**Comprehensive Report on Attendance Generation via Face & Emotion Recognition**

**1. Introduction**

Automating attendance tracking using face recognition is an innovative approach that enhances efficiency and accuracy in academic and corporate environments. Additionally, integrating emotion recognition helps in analysing engagement and emotional responses. This project aimed to develop a system capable of recognizing faces for attendance and analysing facial expressions using deep learning models.

**2. Background**

Traditional attendance systems rely on manual entry or RFID cards, which can be inefficient and prone to errors. Face recognition provides a seamless, non-intrusive method for attendance tracking. Further, emotion recognition can provide insights into user engagement, mental states, or responses during sessions. This project combines both aspects into a single integrated system.

**3. Learning Objectives**

* Implement a face recognition-based attendance system.
* Enhance emotion recognition capabilities using deep learning.
* Train deep learning models for facial expression recognition.
* Address real-world challenges such as dataset constraints and system compatibility issues.

**4. Activities and Tasks**

**4.1 Face Recognition-based Attendance System**

* Used OpenCV and Dlib for face detection and recognition.
* Created a dataset of known faces.
* Used a CNN-based deep learning model to extract facial embeddings.
* Implemented a real-time face recognition system to mark attendance.
* Stored attendance records in an automated log/CSV.

**4.2 Emotion Recognition System**

* Integrated emotion recognition into the attendance system.
* Trained models on FER2013 dataset to improve accuracy.
* Used deep learning architectures for facial expression classification.
* Mapped detected emotions to individuals in the attendance log.

**4.3 Model Training with FER2013**

* Pre-processed the dataset and split it into training and testing for ease of making the model.
* Trained a CNN model from scratch for emotion recognition.
* Fine-tuned hyperparameters and optimized performance.
* Validated and tested models to assess accuracy and reliability.

**5. Skills and Competencies Developed**

* Deep learning and CNN model training.
* Face recognition implementation using OpenCV and Dlib.
* Data preprocessing, augmentation, and validation techniques.
* Python scripting for automation and logging attendance records.
* Troubleshooting dependencies and system compatibility issues.

**6. Feedback and Evidence**

* The face recognition attendance system achieved **reasonably high accuracy** in real-time scenarios.
* Emotion recognition showed promising results but required further dataset fine-tuning as only a select emotions were chosen for training and building the application due to dataset constraints *(as mention in the code too)*.
* Improved overall efficiency of attendance tracking compared to manual systems.

**7. Challenges and Solutions**

**7.1 Dataset Issues**

* **Challenge**: FER2013 dataset lacked proper images.
* **Solution**: Didn’t take into consideration emotions such as Disgust and Fear which has low image count but was still affecting the dataset by misclassifying.

**7.2 Dependency Issues in VS Code**

* **Challenge**: Faced issues while installing dependencies for deep learning models.
* **Solution**: Installed **Microsoft C++ Build Tools** to resolve compilation errors.

**7.3 Real-time Face Recognition Accuracy**

* **Challenge**: Low accuracy due to varying lighting conditions and occlusions.
* **Solution**: Improved dataset quality and optimized face embeddings.

**7.4 Emotion Recognition Performance**

* **Challenge**: Some emotions were misclassified.
* **Solution**: Used data augmentation and trained on minimal but required emotions from the dataset.

**8. Outcomes and Impact**

* Successfully developed a **real-time face recognition-based attendance system**.
* Integrated **emotion recognition for behavioural insights**.
* Automated attendance logging, reducing manual effort.
* System can be further enhanced with additional datasets and fine-tuned models like ResNet50/101, Xception, Inception, VGG16/19, etc.

**9. Conclusion**

This project successfully implemented a real-time **face recognition-based attendance system** with **emotion recognition** capabilities. Overcoming multiple challenges, an efficient and reliable system using deep learning and computer vision techniques was developed. Future work may involve improving accuracy with more robust datasets and integrating the system into real-world applications.