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REAL-TIME FACIAL EXPRESSION RECOGNITION USING CNNS

R.Nithya
Assistant Professor,
Department of Computer Science,
Bon Secours College for Women,
Affiliated to Bharathidasan University,
Thanjavur, Tamil Nadu, India.
Email ID: rajennithya@gmail.com

Viveka.V
M.Sc. Scholar,
Department of Computer Science,
Bon Secours College for Women,
Affiliated to Bharathidasan University,
Thanjavur, Tamil Nadu, India.
Email ID: vivekavijayakumar93@gmail.com

Abstract

Facial expression recognition (FER) plays a vital role in human-computer interaction, enabling machines to understand and respond to human emotions. In this work, we present a real-time facial expression recognition system leveraging Convolutional Neural Networks (CNNs). The proposed approach focuses on accurately detecting and classifying facial expressions, such as happiness, sadness, anger, surprise, fear, and neutrality, in dynamic environments. Our system integrates advanced CNN architectures optimized for processing real-time video streams, ensuring a balance between accuracy and computational efficiency. The framework involves preprocessing stages such as face detection, alignment, and normalization, followed by feature extraction through deep CNN layers. The extracted features are then classified into distinct emotion categories using a fully connected network and softmax activation. To achieve real-time performance, we employ model optimization techniques, including quantization, pruning, and hardware acceleration with Graphics Processing Units (GPUs) or Tensor Processing Units (TPUs). The model is trained on publicly available FER datasets, such as FER2013 and CK+, augmented with domain-specific enhancements to improve generalization to

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real-world scenarios. Experimental results demonstrate that the proposed system achieves high accuracy and robustness across diverse lighting conditions, occlusions, and variations in facial orientations. Additionally, the real-time implementation is benchmarked to run efficiently on resource-constrained devices, making it suitable for applications such as surveillance, assistive technologies, virtual reality, and interactive gaming. This study underscores the potential of CNNs in enabling real-time facial expression recognition, offering significant advancements for emotion-aware systems and fostering seamless interaction between humans and intelligent machines.

Keywords: Facial Expression Recognition (FER), Convolutional Neural Networks (CNNs), Real-Time Emotion Detection, Human-Computer Interaction, Deep Learning-Based FER.

I. INTRODUCTION

Facial expression recognition (FER) is a crucial aspect of human-computer interaction, enabling machines to interpret human emotions through facial cues. With the growing demand for automated systems in healthcare, security, and human-computer interaction, real-time FER has become an area of significant research interest. Traditional methods rely on handcrafted features and classical machine learning techniques, which often fail to generalize well in real-world scenarios. Deep learning, particularly Convolutional Neural Networks (CNNs), has revolutionized the field by providing robust and scalable solutions for facial expression analysis.CNN-based approaches for real-time facial expression recognition leverage the hierarchical learning capability of deep networks to extract meaningful facial features automatically. Unlike conventional methods, CNNs can learn spatial hierarchies of features, making them highly effective for recognizing complex and subtle facial expressions. These networks are trained on large-scale facial expression datasets, enabling them to generalize across diverse demographics and lighting conditions. With advancements in computational power and optimized architectures, real-time implementation of CNN-based FER systems has become feasible, allowing for applications in real-time video processing and interactive systems.

One of the primary challenges in real-time facial expression recognition is achieving high accuracy while maintaining low latency. Efficient CNN architectures, such as MobileNet and EfficientNet, offer lightweight yet powerful models suitable for real-time deployment on edge devices. Techniques such as transfer learning, data augmentation, and model compression further enhance the performance of CNNs while reducing computational overhead. Additionally, integrating attention mechanisms and spatiotemporal modeling improves the robustness of FER systems by focusing on crucial facial regions and accounting for dynamic variations in expressions. The real-time application of CNN-based facial expression recognition spans various

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domains, including mental health assessment, affective computing, security surveillance, and virtual assistants. In healthcare, FER can aid in detecting emotional distress and supporting mental health diagnoses. In human-computer interaction, it enhances user experience by enabling emotion-aware interfaces. As deep learning models continue to evolve, the integration of CNNs with real-time systems will play a vital role in bridging the gap between artificial intelligence and human emotional intelligence, making technology more responsive to human emotions.

