**Run in terminal :**

**venv\Scripts\activate**

**python app.py**

**How to Use:**

**1. Capture a Face**

* **What It Does**: Captures an image of your face and generates a unique encryption key based on that image.
* **How to Use**:
  1. Click the **"Capture Face"** button.
  2. A face image will be captured and displayed on the screen.
  3. The encryption key will be saved automatically.

**2. Select an Image**

* **What It Does**: Allows you to choose an image file from your computer that you want to encrypt.
* **How to Use**:
  1. Click the **"Select Image"** button.
  2. A file dialog will open. Choose the image file you want to encrypt.
  3. The selected image will be displayed on the screen.

**3. Encrypt the Image**

* **What It Does**: Encrypts the selected image using the encryption key generated from the face image.
* **How to Use**:
  1. Ensure you have captured a face and selected an image.
  2. Click the **"Encrypt Image"** button.
  3. A file dialog will open. Choose where to save the encrypted image file.
  4. The encrypted image will be saved with a .enc extension.

**4. Decrypt an Image**

* **What It Does**: Decrypts an encrypted image file using the stored face key.
* **How to Use**:
  1. Click the **"Decrypt Image"** button.
  2. A file dialog will open. Choose the encrypted image file (.enc).
  3. The decrypted image will be displayed and can be saved as a .png or .jpg file.

**Notes**

* Ensure your webcam is properly connected for face capturing.
* The **"Select Image"** and **"Encrypt Image"** buttons will be enabled only after you capture a face.
* The **"Encrypt Image"** button will be enabled only after you select an image.

**Technologies and Models Used**

**Technologies:**

1. **Python**: The programming language used to develop the application.
2. **OpenCV**: Used for accessing the webcam, face detection, and image processing.
3. **Pillow (PIL)**: Utilized for handling image files and displaying them in the GUI.
4. **Tkinter**: Provides the graphical user interface (GUI) components for the application.
5. **Cryptography**: Used for encryption and decryption of images.
6. **NumPy**: Helps with numerical operations, especially for handling image data.

**Models:**

1. **Face Detection Model**:
   * **deploy.prototxt**: Defines the model architecture for face detection.
   * **res10\_300x300\_ssd\_iter\_140000.caffemodel**: A pre-trained model used for detecting faces in images. This model is part of the Caffe framework and is used with OpenCV for face detection.

**Encryption:**

* **AES (Advanced Encryption Standard)**: Utilized for encrypting and decrypting images. The key for AES encryption is generated based on the face image captured from the webcam.