Python Programming Language

Prepared by: Mohamed Ayman

Algorithm Engineer at Valeo

Deep Learning Researcher and Teaching Assistant

at The American University in Cairo (AUC)

spring 2020

sw.eng.MohamedAyman@gmail.com

linkedin.com/in/cs-MohamedAyman

github.com/cs-MohamedAyman

codeforces.com/profile/Mohamed_Ayman

Mohamed Ayman

Experience

- Valeo
  - Deep Learning Researcher
  - Algorithm Software Engineer
- The American University in Cairo (AUC)
  - Research Assistant
  - Teaching Assistant
- BBI Consultancy
  - Research and Development Engineer (R&D Engineer)
  - Data Engineer

Education

- MSc in Deep Learning, Cairo University
- BSc in Computer Science, Cairo University

Python Programming Language Training

Lecture Agenda

We will discuss in this lecture the following topics

1- Python Features

2- Python Content

3- Practice on Online Judges

4- Tutorials and References

5- Online Courses

6- Python Installation


Let's
START UP

Lecture Agenda

- ✔ Section 1: Python Features
- Section 2: Python Content
- Section 3: Practice on Online Judges
- Section 4: Tutorials and References
- Section 5: Online Courses
- Section 6: Python Installation

Python Features

1. **A simple language which is easier to learn**
   Python has a very simple and elegant syntax. It's much easier to read and write Python programs compared to other languages like: C++, Java, C#. Python makes programming fun and allows you to focus on the solution rather than syntax.
   If you are a newbie, it's a great choice to start your journey with Python.

2. **Free and open-source**
   You can freely use and distribute Python, even for commercial use. Not only can you use and distribute softwares written in it, you can even make changes to the Python's source code.
   Python has a large community constantly improving it in each iteration.

3. **Portability**
   You can move Python programs from one platform to another, and run it without any changes.
   It runs seamlessly on almost all platforms including Windows, Mac OS X and Linux.

Python Features

4 **A high-level, interpreted language**

Unlike C/C++, you don't have to worry about daunting tasks like memory management, garbage collection and so on.

Likewise, when you run Python code, it automatically converts your code to the language your computer understands. You don't need to worry about any lower-level operations.

5 **Large standard libraries to solve common tasks**

Python has a number of standard libraries which makes life of a programmer much easier since you don't have to write all the code yourself. For example: Need to connect MySQL database on a Web server? You can use MySQLdb library using `import MySQLdb` .

Standard libraries in Python are well tested and used by hundreds of people. So you can be sure that it won't break your application.

6 **Object-oriented**

Everything in Python is an object. Object oriented programming (OOP) helps you solve a complex problem intuitively.

With OOP, you are able to divide these complex problems into smaller sets by creating objects.

Python Features

- Simple & Easy to Learn

Java

```
public class HelloWorld {
    public static void main(String[] args) {
        System.out.println("Hello, world");
    }
}
```

Python

```
print("Hello, world")
```

Python Features

- Portable & Extensible

Python Features

- Testing Frameworks

  - Python supports testing with cross-platform & cross-browser
  - Built in testing framework which covers debugging time and fastest workflows

Tools

Framework

Splinter

pytest

Python Features

- Web Development

- Develop web applications
- Scrape websites

Frameworks

django | Flask | Pylons | WEB2PY

Python Features

- Computer Graphics

➢ Graphical User Interface ➢ Desktop applications ➢ Game development

Libraries

Tkinter Jython wxPython pygame

Python Features

- Data Science

- Well-suited for data manipulation & analysis
- Deals with tabular data with heterogeneously-typed columns
- Arbitrary matrix data
- Observational/ statistical datasets

Libraries

NumPy

Pandas

matplotlib

seaborn

Python Features

- Big Data

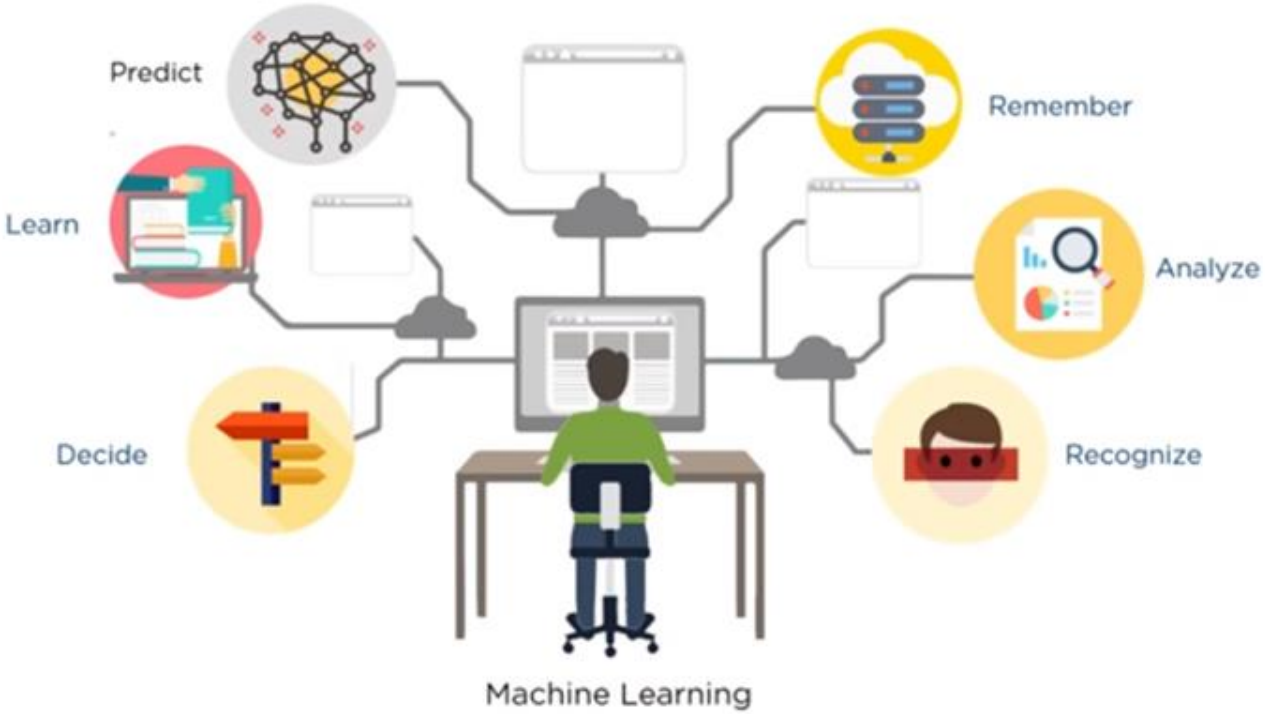
  - Python handles **BIG DATA!**
  - Python supports parallel computing
  - You can write MapReduce codes in Python

Libraries

PYDOOP | DASK | PySpark

Python Features

- Artificial Intelligence



Lecture Agenda

- ✔ Section 1: Python Features
- **Section 2: Python Content**
- Section 3: Practice on Online Judges
- Section 4: Tutorials and References
- Section 5: Online Courses
- Section 6: Python Installation

Python Content

Part 1: Python Basics and Functions

Lecture 1: Python Overview

Lecture 2: Variable Types

Lecture 3: Basic Operations

Lecture 4: Conditions

Lecture 5: Loops

Lecture 6: Functions

Part 2: Python Collections and Strings

Lecture 7: Strings

Lecture 8: Lists

Lecture 9: Tuples

Lecture 10: Dictionaries

Lecture 11: Sets

Lecture 12: Numbers

Python Content

Part 3: Python Object Oriented

Lecture 13: Object Oriented Overview

Lecture 14: Data Encapsulation

Lecture 15: Operator Overloading

Function Overloading

Lecture 16: Inheritance

Function Overriding

Lecture 17: Polymorphism

Abstract Class

Part 4: Python Files and Standard Libraries

Lecture 18: Modules

Standard Libraries

Lecture 19: File Handling

Lecture 20: Exception Handling

Hands-on Projects & Practices

Python Basics Projects (4 Projects)

- Project 1: Tic-Tac-Toe Game (python basics application)
- Project 2: Connect Four Game (python basics application)
- Project 3: Sudoku Game (python basics application)
- Project 4: 2048 Game (python basics application)

Python Object Oriented Projects (4 Projects)

- Project 1: Advanced Mathematical Calculator (python object oriented application)
- Project 2: Library Management System (python object oriented application)
- Project 3: Bank Management System (python object oriented application)
- Project 4: Project Management System (python object oriented application)

Python Practices (30+ Practice Problems) on each Lecture

Lecture Agenda

- ✔ Section 1: Python Features
- ✔ Section 2: Python Content
- **Section 3: Practice on Online Judges**
- Section 4: Tutorials and References
- Section 5: Online Courses
- Section 6: Python Installation

Practice on Online Judges

codeforces.com

hackerearth.com

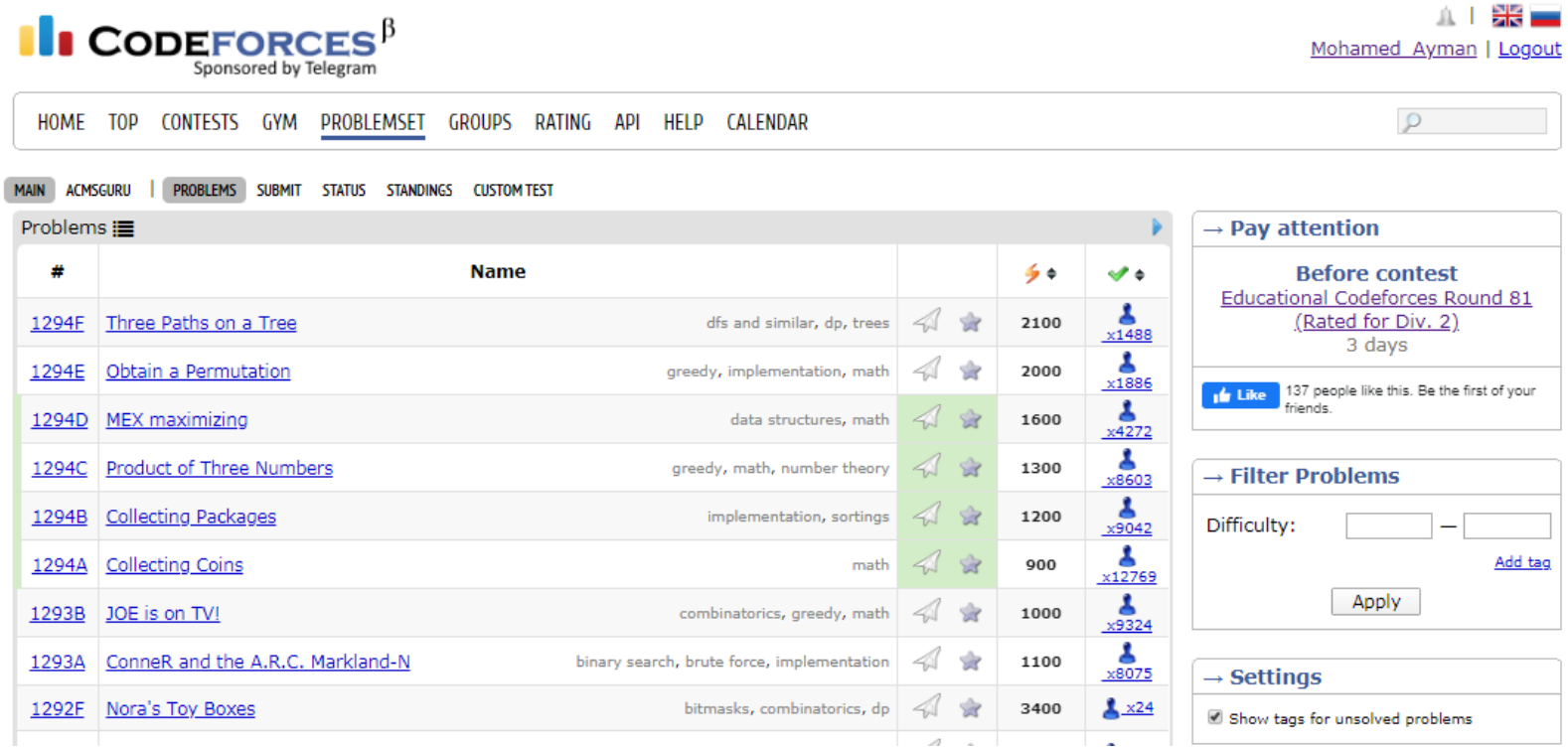
hackerrank.com

atcoder.jp

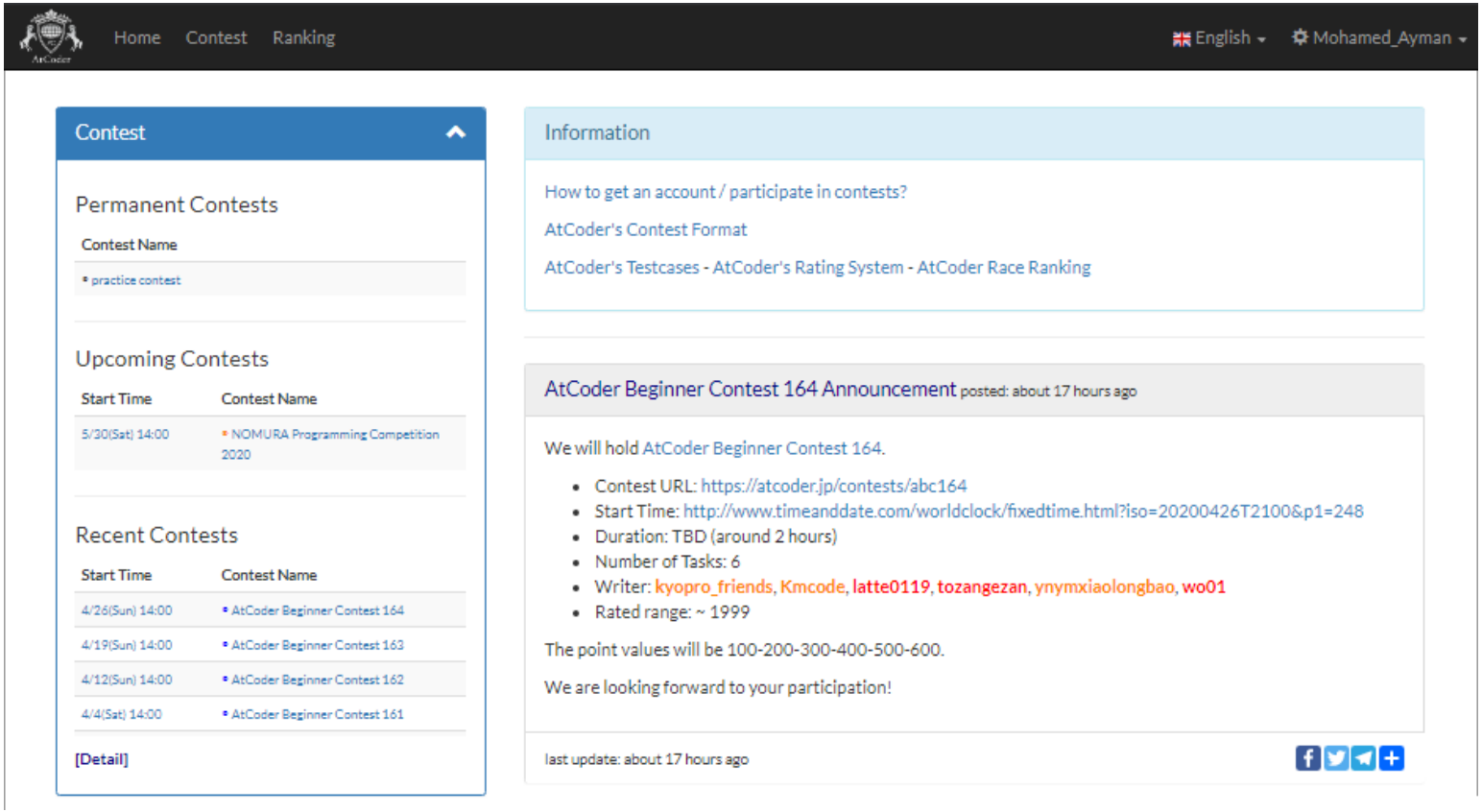
Codeforces Online Judge

Codeforces is a website that hosts competitive programming contests. It is maintained by a group of competitive programmers from ITMO University led by Mikhail Mirzayanov.

