Software Requirement Specification (SRS)

Emotion Detection Web Application

Using CNN with FER-2013 Dataset

1. Introduction

Purpose: This document describes the requirements for an Emotion Detection Web Application that detects human emotions from facial images using a Convolutional Neural Network (CNN) trained on the FER-2013 dataset.

Scope: The system allows users to upload or capture facial images and receive emotion predictions with confidence scores. The application will be built using Python Flask and deployed on Render cloud platform.

2. Dataset Description

Dataset: FER-2013
- 35,887 grayscale images
- Image size: 48x48 pixels
- 7 Emotion Classes: Angry, Disgust, Fear, Happy, Sad, Surprise, Neutral

3. Functional Requirements

- User image upload (JPG/PNG validation)
- Webcam image capture
- Image preprocessing (grayscale, resize, normalization)
- Emotion prediction using CNN model
- Display emotion label with confidence percentage
- Optional: User login and prediction history tracking

4. Non-Functional Requirements

Performance: Response time <= 3 seconds
Accuracy: Expected 65-75% (baseline FER performance)
Security: Input validation and secure endpoints
Usability: Mobile responsive UI
Scalability: Deployable using Docker and Render

5. System Requirements

Hardware: Minimum 4GB RAM, Webcam for live detection
Software: Python 3.9+, Flask, TensorFlow/Keras, OpenCV, NumPy, Gunicorn

6. CNN Model Architecture

- Conv2D (32 filters) + MaxPooling
- Conv2D (64 filters) + MaxPooling
- Conv2D (128 filters)
- Flatten
- Dense (128) + Dropout
- Output Layer (Softmax - 7 classes)

Loss Function: Categorical Crossentropy
Optimizer: Adam
Metric: Accuracy

7. Deployment Plan

1. Push project to GitHub
2. Create Web Service on Render
3. Build Command: pip install -r requirements.txt
4. Start Command: gunicorn app:app
5. Configure environment variables and deploy

8. Future Enhancements

- Real-time video emotion detection
- Multi-face detection
- Emotion analytics dashboard

- Integration with chatbot systems
- Transfer learning using advanced models