EMOLENS

Sentimental Analysis Through Image Recognition

Project Synopsis Report

Bachelor of Computer Applications with Specialization AI-DS

To

K R Mangalam University

By

Riya Singhal-2401201198

Mohd Aman- 2401201145

Sujal Singh- 2401201209

Under the supervision of

Dr. Amar Saraswat

Department of Computer Science and Engineering

School of Engineering and Technology

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1. Abstract

Emolens is an innovative system designed for the real-time analysis of human emotions by interpreting facial expressions. Leveraging advances in computer vision and deep learning, *Emolens* captures subtle facial movements and correlates them with a comprehensive emotional model to accurately classify sentiments such as happiness, sadness, anger, surprise, fear, and disgust. Unlike traditional sentiment analysis methods that rely on textual input, *Emolens* offers a non-invasive and immediate evaluation of emotional states, making it highly valuable for applications in mental health assessment, user experience optimization, education, and human-computer interaction. Through a combination of convolutional neural networks (CNNs) for feature extraction and recurrent neural networks (RNNs) for temporal emotion tracking, *Emolens* achieves robust performance even under varying lighting conditions, facial orientations, and cultural expression differences. This research outlines the architecture of *Emolens*, evaluates its performance against existing benchmarks, and discusses its potential for future real-world deployment.

2. ***Introduction***

In today's digital world, understanding human emotions is crucial for enhancing interactions between people and technology. *Emolens* is an advanced system designed to detect and classify human emotions through facial expression analysis. By capturing subtle facial cues, it provides real-time sentiment recognition across emotions such as happiness, sadness, anger, fear, and surprise. Using convolutional neural networks (CNNs) for feature extraction and recurrent neural networks (RNNs) for temporal analysis, *Emolens* ensures high accuracy even under challenging conditions like varied lighting and facial orientations. Its applications span mental health monitoring, adaptive learning, user experience design, and human-computer interaction, offering a powerful emotional insight tool. Emotions play a central role in human communication, influencing decisions, behaviors, and interactions. Recognizing emotions accurately is essential for creating intelligent systems capable of responding to human needs. *Emolens* represents a step forward in developing empathetic and responsive technologies that can understand and adapt to human emotions.

3. ***Motivation***

The ability to understand and respond to human emotions is a critical component of effective communication. As technology continues to integrate into daily life, the need for emotionally intelligent systems has become increasingly important. Traditional human-computer interactions often lack emotional awareness, resulting in less engaging and less effective experiences.

Facial expressions are among the most direct and universal ways of conveying emotions. However, most existing systems either overlook this non-verbal channel or fail to interpret it accurately. This gap motivates the development of *Emolens*, a system aimed at recognizing human emotions through real-time facial expression analysis.

By utilizing deep learning techniques, *Emolens* seeks to provide a more natural and empathetic interaction between humans and machines. The system is designed to operate under diverse conditions and has potential applications in fields such as mental health monitoring, adaptive learning, customer support, and human-computer interaction. Through this project, we aim to contribute to the creation of emotionally aware technologies that can better serve human needs.

4. ***Problem Statement***

Despite significant advancements in human-computer interaction, most systems today lack the ability to perceive and interpret human emotions effectively. Traditional methods of sentiment analysis rely primarily on textual or audio data, ignoring the rich, non-verbal emotional cues conveyed through facial expressions. This leads to interactions that are often impersonal, rigid, and limited in responsiveness.

- Human-computer interaction systems currently lack the ability to accurately perceive and respond to human emotions.
- Traditional sentiment analysis methods focus mainly on textual or audio inputs, overlooking critical non-verbal cues like facial expressions.
- Facial expressions provide rich emotional information but are difficult to capture and interpret accurately in real-time.
- Challenges such as variations in lighting, facial orientation, cultural expression differences, and individual uniqueness complicate emotion recognition.
- There is a need for a robust system that can perform real-time facial emotion recognition with high accuracy and adaptability across diverse conditions.

5. ***Objective***

- To develop a real-time facial expression recognition system for human sentiment analysis.
- To accurately classify basic human emotions such as happiness, sadness, anger, fear, disgust, and surprise based on facial cues.
- To utilize deep learning techniques, particularly Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs), for feature extraction and emotion classification.
- To ensure system robustness under varying lighting conditions, facial angles, and across different demographic and cultural backgrounds.
- To create a non-invasive, efficient, and scalable system suitable for applications in mental health monitoring, education, customer service, and user experience enhancement.
- To contribute to the development of emotionally intelligent human-computer interaction systems.

6. ***Tool/Platform Used***

- Programming Language- Python.
- Framework-TenserFlow, OpenCV, 9-layer deep neural network (CNN).
- Dataset- Kaggle’s, GitHub.
- Model Architectures- DeepFace.
- Development Environment- VS code, Google collab.

7. ***METHODOLOGY***

1.Data Collection & Preprocessing

➢ Collecting labeled Diabetic Retinopathy datasets (APTOS, EyePACS).

➢ Image augmentation for class balance.

2.Model Selection & Training

➢ Experimenting with CNN architectures (ResNet, VGG16, InceptionV3).

➢ Hyperparameter tuning for optimal performance.

3.Evaluation & Performance Metrics

➢ Testing accuracy, precision, recall, and F1-score.

➢ Using Grad-CAM for model interpretability.

4.Deployment & Testing

➢ Developing a web/mobile application for Diabetic Retinopathy screening.

➢ Real-world validation with healthcare professionals.

8. ***Risk Management***

- Data Quality and Availability
- Model Overfitting:
- Real-Time Performance Constraints
- Ethical and Privacy Concerns
- Hardware Limitations

9. ***Reference***

Mollahosseini et al. (2017) introduced AffectNet, a large-scale dataset with over one million facial images labeled for seven emotions, valence, and arousal. Collected from the internet, it supports real-world emotion recognition. Using deep CNNs, the study achieved strong results under challenging conditions, making AffectNet a benchmark for training and evaluating emotion detection systems.

Research Paper: FACIAL EMOTION DETECTION AND RECOGNITION by Amit Pandey, Aman Gupta, Radhey Shyam

Computer Science Department

SRMCEM, AKTU

Lucknow, India.

10.Conclusion

The *Emolens* project—**Sentimental Analysis Through Image Recognition**—successfully integrates computer vision and affective computing to detect emotions from facial images. Through a sleek and interactive frontend built using HTML, CSS, and JavaScript, users can easily upload images and receive emotion predictions in real time.

On the backend, facial features are analyzed using machine learning techniques trained on robust datasets like AffectNet. The system is capable of identifying a range of human emotions such as happiness, sadness, anger, and surprise, even under challenging real-world conditions like varying lighting and occlusions.

The core achievement of Emolens lies in its ability to bridge technical capability with user accessibility. It not only showcases the power of deep learning in emotion detection but also emphasizes the importance of intuitive design in deploying AI systems for public use. By enabling machines to understand human emotions, Emolens contributes to the broader vision of building emotionally intelligent applications—useful in fields like mental health, user experience, education, and security.