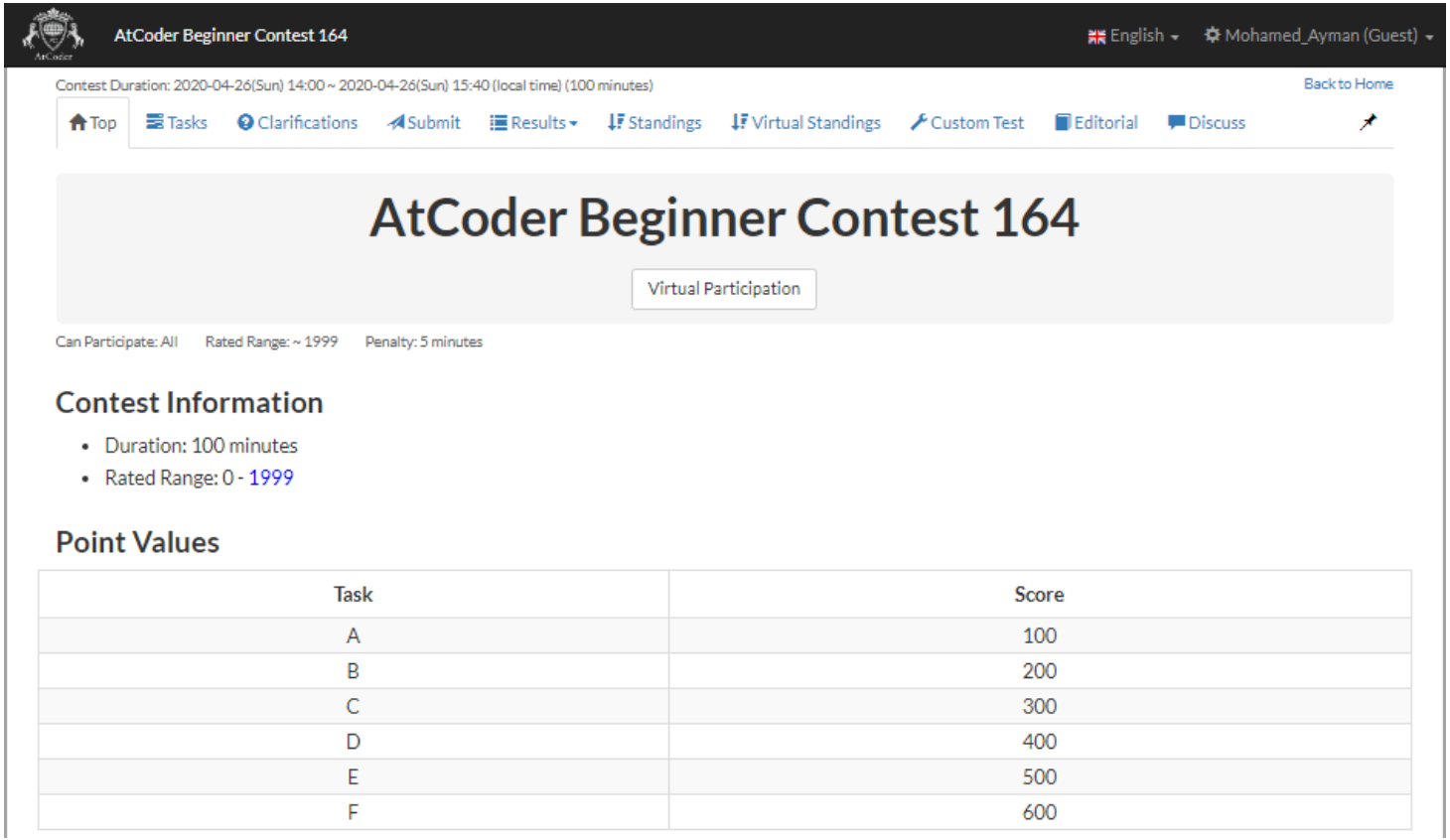
Codeforces Online Judge



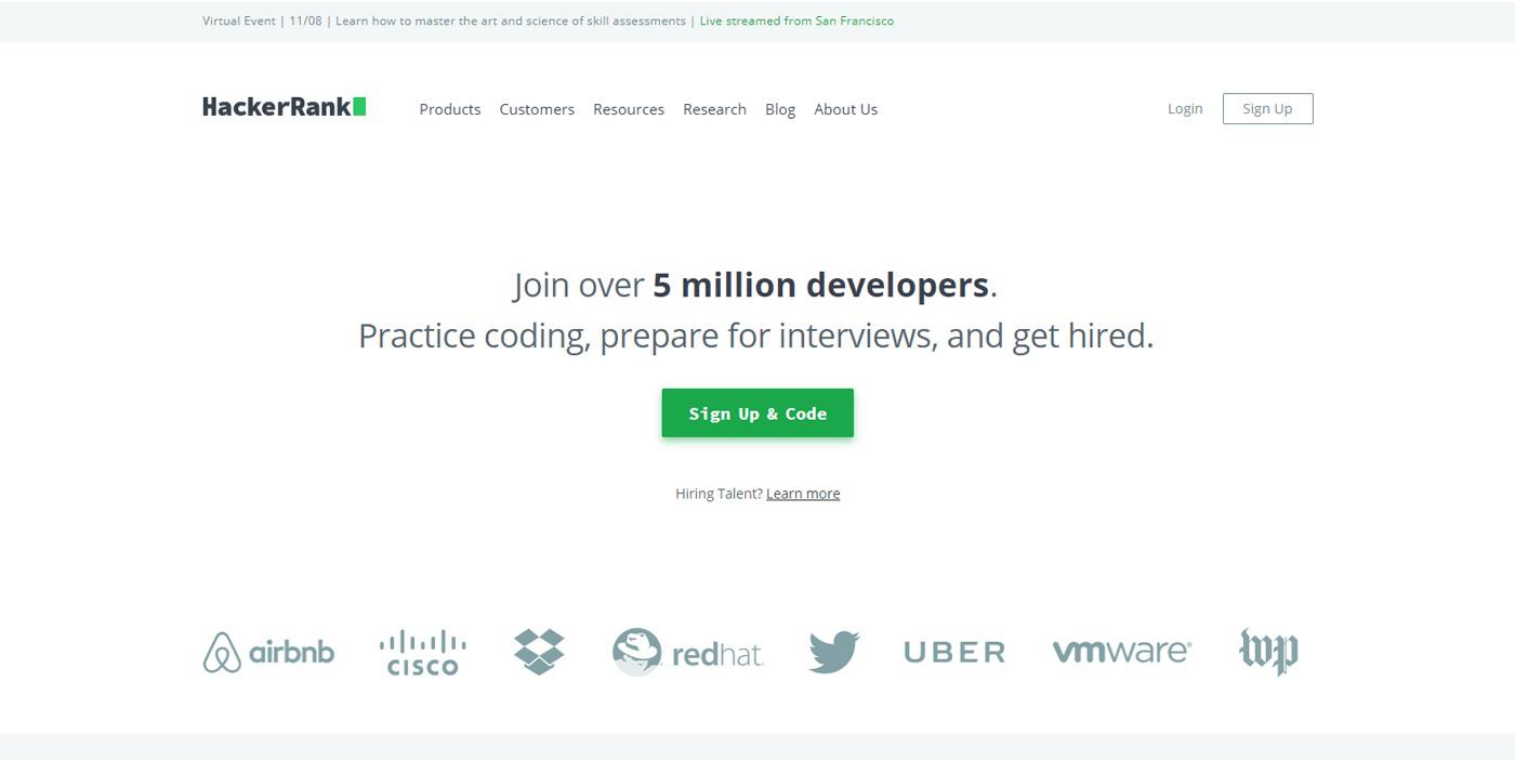
AtCoder - Online Judge



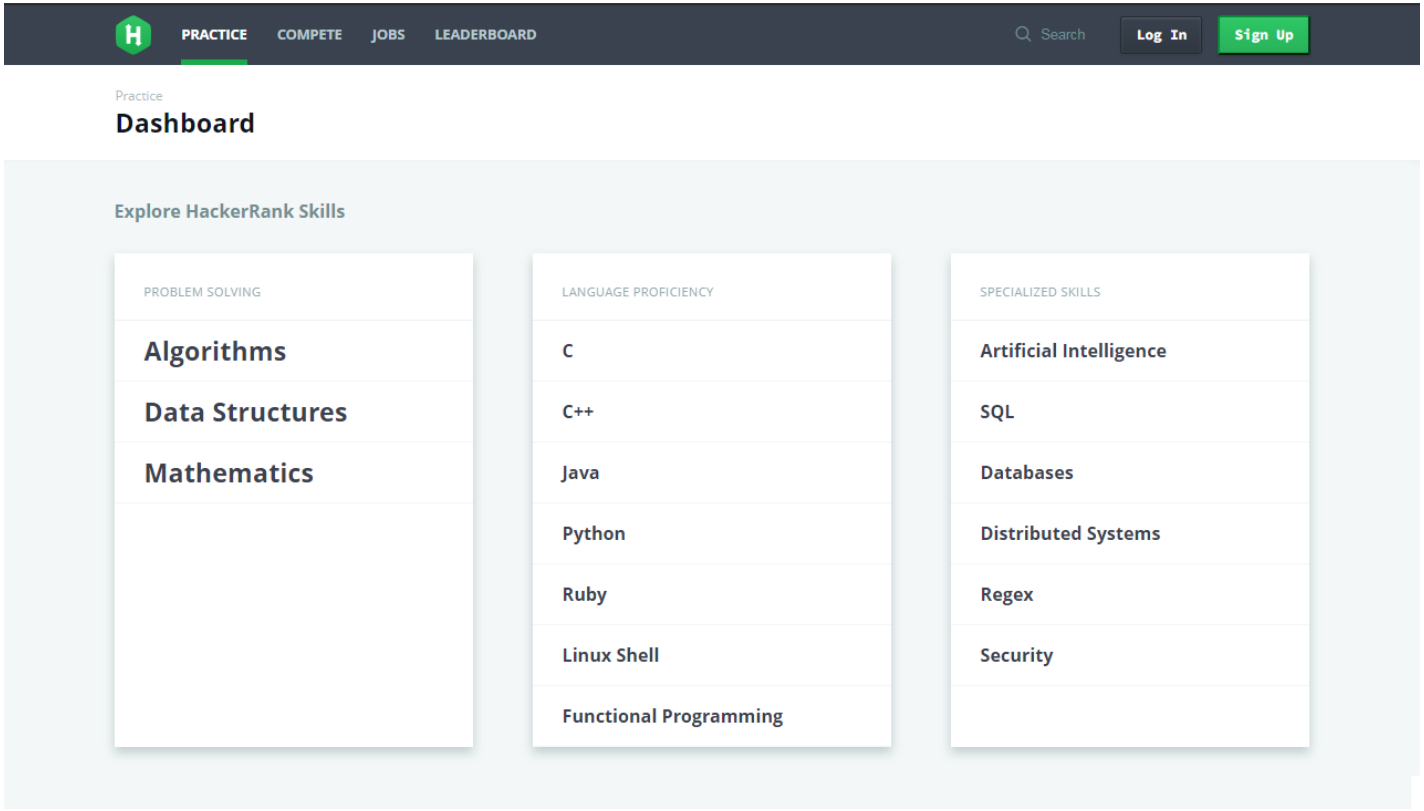
AtCoder - Online Judge



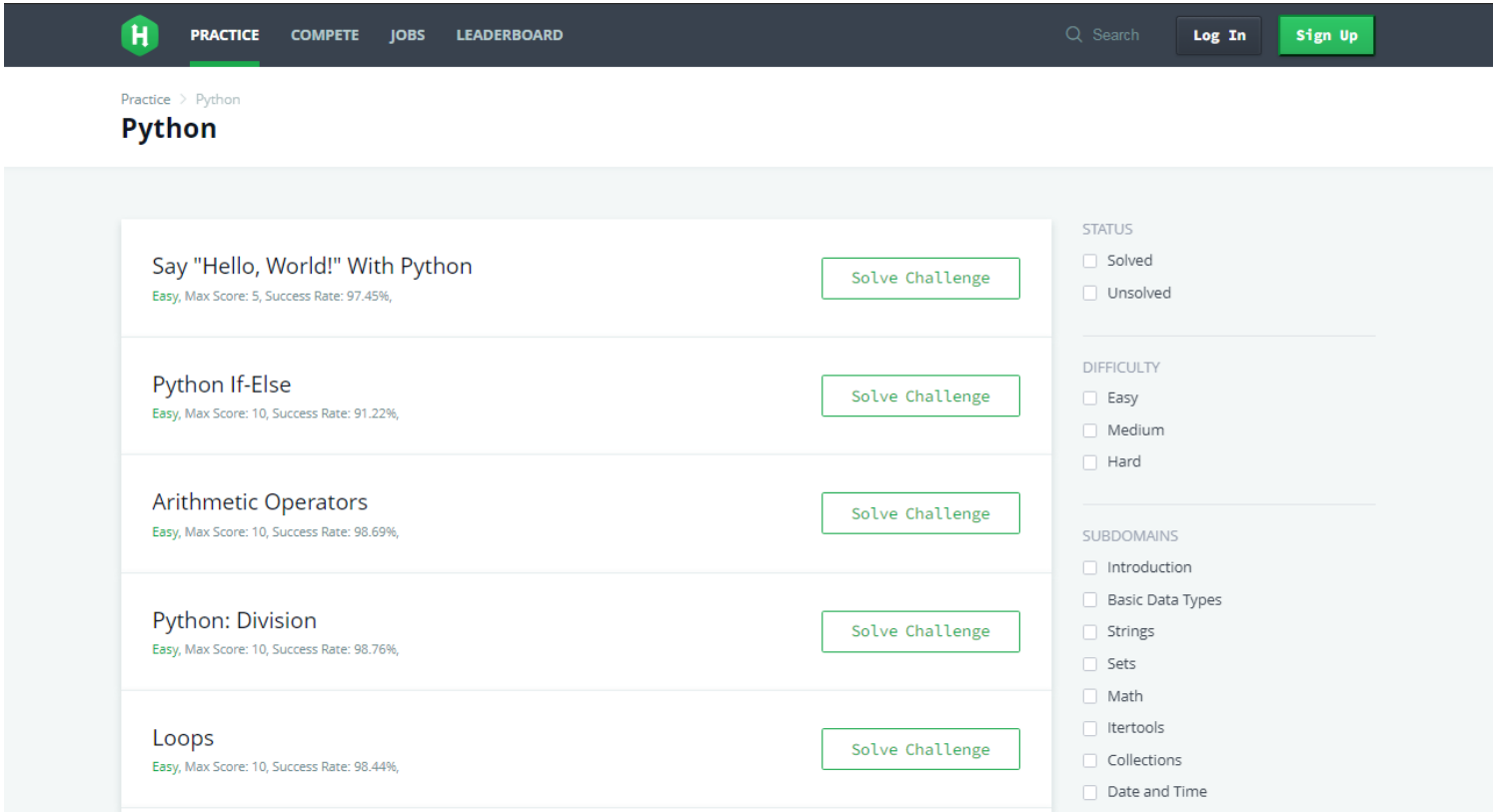
HackerRank - Online Judge



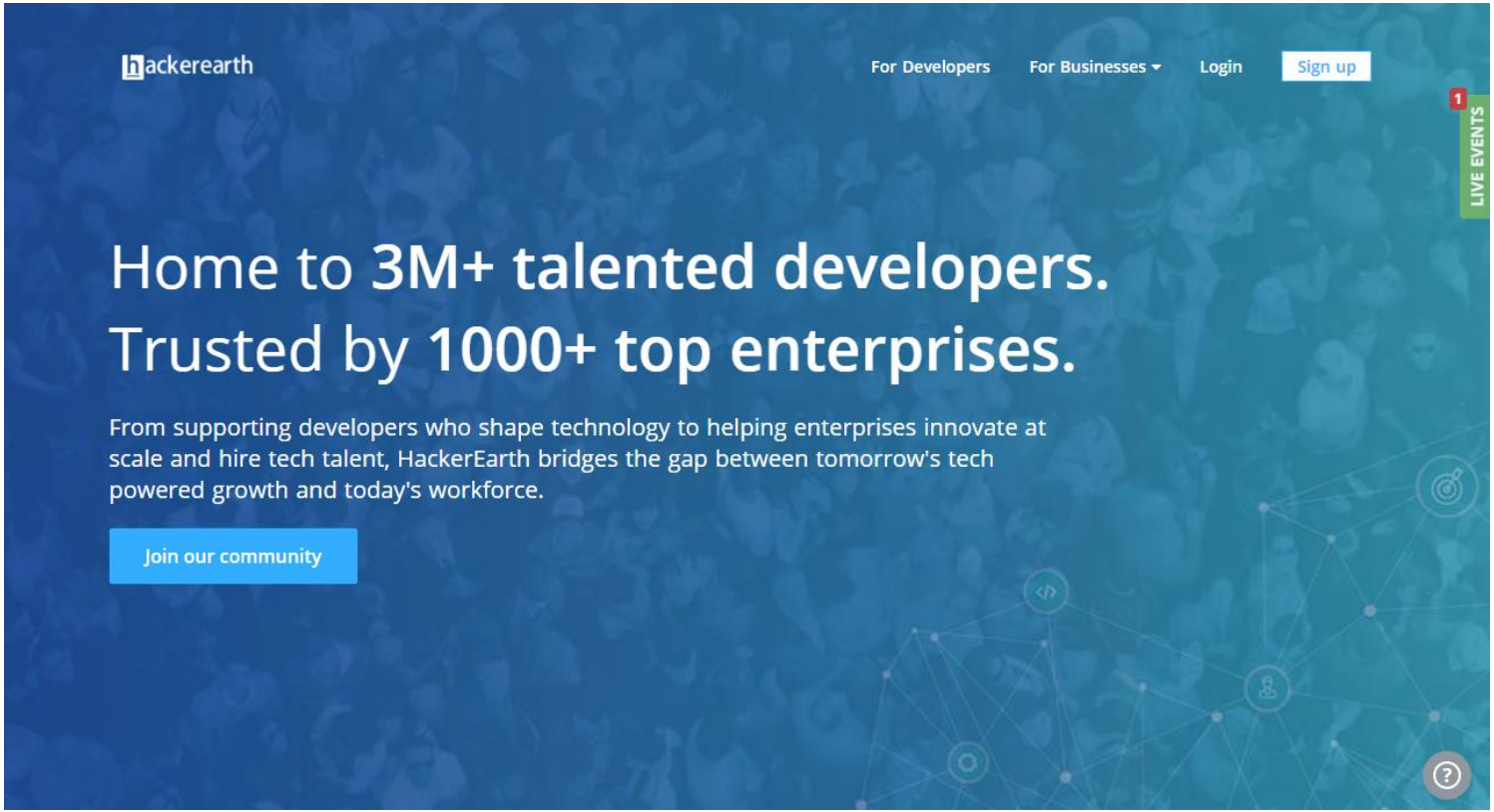
HackerRank - Online Judge



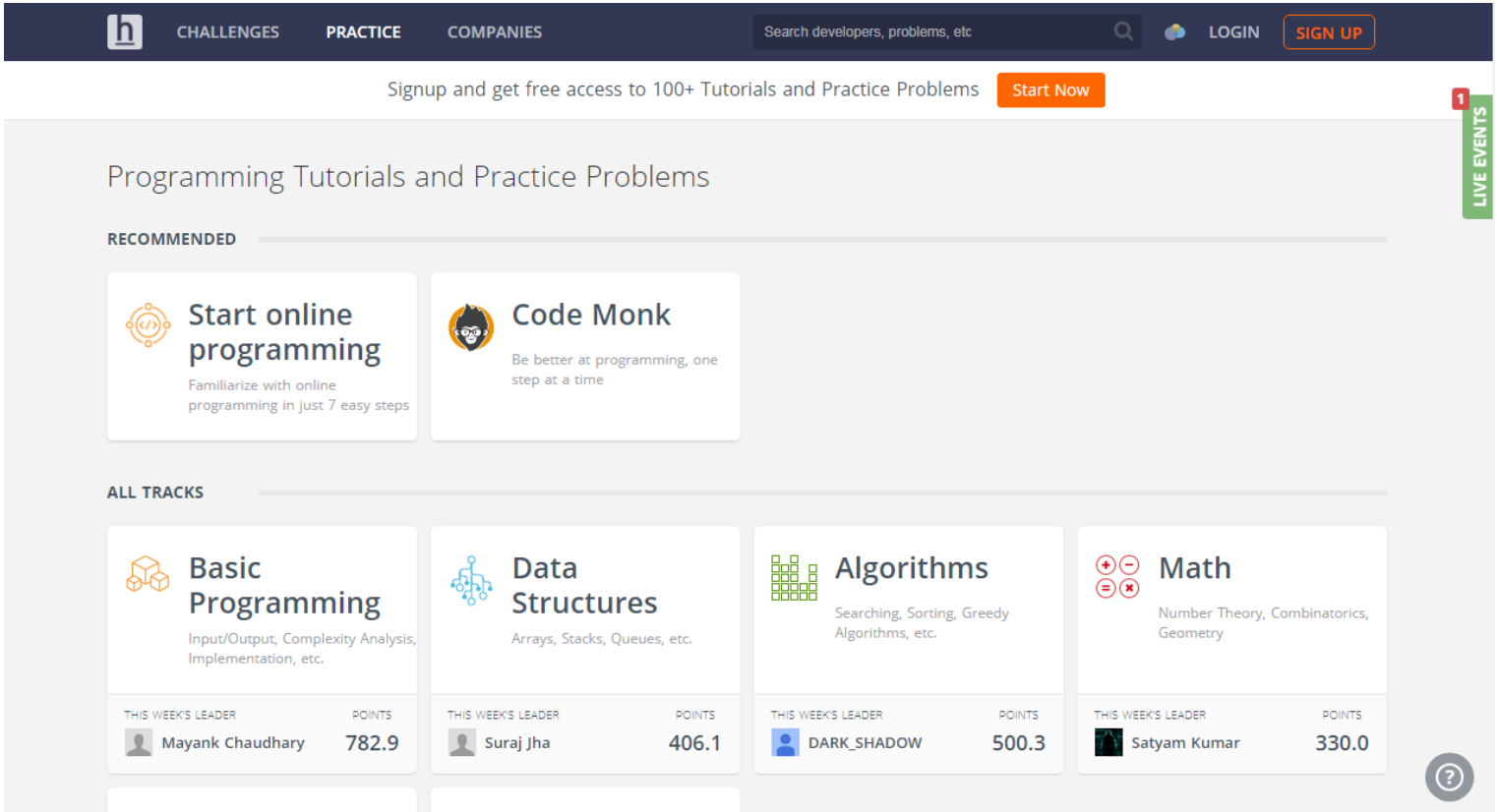
HackerRank - Online Judge



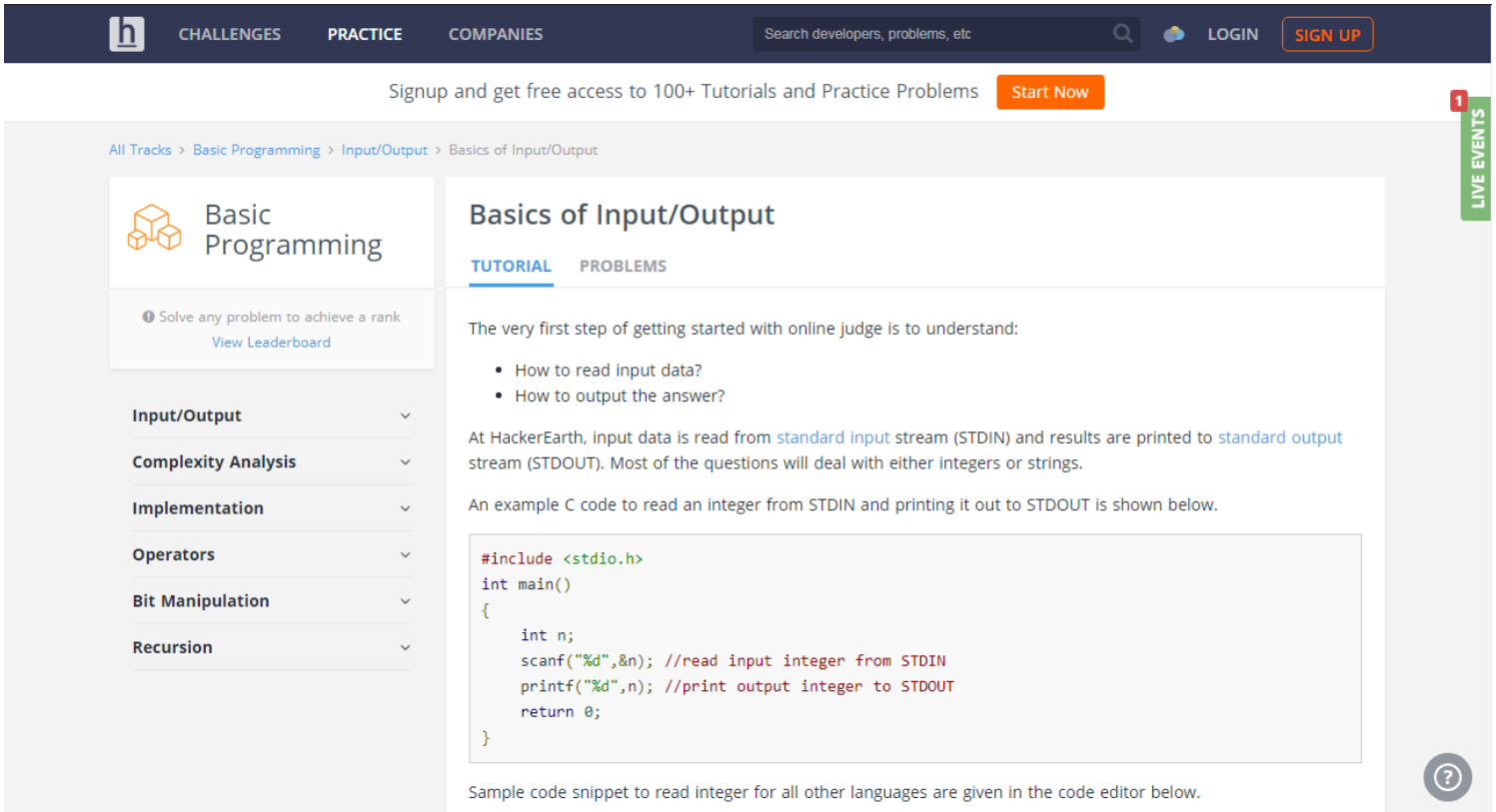
HackerEarth - Online Judge



HackerEarth - Online Judge



