Smart Attendance System

Smile to be counted, no proxies allowed.

ABSTRACT

The Smart Attendance System is a Python program that automates attendance using face recognition, voice commands, and a themed Tkinter interface. It captures faces via webcam, logs attendance to CSV, and provides an admin vault for viewing records, blocking users, and managing registrations.

Report By	Shehar Bano
Student I'D	70151528
Program	BS-IET Section-I
Course	Artificial Intelligence
Submitted To	Dr. Syed M Hamedoon
Date of Submission	January 6th, 2026

Contents

1. Project Description 2
    1.1. Core Stack 2
    1.2. Data Files 2
2. Project flow diagram 3
3. Project code 4
4. Output 6
5. Scope of my work 8
6. Github repository link 8
7. Quick setup and run 8

Project Description

The **Smart Attendance System** is a Python program designed to modernize and automate attendance marking. It combines computer vision, voice interaction, and a playful Tkinter interface to create a system that is both functional and engaging. By leveraging face recognition technology, it ensures accurate identification of individuals, while voice commands and themed dialogs make the experience more user-friendly.

At its core, the system uses a webcam to capture live video streams. Faces are processed using the LBPH (Local Binary Patterns Histograms) algorithm in OpenCV, compared against a trained dataset of registered users. When a match is found, attendance is logged in a CSV file with name, ID, date, time, and day. Duplicate entries are prevented by checking if a user has already been marked present.

A secure **Admin Vault** provides advanced functionality: viewing attendance in a stylized table, blocking/unblocking users, and marking admin attendance. The workflow includes login credentials, admin face capture, and fullscreen controls to ensure authority.

The system also integrates **voice control** for hands-free operation. Using the wake word “hello,” users can issue commands such as starting attendance, opening the admin panel, viewing logs, blocking/unblocking users, or exiting. Voice feedback via Windows SAPI makes the experience conversational and immersive.

To maintain usability, camera feeds and dialogs remain topmost. Unknown users are guided through auto-registration, where face samples are collected and linked to a name and numeric ID. This data is added to the dataset, retraining the recognition model for future use.

