminal using a Python Interpreter
LESSON SIX	**NumPy**	• Create, access, modify, and sort multidimensional NumPy arrays (ndarrays) • Load and save ndarrays • Use slicing, boolean indexing, and set operations to select or change subsets of an ndarray • Understand difference between a view and a copy of ndarray • Perform element-wise operations on ndarrays • Use broadcasting to perform operations on ndarrays of different sizes.
LESSON SEVEN	**Pandas**	• Create, access, and modify the main objects in Pandas, Series and DataFrames • Perform arithmetic operations on Series and DataFrames • Load data into a DataFrame • Deal with Not a Number (NaN) values

Course 3: Introduction to Version Control

Learn how to use version control and share your work with other people in the data science industry.

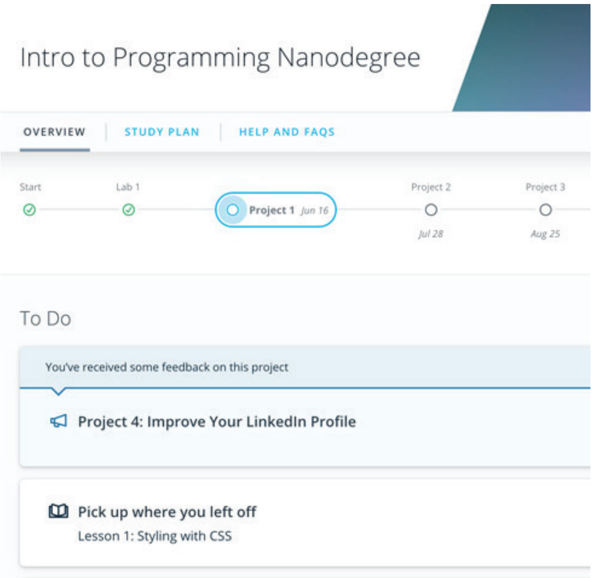
Course Project
Post your work on Github

In this project, you will learn important tools that all programmers use. First, you'll get an introduction to working in the terminal. Next, you'll learn to use git and Github to manage versions of a program and collaborate with others on programming projects. In this project you will post two different versions of a Jupyter Notebook capturing your learnings from the course, and add commits to your project Git repository.

	LEARNING OUTCOMES	
LESSON ONE	Shell Workshop	• The Unix shell is a powerful tool for developers of all sorts. Get a quick introduction to the basics of using it on your computer.
LESSON TWO	Purpose & Terminology	• Learn why developers use version control and discover ways you use version control in your daily life • Get an overview of essential Git vocabulary • Configure Git using the command line
LESSON THREE	Create a Git Repo	• Create your first Git repository with git init • Copy an existing Git repository with git clone • Review the current state of a repository with the powerful git status
LESSON FOUR	Review a Repo's History	• Review a repo's commit history git log • Customize git log's output using command line flags in order to reveal more (or less) information about each commit • Use the git show command to display just one commit

LESSON FIVE	**Add Commits to a Repo**	• Master the Git workflow and make commits to an example project • Use git diff to identify what parts of a file have been changed in a commit • Learn how to mark files as “untracked” using .gitignore
LESSON SIX	**Tagging, Branching, and Merging**	• Tagging, Branching, and Merging • Organize your commits with tags and branches • Jump to particular tags and branches using git checkout • Learn how to merge together changes on different branches and crush those pesky merge conflicts
LESSON SEVEN	**Undoing Changes**	• Learn how and when to edit or delete an existing commit • Use git commit’s -amend flag to alter the last commit • Use git reset and git revert to undo and erase commits

Our Classroom Experience



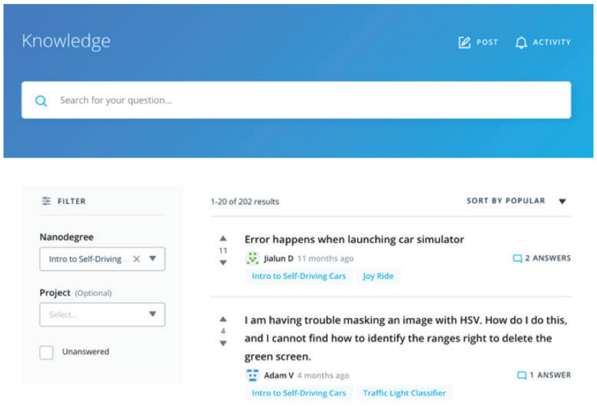
Intro to Programming Nanodegree

To Do

You've received some feedback on this project

Project 4: Improve Your LinkedIn Profile

Pick up where you left off
Lesson 1: Styling with CSS

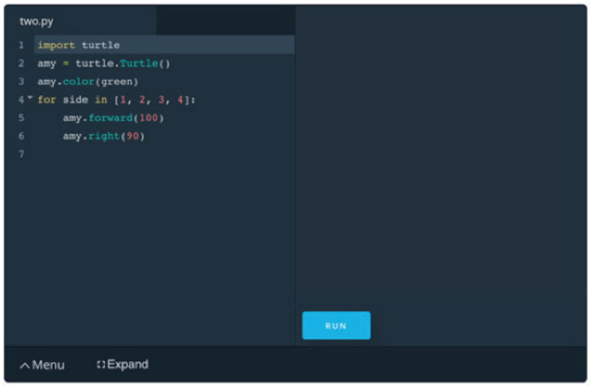


Knowledge

1-20 of 202 results

11 Error happens when launching car simulator
Jialun D 11 months ago — 2 ANSWERS
Intro to Self-Driving Cars | Joy Ride

4 I am having trouble masking an image with HSV. How do I do this, and I cannot find how to identify the ranges right to delete the green screen.
Adam V 4 months ago — 1 ANSWER
Intro to Self-Driving Cars | Traffic Light Classifier