HackerEarth - Online Judge



Lecture Agenda

- ✔ Section 1: Python Features
- ✔ Section 2: Python Content
- ✔ Section 3: Practice on Online Judges
- **Section 4: Tutorials and References**
- Section 5: Online Courses
- Section 6: Python Installation

Python Tutorials

programiz.com/python-programming

docs.python.org/3

geeksforgeeks.org/python-programming-language

tutorialspoint.com/python3

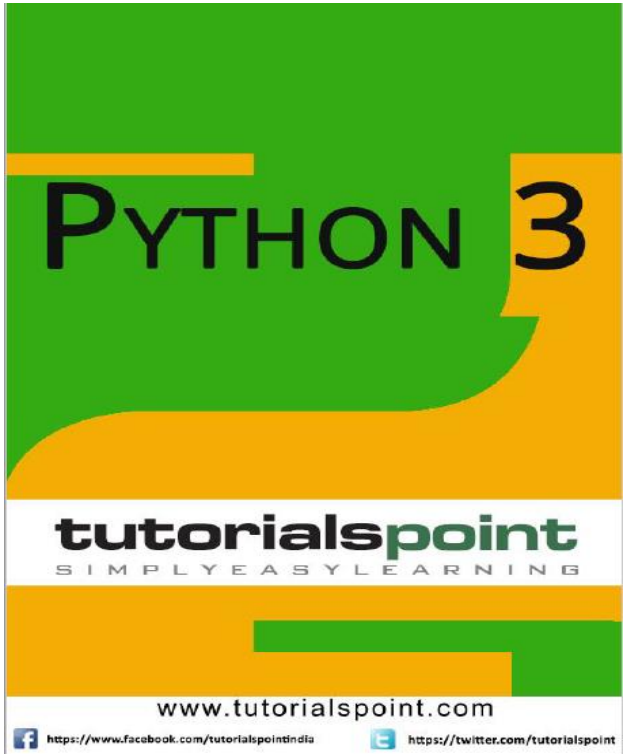
Python 3 TutorialsPoint

- PYTHON 3 - BASIC TUTORIAL [001 - 330]