II. RELATED WORK

We propose a method for improving the robustness of real-time facial expression recognition. Although there are many ways to improve the accuracy of facial expression recognition, a revamp of the training framework and image preprocessing allow better results in applications. One existing problem is that when the camera is capturing images in high speed, changes in image characteristics may occur at certain moments due to the influence of light and other factors. Such changes can result in incorrect recognition of the human facial expression. To solve this problem for smooth system operation and maintenance of recognition speed, we take changes in image characteristics at high speed capturing into account. The proposed method does not use the immediate output for reference, but refers to the previous image for averaging to facilitate recognition. In this way, we are able to reduce interference by the characteristics of the images. The experimental results show that after adopting this method, overall robustness and accuracy of facial expression recognition have been greatly improved compared to those obtained by only the convolution neural network (CNN). Emotion is an important topic in different fields such as biomedical engineering, psychology, neuroscience and health. Emotion recognition could be useful for diagnosis of brain and psychological disorders. In recent years, deep learning has progressed much in the field of image classification. In this study, we proposed a Convolutional Neural Network (CNN) based LeNet architecture for facial expression recognition. First of all, we merged 3 datasets (JAFFE, KDEF and our custom dataset). Then we trained our LeNet architecture for emotion states classification. In this study, we achieved accuracy of 96.43% and validation accuracy of 91.81% for classification of 7 different emotions through facial expressions. We verify whether our model is effective by creating a real-time vision system. This system employs multi-task cascaded convolutional networks (MTCNN) to complete face detection and transmit the obtained face coordinates to the facial emotions classification model we designed firstly. Then it accomplishes the task of emotion classification. Multi-task cascaded convolutional networks have a cascade detection feature, one of which can be used alone, thereby reducing the occupation of memory resources. Our expression classification model employs Global Average Pooling to replace the fully connected layer in the traditional deep convolution neural network model. Each channel of the feature map is associated with the corresponding category, eliminating the black box characteristics of the fully connected layer to a certain extent. At the same time, our model marries the residual modules and depth-wise separable convolutions, reducing large quantities of parameters and making the model more portable. Finally, our model is tested on the FER-2013 dataset. It only takes 3.1% of the 16GB memory, that is, only 0.496GB memory is needed to complete the task of classifying facial expressions. Facial expression recognition plays a crucial role in enabling natural and intuitive human-computer interaction. However, existing approaches often struggle with robustness and accuracy, particularly in unconstrained environments with varying illumination, occlusions, and pose variations. This research proposes a novel real-time facial expression recognition system based on convolutional neural networks (CNNs) to address these challenges. The proposed system leverages state-of-the-art deep learning architectures and techniques to accurately recognize a wide range of facial expressions in real-time. Through extensive data preprocessing, augmentation, and a carefully designed CNN architecture, the system aims to achieve high accuracy and generalization capabilities across diverse scenarios. The recognized facial expressions are then utilized to enable adaptive user interfaces that can dynamically adapt to the user's emotional state, enhancing the overall user experience. Comprehensive experiments and user studies are conducted to evaluate the system's performance, robustness, and effectiveness in improving human-computer interaction. The proposed approach has the potential to significantly impact various domains, including gaming, healthcare, education, and beyond, by enabling emotion-aware computing and personalized interfaces.

III. METHODOLOGY

The proposed system for Real-Time Facial Expression Recognition Using CNNs (Convolutional Neural Networks) is designed to enable real-time emotion detection and classification, enhancing human-computer interaction through advanced artificial intelligence techniques. The system operates by capturing live video input using a webcam or other image-capturing devices, ensuring seamless real-time processing. The captured video frames undergo a series of preprocessing steps where faces are detected and extracted using robust face detection techniques such as Haar cascades, Multi-task Cascaded Convolutional Networks (MTCNN), or You Only Look Once (YOLO). These methods enhance detection accuracy by identifying facial landmarks and reducing errors caused by variations in lighting, facial orientation, and occlusions. To ensure consistency and improve model generalization, the extracted facial regions are resized and normalized before being passed to a deep CNN model trained specifically for facial expression recognition.