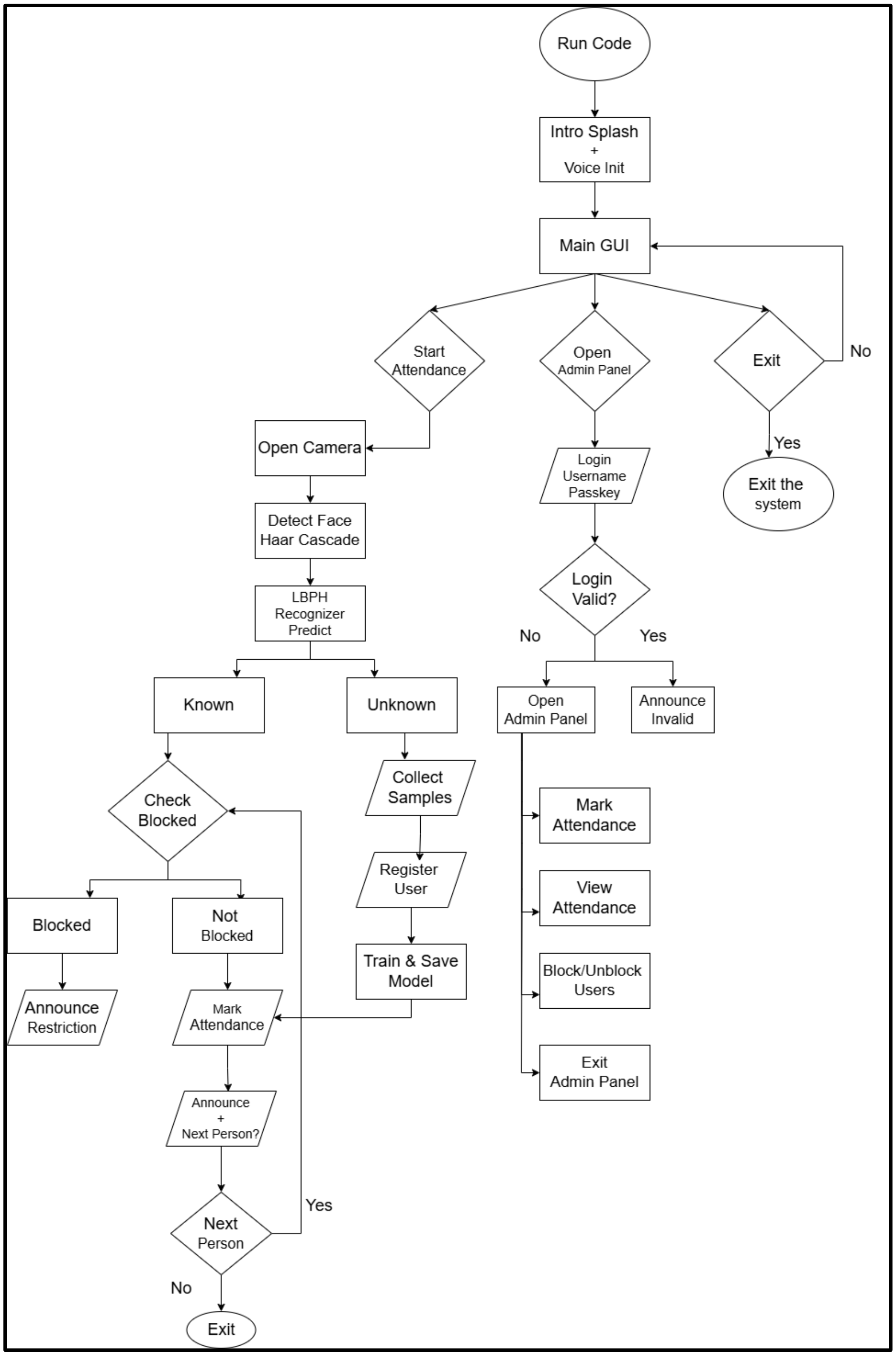
Core Stack

- **OpenCV (LBPH):** Face detection and recognition.
- **OpenCV (Haar Cascade):** Face detection using pre-trained classifiers.
- **Tkinter (GUI):** User interface with themed dialogs and panels.
- **PIL (ImageTk):** Displaying camera frames in Tkinter windows.
- **SAPI (Windows Speech):** Voice feedback and announcements.
- **speech_recognition (Google):** Voice command input.
- **CSV/JSON:** Storage for attendance logs, user maps, and blocked lists.

