



Research Proposal: Facial Recognition for Personalized Hotel Guest Services

Student Name: Annem Saad

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Project Overview

This research project aims to develop a facial recognition system that revolutionizes personalized service delivery in the hotel industry. By leveraging advanced computer vision techniques and deep learning algorithms, the system will accurately identify guests in real-time, enabling hotel staff to greet them by name and provide tailored recommendations based on their preferences. The integration of facial recognition technology with hotel systems will enhance the guest experience, increase customer satisfaction, and offer a potentially commercializable solution for the hospitality sector.

Subject

Computer Vision, Computer Science

Ref ID

OMO/RE/081

Problem

The hotel industry faces challenges in providing personalized service to guests, which can impact customer satisfaction and loyalty. Current methods of identifying guests and recalling their preferences are often manual, time-consuming, and prone to errors. This research aims to address the problem of delivering personalized service to hotel guests by leveraging facial recognition technology.

Importance of Solving Given Problem

Solving this problem has significant implications for the hotel industry. By providing personalized service, hotels can enhance the customer experience, increase guest satisfaction, and foster loyalty.

This can lead to improved customer retention, positive word-of-mouth recommendations, and ultimately, increased revenue for the hotel. Additionally, the development of a facial recognition solution for personalized guest services has the potential to be productized and commercialized, offering benefits to the wider hotel industry.

Research Description

The research will focus on developing a facial recognition system specifically tailored for hotel guest services. The system will utilize computer vision techniques to accurately identify guests in real-time. Cameras will be installed at various hotel facilities, such as restaurants, to capture guest images. The facial recognition software will be integrated with a server to process the captured images and match them against a database of registered guests. The research will involve the development of advanced algorithms for face detection, feature extraction, and matching. Deep learning techniques, such as convolutional neural networks (CNNs), will be employed to train the facial recognition models on a large dataset of guest images. The system will be designed to handle variations in lighting conditions, facial angles, and occlusions to ensure robust performance. Once a guest is identified, the system will retrieve their stored preferences, such as food choices, from the hotel's database. This information will be displayed on the server allowing hotel staff to greet the guest by name and provide personalized recommendations and services.

Hardware Requirements

- High-resolution cameras (minimum 1080p) for capturing guest images at hotel facilities.
- Compute resource with sufficient processing power and storage capacity to run the facial recognition software and store guest data.

Software Requirements

- Deep learning frameworks such as TensorFlow or PyTorch for developing and training facial recognition models.
- OpenCV library for image processing and computer vision tasks.
- Database management system (e.g., MySQL, PostgreSQL) for storing guest information and preferences.
- Web development frameworks (e.g., Django, Flask, Gradio) for creating user interfaces and integrating the facial recognition system with hotel systems.

Research Hypothesis

- The implementation of a facial recognition system for hotel guest services will significantly improve the personalization of service delivery compared to traditional methods.
- The accuracy of guest identification using facial recognition will exceed 95% under various lighting conditions and facial angles.

Research Questions

- How can facial recognition technology be effectively integrated into hotel guest services to provide personalized experiences?
- How does the personalization of service delivery through facial recognition impact guest satisfaction and loyalty?

Approach

The selected approach for this research involves the following steps:

- Conduct a comprehensive literature review on facial recognition techniques, computer vision algorithms, and their applications in the hospitality industry.
- Collect a large dataset of guest images from participating hotels, ensuring diversity in age, gender, ethnicity, and facial variations.
- Develop and train deep learning models, such as CNNs, for face detection, feature extraction, and matching using the collected dataset.
- Integrate the trained facial recognition models with a server or hotel system to enable real-time guest identification and preference retrieval.
- Conduct extensive testing and evaluation of the system's accuracy, robustness, and performance under various conditions
- Analyze the collected data to assess the effectiveness of the system and identify areas for improvement.
- Address any privacy concerns by implementing strict data protection measures and obtaining guest consent for the use of facial recognition.

Prerequisites

- Foundation in computer vision and deep learning concepts.
- Proficiency in programming languages such as Python and frameworks like TensorFlow or PyTorch.
- Knowledge of image processing techniques and algorithms for face detection, feature extraction, and matching.
- Understanding of data privacy regulations and ethical considerations related to facial recognition technology.
- Familiarity with database management systems and web development frameworks for system integration.

References

1. Bai, Li. (2023). The current situation and potential development of face recognition. Applied and Computational Engineering, doi: 10.54254/2755-2721/4/20230478
2. H., Y., Sohn. (2023). Analysis of Recent Trends in Face Recognition Systems. doi: 10.48550/arxiv.2304.11725

General Note:

1. The device will be a prototype only and not a final minimum viable product (MVP) or production-grade device, but it will be functional enough to demonstrate the project idea.
2. The software component will be implemented in Python and will not be implemented for iOS or Android devices.

FAQ's

What is a research description?

- A research description outlines the main objectives, methods, and scope of a study. It serves as a comprehensive overview of the research project, helping you to understand what the study aims to achieve and how it plans to do so.

What is a research hypothesis?

- A research hypothesis is a specific, testable prediction about what you expect to happen in your study. It is based on knowledge, theory, and research related to the topic and directs the focus of the study.

What is a research question?

- Research questions are the questions around which you center your research. They should be clear, focused, and researchable within the constraints of your project.

What if I don't fulfil all the prerequisites?, Can I still Continue?

- Yes, you can continue with the idea; just let your mentor know beforehand, and they will guide you with the required skills.

What are the time commitments I will need to give for research?

- The program requires a commitment of 30 hours over a period of 4 months. This allows for a well-paced and immersive research experience without overwhelming your academic schedules.
- In case there is no experience of TECH / Analysis, then the student needs to allocate 20 hours for skilling as well.
- All sessions for Research and Skilling are aligned one-on-one with mentor
- Sessions are one-on-one with the mentor assigned to you. Ideally, the sessions should be twice a week, and this will ensure you complete the research project in 4 months.
- In case of an exam, health, or personal reasons, you can take a pre-informed break, which will carry forward the time to complete accordingly.

Who will be my mentor?

- Each student will be assigned a dedicated mentor, who is full-time with OMOTEC, and will guide you through every step of the process. All our mentors are qualified engineers. Your mentor will be your partner in exploring and taking your idea to execution, overcoming challenges, and achieving success.