***Technological Requirements for Face Recognition Attendance System***

**1. Programming Language**

* **Python 3.10+**
  + Ensure compatibility with the latest face\_recognition, supabase, and cvzone libraries.

**2. Python Libraries & Versions**

| **Library** | **Purpose** | **Version (Recommended)** |
| --- | --- | --- |
| opencv-python | Webcam access, image processing | 4.9.0.80 |
| face\_recognition | Facial detection and encoding | 1.3.0 |
| numpy | Array and matrix operations | 1.26.4 |
| cvzone | UI enhancements and drawing overlays | 1.5.6 |
| requests | Downloading images from URL | 2.31.0 |
| supabase | Supabase Python client for database operations | 1.0.3 |
| pickle (built-in) | Save/load face encoding data | Built-in |
| datetime (built-in) | Handling timestamps for logs & UI | Built-in |
| json (built-in) | Read Supabase credentials | Built-in |
| os (built-in) | Directory handling and file operations | Built-in |
| time (built-in) | Delays, timers, and cooldowns | Built-in |

To install required packages, use:

pip install opencv-python face\_recognition numpy cvzone requests supabase

**3. Local Resources**

* **Images/** folder: Contains pre-registered student face images (PNG format).
* **unauthorized/** folder: Created to store images of unrecognized/unauthorized entries.
* **Resources/** folder: Contains UI backgrounds (background.png, Modes/ screens, etc).
* **EncodeFile.p**: Pickle file storing encoded face data for all registered students.
* **supabase\_admin.json**: Contains project\_url and service\_role\_key for Supabase.

**4. Supabase Setup**

* Required Supabase table: students
* Columns:
  + id (text)
  + name (text)
  + technical\_department (text)
  + total\_grants (integer)
  + last\_granting\_time (timestamp)
  + image\_url (optional, text)

**5. Hardware Requirements**

* A functional webcam (minimum 720p resolution)
* Decent CPU (for real-time face recognition)
* Optional GPU (for faster processing with dlib backend)

**6. System Requirements**

* Operating System: Windows, macOS, or Linux
* Python Environment: Virtualenv or Conda recommended
* RAM: Minimum 4 GB
* Disk Space: Minimum 500 MB for images and resources

**7. Future Recommendations**

* Use virtualenv or conda to isolate dependencies.
* Store images in Supabase Storage instead of local folder.
* Add logging system (e.g., loguru or logging module).
* Consider Dockerizing for consistent deployment.