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The CNN architecture comprises multiple convolutional layers, pooling layers, and fully connected layers that work together to extract meaningful spatial features from facial images. By leveraging deep learning models trained on labeled facial expression datasets such as FER-2013, CK+, and AffectNet, the system can effectively classify expressions into different categories, including happiness, sadness, anger, surprise, fear, disgust, and neutrality. Once the model predicts the emotion, real-time feedback is displayed by overlaying the detected expression onto the live video feed, allowing for immediate interaction and response. The system is further optimized using techniques like model quantization, pruning, and GPU or TPU acceleration, ensuring efficient processing with minimal computational overhead, making it suitable for deployment on mobile devices, embedded systems, and cloud-based platforms.

This system offers numerous advantages in various domains. High accuracy is achieved through CNNs, which efficiently capture complex spatial relationships and hierarchical patterns in facial expressions, improving recognition performance. The automated feature extraction process eliminates the need for manual feature engineering, making the system more adaptable to different datasets and real-world conditions. Real-time processing is a key feature, enabling instant emotion classification without delays, which is crucial for interactive applications such as virtual assistants, gaming, and behavioral analysis. The system is also highly robust to noise, utilizing preprocessing techniques such as histogram equalization, normalization, and augmentation, which help mitigate challenges posed by diverse lighting conditions, occlusions, and varying facial orientations.

The system's scalability allows deployment across multiple platforms, from high-performance GPU-based systems to resource-constrained edge devices, ensuring flexibility in implementation. Adaptability is another key strength, as the model can be fine-tuned with domain-specific datasets to improve performance in specialized applications such as medical diagnosis, mental health monitoring, and surveillance. Moreover, the model can distinguish complex and subtle facial expressions, making it capable of analyzing nuanced human emotions beyond basic categories, thus improving affective computing applications.

A significant aspect of the proposed system is its seamless integration with AI-driven applications, making it an essential tool in areas like human-computer interaction (HCI), healthcare, security, and education. In healthcare, it can be used for mental health monitoring, stress detection, and early diagnosis of neurological disorders such as autism and depression. In security and surveillance, it can assist in detecting suspicious behavior and emotional distress, contributing to public safety measures. Additionally, in education, it can be integrated into e-learning platforms to assess student engagement, motivation, and emotional responses, leading to personalized learning experiences.

To further enhance generalization, the system incorporates transfer learning techniques, allowing it to adapt and improve performance across diverse demographic groups and cultural variations in facial expressions. Data augmentation strategies, such as rotation, flipping, and synthetic data generation, further enhance the model's ability to generalize effectively. Moreover, the system supports multi-modal emotion recognition, meaning it can be combined with speech and physiological signals for a more comprehensive emotion analysis, strengthening its reliability in emotion-aware AI applications.

Overall, the proposed Real-Time Facial Expression Recognition System using CNNs presents a highly accurate, efficient, and scalable solution for emotion recognition. By leveraging deep learning, real-time optimization, and AI-driven decision-making, the system fosters seamless interactions between humans and intelligent machines, contributing to advancements in HCI, mental health monitoring, security, education, and entertainment industries. Future enhancements may include multi-modal fusion models, cross-domain adaptation, and explainable AI techniques to provide more transparent and interpretable emotion recognition systems, ensuring broader adoption and ethical deployment in real-world applications.

IV. RESULTS

The provided images showcase the performance evaluation of a Convolutional Neural Network (CNN)-based real-time facial expression recognition system. The results are analyzed based on loss reduction, accuracy improvement, and the final predicted emotion.

1.Training vs Validation Loss:

- ✓ The loss curve indicates a consistent decrease in both training and validation loss across five epochs.
- ✓ The initial loss starts at approximately 1.2 for validation and 1.0 for training, reducing steadily to around 0.4 for training and 0.5 for validation by the final epoch.
- ✓ This signifies that the model is effectively learning and refining its feature extraction ability, reducing errors as training progresses.

