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Title: "Evaluating impact of race in facial recognition across machine learning and deep learning algorithms." [4] Author: Coe, James, and Mustafa Atay. 2021 1) The paper provides a detailed comparison of various facial recognition algorithms, including Eigenfaces, Fisherfaces, Local Binary Pattern Histogram, deep convolutional neural network algorithm, and OpenFace.1) The paper focuses on a few specific facial recognition algorithms like Eigenfaces, Fish- erfaces, and Local Binary Pattern Histograms. It lacks exploration of a wider range of algo- rithms available in the field, potentially missing out on newer, more accurate models. 2) While the study evaluates the algorithms' accu- racy, it does not delve into their performance in real-life settings or practical applications. This gap could impact the algorithms' effectiveness when deployed in scenarios beyond controlled test environments. 3) The paper mentions the use of a custom dataset for testing the algorithms but does not elaborate on the dataset's diversity or size. 5 Title: "Comparisons of Facial Recognition Algorithms Through a Case Study Application" [5] Author: Dirin, Amir, Nicolas Delbiaggio, and Janne Kauttonen. 2020 1) Efficiency Evaluation: The paper provides a detailed comparison of popular open source facial recognition algorithms, highlighting the efficiency and accuracy of each in real-life settings. 2) Practical Implications: The findings of the study offer valuable insights for practitioners in selecting the most suitable algorithm for facial recognition applications, enhancing decision- making processes. 3) Academic Contribution: The research con- tributes to the academic field by emphasizing the importance of improving the accuracy of existing algorithms, paving the way for further advancements in facial recognition technology. 1) The paper focuses on comparing a few facial recognition algorithms like Eigenfaces, Fish- erfaces, and Local Binary Pattern Histogram. However, it lacks a comparison with a wider range of algorithms to provide a more compre- hensive analysis. 2) While the paper evaluates the algorithms' per- formance in a controlled environment using test datasets, it doesn't discuss the practical im- plementation challenges or results in real-life scenarios, which could be a crucial research gap. 3) The paper does not delve into the scalability and efficiency aspects of the facial recognition algorithms studied. Understanding how these algorithms perform with larger datasets or in real-time applications could be a significant research gap to address.

TABLE I LITERATURE REVIEW TABLE serves as the core of the system, responsible for data storage, processing, and business logic implementation. MongoDB is utilized as the database to store various collections repre- senting schools, specializations, panels, and students. FastAPI provides robust API endpoints to handle CRUD operations, facial recognition, and data retrieval. 2) Frontend App :: The frontend app is developed using React Native and Expo to provide a cross-platform mobile ap- plication. It offers a user-friendly interface for administrators, teachers, and students to interact with the system. The app communicates with the backend through API calls to fetch data, mark attendance, and display relevant information. 3) IoT Devices :: Raspberry Pi IoT devices equipped with camera modules are deployed in classrooms to capture facial data. These devices run a lightweight software to capture images, which are then processed for facial recognition. The captured data is transmitted securely to the backend for further processing and attendance marking. C. Interactions 1) Data Flow: The data flow in the system begins with IoT devices capturing facial data, which is then sent to the backend for facial recognition. After processing, the attendance data is stored in MongoDB and made available to the frontend app through API calls. 2) Communication Protocols: Secure communication pro- tocols such as HTTPS are used to ensure data integrity and confidentiality. MQTT or WebSocket can be employed 1 . for real-time data transmission between IoT devices and the backend. 3) Integration Points: Integration points between compo- nents include API endpoints exposed by the backend for data retrieval and facial recognition services, MQTT or WebSocket channels for real-time communication with IoT devices, and API calls from the frontend app to fetch and display data. D. Scalability and Flexibility The modular architecture allows for easy scalability by adding more IoT devices or backend instances as the user base grows. The use of cloud-based MongoDB ensures flexibility in managing data storage and handling large datasets. V. DATABASE DESIGN A. Schema Design The database design of Attendance-Assistant-Backend is 2 . crafted to ensure efficient data storage, retrieval, and main- tainability. MongoDB, a NoSQL database, is chosen due to its flexibility and scalability, allowing for dynamic schema design. 1) Collections Overview: • Specializations: Stores details of different specializa- tions. • Subjects: Contains atomic subjects taught to panels. • Schools: Represents educational institutions with associ- ated specializations. • Semesters: Tracks subjects, teachers, and panels for each semester. • Panels: Holds student panels, semesters, and current semester details. • Students: Manages student details for attendance calcu- lation. • Encodings: Stores face encodings with links to Firebase or S3. • Teachers: Contains teacher details for authentication and subject assignments. • Rooms: Stores room details available in buildings. • Buildings: Lists buildings with associated rooms. • Classes: Manages class details, attendance, and student presence. • Images: Stores images captured by IoT devices for ver- ification. B. Relationships Between Collections 1) One-to-Many Relationships: • Schools to Specializations: One school can have multiple specializations.

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