Data Files

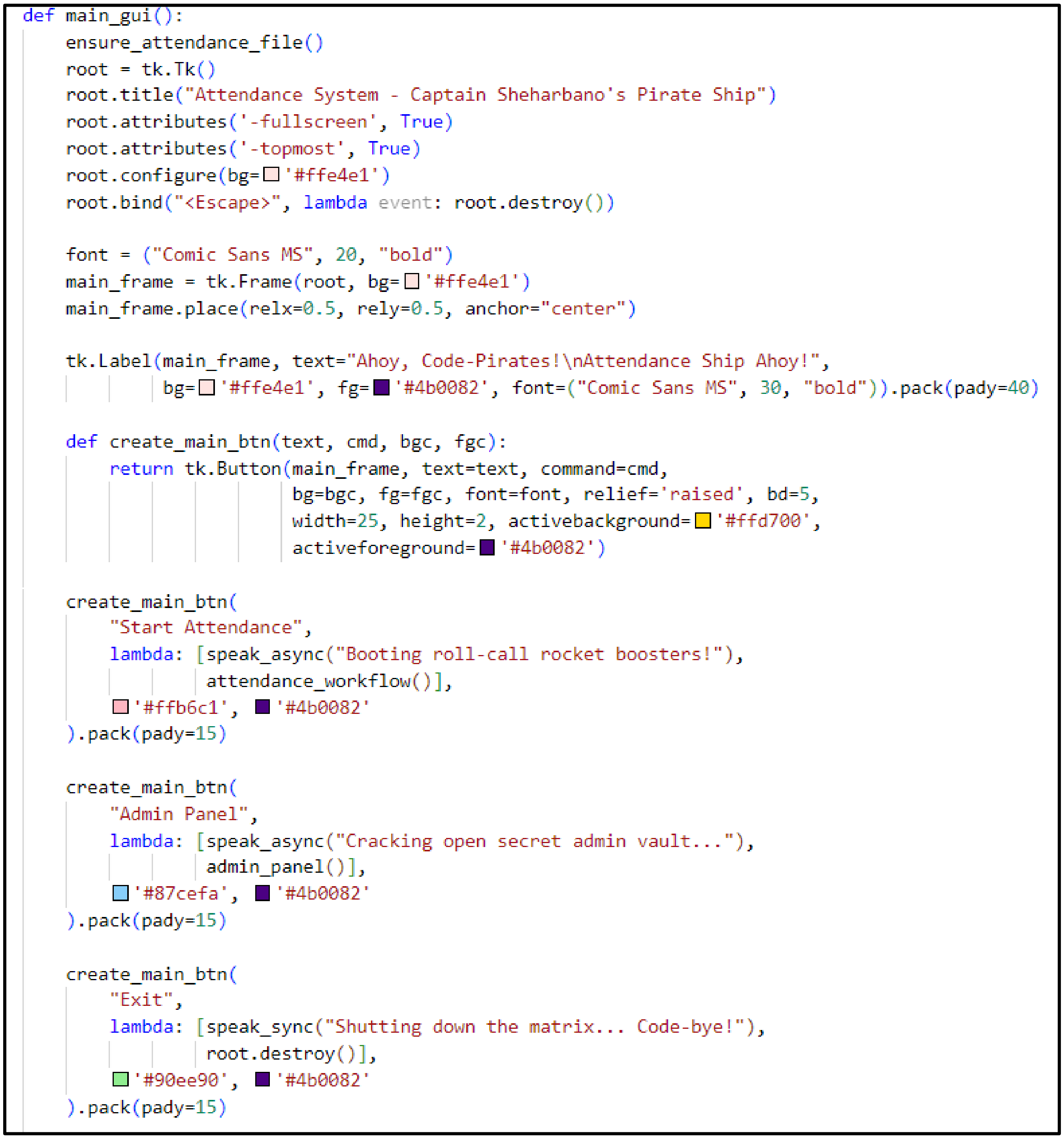
- **Faces directory:** `faces/<Name>/*.jpg` — stores user face samples.
- **Admin face:** `faces/Admin/admin.jpg` — admin’s registered face image.
- **Model:** `trainer.yml` — trained LBPH model for recognition.
- **Maps:** `label_map.json`, `id_map.json` — maps labels to names and IDs.
- **Attendance log:** `attendance.csv` — records attendance entries.
- **Blocked users:** `blocked.json` — list of users restricted from attendance.