- Python 3 - What is New?
- Environment Setup
- Variable Types
- Decision Making
- Numbers
- Lists
- Dictionary
- Functions
- Files I/O
- Overview
- Basic Syntax
- Basic Operators
- Loops
- Strings
- Tuples
- Date & Time
- Modules
- Exceptions Handling

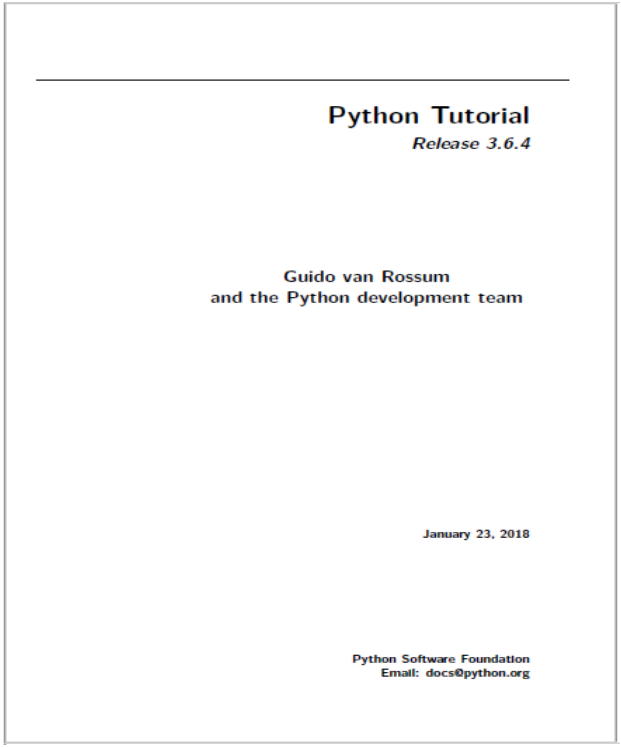
- PYTHON 3 - ADVANCED TUTORIAL [330 - 500]

- Object Oriented
- CGI Programming
- Multithreaded Programming
- GUI Programming
- Regular Expressions
- MySQL Database Access
- XML Processing
- Extension Programming with C



Python 3 TutorialsPoint

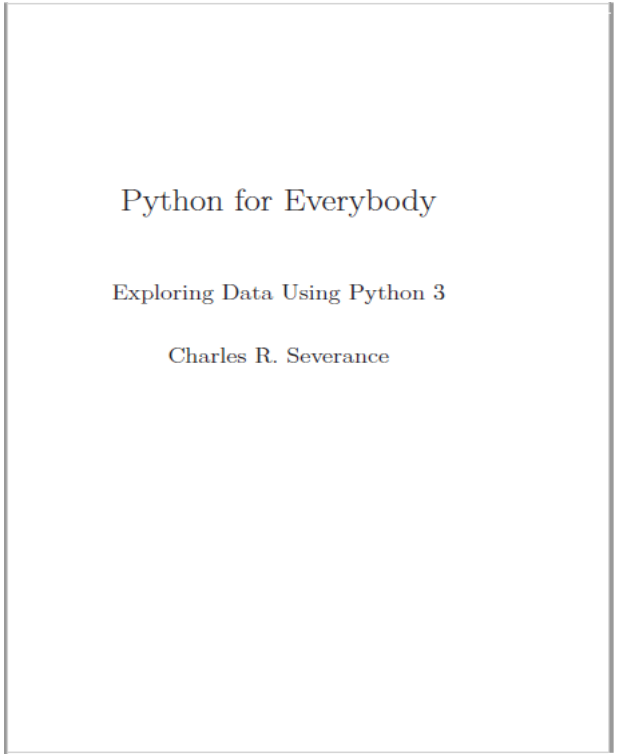
Python Tutorial, Guido van Rossum



Python Tutorial, Guido van Rossum

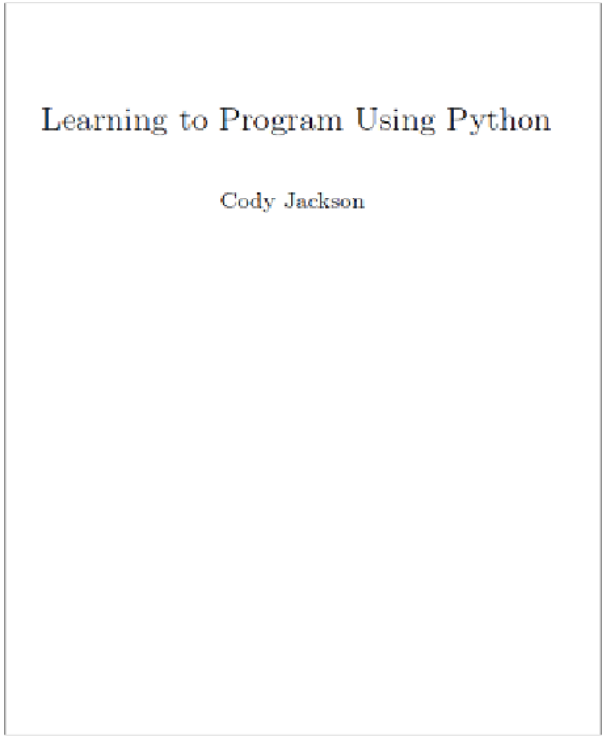
Python for Everybody, Charles R. Severance

- Why should you learn to write programs? [001 - 015]
- Variables, expressions, and statements [020 - 030]
- Conditional execution [030 - 040]
- Functions [040 - 055]
- Iteration [055 - 065]
- Strings [065 - 075]
- Files [080 - 090]
- Lists [090 - 105]
- Dictionaries [105 - 115]
- Tuples [115 - 125]
- Regular expressions [125 - 140]
- Object-oriented programming [170 - 185]
- Using Databases and SQL [185 - 210]



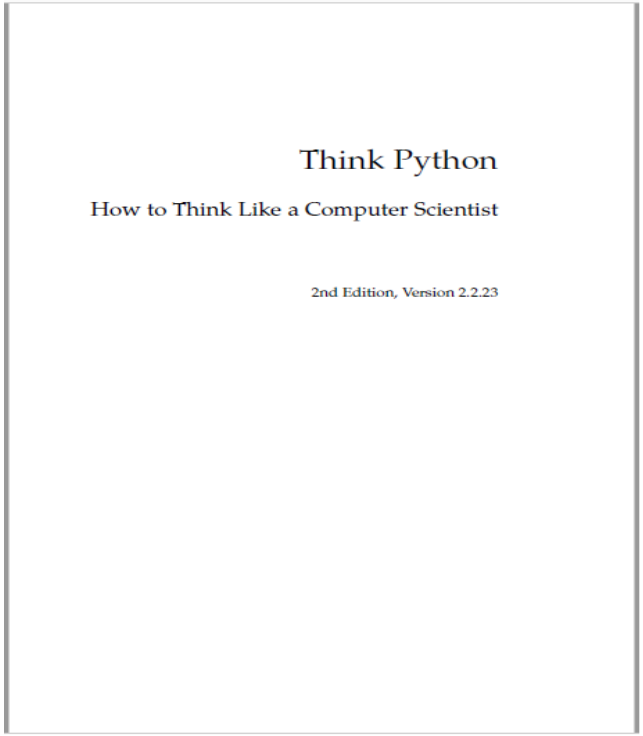
Python for Everybody, Charles R. Severance

Learning to Program Using Python, Cody Jackson



Learning to Program Using Python, Cody Jackson

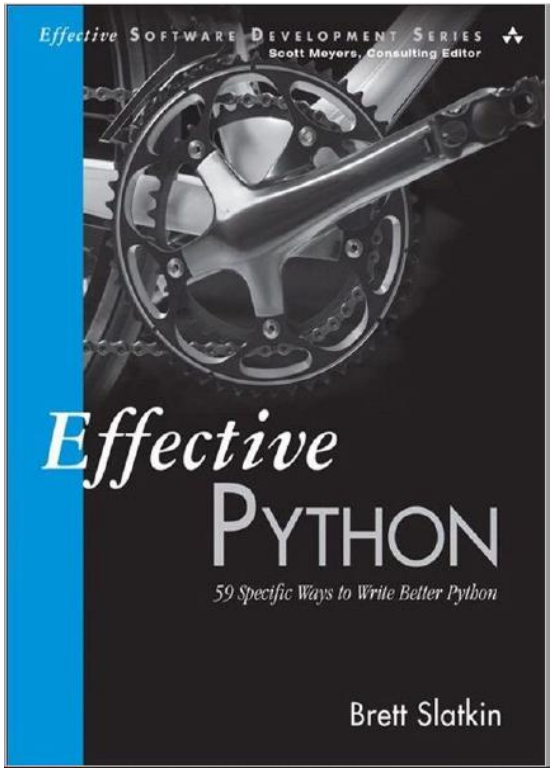
Think Python, Allen B. Downey



Think Python, Allen B. Downey

Effective Python, Brett Slatkin

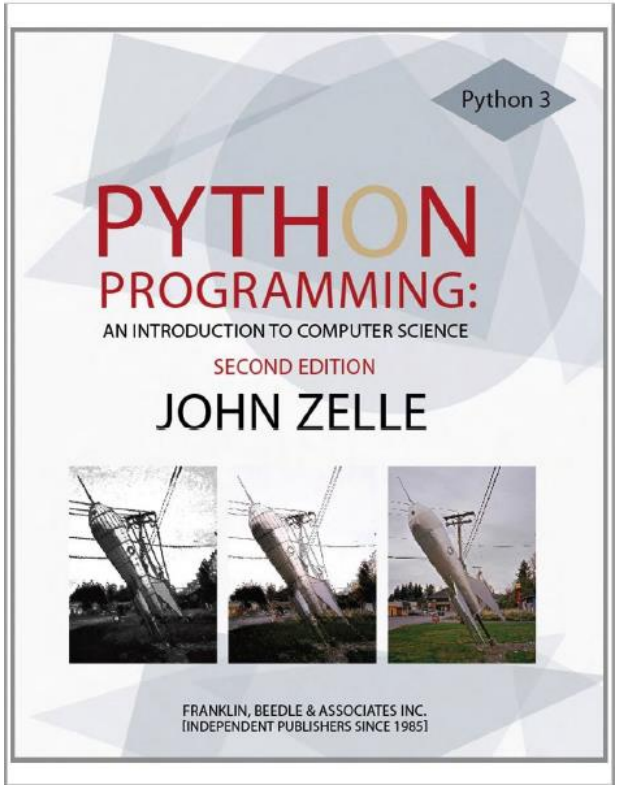
- Pythonic Thinking [001 - 025]
- Functions [025 - 050]
- Classes and Inheritance [050 - 075]
- Metaclasses and Attributes [075 - 100]
- Concurrency and Parallelism [100 - 125]
- Built-in Modules [125 - 150]
- Collaboration [150 - 175]
- Production [175 - 200]



Effective Python, Brett Slatkin

Python Programming, John Zelle

- Computers and Programs [001 - 020]
- Writing Simple Programs [020 - 045]
- Computing with Numbers [045 - 065]
- Objects and Graphics [065 - 100]
- Sequences: Strings, Lists, and Files [100 - 140]
- Defining Functions [140 - 165]
- Decision Structures [165 - 200]
- Loop Structures and Booleans [200 - 225]
- Simulation and Design [225 - 245]
- Defining Classes [245 - 280]
- Data Collections [280 - 325]
- Object-Oriented Design [325 - 360]
- Algorithm Design and Recursion [360 - 385]



Python Programming, John Zelle

Lecture Agenda

- ✔ Section 1: Python Features
- ✔ Section 2: Python Content
- ✔ Section 3: Practice on Online Judges
- ✔ Section 4: Tutorials and References
- **Section 5: Online Courses**
- Section 6: Python Installation

Python Coursera Specializations

- Introduction to Scripting in Python Specialization (4 Courses) by Rice University

coursera.org/specializations/introduction-scripting-in-python

Course : Python Programming Essentials

Week 1: Python as a Calculator
Week 2: Functions
Week 3: Logic and Conditionals
Week 4: Python Modules

Course : Python Data Representations

Week 1: Strings
Week 2: Basics of Lists
Week 3: List Manipulation
Week 4: File Access

Python Coursera Specializations

- Introduction to Scripting in Python Specialization (4 Courses) by Rice University

coursera.org/specializations/introduction-scripting-in-python

Course : Python Data Analysis

Week 1: Dictionaries
Week 2: Tabular Data and Nested Data Structures
Week 3: Tabular Data and CSV Files
Week 4: Organizing Data

Course : Python Data Visualization

Week 1: Python Documentation
Week 2: Python Packages and Modules
Week 3: Python Sets
Week 4: Plotting GDP Data

Python Coursera Specializations

- Python 3 Programming Specialization (5 Courses) by University of Michigan

coursera.org/specializations/python-3-programming

Course : Python Basics

Week 1: General Introduction
Week 2: Sequences and Iteration
Week 3: Booleans and Conditionals
Week 4: Sequence Mutation and Accumulation Patterns

Course : Python Functions, Files, and Dictionaries

Week 1: Files and CSV Output
Week 2: Dictionaries and Dictionary Accumulation
Week 3: Functions and Tuples
Week 4: More Iteration and Advanced Functions
Week 5: Sorting

Python Coursera Specializations

- Python 3 Programming Specialization (5 Courses) by University of Michigan

coursera.org/specializations/python-3-programming

Course : Data Collection and Processing with Python

Week 1: Nested Data and Nested Iteration
Week 2: Map, Filter, and List Comprehensions
Week 3: Internet APIs

Course : Python Classes and Inheritance

Week 1: Classes
Week 2: Inheritance
Week 3: Unit Testing and Exceptions

Course : Python Project: pillow, tesseract, and opencv

Week 1: The Python Imaging Library
Week 2: Tesseract and Optical Character Recognition
Week 3: Computer Vision with OpenCV

Python Coursera Specializations

- Fundamentals of Computing Specialization (7 Courses) by Rice University

coursera.org/specializations/computer-fundamentals

Course : An Introduction to Interactive Programming in Python (Part 1)

Week 1: Statements, expressions, variables
Week 2: Functions, logic, conditionals
Week 3: Event-driven programming, local/global variables
Week 4: Canvas, drawing, timers
Week 5: Lists, keyboard input, the basics of modeling motion

Course : An Introduction to Interactive Programming in Python (Part 2)