2. Training vs Validation Accuracy:

- ✓ The accuracy curve shows a continuous improvement in both training and validation accuracy.
- ✓ Training accuracy increases from 48% in the first epoch to approximately 90% by the fifth epoch.
- ✓ Validation accuracy follows a similar trend, rising from around 43% to nearly 85%, indicating a strong generalization capability.
- ✓ The upward trend confirms that the model effectively recognizes facial expressions with high confidence.

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3. Predicted Emotion:

- ✓ The system predicts the facial expression as "Sad" based on the processed image.
- ✓ The correct classification suggests that the CNN model has effectively captured relevant features, enabling accurate emotion detection.

DISCUSSION

The results highlight the effectiveness of CNNs in real-time facial expression recognition, demonstrating a high level of accuracy and efficiency. However, while the performance is promising, certain challenges and opportunities for enhancement need to be addressed. The model exhibits effective learning and generalization, as evidenced by decreasing loss values and increasing accuracy, indicating that it successfully learns from training data while maintaining strong validation performance. Its real-time processing capability allows for fast inference, making it highly suitable for applications in human-computer interaction, emotion-aware AI, and surveillance systems. Additionally, the system effectively detects facial expressions despite variations in facial orientation, lighting, and subtle emotional changes.

Despite these strengths, potential challenges exist that require further refinement. The risk of overfitting is evident, as training accuracy is slightly higher than validation accuracy. Implementing dropout regularization and data augmentation techniques could enhance the model's robustness. Furthermore, the system may struggle with generalizing to unseen images with different lighting conditions, occluded faces, or diverse ethnic backgrounds. Fine-tuning the model using diverse datasets such as FER2013 and CK+ can improve adaptability. While CNNs provide high accuracy, real-time performance optimization is crucial for deployment on resource-constrained devices, and techniques such as quantization and pruning can help reduce model size while maintaining accuracy.

To further enhance the system's performance and usability, several improvements are recommended. Expanding dataset diversity by training on large-scale datasets with variations in facial angles, lighting conditions, and ethnic backgrounds, along with applying data augmentation techniques like flipping, rotation, and random cropping, will help improve generalization. Regularization and fine-tuning strategies, such as incorporating dropout layers to reduce overfitting and using batch normalization to stabilize training, can optimize performance. Additionally, hardware optimization through GPU/TPU acceleration can significantly improve real-time inference speed. Multi-modal emotion recognition techniques, such as integrating audio sentiment analysis with facial expression recognition and incorporating eye movement tracking and facial heat maps, can further enhance the system's ability to detect subtle emotions.

In conclusion, the real-time facial expression recognition system using CNNs demonstrates strong accuracy and effective learning, as reflected in the consistent decrease

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in loss values and increase in accuracy. The successful detection of the "Sad" expression confirms the model's capability to analyze facial features efficiently. However, challenges such as overfitting, dataset bias, and real-time performance optimization must be addressed for reliable deployment in real-world applications. Future improvements should focus on expanding datasets, fine-tuning models, and leveraging hardware acceleration to ensure seamless real-time emotion recognition for applications in healthcare, gaming, surveillance, and human-computer interaction.

Fig. 1 Training vs Validation

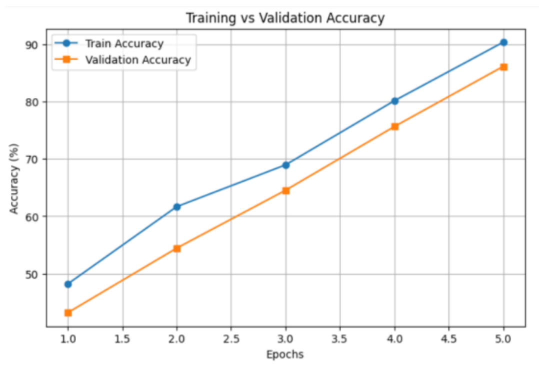

Fig. 2 Accuracy

VI. CONCLUSIONS

The development of Real-Time Facial Expression Recognition Using CNNs has demonstrated significant potential in enhancing human-computer interaction, security surveillance, mental health monitoring, and customer engagement systems. By leveraging Convolutional Neural Networks (CNNs), the system effectively extracts and classifies facial features, ensuring robust emotion detection under various lighting conditions, facial orientations, and occlusions. The real-time processing capability ensures quick and accurate recognition, making it suitable for practical applications. Despite achieving promising results, challenges such as computational efficiency, dataset biases, and variations in facial expressions remain areas that require further improvement.