Project flow diagram



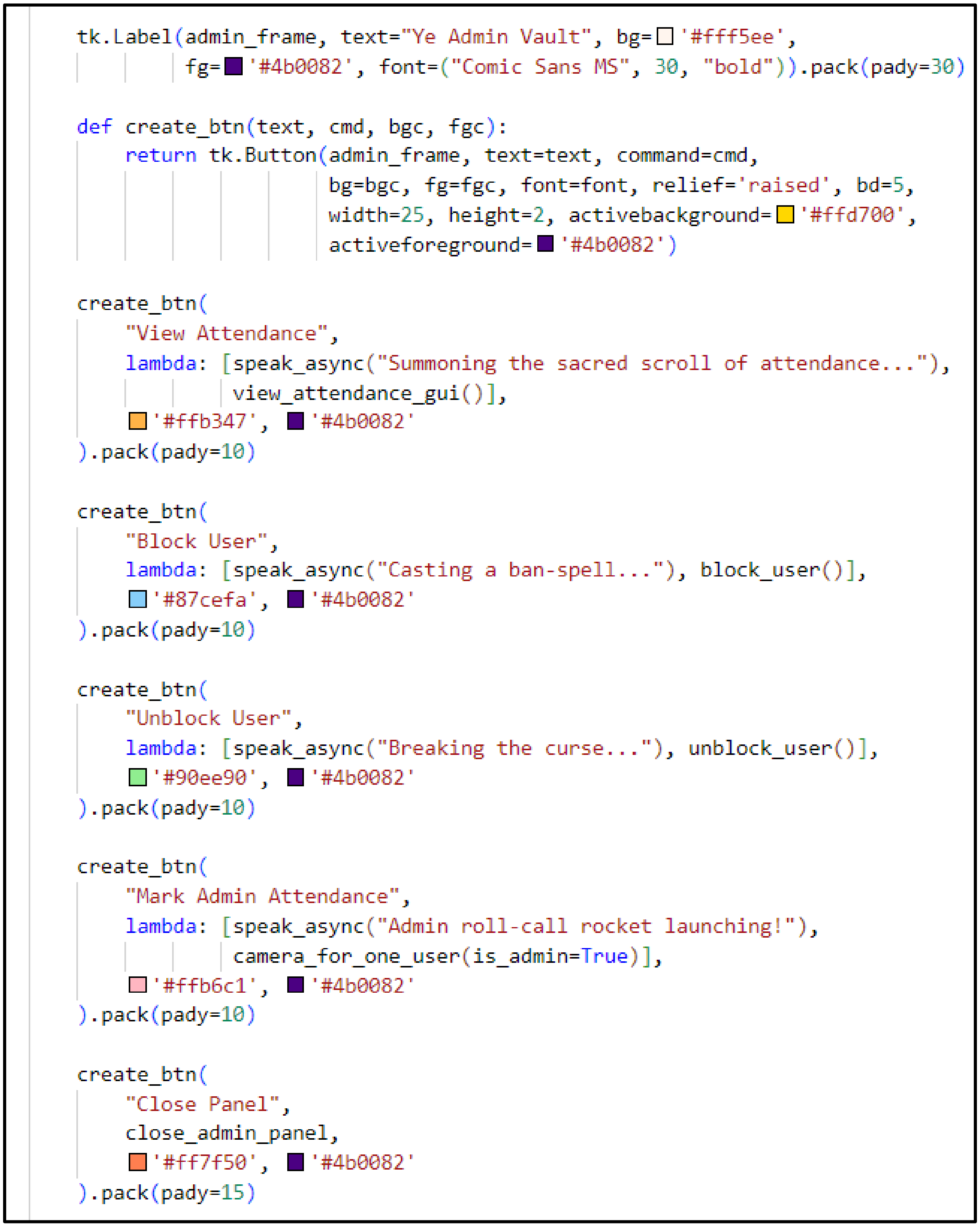
Project code

- **Main GUI:** “Attendance Ship Ahoy!” screen with buttons (Start Attendance, Admin Panel, Exit).



