

Human Emotion Detection for Hotel Industry Feedback System

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Abstract: The "Human Emotion Detection for Hotel Feedback System" project is designed to revolutionize the way customer feedback is collected and analyzed in the hospitality industry. This system integrates advanced technologies to provide a seamless and efficient feedback collection process. The core components of the system include a web-based interface, image processing, and machine learning algorithms to detect and analyze customer emotions. The system comprises three main user roles: Admin, Staff, and Customer. Admins can log in through a frontend developed using AngularJS and C#, allowing them to add feedback questions categorized by type and view the collected feedback. Staff members also use the same frontend technologies to log in and review customer feedback. Customers provide feedback through a camera interface that captures their image, and the system processes these images to detect emotional responses. The backend system is built using Python, leveraging machine learning technologies. Specifically, a Convolutional Neural Network (CNN) algorithm is employed for image detection and emotion recognition. The captured images are analyzed to determine the customer's emotional state, and this information, along with the feedback, is stored in a database.

Keywords: Image Processing, Machine Learning, Convolutional Neural Network (CNN), Customer Feedback.

I. INTRODUCTION

The hospitality industry thrives on customer satisfaction, and effective feedback collection is pivotal in understanding and enhancing guest experiences. Traditional methods, such as surveys and comment cards, often fail to capture true customer sentiments. To address this, the "Human Emotion Detection for Hotel Feedback System" leverages cutting-edge technology by integrating emotional analysis. Customers' images are captured through a camera interface during feedback, enabling real-time emotion analysis. This approach provides deeper insights into their experiences by capturing both textual and emotional feedback. Enhancing this system with digital video cameras strategically placed within the hotel or restaurant allows for continuous mood/emotion capture. AI and machine learning extract frames from video streams, recording exact emotions in response to services. Special frames with displayed emotions are analyzed using human emotion detection algorithms to classify responses like "excellent," "outstanding," or "not satisfactory." This innovative feedback system enables service providers to receive actionable insights and take corrective measures to improve service quality.

II. LITERATURE SURVEY

Antoanela N, Andrei G, Monica C, & Hemanth J. [1]. This system proposes sentiment analysis model based on images. Pretrained models (VGG-19, DenseNet121, and ResNet50V2) are compared to predict the sentiments from pictures. The performance of the model is improved by freezing the initial layers and unfreezing part of the model. Over fitting effect is been reduced by addition of layers like dropout, batch normalization, and weight regularization layers in turn helped to predict sentiments from the database. With DenseNet121 model 0.89 accuracy is obtained for image sentiment analysis.

Swapnil Sanjay Nagvenkar, Ruchika Prakash Nagekar, Tanmay Naik, Amey Kerkar [2]. This research work uses social media platforms, which is the easiest way to express emotions pertaining to any occasion and expressing their feelings through social media is by uploading pictures. Based on the emotions in picture they are classified into positive, negative and neutral.

This classification is used in automatic tag available on social media based on the available image through which emotions and sentiments of person can be found by Natural language processing (NLP). Two pretrained and one custom model are used comparison and to predict the emotions. Better results are shown in custom model and by using web camera.

Aynur Sevinç, Buket Kaya, Ayten Geçmez. [3]. This research study is based on the facial expression of the person, there emotions and sentiment is found which is conducted with available database using Matlab. Gaussian filtering is used to remove the noise in the image, canny is used find out heavy edges, geometric ratios remove errors. which increases the performance of image processing. The expressions such happy, sad, angry, confused etc are classified based the sentiment recognition.

Gherkar Y, Gujar P, Gaziyani A, & Kadu S [4]. This study aims at improving signal to noise ratio of seismic data by using median filtering, mean filtering which as yielded to high signal to noise ration and put forwards Convolutional neural network noise reduction framework. Presents deep learning Convolutional neural network based on fault noise suppression method which results in high performance. The network comprises of input layer, convolution layer, activation layer, normalization layer and output layer. The usage of residual learning, RELU function, and batch normalization has improved accuracy FD-Net model and preserving the original datasets and high signal to noise ratio and retains fault information pertaining to the image.