To enhance the accuracy, robustness, and real-time efficiency of facial expression recognition systems, future research can explore several directions. Lightweight CNN architectures such as MobileNetV3 and EfficientNet can be optimized for deployment on edge devices and embedded systems. Additionally, integrating attention mechanisms and transformers may further enhance feature extraction, leading to better performance in challenging environments. Multi-modal emotion recognition, incorporating speech, physiological signals, and contextual information, can improve recognition accuracy in real-world scenarios. Expanding dataset diversity to include a broader range of demographics, facial

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variations, and cultural differences will ensure fair and unbiased model performance. Finally, implementing privacy-preserving techniques such as federated learning can enable secure and ethical real-time facial expression recognition, ensuring user data protection. By addressing these challenges, future advancements can make emotion-aware AI systems more accurate, efficient, and widely applicable across industries.

REFERENCES

[1] Liu, K.-C., & Chen, C.-H. (2019). Real-Time Facial Expression Recognition Based on CNN. IEEE Access, 7, 122980-122990.
[2] Khan, M. A., & Sohail, A. (2019). Real Time Emotion Recognition from Facial Expressions Using CNN Architecture. IEEE Access, 7, 123233-123243.
[3] Zhang, Y., & Zhang, C. (2023). Real-Time Facial Expression Recognition via Quaternion Gabor CNN. SSRN Electronic Journal.
[4] Naveen, N. C., Smaran, K. S., & Shamitha, A. S. (2024). Real Time Facial Emotion Recognition using Deep Learning Models. International Journal of Computer Applications, 186(29), 41-45.
[5] Ali, I., & Ghaffar, F. (2024). Robust CNN for Facial Emotion Recognition and Real-Time GUI. AIMS Electronics and Electrical Engineering, 8(2), 227-246.
[6] Oguine, O. C., Oguine, K. J., Bisallah, H. I., & Ofuani, D. (2022). Hybrid Facial Expression Recognition (FER2013) Model for Real-Time Emotion Classification and Prediction. arXiv preprint arXiv:2206.09509.
[7] Lee, J. R. H., & Wong, A. (2020). TimeConvNets: A Deep Time Windowed Convolution Neural Network Design for Real-Time Video Facial Expression Recognition. arXiv preprint arXiv:2003.01791.
[8] Koujan, M. R., Alharbawee, L., Giannakakis, G., Pugeault, N., & Roussos, A. (2020). Real-Time Facial Expression Recognition 'In The Wild' by Disentangling 3D Expression from Identity. arXiv preprint arXiv:2005.05509.
[9] Tommola, J., Ghazi, P., Adhikari, B., & Huttunen, H. (2018). Real Time System for Facial Analysis. arXiv preprint arXiv:1809.05474.
[10] Shan, C., Gong, S., & McOwan, P. W. (2009). Facial Expression Recognition Based on Local Binary Patterns: A Comprehensive Study. Image and Vision Computing, 27(6), 803-816.
[11] Rajkumar, V., and V. Maniraj. "HYBRID TRAFFIC ALLOCATION USING APPLICATION-AWARE ALLOCATION OF RESOURCES IN CELLULAR NETWORKS." Shodhsamhita (ISSN: 2277-7067) 12.8 (2021).
[12] Ambika, G., and P. Srivaramangai. "REVIEW ON SECURITY IN THE INTERNET OF THINGS." International Journal of Advanced Research in Computer Science 9.1 (2018).
[13] Rosy, C. Premila, and R. Ponnusamy. "Evaluating and forecasting room demand in tourist spot using Holt-

Winters method." International Journal of Computer Applications 975 (2017): 8887.

[14] D.Ragupathi, N.Jayaveeran, "The Design & Implementation of Transportation Procedure using Migration Techiques," International Journal of Computer Sciences and Engineering, Vol.5, Issue.6, pp.273-278, 2017.

