Configuration Manual

MSc Research Project

Data Analytics

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MSc Project Submission Sheet

School of Computing

Student Name:	Harshavardhan kajipuram……………………………………………………………………………
Student ID:	………………………………x23182717………………………………………………………………… ……..
Program:	…MSC Data Analytics…………………… **Year:** 2024-2025…………………..
Module:	…………………………………MSC Research project…………………………………………
Lecturer:	…………………………12-12-2024……………………………………………………….………
Submission Due Date:	…………………………………………………………………………………………..………
Project Title:	Analyzing Limitations of Pre-Trained Deep Learning Models for Facial Emotion Recognition ………………………………………………………………………………….………
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I hereby certify that the information contained in this (my submission) is information pertaining to research I conducted for this project. All information other than my own contribution will be fully referenced and listed in the relevant bibliography section at the rear of the project.

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PLEASE READ THE FOLLOWING INSTRUCTIONS AND CHECKLIST

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Configuration Manual

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1. CONFIGURATION MANUAL

This configuration manual provides a step-by-step guide to set up, run, and evaluate the models described in the dissertation for facial recognition and emotion detection using the **VGG16** architecture.

2. SYSTEM REQUIREMENTS

To run the project efficiently, ensure the system meets the following hardware and software specifications

1 Hardware:
- **Processor**: Intel Core i5 (or equivalent) and above
- **RAM**: Minimum 16 GB (32 GB recommended for large datasets)
- **GPU**: NVIDIA GPU with CUDA support (e.g., GTX 1060, RTX 3060, or Tesla K80)
- **Storage**: At least 50 GB of free space for datasets and model checkpoints

2 Software:
- **Operating System**: Windows 10/11, Linux (Ubuntu 18.04+), or macOS
- **Python Version**: Python 3.8 or higher
- **IDE/Platform**: Google Colab, Jupyter Notebook, or any Python IDE (e.g., PyCharm, VS Code)
- **Libraries**:
  - TensorFlow 2.x
  - Keras
  - NumPy
  - OpenCV
  - Matplotlib
  - Scikit-learn

3. INSTALLATION GUIDE

Follow these steps to set up the environment:
> **Step 1: Install Python and Virtual Environment**
> 1. Download and install **Python 3.8**+ from python.org.
> 2. Create a virtual environment to isolate the project dependencies

code
```
python -m venv emotion_detection_env
source emotion_detection_env/bin/activate  # Linux/macOS
emotion_detection_env\Scripts\activate    # Windows
```

> **Step 2: Install Required Libraries**

Run the following command to install necessary libraries:

Copy code
```
pip install tensorflow keras numpy opencv-python matplotlib scikit-learn tqdm
```

> **Step 3: Set Up Google Colab (Optional)**

If running on Google Colab, upload your dataset to Google Drive and mount it:

Copy code
```
from google.colab import drive
drive.mount('/content/drive')
```
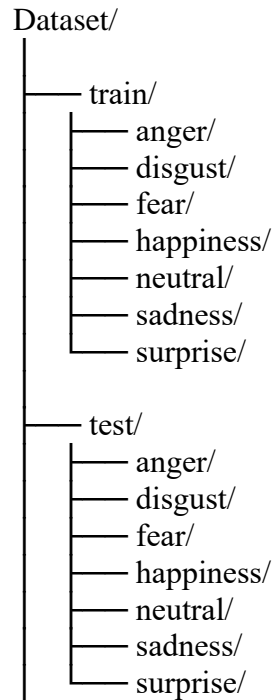
Install required libraries in Colab:

Copy code
```
!pip install tensorflow keras numpy opencv-python matplotlib scikit-learn tqdm
```

4. DATASET CONFIGURATION

The dataset must be organized as follows for training and validation:

```
Dataset/
│
├── train/
│       ├── anger/
│       ├── disgust/
│       ├── fear/
│       ├── happiness/
│       ├── neutral/
│       ├── sadness/
│       └── surprise/
│
├── test/
│       ├── anger/
│       ├── disgust/
│       ├── fear/
│       ├── happiness/
│       ├── neutral/
│       ├── sadness/
│       └── surprise/
```

5. MODEL TRAINING CONFIGURATION

Base Model:
- Pretrained **VGG16** with imagenet weights.
- Top layers customized with fully connected layers and a softmax output for 7 classes.

Training Parameters:

Parameter	Value
Optimizers	Adam, SGD, RMSprop
Learning Rate	1e-5 (Reduced dynamically)
Batch Size	4
Dropout Rate	0.3–0.5
Dense Units	512
Loss Function	Categorical Crossentropy

6. CODE EXECUTION STEPS

Follow these steps to run the code:
    Step 1: Preprocess the Dataset

Run the dataset preprocessing script to clean and augment images dynamically (run all codes from the first cell)

    Step 2: Train the VGG16 Model
Run the training script with hyperparameter tuning

7. TROUBLESHOOTING
- Memory Issues: Reduce batch size or use Google Colab with GPU support.
- Overfitting: Apply stronger regularization, increase dropout rates, or augment the dataset further.
- Low Accuracy: Verify dataset balance, improve preprocessing, or experiment with alternative architectures (e.g., ResNet).

8. CONCLUSION
This manual provides all the necessary steps to configure, train, and evaluate the VGG16 model for emotion detection. By following the outlined setup and execution instructions, users can reproduce the results and apply further optimizations as needed for improved performance.