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Photo Retrieval System based on Face Recognition with Cloud Integration

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Abstract
Event photography is the process of capturing images of personal or public event in order to preserve memories. Using AI and cloud storage, this study streamline and accelerate the process of locating, sharing, and managing event photographs in real-time. Without need of manual sorting, users can easily retrieve their photos, due to online storage, QR code login, and facial recognition technology.

In this paper we have implemented FaceNet AI model to locate attendees' photos without going through numerous images. Our model has achieved 90% accuracy for single-face recognition and average 78% accuracy in group photos, where lighting and varied angles impacted performance. We have used AWS S3 provides scalable cloud storage for event images, while PostgreSQL securely manages user data and photo metadata. This research project focuses on implementing the use of access control measure, and regulations such as General Data Protection Regulation (GDPR), to safeguard user information's it uses QR code-based authentication to ensure authorized access to images. Furthermore, it proposes strategies for enhancing the system's balance and dependability. This technology uses AI, cloud storage, and real-time image processing to make event photography easier for both attendees and professional photographers. Events are made more memorable by automating the photo-finding process and enhancing user experience and security.

Keywords – Event Photography, FaceNet, Facial Recognition, Cloud Storage, QR Code.

1. INTRODUCTION

Photography is crucial at occasions like weddings, business meetings, and festivities for maintaining priceless memories. A quick and simple method to view, post, and share these images in real time is also required, as more people desire high-quality event photography. Photographers typically take a considerable time to sort and upload their photographs, so guests may not always receive their images right away [1]. Organizing many images while maintaining their security and privacy is another difficulty [2].

This research presents a platform that streamlines and accelerate the process of sharing photos, enhancing event photography. The website allows event attendees to conveniently locate their own photos, upload

their image and securely share them with others. By utilizing the facial recognition, QR code scanning and immediate notification, It connects Photographers with guest allowing them to see and appreciates their event photos right away [3].

The platform enhances the user experience by providing private photo albums, customizable privacy options, and direct interaction with photographers. Attendees can readily find their photos without having to scroll through countless images due to advance face detection and sorting technology [4]. As artificial intelligence and cloud computing continue to improve photography, this study intends to help both event attendees and professional photographers. The platform streamlines the organization, editing, and sharing of event photos. ensuring that moments are captured, shared, and preserved effortlessly and promptly by offering real-time updates and access via QR codes. This research aids photographers in better managing their workload and enhances photography experiences for users.

2. LITERATURE REVIEW

In recent times, significant advancement has been made in realms of instant photo searching and sharing, especially with AI- driven systems. Previously, identifying and organizing images was a labour-intensive process that required manual effort, difficult for large events like parties, conferences, and concerts. To address this challenge, facial recognition utilizes deep learning algorithms like MobileNetV2, which can efficiently and rapidly detect faces [5]. These algorithms analyse facial characteristics through a technique called Euclidean distance matching, allowing users to take selfies and instantly find their event photographs. A popular facial recognition model, FaceNet, generates robust facial patterns that enhance the precision of photos searches [6].

Few real-time applications such as Foto Owl and Algo Mage have simplified to access photos using QR code for attendees. This advancement allows individuals to conveniently view and download their pictures. Additionally, Cloud-based services such as Google Cloud AI and AWS Recognition can accelerate and improve the retrieval of photos for extensive facial recognition procedure [7]. Additionally, edge computing is becoming an option to reduce the processing time of photo searches. In order to speed up the system and use less internet, some tasks are done by nearby devices instead of just cloud servers [8].

However, privacy and security remain important concerns. Facial recognition processes sensitive personal data, therefore strong encryption, secure access control, and keeping up with privacy laws like GDPR are essential [9]. Researchers advise using methods like confidentiality, which hides personal information, and blockchain-based authentication to improve the security of cloud-based facial recognition systems [10]. Another major issue with AI-based facial recognition is fairness. Studies suggest that certain populations may gain more from these systems than others. Researchers like Buolamwini and Gebru highlight the need for more diverse training data in order to make facial recognition equal for everyone [11].

Future developments should focus on increasing computational efficiency, reducing the number of incorrect matches, and improving facial recognition accuracy in a variety of lighting conditions. AI-powered smart cameras and drones have the ability to completely change event photography by identifying and taking pictures of people without the help of a photographer [12]. AI-driven photo retrieval systems for event photography will become safer, more scalable, and more dependable by addressing these issues.

3. EXPERIMENTATION

Database – All the photos captured during the events are uploaded to Amazon S3 bucket for storage by the Organizer or the Photographer. These photos are then matched with the image uploaded by the user.

Step 1: QR Code Scanning & User Registration

In order to access the event's website, attendees scan a QR code that is issued by the organizer. Users register here by entering their name, phone number, and email address. After that, they post a selfie. This selfie serves as a reference image for facial recognition and is securely stored in an AWS S3 bucket for further processing.