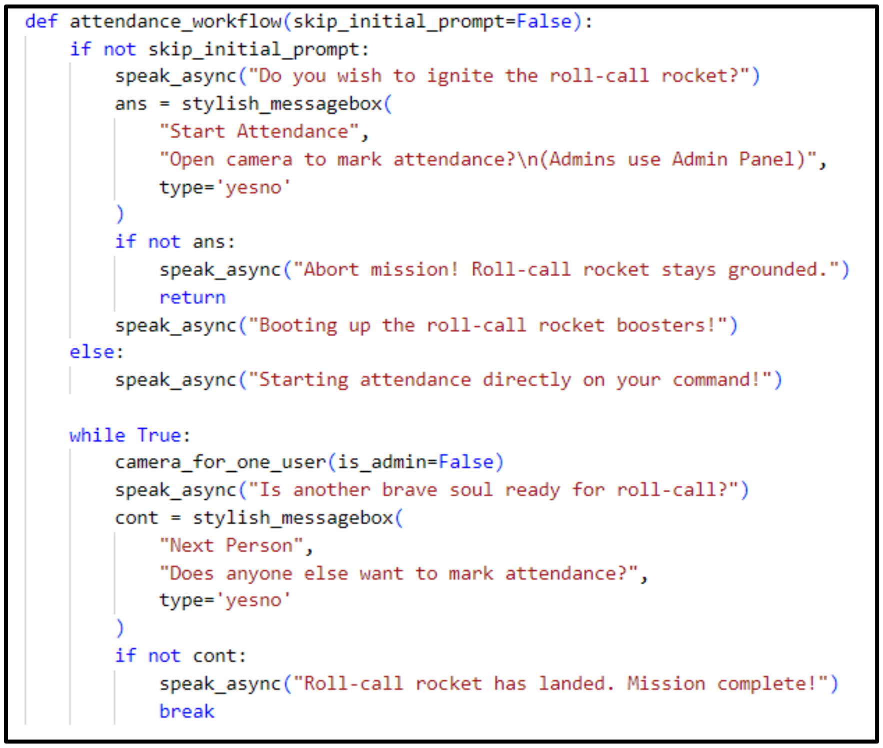
```python
def main_gui():
    ensure_attendance_file()
    root = tk.Tk()
    root.title("Attendance System - Captain Sheharbano's Pirate Ship")
    root.attributes('-fullscreen', True)
    root.attributes('-topmost', True)
    root.configure(bg='#ffe4e1')
    root.bind("<Escape>", lambda event: root.destroy())

    font = ("Comic Sans MS", 20, "bold")
    main_frame = tk.Frame(root, bg='#ffe4e1')
    main_frame.place(relx=0.5, rely=0.5, anchor="center")

    tk.Label(main_frame, text="Ahoy, Code-Pirates!\nAttendance Ship Ahoy!",
             bg='#ffe4e1', fg='#4b0082', font=("Comic Sans MS", 30, "bold")).pack(pady=40)

    def create_main_btn(text, cmd, bgc, fgc):
        return tk.Button(main_frame, text=text, command=cmd,
                         bg=bgc, fg=fgc, font=font, relief='raised', bd=5,
                         width=25, height=2, activebackground='#ffd700',
                         activeforeground='#4b0082')

    create_main_btn(
        "Start Attendance",
        lambda: [speak_async("Booting roll-call rocket boosters!"),
                 attendance_workflow()],
        '#ffb6c1', '#4b0082'
    ).pack(pady=15)

    create_main_btn(
        "Admin Panel",
        lambda: [speak_async("Cracking open secret admin vault..."),
                 admin_panel()],
        '#87cefa', '#4b0082'
    ).pack(pady=15)

    create_main_btn(
        "Exit",
        lambda: [speak_sync("Shutting down the matrix... Code-bye!"),
                 root.destroy()],
        '#90ee90', '#4b0082'
    ).pack(pady=15)
```

- **Admin vault:** Full screen panel with buttons (View Attendance, Block/Unblock, Mark Admin Attendance, Close Panel).



```python
tk.Label(admin_frame, text="Ye Admin Vault", bg='#fff5ee',
         fg='#4b0082', font=("Comic Sans MS", 30, "bold")).pack(pady=30)

def create_btn(text, cmd, bgc, fgc):
    return tk.Button(admin_frame, text=text, command=cmd,
                     bg=bgc, fg=fgc, font=font, relief='raised', bd=5,
                     width=25, height=2, activebackground='#ffd700',
                     activeforeground='#4b0082')

create_btn(
    "View Attendance",
    lambda: [speak_async("Summoning the sacred scroll of attendance..."),
             view_attendance_gui()],
    '#ffb347', '#4b0082'
).pack(pady=10)

create_btn(
    "Block User",
    lambda: [speak_async("Casting a ban-spell..."), block_user()],
    '#87cefa', '#4b0082'
).pack(pady=10)

create_btn(
    "Unblock User",
    lambda: [speak_async("Breaking the curse..."), unblock_user()],
    '#90ee90', '#4b0082'
).pack(pady=10)

create_btn(
    "Mark Admin Attendance",
    lambda: [speak_async("Admin roll-call rocket launching!"),
             camera_for_one_user(is_admin=True)],
    '#ffb6c1', '#4b0082'
).pack(pady=10)

create_btn(
    "Close Panel",
    close_admin_panel,
    '#ff7f50', '#4b0082'
).pack(pady=15)
```