Week 1: Mouse input, list methods, dictionaries
Week 2: Classes and object-oriented programming
Week 3: Basic game physics, sprites
Week 4: Sets and animation

Python Coursera Specializations

- Fundamentals of Computing Specialization (7 Courses) by Rice University

coursera.org/specializations/computer-fundamentals

Course : Principles of Computing (Part 1)

Week 1: Required Python knowledge, coding standards, and machine grading
Week 2: Testing, plotting, and grids
Week 3: Probability, randomness, and objects/references
Week 4: Combinatorics, generators, and debugging
Week 5: Counting, growth of functions, higher-order functions

Course : Principles of Computing (Part 2)

Week 1: Searching and Data Structures
Week 2: Recursion
Week 3: Trees
Week 4: Modeling, Assertions, and Invariants

Python Coursera Specializations

- Fundamentals of Computing Specialization (7 Courses) by Rice University

coursera.org/specializations/computer-fundamentals

Course : Algorithmic Thinking (Part 1)

Week 1: Core Materials
Week 2: Project and Application
Week 3: Core Materials
Week 4: Project and Application

Course : Algorithmic Thinking (Part 2)

Week 1: Core Materials
Week 2: Project and Application
Week 3: Core Materials
Week 4: Project and Application

Course : The Fundamentals of Computing Capstone Exam

Week 1: Fundamentals of Computing Capstone Exam

Python YouTube Playlists

- Playlist: Python Tutorial Videos | Simplilearn [40 videos] [20 H] Channel: Simplilearn
  youtube.com/playlist?list=PLEiEAq2VkUUKoW1o-A-VEmkoGKSC26i_I
- Playlist: Python Tutorial For Beginners | Edureka [180 videos] [45 H] Channel: edureka!
  youtube.com/playlist?list=PL9ooVrP1hQOHY-BeYrKHDrHKphsJOyRyu
- Playlist: Python Tutorial for Beginners [200 videos] [40 H] Channel: ProgrammingKnowledge
  youtube.com/playlist?list=PLS1QulWo1RIaJECMeUT4LFwJ-ghgoSH6n
- Playlist: Python 3 Programming Tutorial [40 videos] [10 H] Channel: codebasics
  youtube.com/playlist?list=PLeo1K3hjS3uslLfyvQlvUBokXkHPSve6S
- Playlist: Learning to program with Python 3 (py 3.7) [15 videos] [3 H] Channel: sentdex
  youtube.com/playlist?list=PLQVvvaa0QuDeAams7fkdcwOGBpGdHpXln
- Playlist: Python 3 Tutorial for Beginners [160 videos] [30 H] Channel: ProgrammingKnowledge
  youtube.com/playlist?list=PLS1QulWo1RIYt4e0WnBp-ZjCNq8X0FX0J
- Playlist: Complete Python Training Course [40 videos] [3 H] Channel: Python Programmer
  youtube.com/playlist?list=PLtb2Lf-cJ_AWhtJE6Rb5oWf02RC2gVU-J
- Playlist: Python Tutorial for Beginners [110 videos] [20 H] Channel: Telusko
  youtube.com/playlist?list=PLsyeobzWxl7poL9JTVyndKe62ieoN-MZ3
- Playlist: Complete Python tutorial in Hindi (2020) [240 videos] [20 H] Channel: Harshit vashisth
  youtube.com/playlist?list=PLwgFb6VsUj_IQTpQKDtLXKXElQychT_2j

Lecture Agenda

- ✔ Section 1: Python Features
- ✔ Section 2: Python Content
- ✔ Section 3: Practice on Online Judges
- ✔ Section 4: Tutorials and References
- ✔ Section 5: Online Courses

Section 6: Python Installation

Python Interpreters Installation

python.org

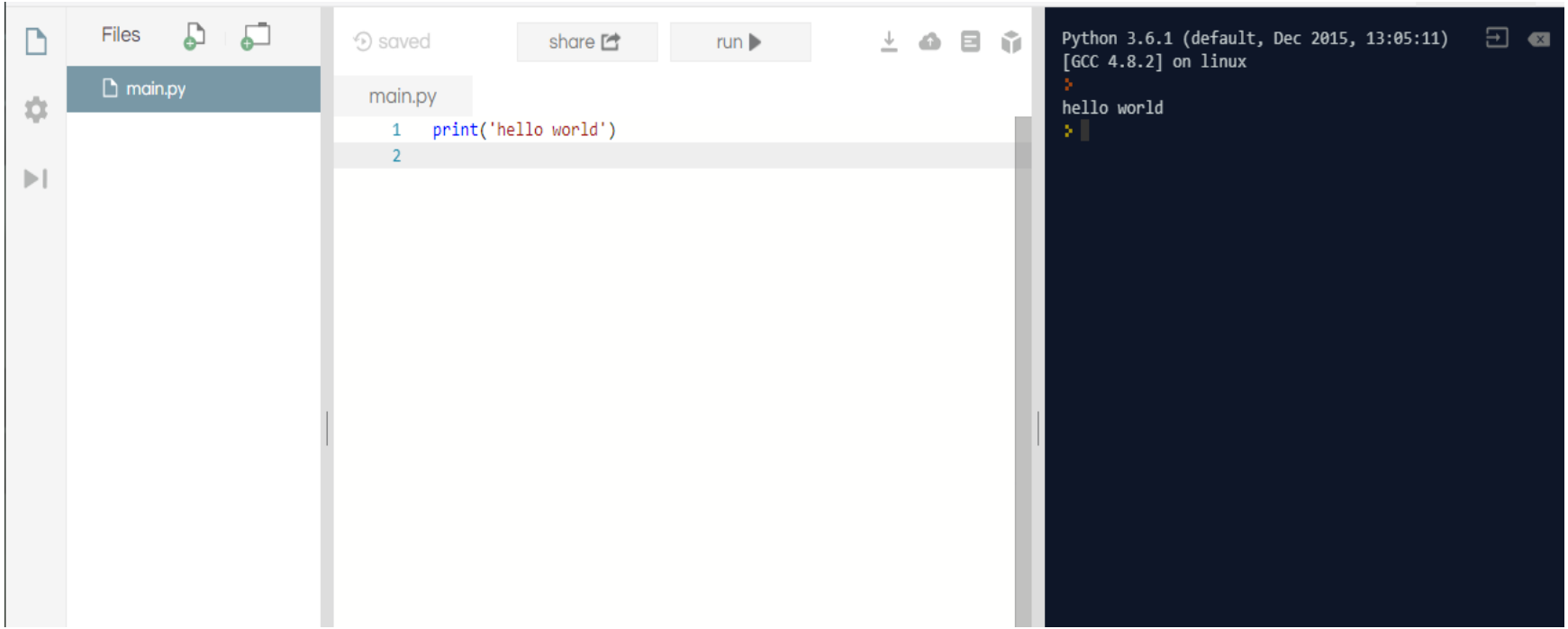
anaconda.com/distribution

jetbrains.com/pycharm

spyder-ide.org

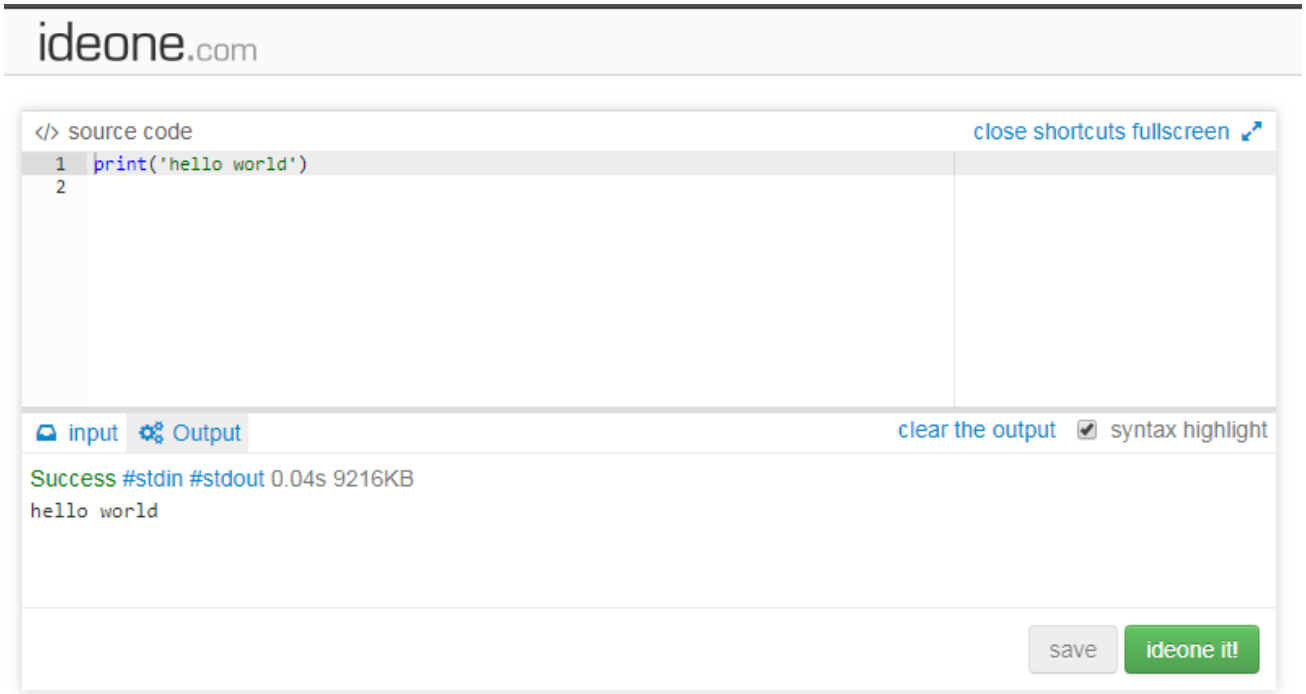
Python Online Interpreters

repl.it online interpreter: repl.it/languages/python3



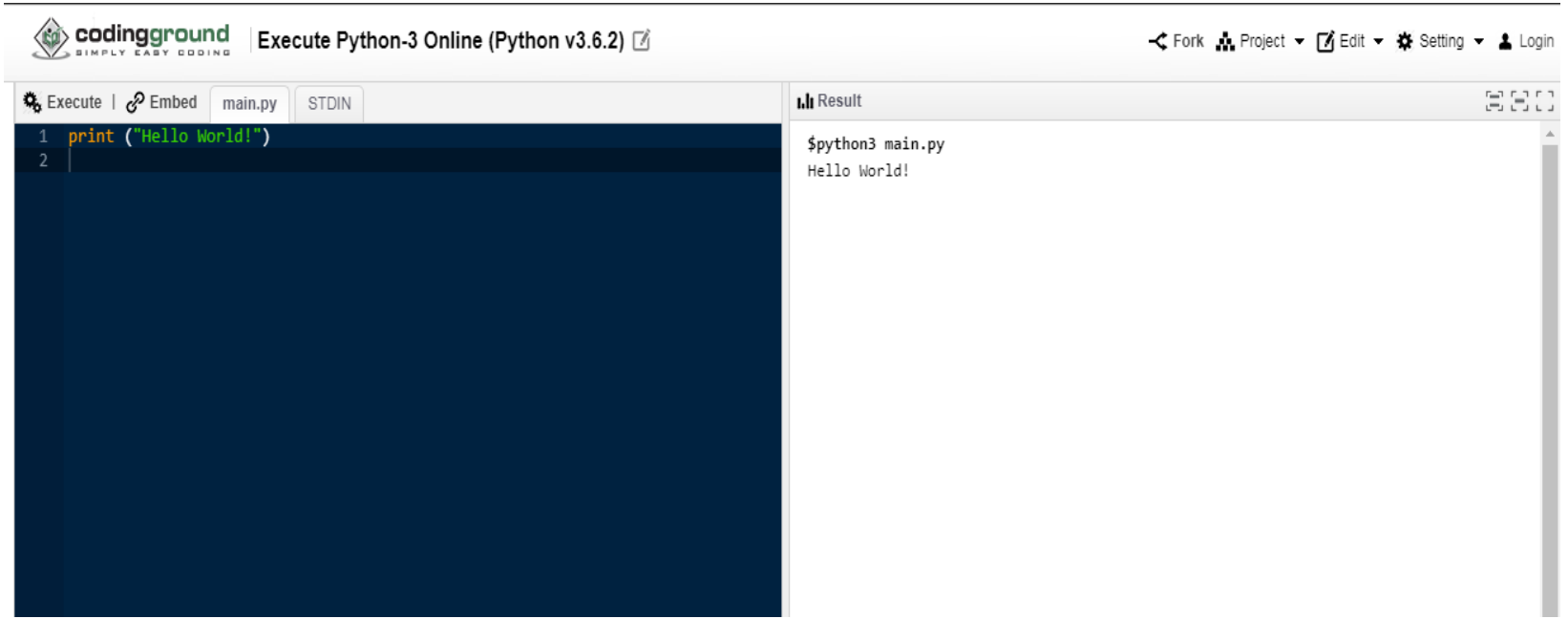
Python Online Interpreters

ideone online interpreter: ideone.com



Python Online Interpreters

Tutorials point online interpreter: tutorialspoint.com/execute_python3_online.php



Python IDE Installation

1. Go to Download Python page on the official site and click **Download Python 3.6.0** (You may see different version name).

2. When the download is completed, double-click the file and follow the instructions to install it.
   When Python is installed, a program called IDLE is also installed along with it. It provides graphical user interface to work with Python.

