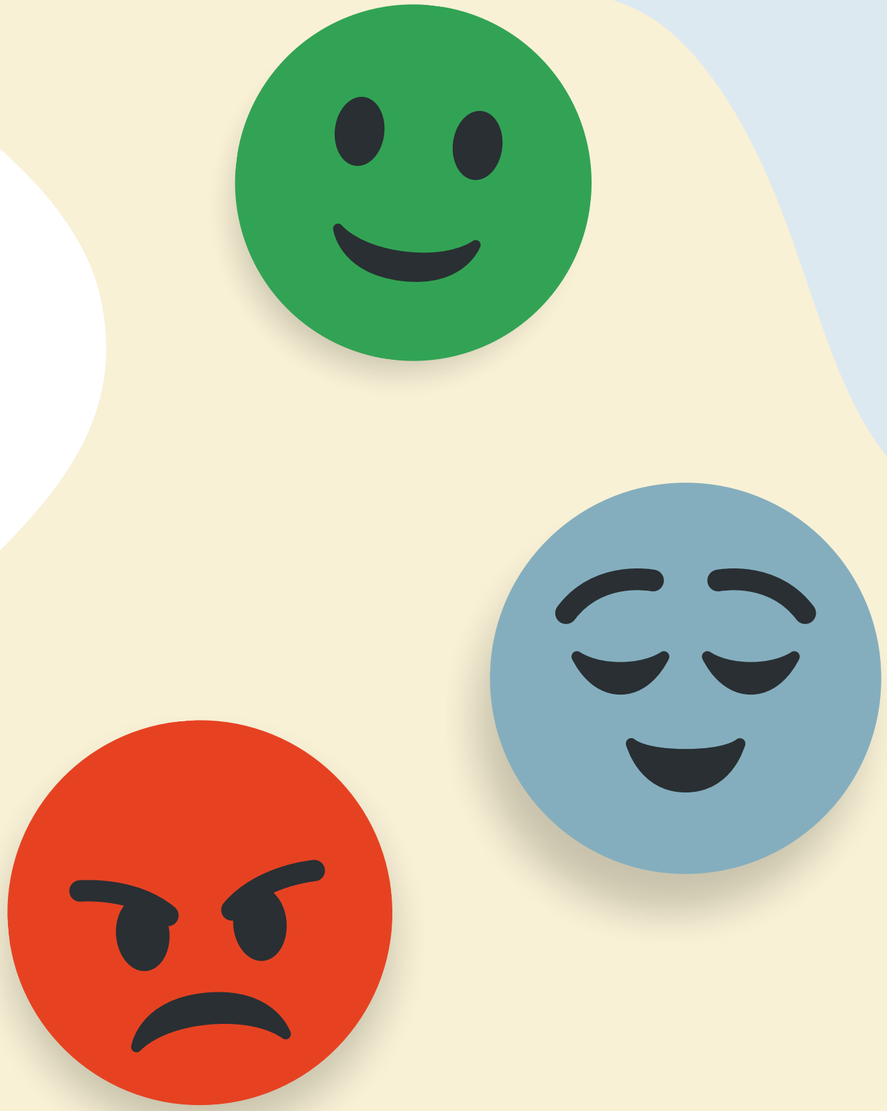
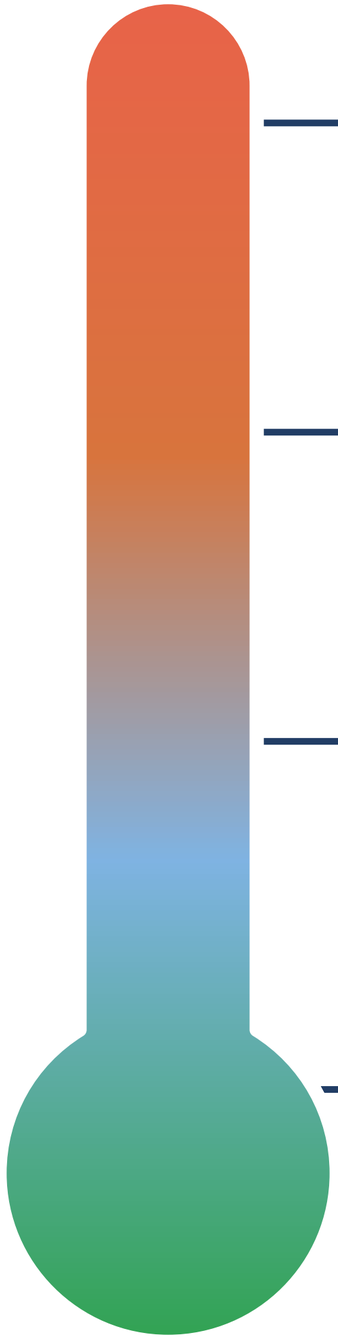
# Real-Time Emotion Detection



