

Facial Emotion Recognition in Educational Settings: Project Report

1. Dataset Description and Size

The proposed project will utilize a combination of three prominent facial emotion recognition datasets:

- FER-2013: Contains approximately 35,887 grayscale images (48x48 pixels) categorized into seven emotion classes: anger, disgust, fear, happiness, sadness, surprise, and neutral.
- AffectNet: One of the largest datasets with over 1,000,000 facial images, about 450,000 manually annotated for eight emotions: neutral, happy, sad, surprise, fear, disgust, anger, and contempt.
- RAF-DB: Comprises 29,672 real-world facial images annotated with basic and compound expressions across diverse demographics.

By integrating these datasets, the model will benefit from diverse, extensive training data, enhancing its generalization capabilities.

2. Preliminary Literature Review and Next Steps

Recent studies show significant advancements in emotion recognition:

- Salloum et al. (2025): Developed a CNN model achieving 95% accuracy using preprocessing and augmentation.
- Diwan et al. (2024): Highlighted the importance of combining facial and body gesture data.
- Indra Saputra et al. (2024): Advocated for real-time emotional feedback to enhance educational outcomes.

Next Steps:

- Implement CNN with transfer learning.
- Incorporate multimodal data (facial expressions and gestures).
- Develop real-time emotional feedback systems.

3. Proposed Machine Learning Model and Methodology

The proposed model will be a Convolutional Neural Network (CNN) based on ResNet-18 architecture with Squeeze-and-Excitation (SE) modules.

- CNN (ResNet-18): Captures spatial hierarchies with residual connections.
- SE Modules: Improve feature recalibration for enhanced emotion detection.
- Transfer Learning: Pre-training on AffectNet, fine-tuning on RAF-DB and FER-2013.

This combination aims for a robust and efficient emotion recognition system capable of real-time operation.

4. Project Timeline (Weekly Plan)

Week	Task
1-2	Finalize project idea and form groups
3	Submit detailed research proposal
4-5	Conduct literature review
6-7	Data collection and preprocessing
8	Preliminary data analysis and step planning
9-10	Model implementation and initial training
11	Model evaluation and refinement
12	Final presentation and project delivery

5. Model Evaluation and Performance Metrics

The model's performance will be assessed using:

- Accuracy: Overall correct predictions.
- Precision: Exactness of positive predictions.
- Recall: Ability to identify all relevant instances.
- F1-Score: Balance between precision and recall.

- Confusion Matrix: Detailed breakdown of prediction results.
- Cross-Validation: To ensure robustness across data subsets.

These evaluation methods will guide improvements, ensuring practical applicability of the model in educational environments.

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