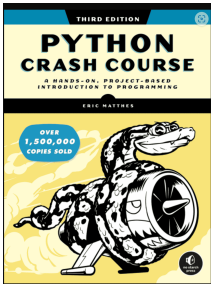
Introduction to Python Programming

Kizito NKURIKIYEYEZU, Ph.D.

Readings and activities

- Read Chap 1 —Getting started (page 3 through 13)
- Complete the installation of Python on your computer
  - Read the installation section in the textbook
  - Follow the instruction on Installing and Configuring Visual Studio Code for Python Development [a]
  - Watch the video on installing Visual Studio Code [b]
- Installing Jupyter notebook and jupyter lab [c]
- Read Chap 2 variable and simple data types
- Practice the exercises in the textbook (short in-text exercises)
- Complete the online quiz on the Google classroom



[a] https://realpython.com/python-development-visual-studio-code/
[b] https://realpython.com/lessons/introduction-visual-studio-code/
[c] https://jupyter.org/install

What is Programming?

Definition

- The process of creating instructions for computers to follow
- A way to communicate with machines using specific languages

Key Components

- Algorithms—Step-by-step procedures for solving problems
- Code—Written instructions in a programming language
- Syntax—Rules for writing code correctly

Purpose

- Automate tasks
- Solve complex problems
- Create software applications
- Control hardware devices

Programming Languages

- High-level languages (e.g., Python, Java, C, C++, C#, Javascript, Rust, Kotlin, etc)
- Low-level languages (e.g., Assembly)
- Each with its own syntax and use cases

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What is Python?

- High-level programming language
- Created by Guido van Rossum
- First released in 1991
- Open-source and community-driven

Philosophy:

- Emphasizes code readability
- "There should be one– and preferably only one –obvious way to do it"
- "Simple is better than complex"
- Focus on programmer productivity

Key Features:

- Readability and clean syntax
- Extensive standard library
- Cross-platform compatibility
- Interpreted and dynamically typed
- Object-oriented and functional

Timeline:

- 1989: Development started
- 1991: Python 0.9.0 released
- 2000: Python 2.0 introduced
- 2008: Python 3.0 released
- 2020: Python 2 retired

Python Applications

Web Development:

- Frameworks: Django, Flask, FastAPI
- RESTful API development
- Web scraping and automation

Data Science & AI:

- Data analysis: Pandas, NumPy
- Machine Learning: Scikit-learn, TensorFlow
- Data visualization: Matplotlib

Scientific Computing:

- Scientific simulations
- Computational biology
- Physics and astronomy research

Other Areas:

- Game development (Pygame)
- Desktop applications (PyQt)
- System administration
- Education and teaching

Application of Python in Industry

Major Companies Using Python:

- Core component in web crawling at Google
- Library management, production engineering at Facebook
- Recommendation algorithms, security tools at Netflix
- Desktop client, backend services at Dropbox
- Data analysis, backend services at Spotify
- Backend web framework (Django) in Instagram
- Scientific computing tasks at NASA
- Production pipeline for films at Pixar

Python in Startups:

- Rapid prototyping capabilities
- Extensive libraries for various domains
- Cost-effective due to open-source nature
- Large talent pool of Python developers

Industries:

- Quantitative trading, risk management
- Medical imaging, genomics research
- Scripting in major game engines
- Penetration testing, threat modeling

Installing Python

Step 1: Downloading

- Go to python.org/downloads/
- Choose the latest stable version
- Select the appropriate installer for your OS

Step 2: Installation

- Run the installer
- Check "Add Python to PATH" (this is very important)

Step 3: Verification

- Open command prompt/terminal
- Type: `python –version`
- Should display installed Python version

Common Issues:

- PATH not set correctly
- Multiple Python versions
- Permission issues (Unix-based systems)

Note—If you get any issue in the installation:

- Carefully watch this video [1] on python installation
- Once done, Type: `python –version`
- This should display installed Python version

[1] https://www.youtube.com/watch?v=nU2Egc3Zx3Q

Choosing a Python IDE

IDLE

- Comes bundled with Python
- Simple and lightweight
- Good for beginners
- Limited features

PyCharm[a]

- Full-featured IDE
- Intelligent code completion
- Integrated debugger
- Available in free Community Edition

[a] https://www.jetbrains.com/pycharm/

Visual Studio Code[a]

- Lightweight but powerful
- Extensive plugin ecosystem
- Built-in Git integration
- Free and open-source

Other Options

- Jupyter Notebook[b]: For data science
- Spyder [c]: Scientific computing
- Thonny[d] : Python IDE for beginners
- Google colab [e]: A free cloud service to create interactive notebooks

[a] https://code.visualstudio.com/
[b] https://jupyter.org/
[c] https://www.spyder-ide.org/
[d] https://thonny.org/

Installing and Setting Up an IDE

We'll demonstrate with Visual Studio Code:

1. Download VS Code from code.visualstudio.com
2. Run the installer and follow the prompts
3. Open VS Code after installation
4. Install the Python extension:
   - Go to Extensions (Ctrl+Shift+X)
   - Search for "Python"
   - Install the official Microsoft Python extension
5. Create a new Python file: hello.py
6. Write a simple program: `print("Hello, World!")`
7. Run the program using the play button or terminal

NOTE: Foll the following online information (and video)

- Introduction to Visual Studio Code [2]
- Python Development in Visual Studio Code [3]

[2] https://realpython.com/lessons/introduction-visual-studio-code/
[3] https://realpython.com/python-development-visual-studio-code/

Next Steps

- Explore your chosen IDE's features
- Set up a virtual environment (we'll cover this later)
- Start writing and running simple Python programs
- Experiment with different IDEs to find your preference
- Don't hesitate to ask for help if you encounter issues
- Now we can start using python.
- Instructions will be provided using Jupiter notebook

Checklist of Tasks to Complete Before Next Lecture

- ☐ Ensure Python is installed on your computer
- ☐ Install Visual Studio Code on your computer
- ☐ Install Jupyter Notebook and JupyterLab on your computer
- ☐ Register for the course's Google Classroom
- ☐ Review the course lecture notes
- ☐ Complete Quiz #1 on the course's Google Classroom

The end