Step 2: Face Detection

Once the selfie has been uploaded, the system uses RetinaFace to identify and extract the facial region, which is liked over traditional face identification approaches due to its high accuracy and efficiency. The recognized face is converted to a specified dimension, aligned, and cropped to ensure consistency throughout recognition. A threshold between 0.4 and 0.5 is maintained in order to balance detection speed and accuracy. Even though MTCNN was first considered, RetinaFace beats MTCNN in practical detecting scenarios.

Step 3: Feature Extraction Using FaceNet

When the face is recognized, it is processed using FaceNet, with TensorFlow Lite optimized for compatibility with mobile devices. FaceNet accurately captures features in a 128-dimensional embedding of the face. TensorFlow Lite speeds up prediction by 5–10 times, which results in a much faster recognition system. These embeddings are temporarily kept and then used for matching.

Step 4: Matching Selfie with Event Dataset in AWS S3

The system searches the event dataset stored in AWS S3 for the attendees' photos, which are taken by photographers during the event and processed to identify and extract faces. The extracted faces are then converted into embeddings using the same FaceNet model, and the uploaded selfie's embedding is compared to all of the stored embeddings using the Euclidean Distance technique. The system then retrieves all of the attendees' matching photosand clusters them for easy access.

Step 5: Backend Development & API Implementation

A FastAPI-based backend manages the entire process, including image processing, face detection, feature extraction, and database queries. All user data and embeddings are safely stored which ensures encryption and follows the privacy regulations. As the system is configured to handle several ongoing API inquiries, performance is improved even under high traffic.

Step 6: Frontend Development & User Interface

The React.js-based frontend makes the user experience flawless. Users can take a selfie, provide their details, and access the registration page after scanning the QR code. Once the recognition process is complete, they receive their matching photos via email or WhatsApp. The user interface includes a progress indicator, drag-and-drop uploading, and a neat photo gallery with matching photos. The design is specifically designed

with tablet and smartphone users in mind.

Step 7: Performance Testing & Optimization

The accuracy, speed, and scalability of the system are evaluated. The accuracy of facial recognition remains between 75 and 80%, and it performs best in well-lit areas. While poor light and high head angles may at times reduce accuracy, picture improvements like adaptive thresholding and contrast adjustments provide better results. The system has been set to process thousands of photographs, allowing it to handle large-scale events. GPU acceleration (where available) and asynchronous API calls are two further ways to improve processing throughput. More improvements include caching commonly requested questions and batch processing for large datasets to reduce face matching latency.

Fig. 1– Block Diagram for Experimentation

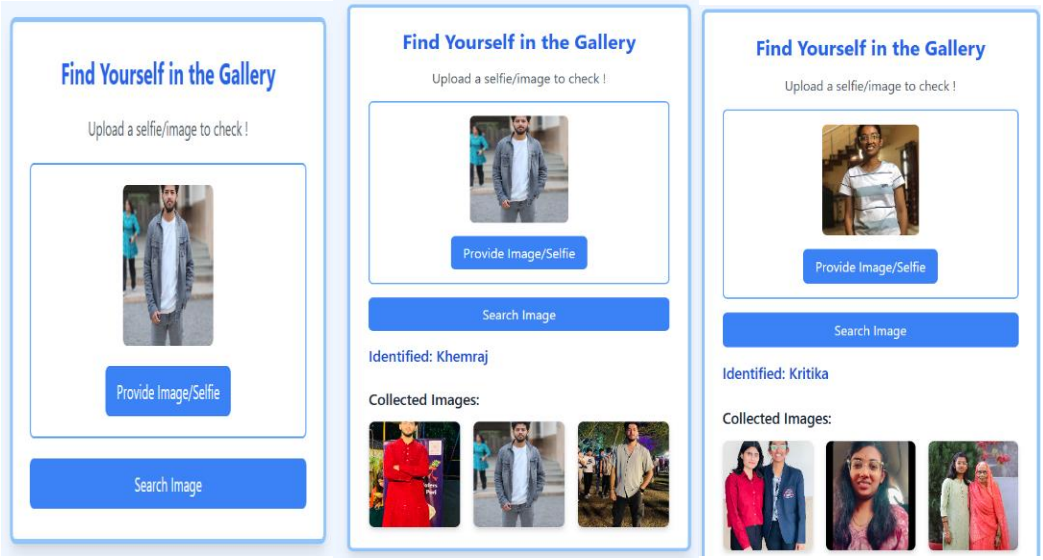

Fig. 2 – Snapshots of the Project

4. RESULTS AND DISCUSSION

The system's capacity to recognize people, quickly retrieve photos, handle a large volume of images, and be user-friendly were all taken care. Two models were trained: one that could identify a single face with 90% accuracy, and another that could identify numerous faces in group photos with average 78% accuracy as some faces overlapped or were in different angles, the system performed less accurately in group photos. By incorporating AI-driven facial recognition, directly on device the system could function more swiftly

and depend less on cloud processing. These results point to the system's possible drawbacks as well as its benefits. The accuracy of our project is compared with other well-known face recognition models such as ArcFace and DeepFace. While these models achieved higher accuracy on benchmark datasets (e.g., LFW), their real-world performance varied due to processing speed and group photo accuracy. Our model using FaceNet and TensorFlow Lite, provided a balance between efficiency and accuracy, which made it better for real-time event photography applications.

