# Automatic Customer Review Analysis from Facial Expression using Convolutional Neural Network

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**Abstract—In the current digital era, customer reviews are becoming increasingly important for businesses.With the advent of facial recognition technology, it is now possible to extract valuable insights from the emotions expressed on a person's face. This project aims to develop an automatic system for customer review analysis that utilizes facial recognition technology to capture and analyze emotions expressed by customers. Our Model is capable of analyzing reviews in real-time, providing businesses with a deeper understanding of customer sentiments and experiences. The study will involve collecting customer reviews from various sources, and classifying the emotions stated in each review using machine learning methods. Proposed system utilizes deep learning techniques and facial expression recognition to automatically analyze customer reviews based on facial expressions.**

Keywords:facialexpressions,CNN,Deep Learning

## I. INTRODUCTION

The customer experience has become a crucial aspect of modern business strategy. With the rise of online shopping and socialmedia, customers have more avenues to share their experiences with awider audience.As a result, customer reviews have become a valuable source of feedback for businesses to improve their products and services. While text-based reviews have been widely used for sentiment analysis, they may not provide a complete picture of the customer's emotional state at the time of writing the review. Recent advances infacial recognition technology have made it possible to extract emotional features from a person's face.By analyzing these features it is possible to determine the customer's emotional state and sentiment expressed in the review. To his technology has the potential to revolutionize the way businesses analyze customer reviews and improve their products and services. The proposed research aims to develop an automatic customer review analysis system that utilizes facial recognition technology to capture and analyze emotions expressed by customers. The system will involve two mainstages :facial emotion recognition and sentiment analysis.The facial emotion recognition stage will extract the emotional featuresfrom the customer'sface,such as the intensity of the emotions and the facial expression displayed. These features will then be used to classify the customer's emotional state using machine learning algorithms.The sentiment analysis stage will analyze the text-based review to determine the customer's overall sentiment towards the product or service. The study will involve collecting from arange of sources, including online stores and social media networks.The reviews will be pre-processed to remove noise, and the proposed system will be used to automatically classify the customer's emotions and sentiment expressed.

By using an automatic system that combines facial recognitionand sentiment analysis, businesses can improve their productsand servicesby addressing customer concerns promptly and providing a better overall customer experience. This research also has broader implications for the use of facial recognition technology in customer analysis and marketing. which could benefit businesses in various industries.Go near the days where there is a need to spend countless man-hours observing and directing them asses on roads across the country. Over the last few decades,rapidly growing countries like India have started shifting towards and depending on digital means of policing traffic This has us here in the new age of understanding and identifying driving behaviors of drivers and provides the opportunity to enforce safety laws on a low-levelplatform.

## II.LITERATUREREVIEW

This survey provides a comprehensive overview of deep learning techniques for facial expression recognition, including CNNs,RNNs,and hybrid models.The authors review various datasets and evaluation metrics used in the field,as well as the challenges and future directions of the research.In automatic customer review analysis from Convolutional Neural Networks (CNNs) and deep learning for face expression are commonly used to recognize facial expressions from images or video frames. CNNs are a specifickind of deep neural network that excels at image recognition applications. Convolutional, pooling, and fully linked layers are some of the layers that make up a CNN.Infacialexpression recognition, the input to the CNNs is typically animage of a face, which is preprocessed to detect and align the face region.The convolutional layers in the CNN learn to extract characteristics from the facial picture,including the formand texture of various facial components (e.g.,eyes,nose, mouth).The extracted features are after that, one or more completely linked layers are traversed,which teach classify the facial expression based on the extracted features.

A probability distribution across the range of potential face expressions is normally the CNN's output, such as happy, sad,angry,orneutral.The CNN is trained With the help of asizable collection of labeled facial expression pictures, such asFER2013 data set or the CK+dataset.During training,the weights of the CNN are adjusted using back propagation to reduce the discrepancy between the anticipated facial expression and also the ground truth label.Overall,CNNs area powerful tool for automatic customer review analysis from facial expression using deep learning,as they are able to acquire knowledge to automatically extract pertinent characteristics from facial pictures and classify the corresponding expressions with high accuracy.

