Comprehensive Python Setup Guide

1. Installing Python

1. Download Python from the official website: https://www.python.org/downloads/
2. Run the installer and ensure to check the box "Add Python to PATH".
3. Verify installation by running:

   python --version

2. Installing pip and Upgrading

1. Install pip and essential packages using:

   python -m pip install --upgrade pip setuptools wheel

   python -m pip install setuptools-rust
2. Verify pip installation with:

   pip --version

3. Setting Up Virtual Environment

1. Create a virtual environment:

   python -m venv myenv
2. Activate the environment:

   On Windows: myenv\Scripts\activate

   On Mac/Linux: source myenv/bin/activate
3. Deactivate the environment when done:

   deactivate

4. Installing Libraries

Install commonly used libraries:

1. OpenCV: pip install opencv-python opencv-contrib-python
2. NumPy: pip install numpy
3. Matplotlib: pip install matplotlib
4. TensorFlow: pip install tensorflow
5. Other useful libraries:

   pip install pandas scikit-learn dlib pillow

5. Adding Environment Variables

1. Add Python and Scripts folder to PATH:

   C:\Users\<Your Username>\AppData\Local\Programs\Python\Python313

   C:\Users\<Your Username>\AppData\Local\Programs\Python\Python313\Scripts
2. Use the command to set PATH:

   setx PATH "%PATH%;<path-to-python>"

6. Navigating Directories

1. Use cd command to change directories:

   cd C:\Users\<Your Username>\AppData\Local\Programs\Python\Python313

7. Testing Installations

Run the following script to test installations:

```
import cv2

import numpy as np

import matplotlib.pyplot as plt

import tensorflow as tf

print("OpenCV:", cv2.__version__)

print("NumPy:", np.__version__)

print("Matplotlib:", plt.__version__)

print("TensorFlow:", tf.__version__)
```

8. Troubleshooting Common Errors

1. If ModuleNotFoundError occurs, install the missing library:

   pip install <library-name>

2. If pip is not working, reinstall it using:

   python -m ensurepip