3. Open IDLE, copy the following code below and press enter.

```
print("Hello, World!")
```

4. To create a file in IDLE, go to **File** > **New Window** (Shortcut: **Ctrl+N**).

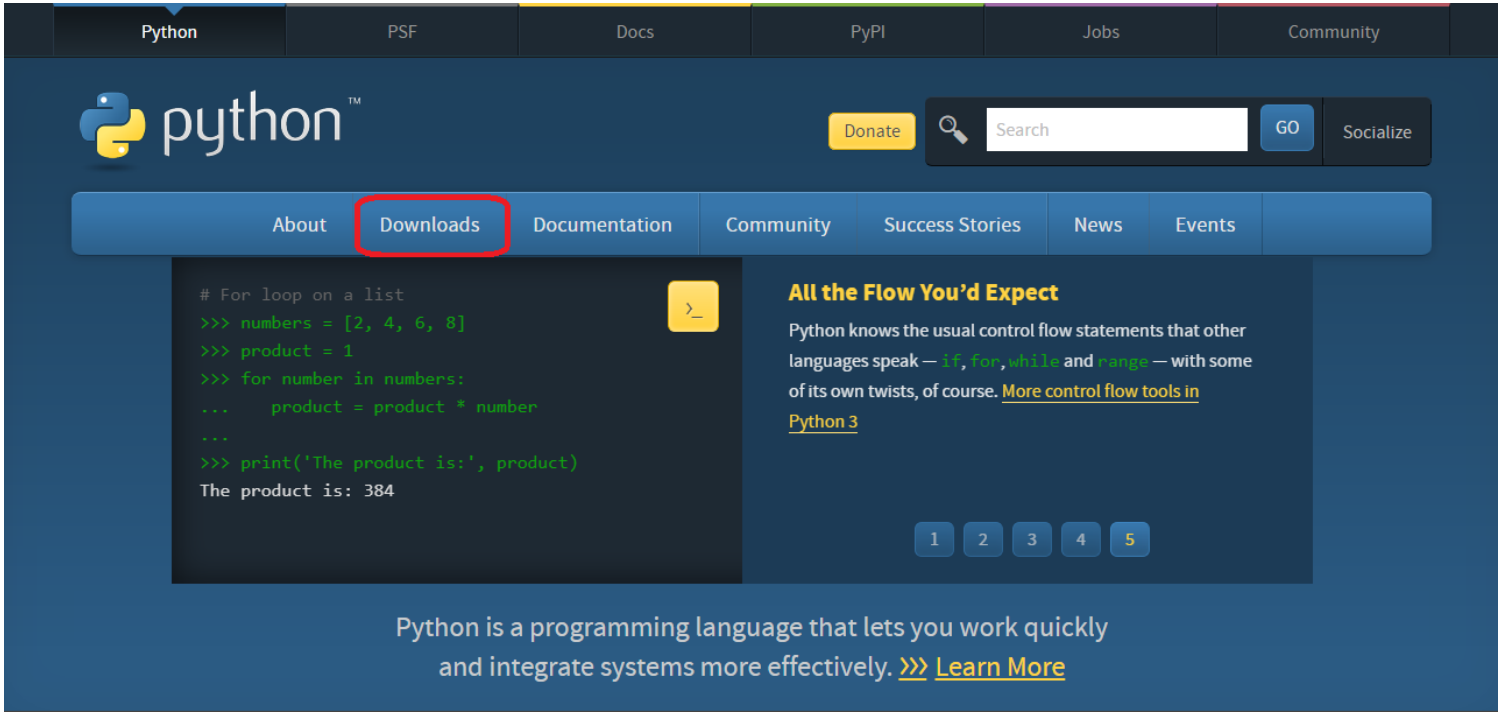
5. Write Python code (you can copy the code below for now) and save (Shortcut: **Ctrl+S**) with **.py** file extension like: hello.py or your-first-program.py

```
1  print("Hello, World!")
```

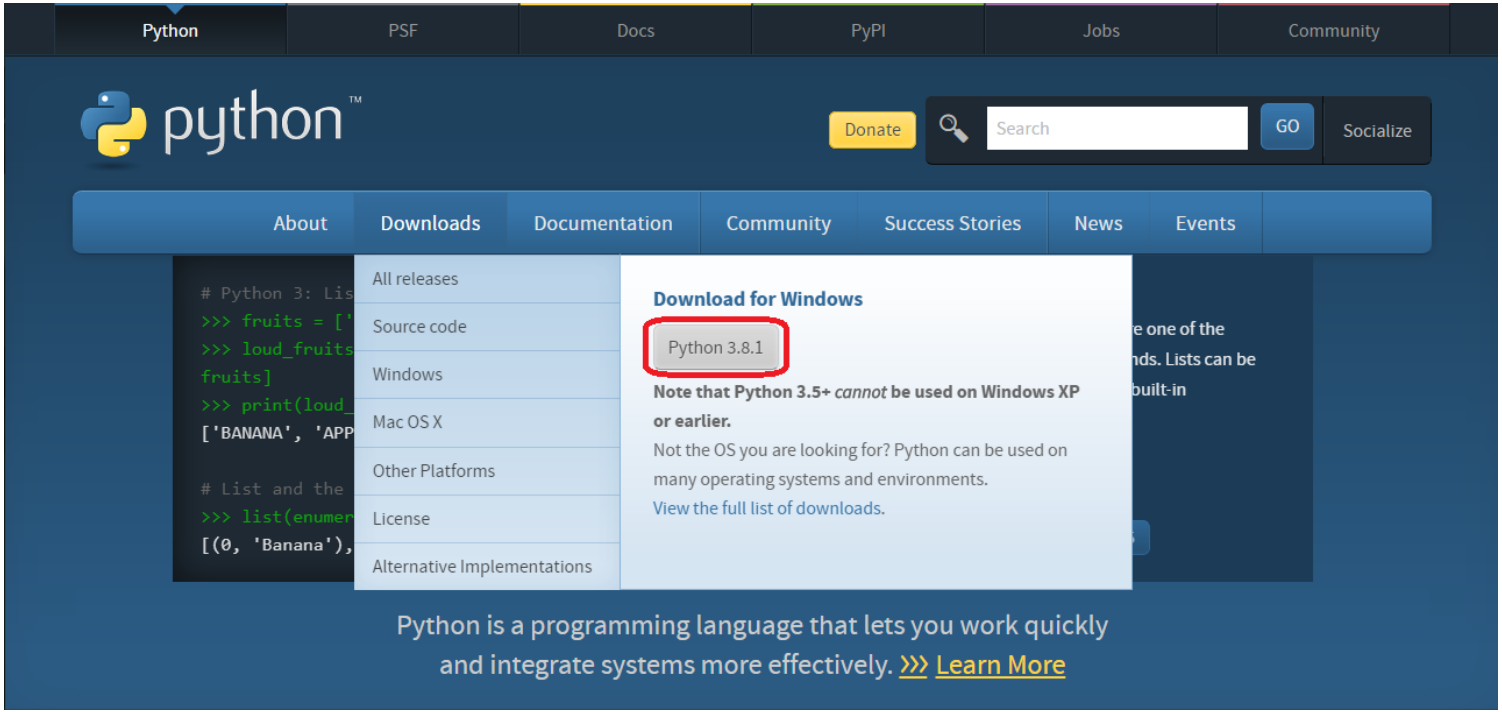
6. Go to **Run** > **Run module** (Shortcut: **F5**) and you can see the output.
   Congratulations, you've successfully run your first Python program.