Doshi U, Barot V, & Gavhane S. [5]. In this study, Convolutional Neural Networks is used to determine different emotions like fear, happy, angry, sad, surprise etc. This type of classification helps in application where automatic tag predictor, usually in social media where in the sentiment of person is understood based on there emotions. Two pretrained model are compared and accuracy's of image sentiment is determined. First sentiment is determined and then emotion are predicted which describes happy, sad, fear, surprise or no emotions etc.

III. PROBLEM STATEMENT

The primary motive behind any consumption activity is need satisfaction, which is triggered by a desire to reduce tension arising from the feeling of deprivation. Inefficient products or services that fail to meet customer demands can delay gratification and lead to negative emotions such as sadness and anger. In the hospitality industry, service encounters are particularly emotion-laden due to intense social contact between customers and service employees. Understanding an individual's internal state from external cues like facial expressions and body language forms the cognitive basis of social functioning and emotional intelligence, crucial for management excellence. This understanding fosters empathy, trust, and prosocial behavior, significantly influencing customer satisfaction and service quality perception. Despite most dissatisfied customers not formally complaining, their emotions must be recognized to effectively address dissatisfaction and improve service. Service employees capable of interpreting emotions can contribute to service recovery and customer retention. Employee empowerment in recognizing and addressing emotions is vital for service quality, teamwork, and cooperation. Thus, this study examines hotel employees' abilities to recognize emotions and facial expressions, comparing their self-efficacy beliefs with actual performance to enhance service quality through better emotional intelligence.

IV. OBJECTIVE

1. To provide hands-free feedback-capturing to the various hotels.
2. To automate the task of collection of feedback from end customer completely.
3. To provide enhanced end-user satisfaction for the dining/lodging experience in hotels.
4. To apply the algorithms for facial emotion detection successfully and fruitfully.

V. METHODOLOGY

The system architecture of the "Human Emotion Detection for Hotel Feedback System" is strategically divided into three main layers: Presentation Layer, Application Layer, and Data Layer. This multi-layered approach ensures modularity, scalability, and efficient interaction between the system's components.

Presentation Layer

The Presentation Layer is responsible for the user interfaces that facilitate interaction with the system. Developed using AngularJS and C#, this layer provides a responsive and intuitive environment tailored to the needs of Admins, Staff, and Customers. Admins can manage and categorize feedback questions, and view comprehensive reports through a user-friendly dashboard. Staff members can access feedback data and emotional analysis results to improve service quality. Customers interact with the system via a camera interface for submitting feedback, ensuring a seamless and engaging user experience.

Application Layer

The Application Layer, the core of the system, is powered by Python and handles essential functionalities. It includes image processing, emotion detection using Convolutional Neural Networks (CNNs), and business logic implementation. This layer processes customer images in real-time to detect emotions, transforming raw data into actionable insights. The use of Python ensures flexibility and efficiency, leveraging its robust libraries for machine learning and data analysis.

Data Layer

The Data Layer is crucial for secure data management. It employs a MySQL database to store all feedback information, including textual feedback and emotional analysis results. This layer ensures data integrity, security, and efficient retrieval, supporting the system's requirement for quick access to feedback records. Structured and indexed appropriately, the database design facilitates scalability and reliable performance, accommodating the growing data volume as the system evolves.

In summary, the three-layer architecture of the system ensures a cohesive, scalable, and secure framework that efficiently supports the dynamic needs of hotel feedback management and emotion detection.