Group 7

# Members



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Lim Chanvina

# Introduction

**Emotional well-being of students** play an important role in their **academic success**.

A **low amount of research papers** has studied this and addressed the emotional factors.

An **emotional detection** that can recognize **seven** types of expression through **images**

# Problems

- **Pay little attention** to the impact of students' emotions on academic performance

- **Struggle to maintain** students' engagement and understanding with complex lessons and traditional classrooms

- **Cannot provide** enough care to all students due to the time and resource constraints.

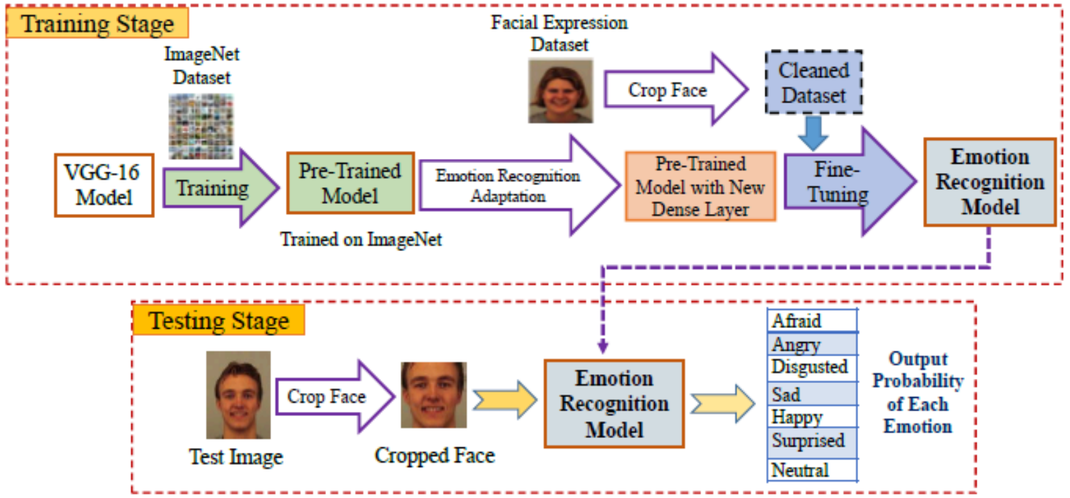
# Objectives

- Monitor how **students' emotional states** influence their academic performance over time
- Improve engagement and comprehension by **adjusting content delivery and classroom settings** to promote a positive environment based on detected emotions
- Identify the **students who are at risk** of mental health problems.

# Literature Review

# DCNN

Akhand, Roy, Siddique, Kamal & Shimamura (2021)