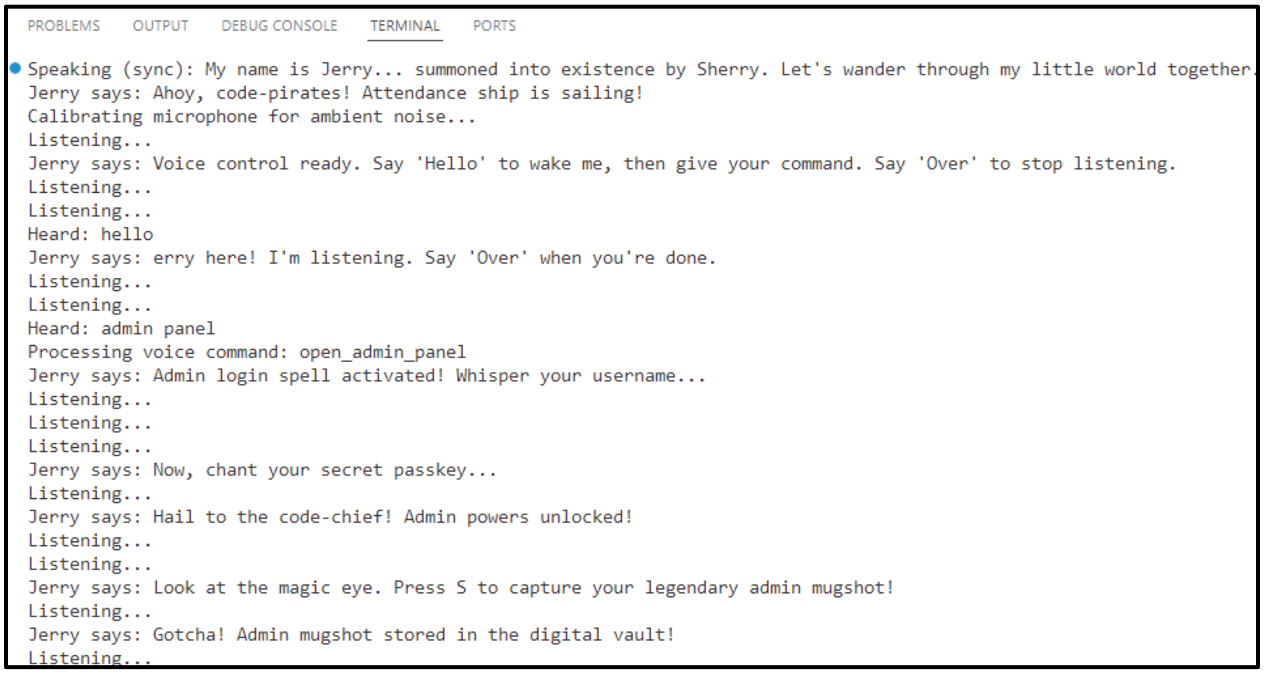
- **Attendance Workflow:** The workflow launches a "roll-call rocket," opens the camera, marks attendance, and loops for next users.



```
def attendance_workflow(skip_initial_prompt=False):
    if not skip_initial_prompt:
        speak_async("Do you wish to ignite the roll-call rocket?")
        ans = stylish_messagebox(
            "Start Attendance",
            "Open camera to mark attendance?\n(Admins use Admin Panel)",
            type='yesno'
        )
        if not ans:
            speak_async("Abort mission! Roll-call rocket stays grounded.")
            return
        speak_async("Booting up the roll-call rocket boosters!")
    else:
        speak_async("Starting attendance directly on your command!")

    while True:
        camera_for_one_user(is_admin=False)
        speak_async("Is another brave soul ready for roll-call?")
        cont = stylish_messagebox(
            "Next Person",
            "Does anyone else want to mark attendance?",
            type='yesno'
        )
        if not cont:
            speak_async("Roll-call rocket has landed. Mission complete!")
            break
```

