Employee Management System

# Overview

The Employee Management System (EMS) is a desktop-based application designed to manage employee information and integrate with the Face Detection Attendance System. The application is built using `tkinter` for the graphical interface and `openpyxl` for handling Excel files to store employee records. It provides functionalities such as adding new employees, editing their details, capturing images for face recognition, and validating data inputs.

# Features and Functionalities

**1. Employee Information Management:**

- The EMS allows users to input details such as department, job title, employee ID, name, gender, date of birth, phone number, email, address, and CNIC.

- All data is stored in an Excel file (`employee\_data.xlsx`), which is created if it doesn’t already exist.

**2. Data Input and Validation:**

- Department & Job Title: Managed via drop-down selections using `ttk.Combobox`.

- Employee ID: Validated to ensure it is a unique, 5-character alphanumeric string.

- Name: Restricted to only alphabetic characters and spaces.

- Phone Number: Enforced to be 11 digits and numeric.

- Email: Checked for the presence of "@" and ".com" to ensure proper format.

- CNIC: Must be exactly 13 numeric digits.

**3. Employee Data Storage and Display:**

- Employee records are displayed in a `Treeview` widget, providing an easy-to-view format.

- Data can be saved, loaded, or deleted from the `employee\_data.xlsx` file.

**4. Face Image Capture:**

- Integrates with a webcam to capture 10 images per employee, saving them in a directory named after the employee ID.

- Images are used for training the Face Detection Attendance System.

**5. Validation and Error Handling:**

- Validates critical fields to prevent incorrect data entry.

- Displays error messages via `messagebox` for user guidance.

# Data Flow and Model Structure

- **Excel File Handling:** The system uses `openpyxl` to create, read, and update the `employee\_data.xlsx` file. It ensures data persistence even when the application is closed.

- **Face Image Management:** The captured images are saved in a structured folder hierarchy, enabling easy access for face recognition training.

# Code Design and Implementation

**1. GUI Layout:**

- The main window (`root`) is divided into two sections: an information form for entering employee details and a `Treeview` for listing saved employee records.

- A `LabelFrame` groups input fields, and a `Frame` organizes the action buttons (`Save`, `Delete`, and `Capture`).

**2. Functions and Methods:**

- create\_widgets(): Sets up all input fields, buttons, and their placements.

- validate\_name\_input(): Ensures names contain only letters and spaces.

- validate\_phone\_entry(): Checks that phone numbers are numeric and 11 digits long.

- validate\_email(): Confirms that email addresses follow a standard format.

- validate\_cnic\_entry(): Validates CNIC numbers to ensure they are exactly 13 digits.

- enable\_capture\_button(): Activates the Capture button when all required fields are filled.

- capture\_images(): Uses OpenCV to capture 10 images and save them.

- save\_info(): Saves validated employee data to the Excel file.

- check\_existing\_data(): Checks if an Employee ID already exists in the Excel file.

- delete\_info(): Deletes selected employee data from both the `Treeview` and the Excel file.

- clear\_inputs(): Clears all input fields after saving or deleting data.

# Model Evaluation and Error Handling

- **Error Handling:** The code uses `try-except` structures where needed to handle errors such as file I/O issues or webcam failures.

- **Validation:** Strong input validation ensures data integrity, and visual feedback informs users of incorrect entries.

- **Performance:** The system efficiently handles data entry and image capture tasks, ensuring smooth operation for attendance management.

# Future Enhancements

- **Integration with Attendance System:** The EMS can be enhanced to directly link with the Face Detection Attendance System, enabling seamless management and recognition.

- **Advanced Recognition Models:** Consider upgrading to more accurate face recognition techniques like Deep Learning models (e.g., FaceNet, Dlib).

- **Data Analytics:** Adding features to analyze attendance patterns and generate reports.

# Conclusion

This documentation provides an in-depth understanding of how the Employee Management System functions, highlighting its core features and the steps taken to ensure data accuracy and user convenience.