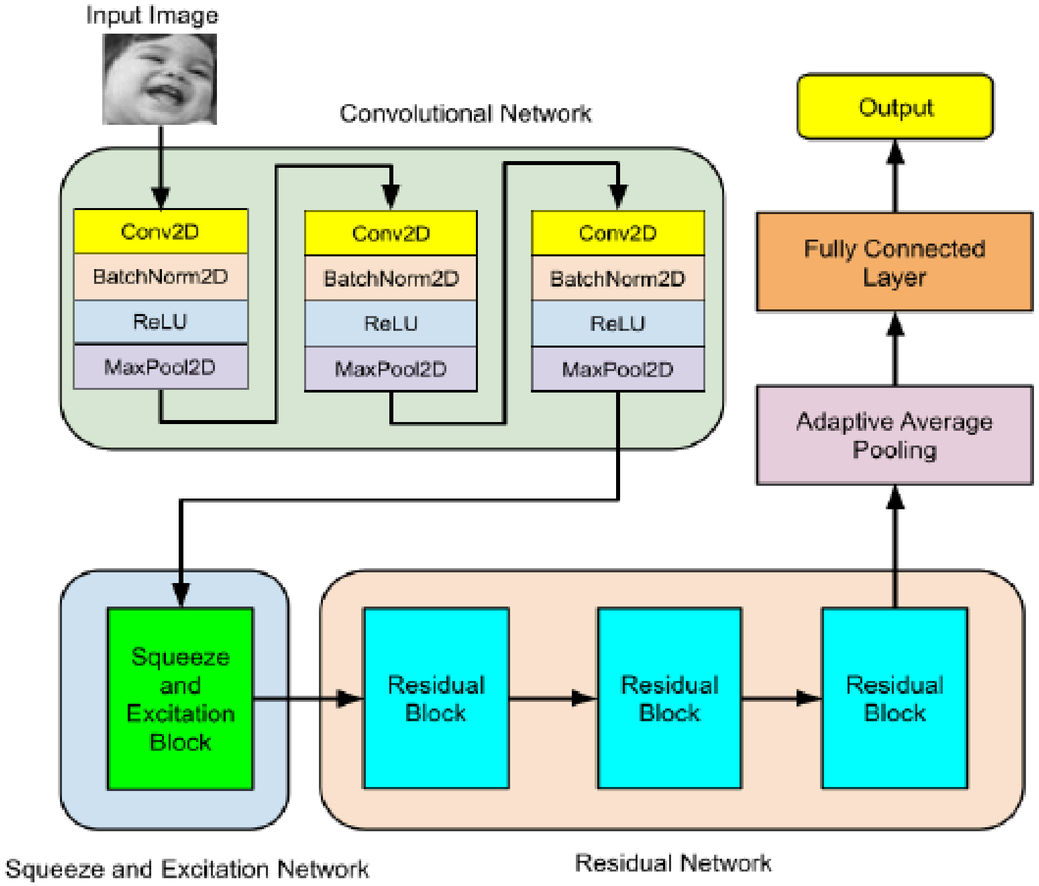



- **Pre-trained Models**: VGG-16, VGG-19, ResNet-18, ResNet-34, ResNet-50, ResNet-152, Inception-v3 & DenseNet-161.
- **Datasets**: FER (Training) & KDEF & JAFFE (Testing).
- **Results**: DenseNet-161 -> 96.51% (KDEF) & 99.52% (JAFFE).

# ResEmoteNet

Roy, Kathania, Sharma, Dey & Ansari (2024)

Batch = 16
Epoch = 80




| Dataset | FER2013 | RAF-DB |
|---|---|---|
| Accuracy | 79.79% | **94.76%** |

| Dataset | AffectNet-7 | ExpW |
|---|---|---|
| Accuracy | 72.93% | 75.67% |

# Dataset

**Classes**: 7

- Happy
- Sad
- Neutral
- Angry
- Disgust
- Surprise.