[2] Retina Net is a type of object detection model based ondeepneuralnetworks,whichcanbeusedinautomaticcustomer review analysis from facial expression using deeplearning. Unlike facial expression recognition, which involvesidentifying the specific emotion expressed by an individual inan image or video frame, object recognition aims for identifypresence of a single or several items within a photo or videoframe. Retina Net is a popular object detection model that usesa feature pyramid network and a novel focal loss function toachieve highaccuracy and efficiency.The feature pyramidnetwork allows the model to detect objects at multiple scales and resolutions,by reusing features computed at different levels of a convolutional neural network(CNN).This is particularly useful in detecting objects with different sizes and as pectratios,such as faces with varying orientations andexpressions. The focal loss function used by Retina Net helpsto address the class in balance problem in object detection,which arises when some object classes are much rarer thanothers. The focal loss function assigns higher weights to themisclassified samples, which belong to the rare classes, andlower weights to the well-classified samples, which belong tothe common classes. This helps to improve the model's abilityto detect rare objects, such as facial expressions that are lessfrequently observed in the dataset. In the context of automaticcustomer review analysis from facial expression using deeplearning, Retina Net can be used to detect the presence andlocationof facesand otherobjectsof interestincustomerreview images or videos. This can help to facilitate further analysis, such as facial expression recognition or sentiment analysis, by localizing there levant facial regions and minimizing the impact of irrelevant back ground information.

[3] Among the supervised learning algorithms that may beapplied are Support Vector Machines (SVM). in automaticcustomer review analysis from facial expression using deeplearning. In facial expression recognition, SVMs can be usedto classify images or video frames into different emotionalcategories, based on the extracted features. SVMs work byfinding a hyper plane It uses the biggest margin to divide the data points of several groups apart. The hyper plane is chosen to maximize the distance between the points closest to different classes, referred to as support vector machines(SVM).can also in corporate kernel functions,which transform the if data is fedentering ahigher dimension environment, it might be simpler to locate an hyper plane thatdivides the information. In the context of facial expression recognition, SVMs can be trained on a set of labeled facialexpression images, such as the FER2013 or CK+ datasets.The features extracted from the facial images using techniques such as HaarCascade or Convolutional Neural Networks can be used as inputs to the SVM model,which the n learns to classify theimages into different emotional categories. SVMs are particularly useful in facial expression recognition tasks in situations where there are few training sample, and the feature space is high-dimensional. SVMs are known to perform well in such scenarios,as they can effectively handle the curse of dimensionality, where the performance of traditional classifiers tends to degrade as the number of features increases. Overall, SVMs are a powerful tool in automatic customer review analysis from facial expression using deep learning,as they can effectively classify images or video frames into different emotional categories,based on theextractedfeatures.A kind of feed-forward neural networkis the Multi-Layer Perceptron (MLP), which can be used in automatic customer review analysis from facial expression using deeplearning. MLPs are commonly used for classification tasks,including facial expression recognition.An MLP consists of one or more hidden neural layers, which are joined a feed forward manner. Every neuron gets information from theprevious layer,applies aweighted sum and a non-linearactivation function, and produces a result that is sent to the subsequent layer. The masses and biases among the MLPlearnwhile receiving instruction, using back propagation and gradient descent optimization,tominimize the classification error on a set of labeled training data. In the context of facial expression recognition,MLPs can be trained on a set of labeled facial expression images, such as the FER2013 or CK+ datasets. The extracted features from the facial images using techniques such as Haar Cascade or Convolutional Neural Networks can be used as inputs to the MLP model, which then learns to classify the images into different emotional categories. MLPs are known for their the capacity to represent intricate non-linearinput-output interactions, making them suitable for handling the high-dimensional and non-linearnature of facial expression recognition tasks. MLPs can also be used in combinationwith other Convolutional and recurrent neural networks aretwo examples of deep learning approaches that improve thefacial expression recognition. Overall, MLPs are a powerful tool in automatic customer review analysis from facial expression using deep learning, as they can effectively classify images or video frames into different emotional categories, based on the extracted features,and learn to simulate intricate,non linear input-to-output interactions.

