Final Training Report

Python Programming

STEP GNDEC, Ludhiana

Duration: 4 Weeks

Trainer: Mr. Ashish Kumar

Trainee: Simrandeep Kaur

1. Introduction This report outlines the successful completion of a 4-week training program in Python programming conducted at STEP GNDEC, Ludhiana under the guidance of Mr. Ashish Kumar. The primary objective of this training was to provide a hands-on understanding of core Python concepts, GUI development, and real-world projects using libraries such as OpenCV, Tkinter, NumPy, and more.

2. Objectives of the Training

- To understand the fundamentals of Python programming.
- To integrate external libraries like OpenCV, NumPy, and Requests for real-time solutions.
- To work on GUI-based applications using Tkinter.
- To build mini-projects for practical understanding.
- To develop analytical and logical thinking through coding.

3. Weekly Progress

Week 1: Foundations of Python Programming The first week focused on building a solid foundation in Python programming. Emphasis was placed on understanding Python's syntax and core programming constructs. Topics covered included variables, data types (strings, integers, floats, lists, tuples, dictionaries), and control structures like loops (for, while) and conditional statements (if-else).

The training also introduced functions, highlighting their role in modular programming and code reusability. Practical exercises involved writing small programs to manipulate data collections, perform arithmetic operations, and implement decision-making logic.

Additionally, basic file handling concepts were introduced to enable reading from and writing to text files, laying the groundwork for data persistence in later projects. The week included hands-on coding challenges to reinforce understanding and problem-solving skills.

Week 2: Introduction to GUI Development with Tkinter Building on the fundamentals, the second week was dedicated to graphical user interface (GUI) development using Python's Tkinter library. Learners explored how to create interactive applications by integrating various GUI components such as Labels, Buttons, Entry fields, Text widgets, and Frames.

The week covered event-driven programming, explaining how user interactions trigger events and how to bind functions (callbacks) to these events. Layout management using grid, pack, and place geometry managers was practiced to design intuitive interfaces.

Hands-on sessions involved creating simple applications like calculators, form input windows, and button-controlled displays. This week strengthened the understanding of combining logic with interface elements to build usable applications and enhanced skills in managing program flow based on user input.

Week 3: Working with External Libraries and Intermediate Projects
The third week introduced important external Python libraries that broadened the scope of application development. The training started with OpenCV, a powerful library for computer vision tasks. Participants learned image processing basics, such as reading, displaying, and manipulating images, along with detecting faces using Haar cascades.

NumPy was introduced as a tool for numerical computing, especially array manipulation, which is critical for handling face recognition data efficiently. The training also covered how to interact with web APIs using the Requests module, parsing JSON responses, and integrating live data into applications.

A significant highlight was creating a Weather Application using the OpenWeatherMap API, which fetched real-time weather data based on user input. This project reinforced working with external data sources, API handling, JSON parsing, and dynamic GUI updates.

Week 4: Final Project Implementation and Integration

The final week focused on consolidating knowledge through the development of comprehensive projects combining various concepts and libraries learned previously. The centerpiece was the Face Recognition System that incorporated OpenCV's LBPH (Local Binary Patterns Histogram) algorithm for real-time detection and recognition of faces, integrated within a Tkinter GUI. This project demanded skills in image capture, data labeling, training models, and live video processing.

Alongside, a Music Player Application was built to handle media files with play, pause, and stop functionalities controlled through an intuitive GUI interface. This project involved working with OS-level commands and multimedia libraries.

An Automated Tic Tac Toe Game was also developed, featuring a one-player mode where the system generated moves using basic AI/randomization to com-

pete against the human player. This project demonstrated logic implementation, GUI event handling, and game state management.

The week concluded with code optimization, debugging sessions, and presentation of projects, enhancing confidence in writing efficient, user-friendly Python applications.

4. Key Projects Developed Project Title Technologies Used Description

Face Recognition App OpenCV, Tkinter, NumPy Real-time face detection and recognition with GUI

Music Player Tkinter, Pygame/OS module GUI-based music player with control buttons

Weather App Tkinter, Requests API Real-time weather data fetched using OpenWeatherMap

Tic Tac Toe (AI Mode) Tkinter, Random module One-player mode with random AI moves against human

5. Skills Acquired

- Python core programming
- GUI design and development using Tkinter
- Handling APIs and JSON responses
- Image processing with OpenCV
- Building real-world applications using logic and code integration
- Error handling and debugging

6. Conclusion The 4-week training has greatly enhanced my practical and theoretical understanding of Python. I have developed the confidence to work on Python-based applications and pursue more advanced concepts in future. I sincerely thank my trainer, **Mr. Ashish Kumar**, for his support and the institute **STEP GNDEC** for providing this learning opportunity.

7. Declaration I, Simrandeep Kaur, declare that this report is a true representation of the work completed during my 4-week Python training.