two.py

```
import turtle
amy = turtle.Turtle()
amy.color(green)
for side in [1, 2, 3, 4]:
    amy.forward(100)
    amy.right(90)
```

REAL-WORLD PROJECTS

Build your skills through industry-relevant projects. Get personalized feedback from our network of 900+ project reviewers. Our simple interface makes it easy to submit your projects as often as you need and receive unlimited feedback on your work.

KNOWLEDGE

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

STUDENT HUB

Leverage the power of community through a simple, yet powerful chat interface built within the classroom. Use Student Hub to connect with your fellow students in your Executive Program.

WORKSPACES

See your code in action. Check the output and quality of your code by running them on workspaces that are a part of our classroom.

QUIZZES

Check your understanding of concepts learned in the program by answering simple and auto-graded quizzes. Easily go back to the lessons to brush up on concepts anytime you get an answer wrong.

CUSTOM STUDY PLANS

Preschedule your study times and save them to your personal calendar to create a custom study plan. Program regular reminders to keep track of your progress toward your goals and completion of your program.

PROGRESS TRACKER

Stay on track to complete your Nanodegree program with useful milestone reminders.

Learn with the Best

Josh Bernhard

DATA SCIENTIST

Josh has been sharing his passion for data for nearly a decade at all levels of university, and as Lead Data Science Instructor at Galvanize. He's used data science for work ranging from cancer research to process automation.

Derek Steer

CEO AT MODE

Derek is the CEO of Mode Analytics. He developed an analytical foundation at Facebook and Yammer and is passionate about sharing it with future analysts. He authored SQL School and is a mentor at Insight Data Science.

Juno Lee

CURRICULUM LEAD

Juno is the curriculum lead for the School of Data Science. She has been sharing her passion for data and teaching, building several courses at Udacity. As a data scientist, she built recommendation engines, computer vision and NLP models, and tools to analyze user behavior.

Richard Kalehoff

INSTRUCTOR

Richard is a Course Developer with a passion for teaching. He has a degree in computer science, and first worked for a nonprofit doing everything from front end web development, to backend programming, to database and server management.

All Our Nanodegree Programs Include:

EXPERIENCED PROJECT REVIEWERS

REVIEWER SERVICES

- Personalized feedback & line by line code reviews
- 1600+ Reviewers with a 4.85/5 average rating
- 3 hour average project review turnaround time
- Unlimited submissions and feedback loops
- Practical tips and industry best practices
- Additional suggested resources to improve

TECHNICAL MENTOR SUPPORT

MENTORSHIP SERVICES

- Questions answered quickly by our team of technical mentors
- 1000+ Mentors with a 4.7/5 average rating
- Support for all your technical questions

PERSONAL CAREER SERVICES

CAREER COACHING

- Personal assistance in your job search
- Monthly 1-on-1 calls
- Personalized feedback and career guidance
- Interview preparation
- Resume services
- Github portfolio review
- LinkedIn profile optimization

Frequently Asked Questions

PROGRAM OVERVIEW

WHY SHOULD I ENROLL?

The Programming for Data Science with Python Nanodegree program offers you the opportunity to learn the most important programming languages used by data scientists today. Get your start into the fascinating field of data science and learn Python, SQL, terminal, and git with the help of experienced instructors.

WHAT JOBS WILL THIS PROGRAM PREPARE ME FOR?

This is an introductory program that is not designed to prepare you for a specific job. However, as a graduate of this program, you will be proficient in the programming skills used in many data analysis and data science roles, including Python, SQL, Terminal, and Git.

HOW DO I KNOW IF THIS PROGRAM IS RIGHT FOR ME?

If you are interested in taking the first step into the field of Data Science, this course is for you. This course will quickly teach you the foundational data science programming tools (Python, SQL, Git). This course requires no pre-requisite knowledge so you can get started now. Having mastered these in demand tools you will be able to tackle real world data analysis problems.

Learning to program Python and SQL, the main programing languages used by data scientists and analysts, is the core of this program. If you decide to take the Programming for Data Science with Python, you'll also learn specialized data libraries for Python including Pandas and Numpy, and use Git and the Terminal to share your work and learn about version control. By learning these foundational programming skills, you will be ready to advance your career in data.

WHAT IS THE DIFFERENCE BETWEEN THE PYTHON TRACK AND THE R TRACK?