[4] A supervised learning technique of this kind is K-Nearest Neighbor (KNN). that can be utilized in automatic customer review analysis from facial expression using deeplearning. KNN is a non-parametric algorithm that is utilized in problems involving regression and classification.Regarding the circumstances surrounding facial expression recognition, KNN can be used to classify images or video frames into different emotional categories based on the extracted features. KNN works by storing all the training data points in memory and Finding the distance between every training point and every test point. Afterwards, using the test point as a reference, the KNN algorithm chooses theK-nearest training data points.The test point's categorization is there after decided by the K-nearest neighbors casting the majority vote. KNN can be used with different distance metrics, such as Euclidean or Man hattan distance, contingent upon the type of issue. KNN can betrained on a set of labeled facial expression images, such asthe FER2013 or CK+ datasets. The features extracted fromthe facial images using techniques such as Haar Cascade orConvolutional Neural Networks can be used as inputs to theKNN model, which then learns to classify the images into different emotional categories.KNN

## II. SYSTEM ANALYSIS

The existing system for Automatic Customer Review Analysis from Facial Expression using Deep Learning is accurate and effective to the extent that the data is available and of high quality. However, acquiring a large and diverse data set of customer reviews with associated emotional features can be challenging, particularly for businesses with limited resources.

The use of facial recognition technology in customer analysis raises privacy concerns, as itinvolves capturing and processing sensitive personal data.To address these concerns, the proposed system must comply with data protection laws and regulations to ensure the privacy of the customer.Additionally,it is important tonote that facial recognition technology is not infallible and may not always accurately detect emotions due to variations in lighting, facial expressions, and other factors. It can lead to wrong outcomes.

Another aspect to consider is the potential bias insentiment analysis algorithms, which may be influencedby cultural, linguistic, or other factors. To ensure accurate sentiment analysis and avoid misleading results,the proposed system should address and mitigate such biases.

The solution involves collecting a diverse dataset of customer reviews and facial expressions, preprocessing the databy extracting facial features, building a deep learning model like CNN for sentiment analysis, training and evaluating the model's performance,deploying it into a production environment, and continuously improving the system based on user feedback and new data.This enables the development of anautomatic customer review analysis system using deep learning techniques to analyze facial expressions and provide valuable insights for businesses.

## III. METHODOLOGY.

A. **Data gathering**: A dataset of customer reviews and corresponding facial expressions. This can be done by either recording customers as they read and respond to reviews,or by using existing data sets of facial expressions labeled with emotions.

B. **Datapreprocessing**: This module will be responsible for preprocessing the collected data. Once the dataset is collected, the next step is to detect and track faces in the videos or images. This can be doneusing a variety of facial recognition algorithms.This includes tasks suchas face detection, alignment, andnormalization.

C. **Featureextraction**: This module will be responsible for extracting features from the preprocessed data. These features can be used to train the deep learning model.These features capture the spatial relationships between facial land marks.The pixel intensity levels of various facial areas are captured by these characteristics.These features capture the changes in facial features over time,such as the movement of the eye brows and lips.

D. **Emotion classification**: The next step is to classify theextracted facial features into emotions. Many machine learning techniques, including support vector machine(SVM), random forest, and deep learning model, can be used to do this.Interms of face expression identification, deeplearning models have emerged as the cutting edge.These models are able to learn complex patterns in the facial features that are associated with different emotions.

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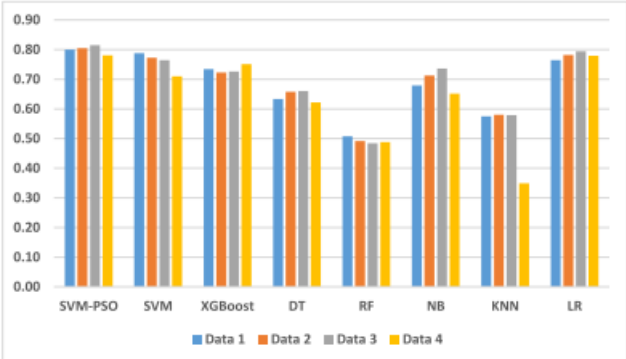
E. **Model training**: The deep learning model willbe trained via this module. A collection of photos withvarious face expressions will be used to train the model.The model will be trained to learn to associate the extracted facial features with different emotions. Aftertraining, the model may be applied to categorize newly facial expressions in to emotions.