Model	**Accuracy (LFW Benchmark)**	**Processing Speed**	**Cost & Scalability**
ArcFace [13]	99.82%	Slow (High GPU demand)	Expensive due to high computation
DeepFace [14]	97.35%	Moderate	Higher cost than FaceNet
FaceNet	99.63%	Fast (Optimized with TFLite)	Lower cost, scalable for large events

Table 1: Comparison of different face recognition models

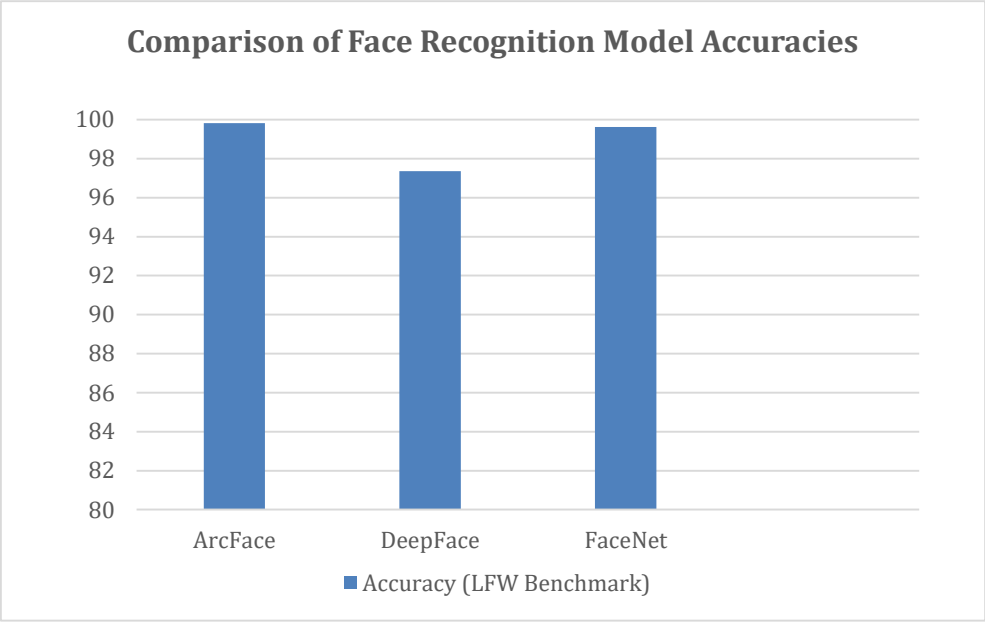

Fig. 3 – Graph comparing different Model Accuracies

5. FUTURE SCOPE

There are several ways to enhance the system, particularly in improving security, increasing speed, and recognizing individuals in group photos. Enhanced recognition in group photos can be achieved by utilizing advanced models like ArcFace or attention-based deep learning, allowing the system to detect faces more accurately in busy images. Faster processing can be implemented by using Edge AI, which

enables facial recognition directly on users' devices, increasing speed and reducing dependency on cloud services. Additionally, AI-driven photo quality enhancements, such as automated brightness adjustment, noise reduction, and sharpening, would improve face recognition in low-light or dimly lit photos. To further strengthen security, improved security with blockchain can be incorporated by implementing a blockchain framework to store user permissions, picture information, and access logs, ensuring enhanced security and transparency. Lastly, social media and online shopping features could be introduced, allowing users to order printed versions of their photos or share images directly on social media, creating new business opportunities for event photographers.

6. CONCLUSION

The AI-driven solution for event photo retrieval helps and

automates event photography. It enables quick photo discovery and simple photo sharing. The single-face recognition model achieved 90% accuracy, whereas the group-photo recognition model achieved average 78% accuracy. Reduced accuracy in group photos was caused by covered faces, poor lighting, and different face angles, though single-face matching worked well. The solution used a FastAPI backend, QR code authentication, and AWS S3 for cloud storage to make photo retrieval fast, scalable, and secure. Attendees can receive their photos via email or WhatsApp in an instant, eliminating the need for tough sorting. Although the system could be upgraded by improving group photo identification, optimizing real-time performance, and. With more development, this system has the potential to improve event photography and find use in fields such as automated surveillance, customized marketing, and security checks.

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