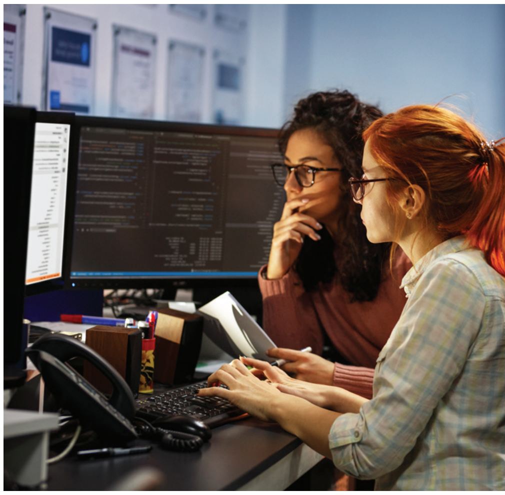
We offer two tracks to this program, one teaching Python and one teaching R. These are both popular among data scientists. You can enroll in one or the other, not both.

Both tracks cover the same fundamental concepts, but use a different programming language. The SQL, command line, and Git curriculum is the same in both tracks. This includes the first and third projects, which are the same between the two tracks.

The programming course and project are different between the two tracks. One course relies on Python, while the other relies on R. The projects for the two courses rely on the same dataset and skills, but they differ in the

FAQs Continued

approach and final deliverable. Learn more about the Programming for Data Science with R Nanodegree program.



WHAT IS THE SCHOOL OF DATA SCIENCE, AND HOW DO I KNOW WHICH PROGRAM TO CHOOSE?

Udacity's School of Data consists of several different Nanodegree programs, each of which offers the opportunity to build data skills, and advance your career. These programs are organized around career roles like Business Analyst, Data Analyst, Data Scientist, and Data Engineer.

The School of Data currently offers three clearly-defined career paths in Business Analytics, Data Science, and Data Engineering. Whether you are just getting started in data, are looking to augment your existing skill set with in-demand data skills, or intend to pursue advanced studies and career roles, Udacity's School of Data has the right path for you! Visit **How to Choose the Data Science Program That's Right for You** to learn more.

ENROLLMENT AND ADMISSION

DO I NEED TO APPLY? WHAT ARE THE ADMISSION CRITERIA?

No. This Nanodegree program accepts all applicants regardless of experience and specific background.

WHAT ARE THE PREREQUISITES FOR ENROLLMENT?

There are no prerequisites for enrolling aside from basic computer skills and English proficiency. You should feel comfortable performing basic operations on your computer like opening files and folders, opening applications, and copying and pasting.

TUITION AND TERM OF PROGRAM

HOW IS THIS NANODEGREE PROGRAM STRUCTURED?

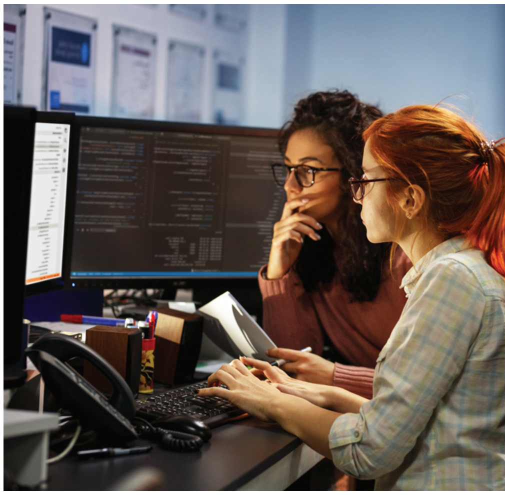
The Programming for Data Science with R Nanodegree program is comprised of content and curriculum to support three (3) projects. We estimate that students can complete the program in three (3) months, working 10 hours per week.

Each project will be reviewed by the Udacity reviewer network. Feedback will be provided, and if you do not pass the project, you will be asked to resubmit the project until it passes.

CAN I SWITCH MY START DATE? CAN I GET A REFUND?

Please see the Udacity Nanodegree program **FAQs** for policies on enrollment in our programs.

FAQs Continued



HOW LONG IS THIS NANODEGREE PROGRAM?

Access to this Nanodegree program runs for the length of time specified in the payment card above. If you do not graduate within that time period, you will continue learning with month to month payments. See the Terms of Use and FAQs for other policies regarding the terms of access to our Nanodegree programs.

I HAVE GRADUATED FROM THE PROGRAMMING FOR DATA SCIENCE WITH R NANODEGREE PROGRAM AND I WANT TO KEEP LEARNING. WHERE SHOULD I GO FROM HERE?

Check out our Data Analyst Nanodegree program to take the programming skills you have learned and apply them to real world Data Analyst business problems. Working on these more complex projects will deepen your knowledge of coding and make you a more attractive candidate to be hired as an data analyst.

You could also consider the Data Engineer Nanodegree program, which focuses on data models, data warehouses, and data pipelines.

WHAT SOFTWARE AND VERSIONS WILL I NEED IN THIS PROGRAM?

To enroll, students should have basic computer skills, a Gmail account, and a Facebook account to complete the projects.

SOFTWARE AND HARDWARE

WHAT SOFTWARE AND VERSIONS WILL I NEED IN THIS PROGRAM?

For this Nanodegree program, you will need a 64-bit computer and access to the Internet.