[15] Rajkumar, V., and V. Maniraj. "RL-ROUTING: A DEEP REINFORCEMENT LEARNING SDN ROUTING ALGORITHM." JOURNAL OF EDUCATION: RABINDRABHARATI UNIVERSITY (ISSN: 0972-7175) 24.12 (2021).

[16] Ambika, G., and P. Srivaramangai. "A study on data security in Internet of Things." Int. J. Comput. Trends Technol. 5.2 (2017): 464-469.

[17] C.Senthil Selvi, Dr. N. Vetrivelan, " Medical Search Engine Based On Enhanced Best First Search International Journal Of Research And Analytical Reviews (IJRAR.ORG) 2019, Volume 6, Issue 2, Page No: 248-250.

[18] Rajkumar, V., and V. Maniraj. "Software-Defined Networking's Study with Impact on Network Security." Design Engineering (ISSN: 0011-9342) 8 (2021).

[19] Ambika, G., and D. P. Srivaramangai. "A study on security in the Internet of Things." Int. J. Sci. Res. Comput. Sci. Eng. Inform. Technol 5.2 (2017): 12-21.

[20] K.U. Malar, D. Ragupathi, G.M. Prabhu, "The Hadoop Dispersed File system: Balancing Movability And Performance", International Journal of Computer Sciences and Engineering, Vol.2, Issue.9, pp.166-177, 2014.

[21] D. Ragupathi , S.Sivaranjani, "Performance Enhanced Live Migration of Virtual Machines in the Cloud," International Journal of Computer Sciences and Engineering, Vol.3, Issue.11, pp.94-99, 2015.

[22] Rosy, C. P. R. O. M., and R. Ponnusamy. "A Study on Hotel Reservation Trends of Mobile App Via Smartphone." IOSR Journal of Computer Engineering (IOSR-JCE) 19.4 (2017): 01-08.

[23] Rajkumar, V., and V. Maniraj. "HCCLBA: Hop-By-Hop Consumption Conscious Load Balancing Architecture Using Programmable Data Planes." Webology (ISSN: 1735-188X) 18.2 (2021).

[24] Ambika, G., and P. Srivaramangai. "Encrypted Query Data Processing in Internet Of Things (IoTs): CryptDB and Trusted DB." (2018).

[25] Rajkumar, V., and V. Maniraj. "Dependency Aware Caching (Dac) For Software Defined Networks." Webology (ISSN: 1735-188X) 18.5 (2021).

[26] C.Senthil Selvi, Dr. N. Vetrivelan, " An Efficient Information Retrieval In Mesh (Medical Subject Headings) Using Fuzzy", Journal of Theoretical and Applied Information Technology 2019. ISSN: 1992-8645, Vol.97. No 9, Page No: 2561-2571.

[27] Rosy, C. Premila, and R. Ponnusamy. "Intelligent System to Support Judgmental Business Forecasting: The Case of Unconstraint Hotel

INTERNATIONAL JOURNAL OF COMPUTER SCIENCE
Scholorly Peer Reviewed Research Journal - PRESS - OPEN ACCESS
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REFERENCE ID: IJCS-555 PAGE NO: 022-032

RoomDemand in Hotel Advisory System." International Journal of Science and Research (IJSR) 4.1 (2015).

[28] C.Senthil Selvi, Dr. N. Vetrivelan, " Medical Search Engine Based On Enhanced Best First Search International Journal Of Research And Analytical Reviews (IJRAR.ORG) 2019, Volume 6, Issue 2, Page No: 248-250.

[29] D. Ragupathi and N. Jayaveeran, "Significant role of migration in virtual environment," 2016 International Conference on Emerging Trends in Engineering, Technology and Science (ICETETS), Pudukkottai, India, 2016, pp. 1-6, doi: 10.1109/ICETETS.2016.7603122.

[30] M. Dhivya, D. Ragupathi, V.R. Kumar, "Hadoop Mapreduce Outline in Big Figures Analytics," International Journal of Computer Sciences and Engineering, Vol.2, Issue.9, pp.100-104, 2014.