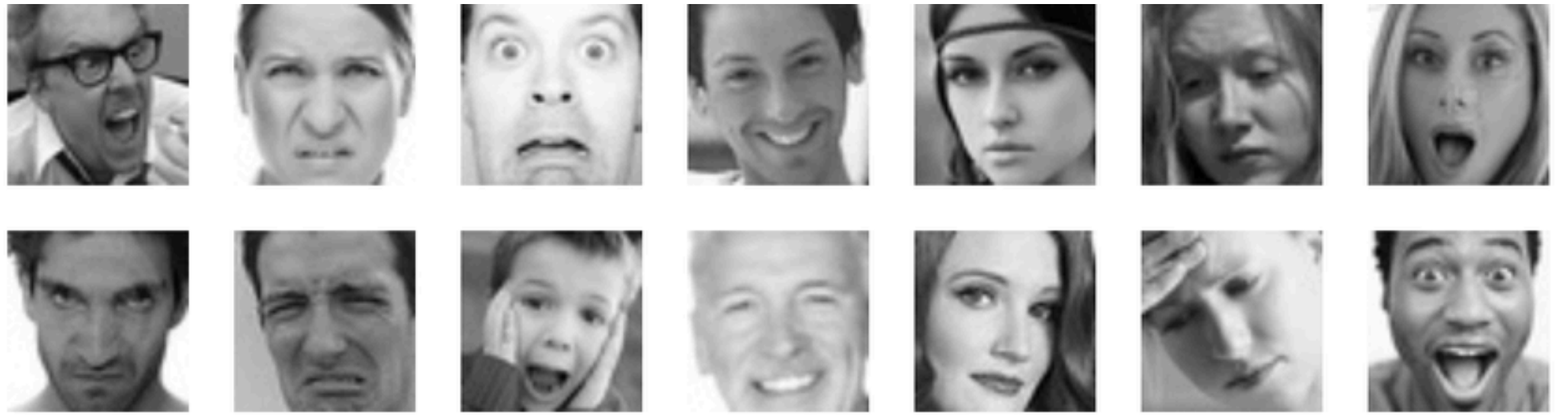
Data Splitting

- Train: 60%
- Test: 20%
- Validation: 20%

# FER2013

- Training: 24406
- Validation: 4303
- Testing: 7178

| | Source | Size | Format |
|---|---|---|---|
| **FER2013** | Google | ~35.9K | jpg / png |