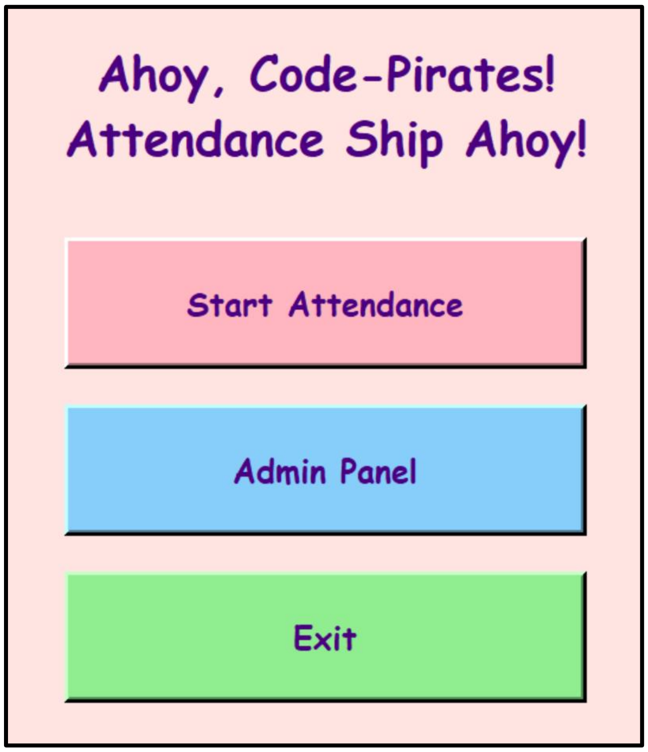
Output

- **Voice control:** Terminal logs for "hello", "open admin panel", etc.

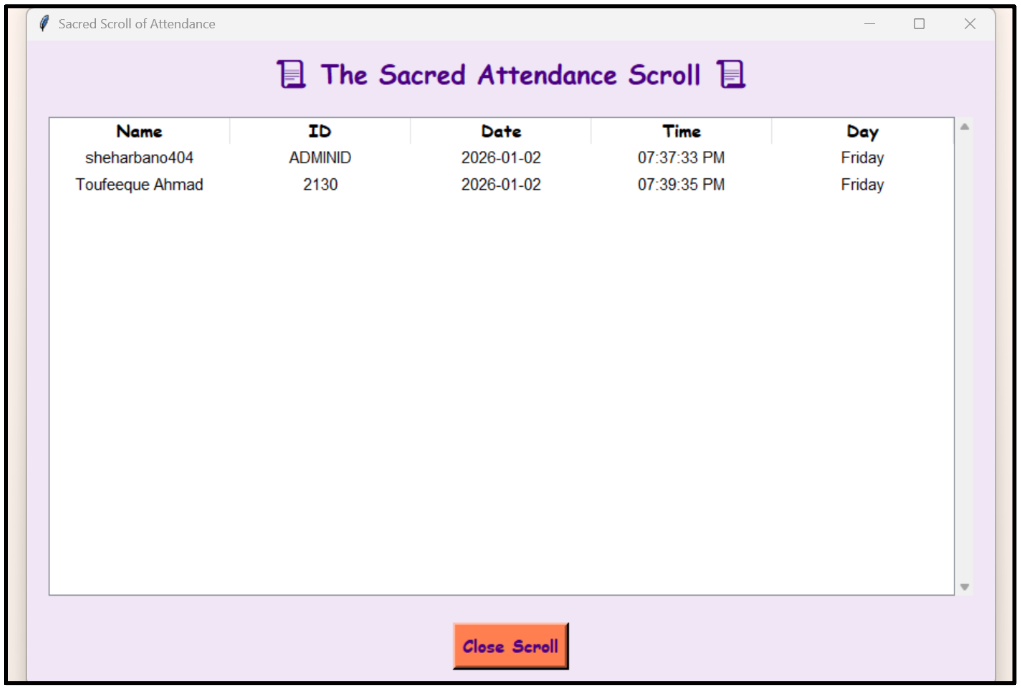


```
Speaking (sync): My name is Jerry... summoned into existence by Sherry. Let's wander through my little world together
Jerry says: Ahoy, code-pirates! Attendance ship is sailing!
Calibrating microphone for ambient noise...
Listening...
Jerry says: Voice control ready. Say 'Hello' to wake me, then give your command. Say 'Over' to stop listening.
Listening...
Listening...
Heard: hello
Jerry says: erry here! I'm listening. Say 'Over' when you're done.
Listening...
Listening...
Heard: admin panel
Processing voice command: open_admin_panel
Jerry says: Admin login spell activated! Whisper your username...
Listening...
Listening...
Listening...
Jerry says: Now, chant your secret passkey...
Listening...
Jerry says: Hail to the code-chief! Admin powers unlocked!
Listening...
Listening...
Jerry says: Look at the magic eye. Press S to capture your legendary admin mugshot!
Listening...
Jerry says: Gotcha! Admin mugshot stored in the digital vault!
Listening...
```

- **Main GUI:** A welcome screen with pirate-themed buttons for starting attendance, accessing the admin panel, or exiting.