python.org

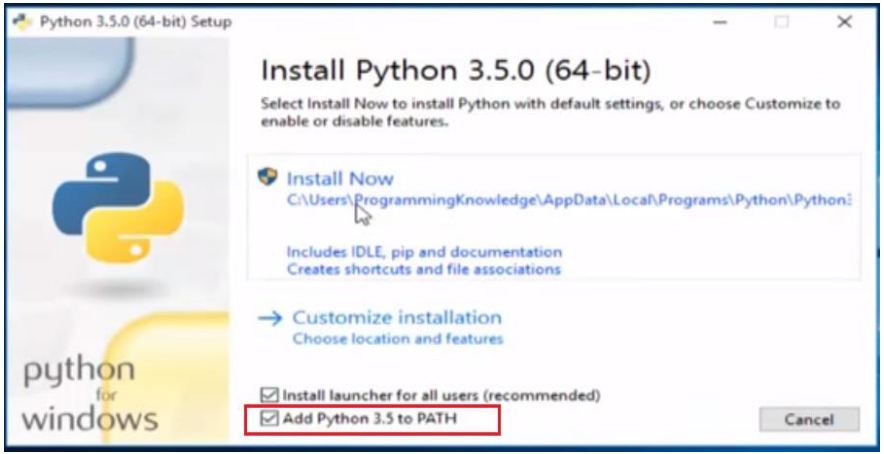
Python IDE Installation

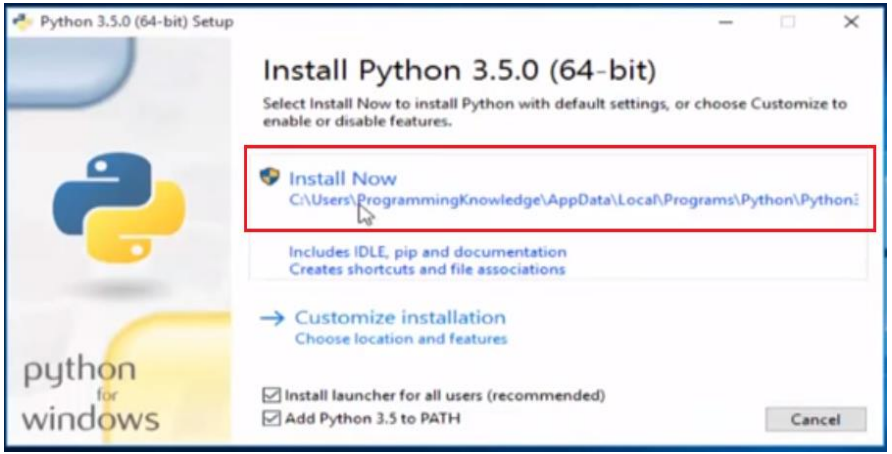


Python IDE Installation

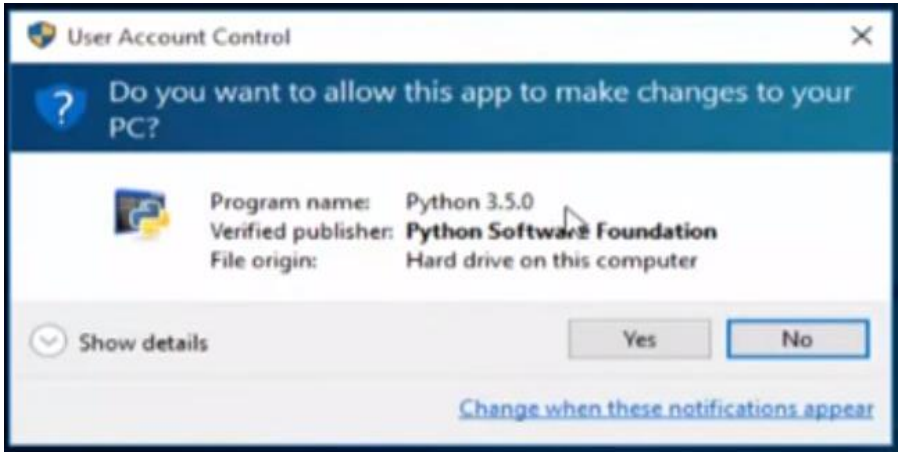


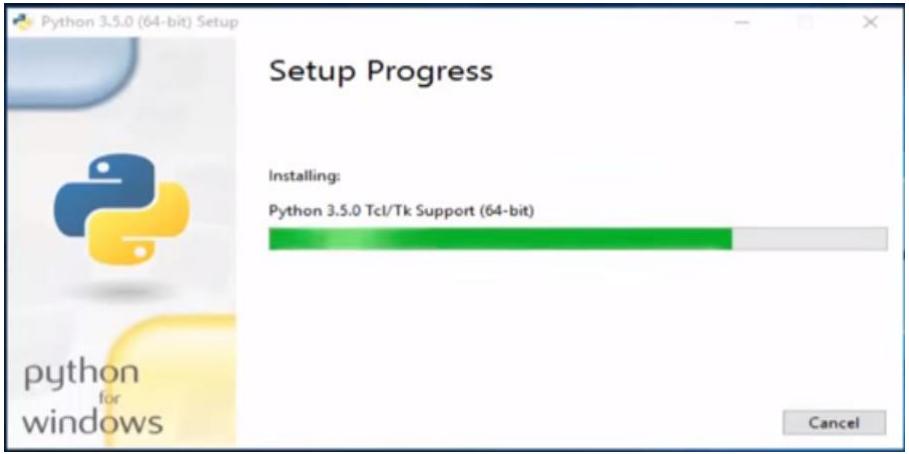
Python IDE Installation



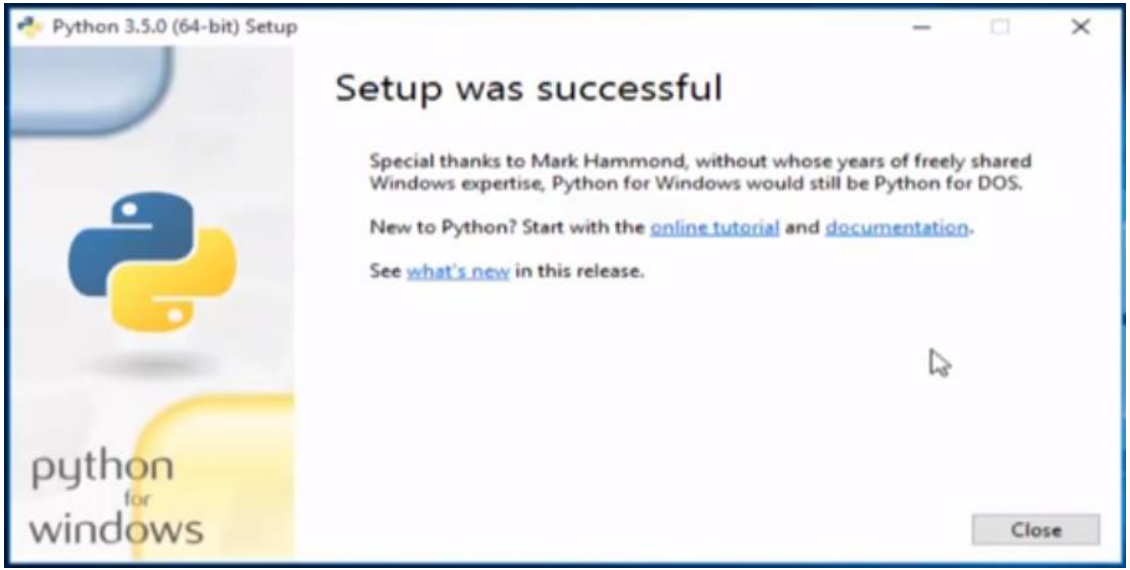


Python IDE Installation

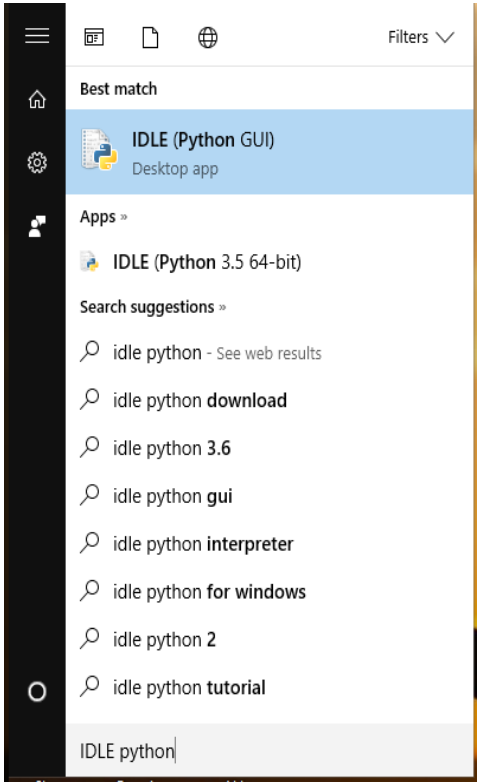


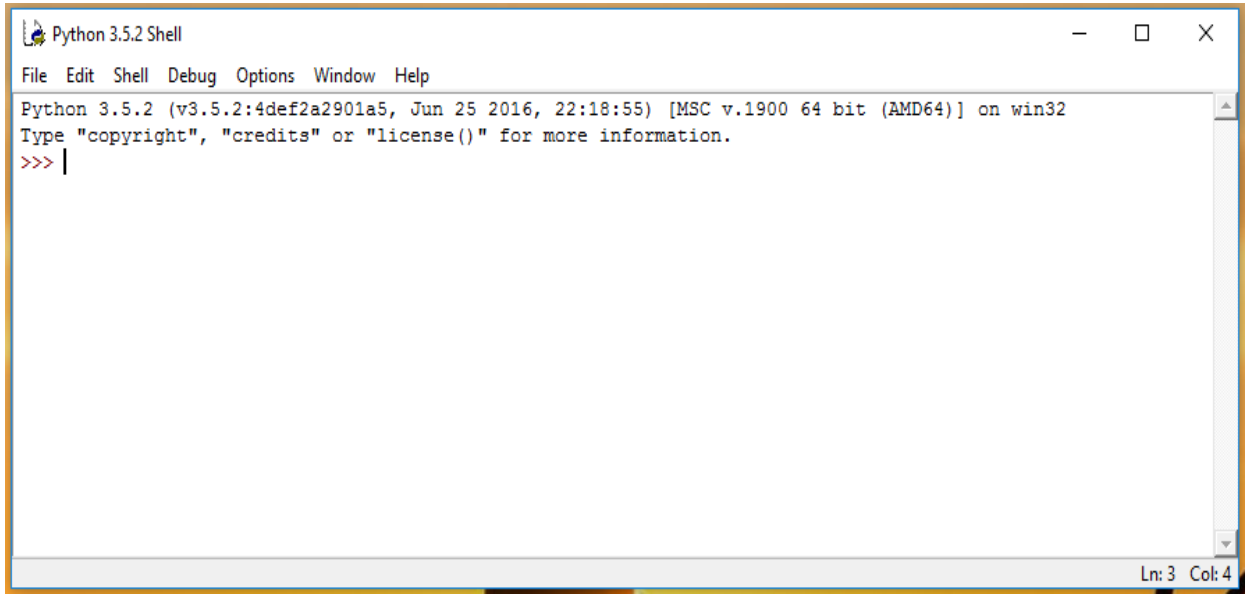


Python IDE Installation

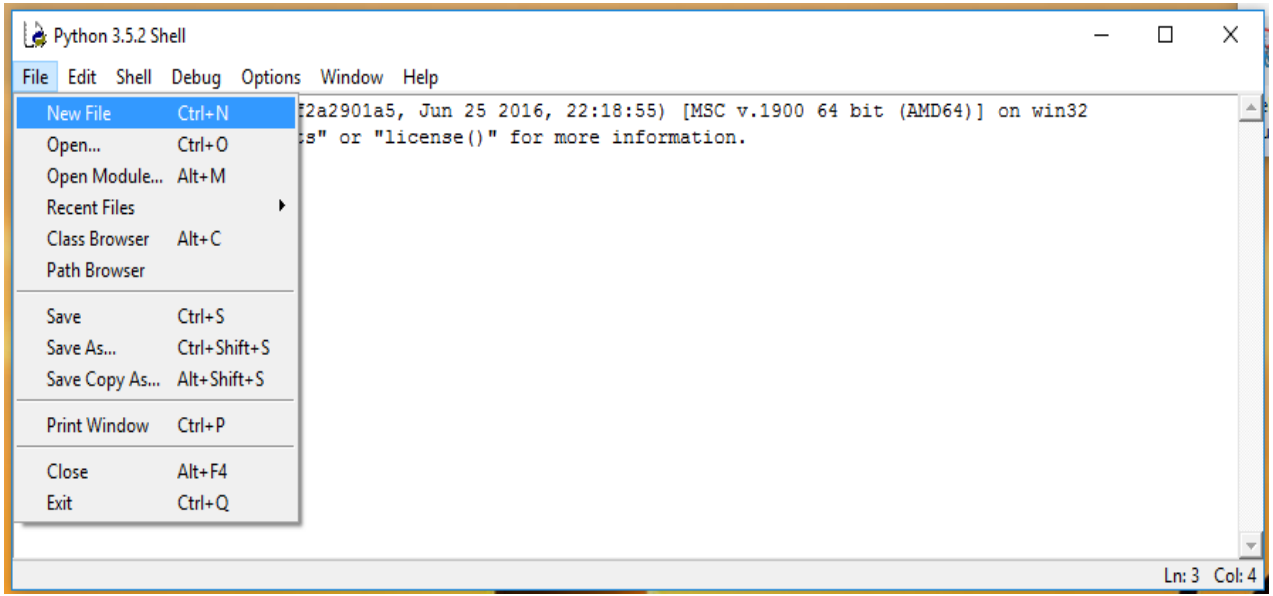


Python IDE Installation

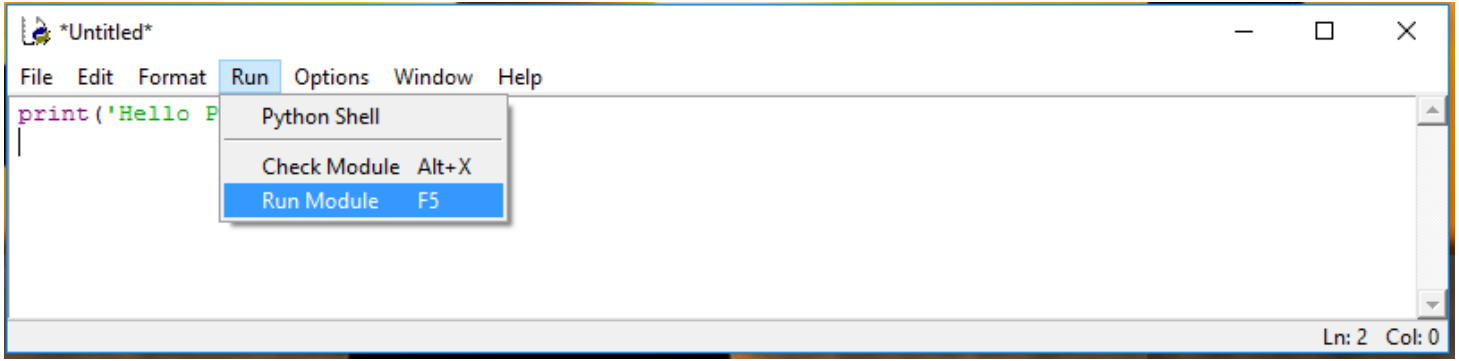


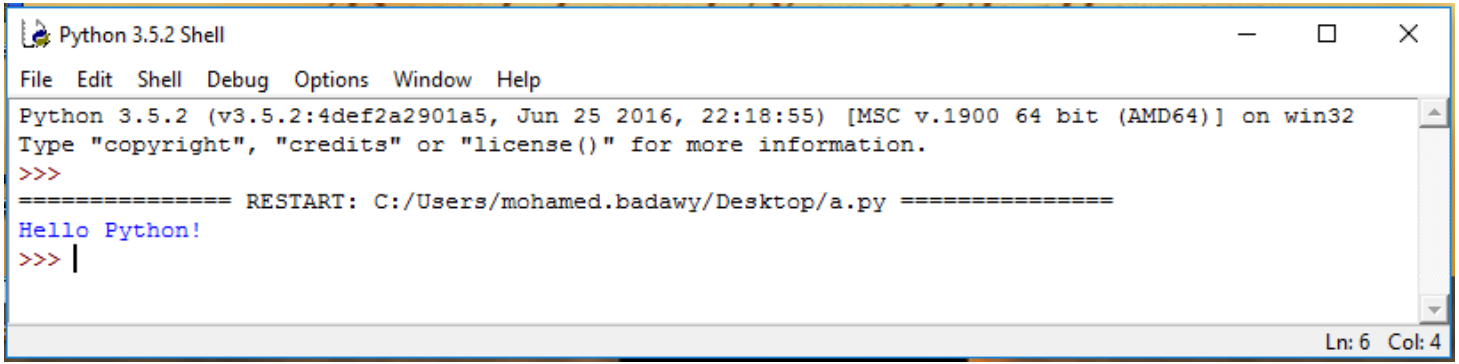


Python IDE Installation



Python IDE Installation



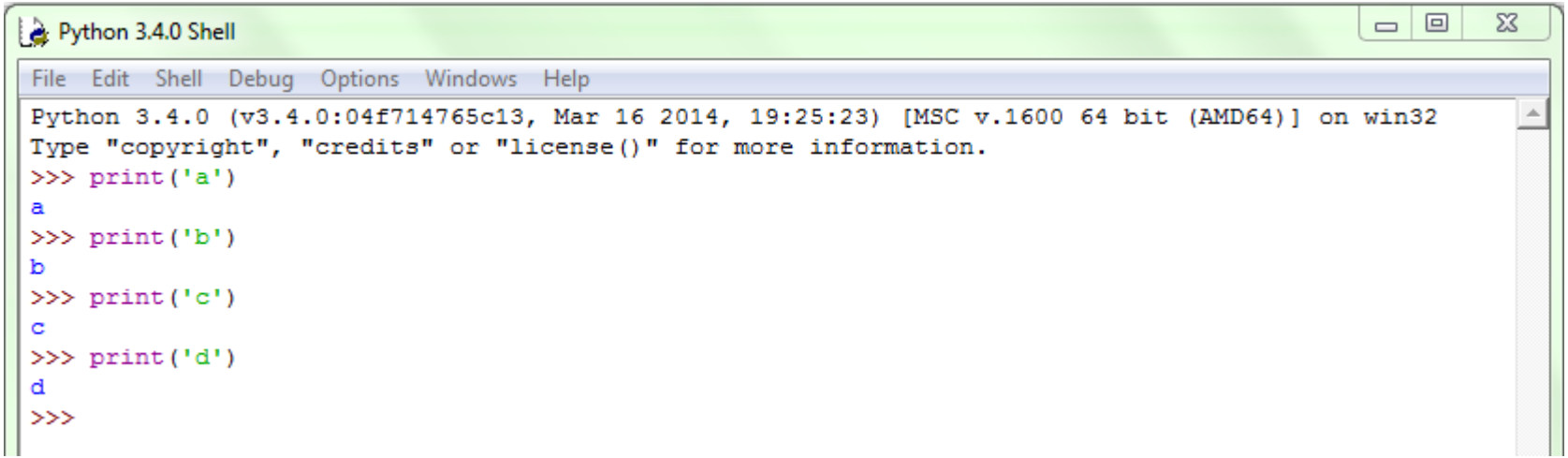


First Python Program

There are two mods of programming to execute the programs

1. Interactive Mode Programming

Invoking the interpreter without passing a script file as a parameter brings up the following prompt

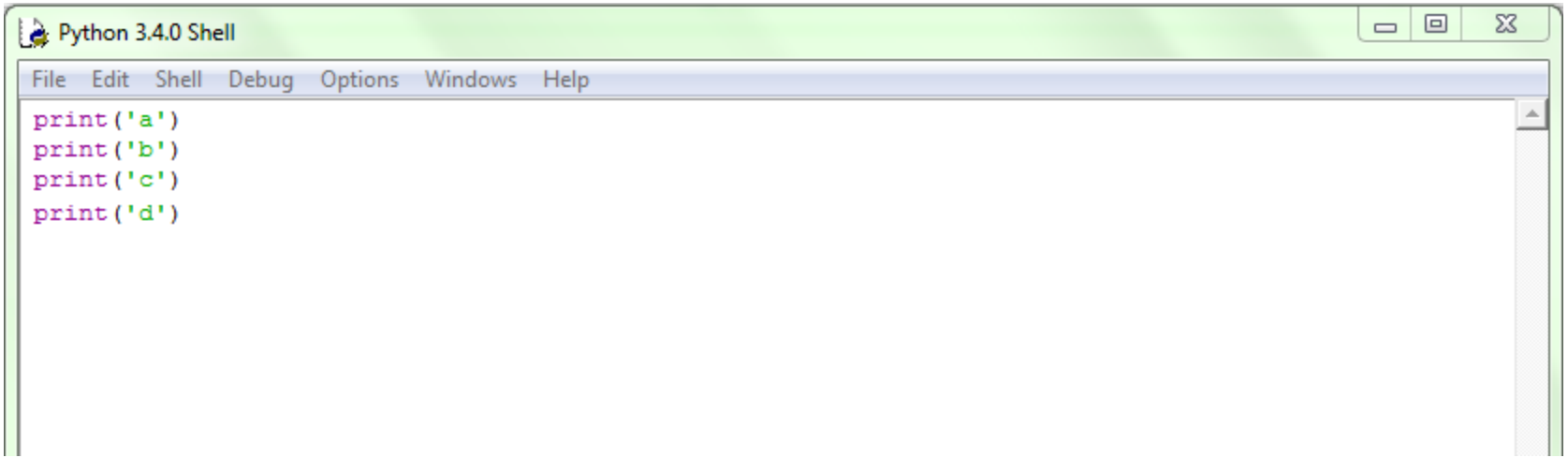


First Python Program

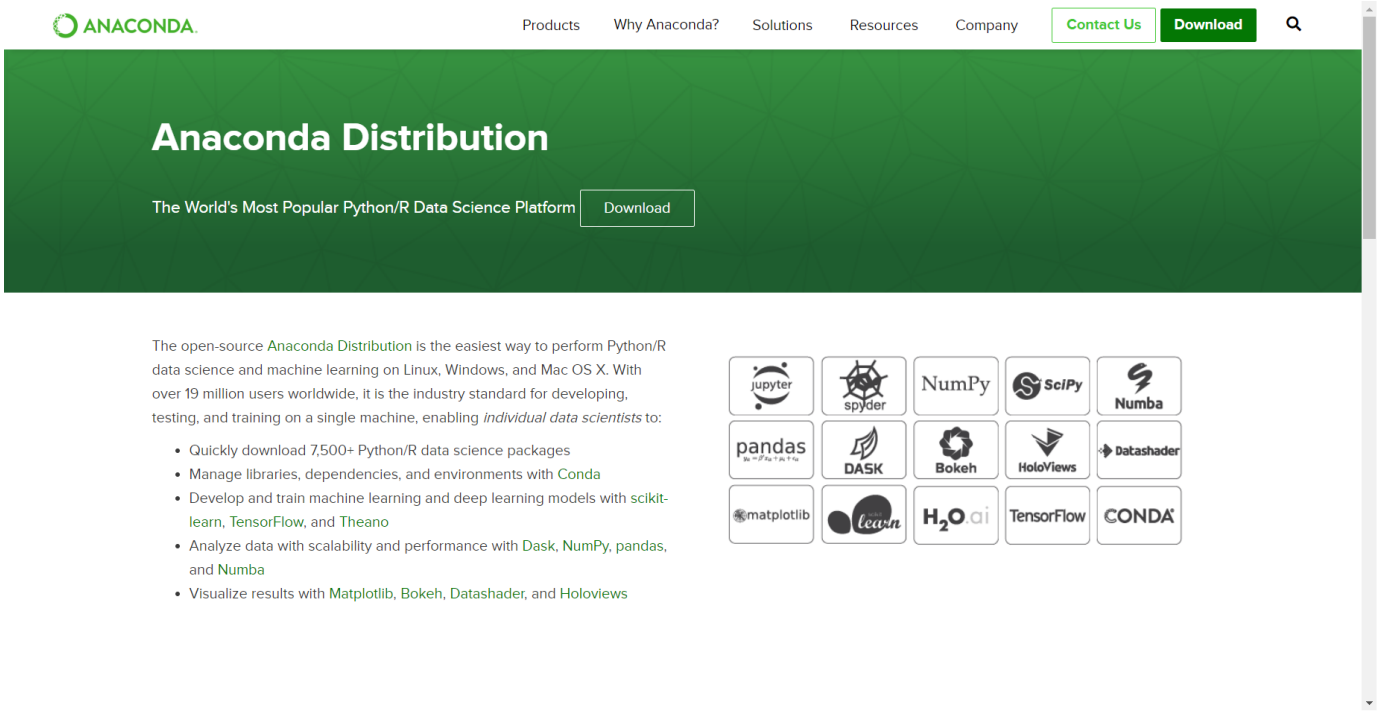
There are two mods of programming to execute the programs

2. Script Mode Programming

Invoking the interpreter with a script parameter begins execution of the script and continues until the script is finished. When the script is finish, the interpreter is no longer active.