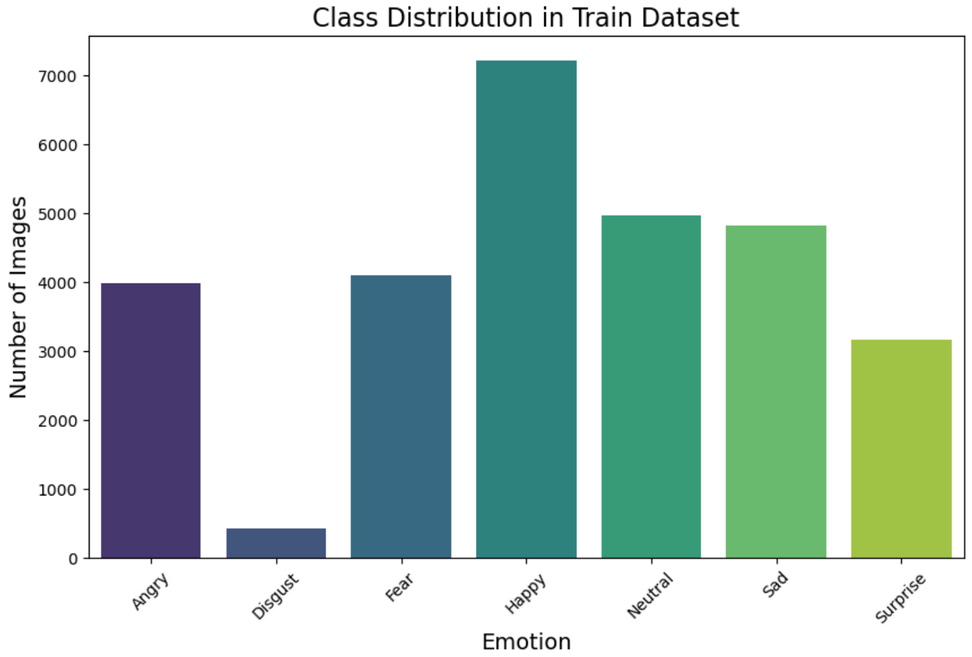
# Custom

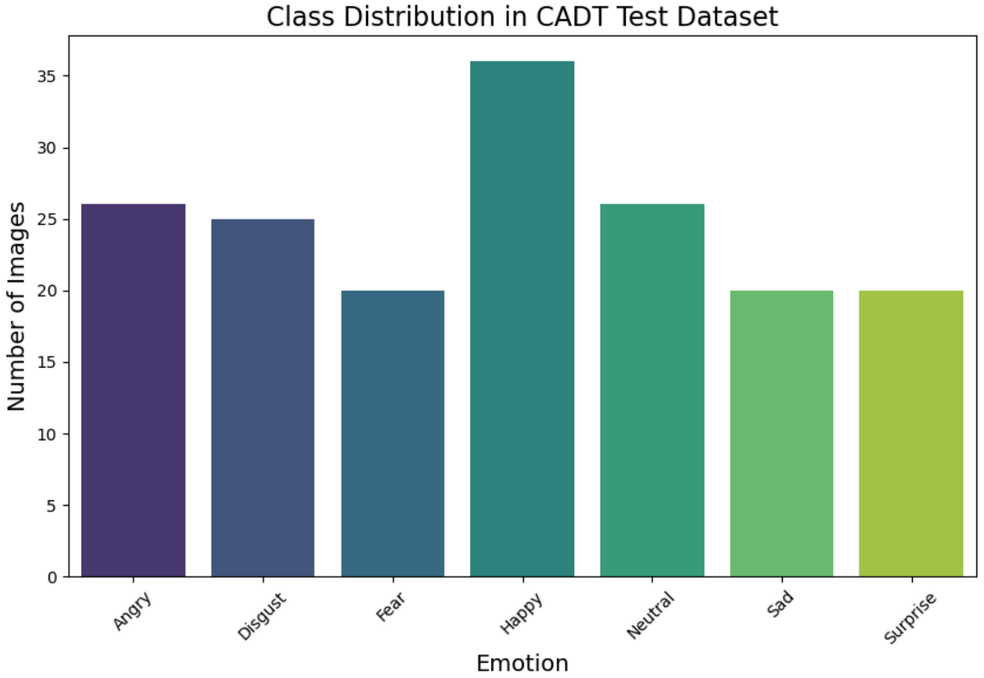
| | Source | Size | Format |
|---|---|---|---|
| **Custom** | Real + Social Media | ~170 | jpg |

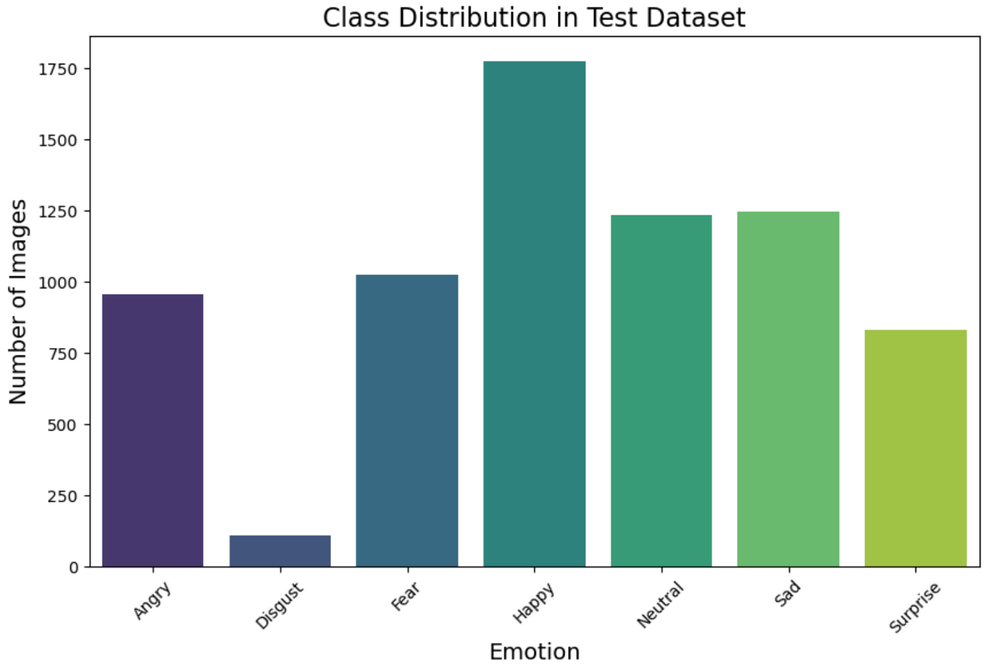
- Testing: 173

# Pre-processing & EDA

# EDA




## Imbalance Data

# Pre-processing

1

*Data Quality Check*

Verify image clarity to discard blurry or low-quality image and check labels to ensure image is correctly label.

