FACIAL EMOTION RECOGNITION USING DEEP LEARNING

Abstract. Facial emotion recognition (FER) is a critical area of research in artificial intelligence, with applications in healthcare, security, and human-computer interaction. Accurately identifying emotions from facial expressions is challenging due to variations in lighting, facial poses, and the subtle differences between emotions. Traditional methods often struggle with these challenges, making deep learning a promising alternative.

In this project, we propose a Convolutional Neural Network (CNN)-based approach for facial emotion recognition using the FER-2013 dataset. The dataset consists of 48x48 grayscale images labeled with seven emotions: angry, disgust, fear, happy, neutral, sad, and surprise. We preprocess the images by resizing and normalizing pixel values, and employ data augmentation techniques such as random rotations, shifts, and flips to enhance the model's generalization ability.

Our CNN model comprises multiple convolutional and pooling layers to extract hierarchical features, followed by fully connected layers for classification. The model is trained using the Adam optimizer and categorical cross-entropy loss, with early stopping to prevent overfitting. After training, the model achieves a test accuracy of 62.45%, demonstrating its effectiveness in recognizing facial emotions. However, the results also highlight challenges such as class imbalance and the difficulty of distinguishing between similar emotions like fear and surprise.

This project showcases the potential of deep learning for facial emotion recognition and provides a foundation for future improvements. Possible enhancements include using advanced architectures like ResNet, incorporating transfer learning, and leveraging larger datasets. By addressing these challenges, we can develop more accurate and robust emotion recognition systems, enabling more intuitive and empathetic human-computer interactions.