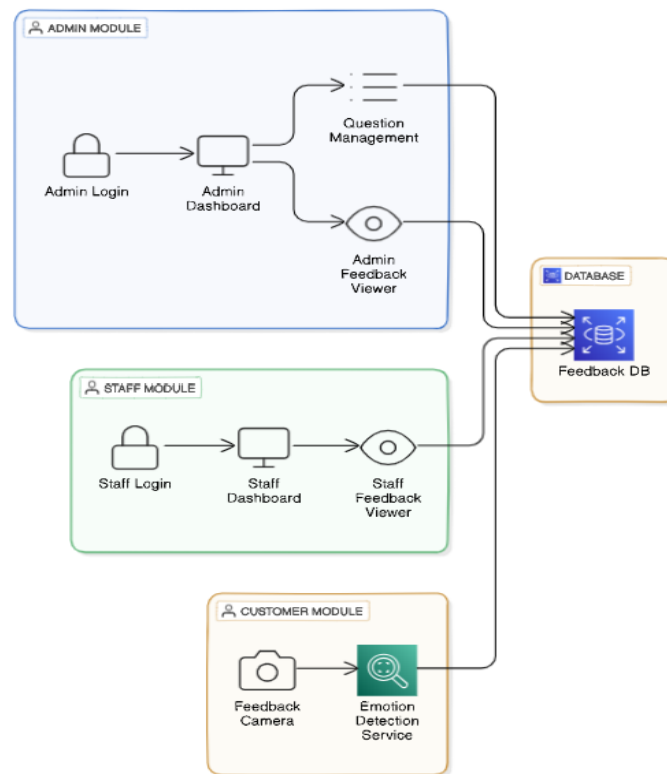


Fig.1. System Architecture

VI. PROPOSED SOLUTION

The major solution is to get proper feedback from the customers, which helps in proper development of the business. Here, the issue is to take review or feedback from the customers who visit the place(hotel). Those who are interested in giving feedback regularly they give it but major percentage of people think it as a waste of time so they will not give the review or feedback so this project helps us to get proper feedback from the customers.

In simple terms we have developed technique in which customer need not spend more time holding a pen and paper fulling according to there wishes we just need a small glimpse of image which the customer will have a look and the camera automatically captures the expression and updates it in the database accordingly. Meaning the question about the particular property e.g service, cost ,food,.. is taken and is analysed using the technology and is auto updated in the database like good , excellent, bad. Based the expression the customer gives for the particular asked question by our server.

VII. SOFTWARE IMPLEMENTATION

The implementation process for the "Human Emotion Detection for Hotel Feedback System" involves a comprehensive setup and integration of hardware and software components. Strategically placed digital video cameras capture customer interactions at key locations, feeding data to high-performance processing units for real-time emotion detection using AI and ML algorithms, specifically Convolutional Neural Networks (CNNs). Facial recognition software detects and extracts relevant frames from video streams, which are preprocessed to prepare the data for model training. The CNN-based model, trained and validated using a combination of public and in-house datasets, is deployed for real-time emotion detection. The system categorizes feedback based on detected emotions and stores it in a robustly designed database. Thorough testing, including unit, integration, and user acceptance tests, ensures system reliability before deployment in live environments. Continuous monitoring, performance evaluation, and feedback collection from staff and customers facilitate iterative improvements, enhancing system accuracy and overall customer experience.

VIII. CONCLUSION AND FUTURE SCOPE

CONCLUSION

The application is related to a solution to get proper feedback from the customers that will help in proper business development. Here, the issue is taking the reviews or feedback from the customers who visit the place (hotel). Interested people who intend to give feedback do it regularly, but the major percentage of people will not give the review or feedback and think it is just a waste of time. This project helps us get proper feedback from the customers. In simple words, we have developed a technique in which customers need not spend more time holding a pen and paper and filling out forms according to their wishes. We just need a small glimpse of an image at which the customer will look and the camera automatically captures the expression and updates it in the database accordingly. Meaning the question about the particular property, e.g., service, cost, food, is taken and analyzed through the technology, then it gets updated automatically in the database as good, excellent, or bad based on the expression the customer gives to the question asked by our server.

FUTURE SCOPE

Future enhancements for the "Human Emotion Detection for Hotel Feedback System" could significantly elevate its capabilities and effectiveness. Integrating advanced analytics tools would provide deeper insights into emotional trends and feedback patterns, offering predictive analytics to anticipate customer needs and preferences for proactive service improvements. Expanding the system to support multiple languages would allow feedback collection from a more diverse customer base, enhancing usability in international markets. Continuously refining the emotion detection algorithms by incorporating newer machine learning techniques and larger datasets could improve the accuracy and reliability of emotion recognition. Additionally, developing integrations with existing customer experience management (CXM) and customer relationship management (CRM) systems would enable seamless data flow, providing a comprehensive view of customer satisfaction and facilitating unified responses to feedback across various touchpoints.

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