Python Anaconda Installation



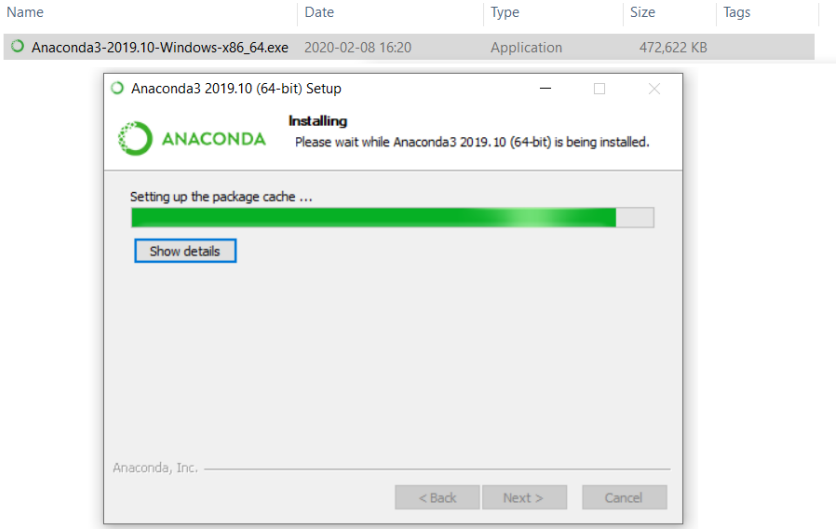
ANACONDA®

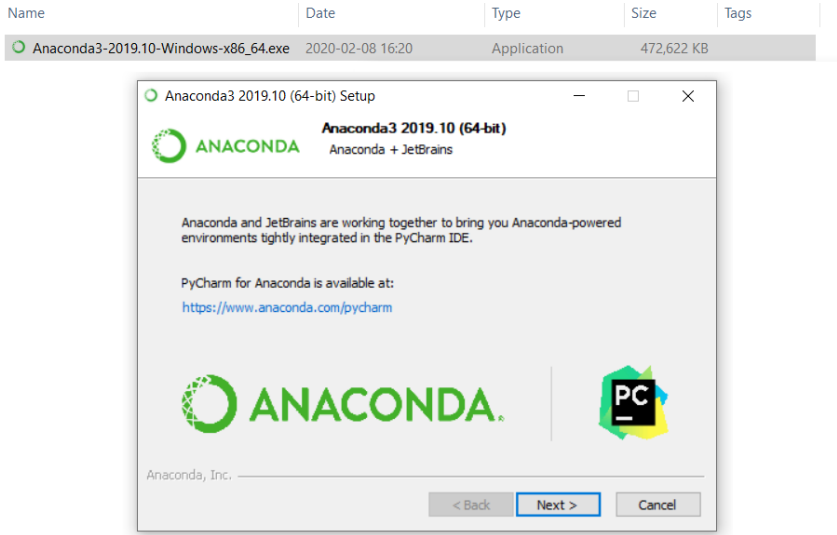
anaconda.com/distribution

Python Anaconda Installation

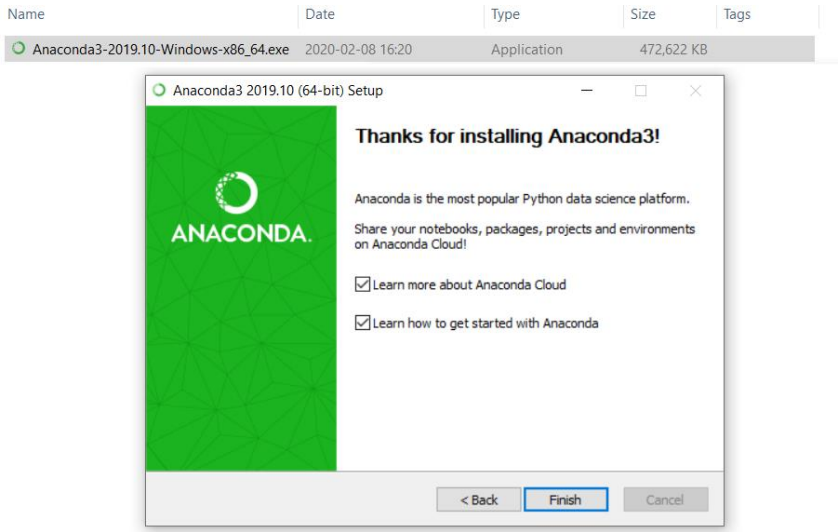
anaconda.com/distribution

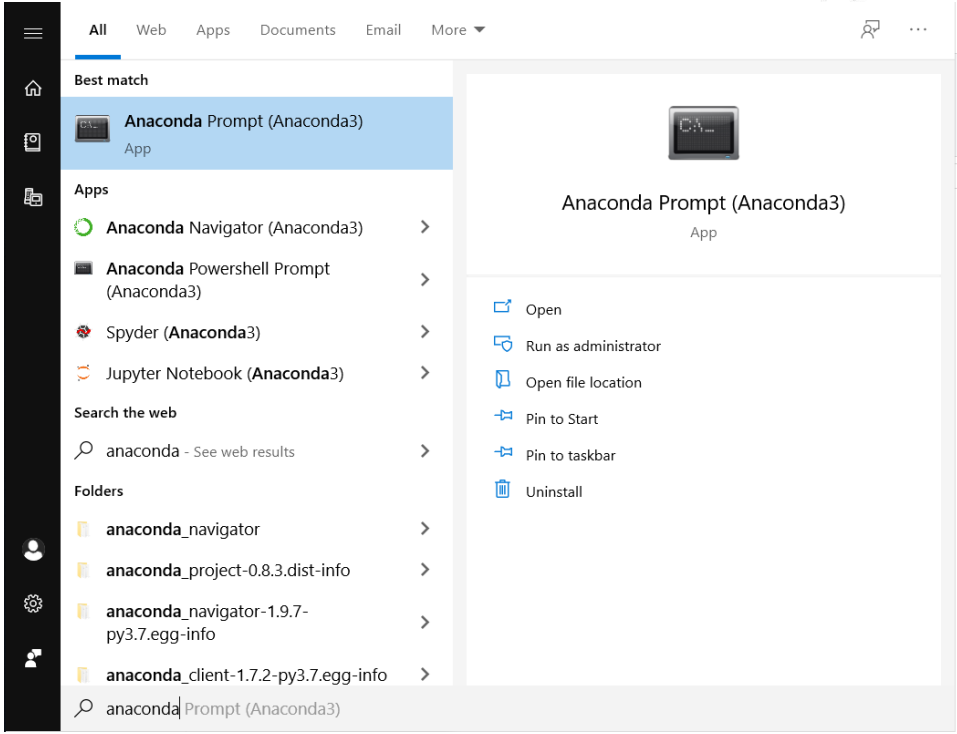
Python Anaconda Installation





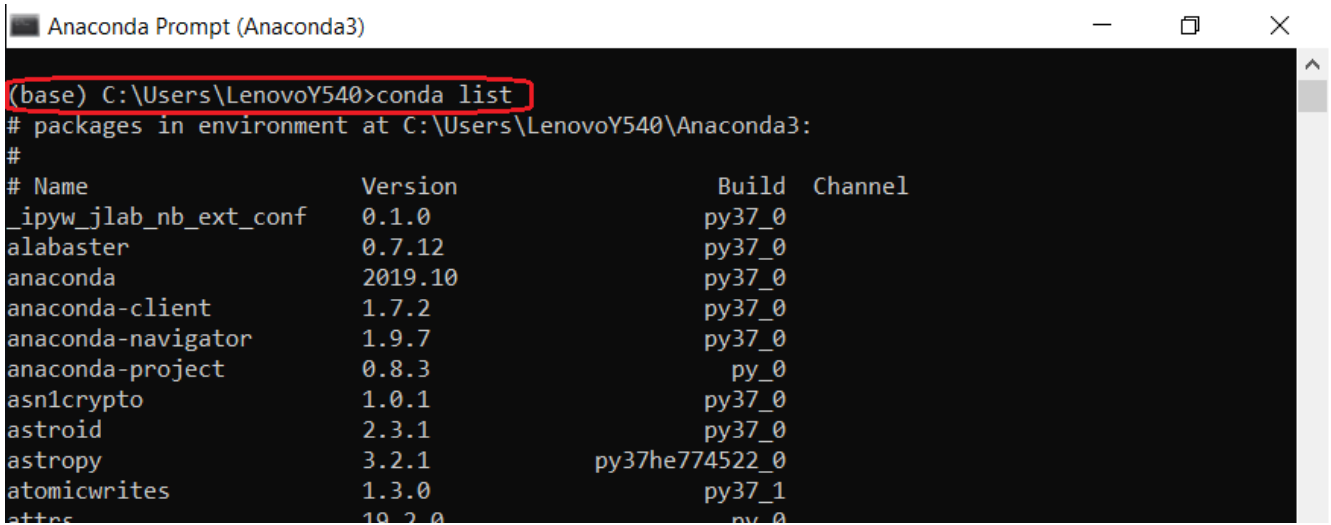
Python Anaconda Installation





Python Anaconda Installation

Ensure that all steps done successfully, you should run the following command lines:

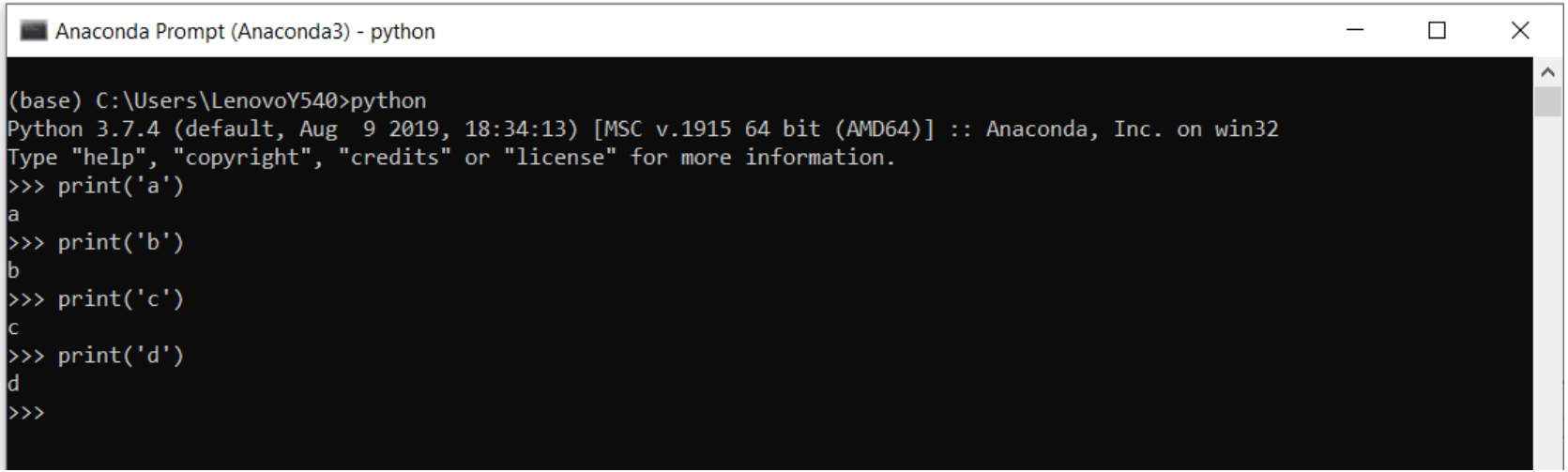


First Python Program

There are two mods of programming to execute the programs

1. Interactive Mode Programming

Invoking the interpreter without passing a script file as a parameter brings up the following prompt

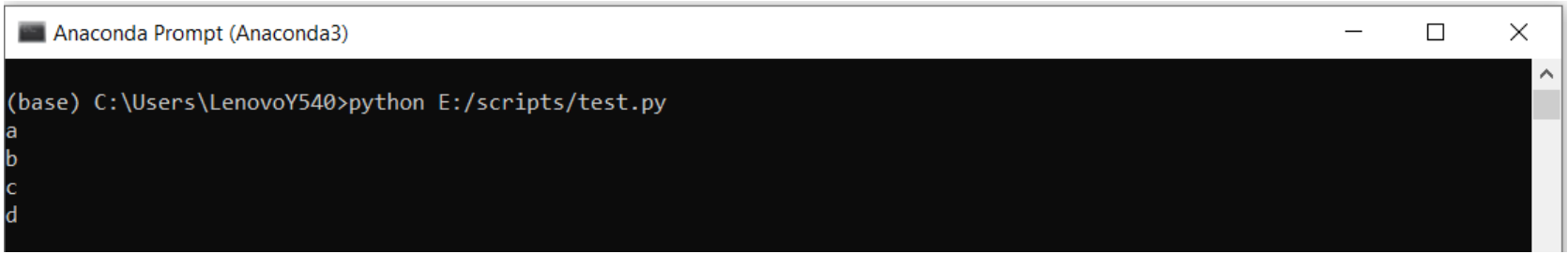


First Python Program

There are two mods of programming to execute the programs

2. Script Mode Programming

Invoking the interpreter with a script parameter begins execution of the script and continues until the script is finished. When the script is finish, the interpreter is no longer active.



Lecture Agenda

- ✓ Section 1: Python Features
- ✓ Section 2: Python Content
- ✓ Section 3: Practice on Online Judges
- ✓ Section 4: Tutorials and References
- ✓ Section 5: Online Courses
- ✓ Section 6: Python Installation


DO
MORE.