2

*Normalization*

Scale pixel values to standardize input for the model

3

*Class Imbalance Handling*

Augment avoid under-fitting and under-sample to avoid over-fitting

4

*Data Augmentation*

Align faces in all images using detection algorithms to maintain consistency

5

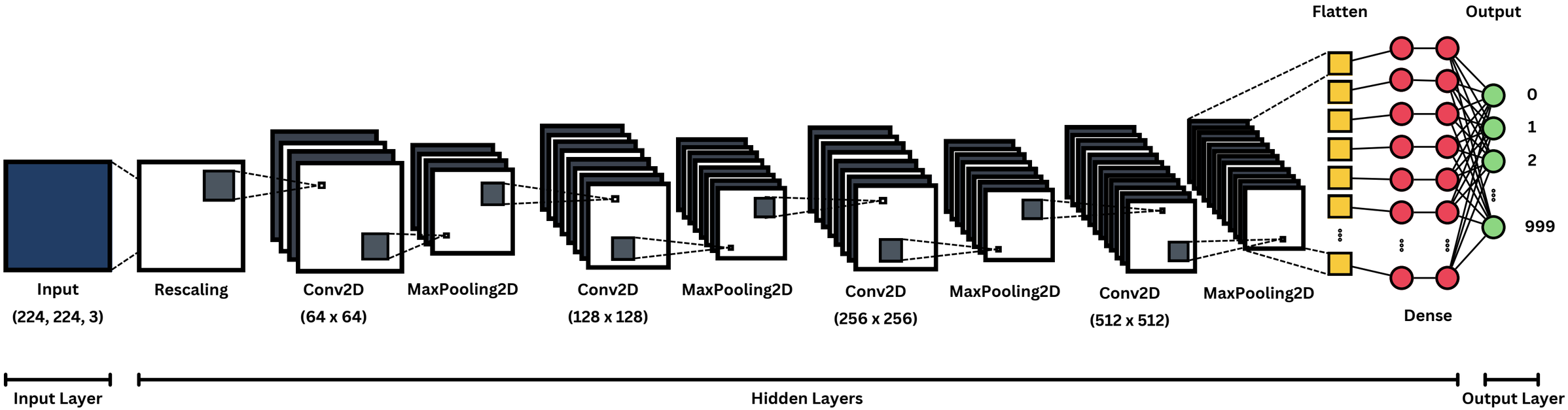
*Dataset Splitting*

Divide the dataset into training, validation, and test sets

# Model Training

# CNN

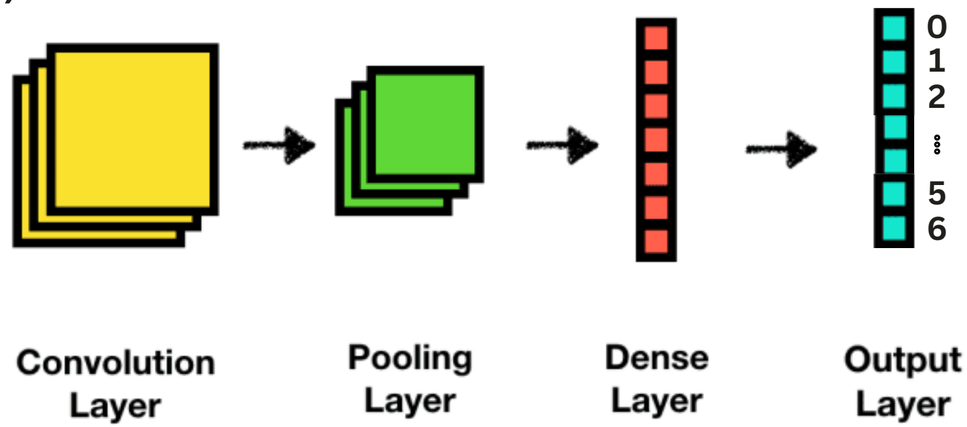
## Architecture



# VGG16

## Fine-Tuning

```
VGG16(
        include_top=False,
        weights='imagenet'
)
```




- **Dense (4096)**
- **Dense (1072)**
- **Dropout (0.3)**

**Parameters**

- optimizer **= Adam**
- learning rate = **0.0001** (**ReduceLROnPlateau**)
- kernel initializer = **HeNormal**
- batch size = **32**
- epoch = **25**