## IV.DIAGRAMS AND GRAPHS




## V.SYSTEM ARCHITECTURE

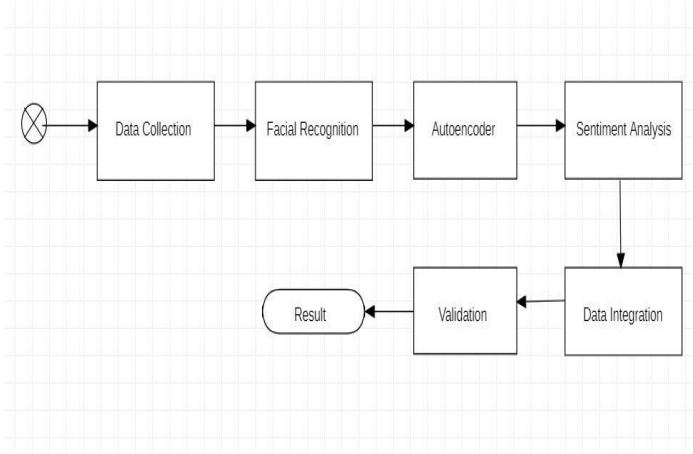



Fig.1.Architecture diagram of algorithm.

**WORKING OF ALGORITHM:** Based on the emotions shown in facial expressions, the working system automatically analyzes customer evaluations using deep convolutional neural networks and facial expression recognition technologies. As a result, companies are able to make better decisions and increase customer satisfaction by gaining insightful knowledge about the opinions and experiences of their customers.

## VI.RESULTS AND DISCUSSIONS

The outcomes and discussions of the Automatic CustomerReview Analysis system, whichanalyzes facial expressions,depend on its accuracy, insights, business impact, scalability, and ethical considerations. It offers businesses valuable insights to identify trends, areas forimprovement, and issues impacting customer satisfaction.Evaluating its impact on business performance involves examining customer happiness, loyalty, and revenue. Ethical concerns regarding data security and privacy should be addressed during implementation.Ultimately,the system has the potential to enhance the customer experience and boost satisfaction, loyalty, and revenue for business.

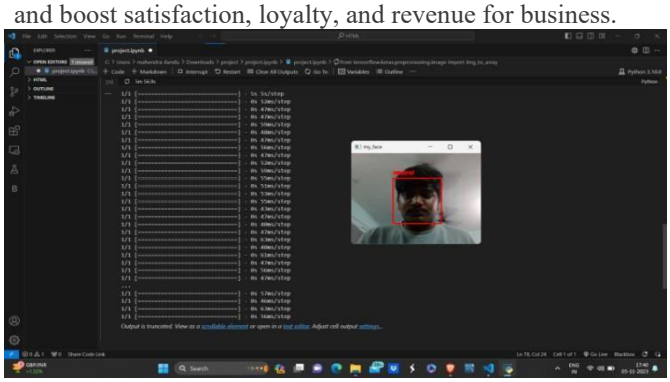


Fig.2.Face Detection

Above shown figure is a output of our project. With these wecan find the person is feeling neutral. This is detected by thesystem.

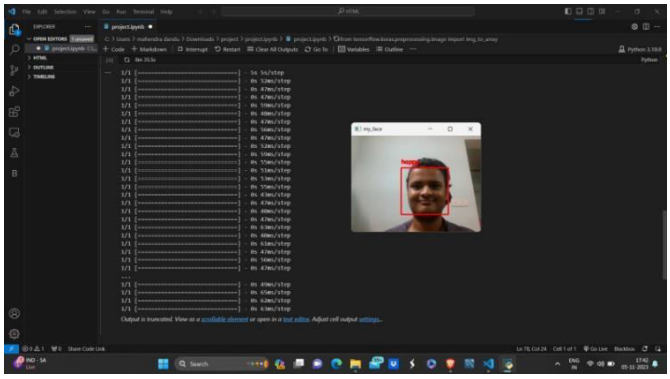
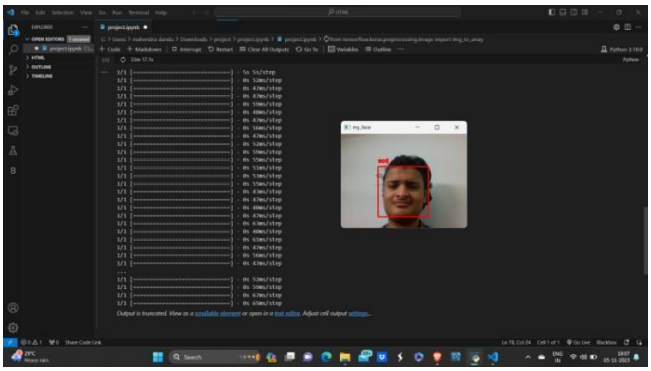


Fig.3.Emotion Detection

Above shownfigure3 is output of the project. It shows thefeeling of the customer. In the above image we can see it was detected the customer was feeling happy.