- **Attendance Viewer:** A themed attendance table showing stamped entries with name, ID, date, time, and day.



Name	ID	Date	Time	Day
sheharbano404	ADMINID	2026-01-02	07:37:33 PM	Friday
Toufeeque Ahmad	2130	2026-01-02	07:39:35 PM	Friday

Scope of my work

- **Implemented:**
  - **Face detection & recognition:** Haar cascade + LBPH with dataset building and model persistence.
  - **Auto-registration:** Buffered unknown faces, guided name/ID capture, retraining.
  - **Attendance logging:** CSV with date, time, day; duplicate prevention per day.
  - **Admin features:** View attendance, block/unblock users, mark admin attendance, admin face capture.
  - **Voice control:** Wake word, command routing via queue, async speech synthesis.
  - **UI polish:** Topmost windows, fullscreen panels, custom dialogs, playful copy.
- **Assumptions & constraints:**
  - **Windows-only speech (SAPI):** Uses `win32com.client` for TTS.
  - **Internet required for speech recognition:** Google API via `speech_recognition`.
  - **Single camera index:** Uses `cv2.VideoCapture(0)`.
  - **LBPH threshold:** `UNKNOWN_THRESHOLD = 70.0` tuned for this dataset; may need calibration.
- **Future scope:**
  - **Cross-platform TTS & offline ASR:** Replace SAPI/Google with platform-agnostic or offline engines.
  - **Model improvements:** Add data augmentation, per-user sample management, and confidence calibration UI.
  - **Security:** Hash admin passkey, role-based access, audit logs.
  - **Database backend:** Migrate CSV/JSON to SQLite/MySQL with triggers and audit tables.
  - **UI/UX:** Theming, animations, and brand-consistent components (your specialty).

Github repository link

- **Repository:** https://github.com/SheharBano404/Smart-Attendance-System.git

Quick setup and run

- **Requirements:**
  - Python 3.9+
  - `opencv-contrib-python`, `numpy`, `Pillow`, `pywin32`, `speechrecognition`, `pyaudio` (or alternative), `tkinter` (bundled with Python on Windows)

- **Install:**

```
pip install opencv-contrib-python numpy Pillow pywin32 SpeechRecognition
pyaudio OR pip install -r requirements.txt
```

- **Run:**

```
python smart_attendance.py
```

- **First-time steps:**

1. **Run the application** Launch the main Python file to initialize GUI, voice engine, and queues.
2. **Admin login**
   - Click **Admin Panel** on the main GUI.
   - Enter username: `sheharbano404` and passkey: `snape` (can be changed in code).
   - Unlocks admin powers and opens the fullscreen vault.
3. **Capture admin face**
   - On first login, press **S** in the camera window to save your face as `faces/Admin/admin.jpg`.
   - Triggers training with admin image.
4. **Train model**
   - Automatically triggered after admin face capture or new user registration.
   - Uses `build_dataset_and_label_map()` and `train_and_save_recognizer()` to save `trainer.yml`.
5. **Start attendance**
   - From main GUI, click **Start Attendance** or say "hello… start attendance".
   - Opens camera, detects faces, and predicts identity using LBPH.
6. **Register unknown user**
   - If face is unknown, collects 5 samples.
   - Prompts for name and numeric ID via `stylish_askstring().`
   - Saves images, updates `id_map.json`, retrains model, and marks attendance.
7. **Mark attendance**
   - Logs name, ID, date, time, and day to `attendance.csv`.
   - Prevents duplicate marking per day using `has_marked_today().`
8. **View attendance**
   - Admins can click **View Attendance** in the vault.
   - Opens a themed GUI table from `view_attendance_gui().`
9. **Block/unblock users**
   - Admins can block users via `block_user()` or unblock via `unblock_user().`
   - Updates `blocked.json` and restricts attendance for blocked names.
10. **Voice commands (optional)**
    - Say "hello" to activate.
    - Commands include: "start attendance", "open admin panel", "view attendance", "block user", "unblock user", "exit system".