# VGG16

## Result

**Evaluation Metrics**

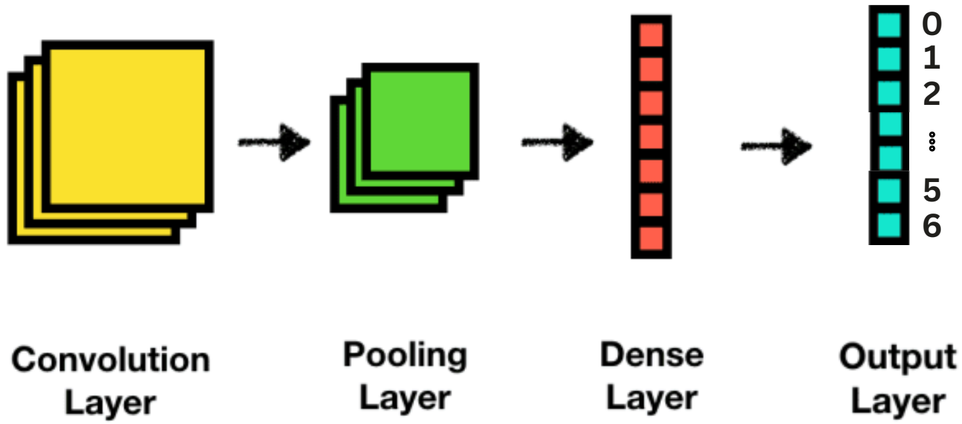
- loss = **Categorical crossentropy**
- evaluation = **Accuracy**

| | Train | Validation | Test |
|---|---|---|---|
| **VGG16** | 53.1% | 46.7% | • 14.25%<br>• 11% |

# MobileNet

## Fine-Tuning

**MobileNetV2**



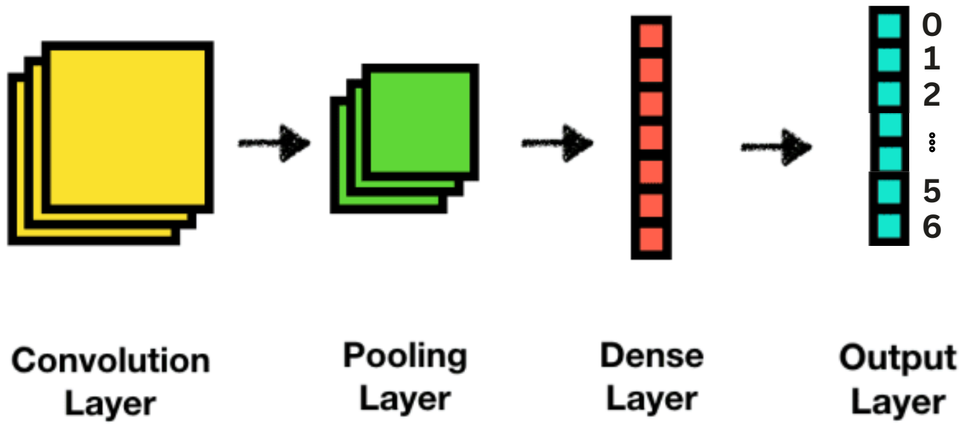

- **Dense (128)**
- **Dense (64)**

- optimizer **= Adam**
- learning rate = **0.001** (**ReduceLROnPlateau**)
- batch size = **32, 64**
- epoch = 40

# ResNet

## Fine-Tuning

**ResNet50**




- **Dense (128)**
- **Dense (64)**

- optimizer **= Adam**
- learning rate = **0.0001** (**ReduceLROnPlateau**)
- batch size = **32, 64**
- epoch = 40

# Evaluation

+ 64 batch

| Model | FER13 Test Set | Our dataset |
|---|---|---|
| MobileNetV2 | 0.69 | 0.33 |
| ResNet50 | 0.67 | 0.35 |

+ 32 batch

| Model | FER13 Test Set | Our dataset |
|---|---|---|
| MobileNetV2 | 0.67 | 0.31 |
| ResNet50 | 0.67 | 0.33 |