Above shown figure shows the feeling of the customer.It was shown the figure customer was feeling sad.It was detected by the system.

## VII. CONCLUSION AND FUTURE SCOPE

### *Conclusion*

The Automatic Customer Review Analysis from Face Expressions using Deep Convolutional Network research shows how well facial recognition technology and deep learning techniques can be used to assess customer sentiments expressed in reviews. It is both practical and efficient. Businesses may increase customer satisfaction and make informed decisions by gaining significant insights into consumer experiences and sentiments through the extraction and analysis of facial expressions.

The project effectively automates the process of assessing customer reviews based on facial expressions by utilizing deep convolutional neural networks, giving businesses a real-time insight of client feelings.

### *Future Scope*

Enhanced Accuracy: To increase sentiment analysis and emotion detection accuracy, deep learning models should be improved over time. This can entail looking at more sophisticated designs or adding more data sources.

Multimodal Analysis: To give a more thorough knowledge of client feedback, incorporate additional modalities including text analysis and audio sentiment analysis. Richer insights can be obtained by combining textual reviews with face expressions.

Real-time input Mechanism: Using the sentiment analysis data, create systems that allow companies to react to consumer input instantly. This can entail alerts for especially unfavorable reviews or automated reaction systems.

Sector-specific Customization: To handle particular consumer sentiment difficulties and requirements, adapt the system to particular sectors or domains. Certain linguistic or emotional indicators may be unique to certain sectors

## REFERENCES


[1] Tengfei Song, Wenming Zheng, Cheng Lu, et al. MPED: A Multi-Modal Physiological Emotion Database for Discrete Emotion Recognition [J]. IEEE Access, 2019, 7: 12177-12191.

[2] Erdenebileg Batbaatar, Meijing Li, Keun Ho Ryu. Semantic-Emotion Neural Network for Emotion Recognition From Text [J]. IEEE Access, 2019, 7: 111866-111878.

[3] Ma H, Celik T. FER-Net: facial expression recognition using densely connected convolutional network[J]. Electronics Letters, 2019, 55(4):184-186.

[4] Escalera S, Baró X, Guyon I, et al. Guest Editorial: The Computational Face[J]. IEEE Transactions on Pattern Analysis and Machine Intelligence, 2018, 40(11):2541-2545

[5] Cai J, Chang Q, Tang X L, et al. Facial Expression Recognition Method Based on Sparse Batch Normalization CNN[J]. 2018:9608-9613.

[6] Takalkar M, Xu M, Wu Q, et al. A survey: facial microexpression recognition[J]. Multimedia Tools & Applications, 2018, 77(15):1-25.

[7] Zhang F, Mao Q, Shen X, et al. Spatially Coherent Feature Learning for Pose-Invariant Facial Expression Recognition[J]. Acm Transactions on Multimedia Computing Communications & Applications, 2018, 14(1s):1-19.

[8] M.S. Bouzakraoui, S.Abdelalim, Y.A. Abdssamed, "Appreciation of Customer Satisfaction Through Analysis Facial Expressions and Emotions Recognition" in 2019 4th Edition of World conference on Complex Systems, Ouarzazate, Morocco, 2019. https://doi.org/10.1109/ICoCS.2019.8930761.

[9] F. Conejo, "The Hidden Wealth of Customers: Realizing the Untapped Value of your Most Important Asset", Journal of Consumer Marketing, 30(5), 463464, 2013. https://doi.org/10.1108/JCM-05-2013 0570 .

[10] A.Mehrabian,Communication without words, Psychology today, 1968.

[11] S.M. C. Loureiro, " Consumer-Brand Relationship: Foundation and State-ofthe-Art", Customer-Centric Marketing Strategies: Tools for Building

[12] Organizational Performance, 21, 2013, https://doi.org/10.4018/978-1-4666

[13] C. Darwin, The expression of the emotions in man and animals, D. Appleton and Company, London, 1913

[14] JA . A. Marsh, H. A. Elfenbein, N. Ambady- "Nonverbal “accents” cultural differences in facial expressions of emotion", Psychological Science, 14(4), 373-376, 2003. 9280 .24461

[15] M.Nishiyama, H. Kawashima, T. Hirayama, https://doi.org/10.1111/1467 "Facial Expression representation based on timing structures in faces", in 2005 workshop on Analysis Modeling of faces and Gestures, Beijing, China, 2005. https://doi.org/10.1007/11564386_12