# Discussion

**Model Low Accuracy:**

- **Require large amount of**

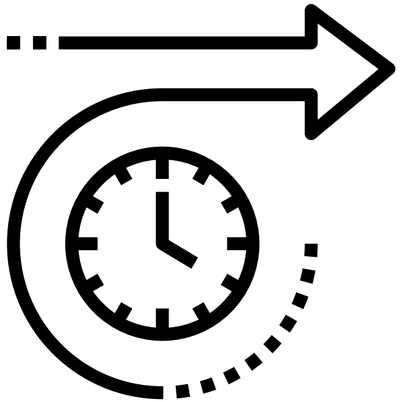
  **Training time resource**

**Data**

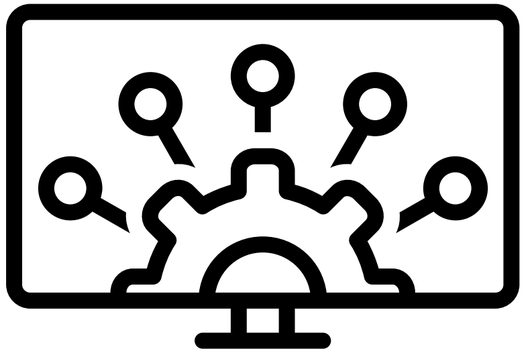
# Demo

# Conclusion

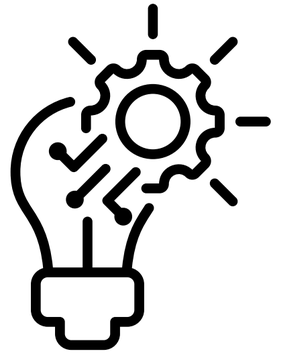
# Challenges



Time Constraint

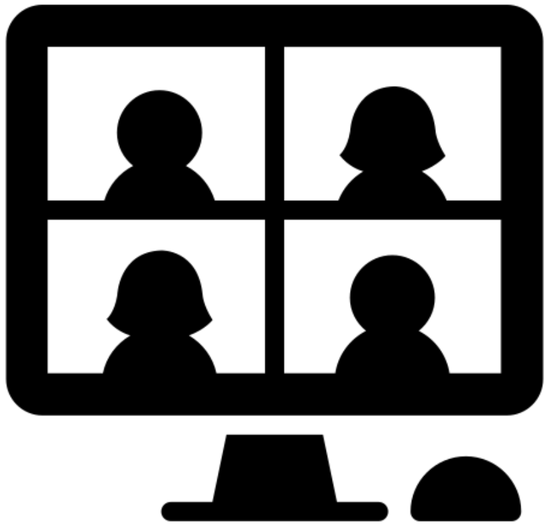


Limited Computational Resources

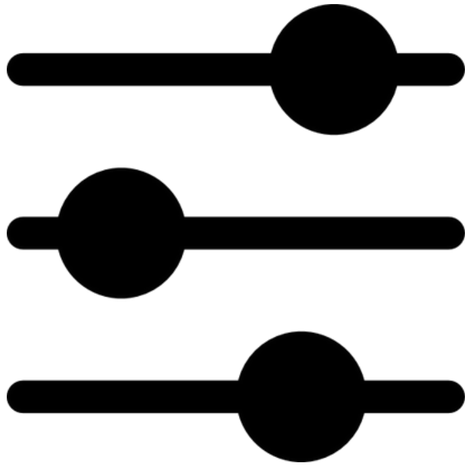


New Technology

# Future Work



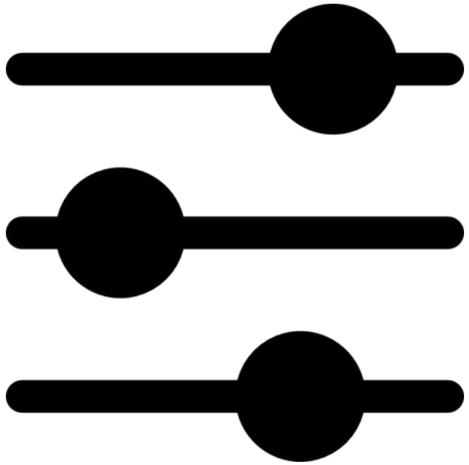
Capture Many People



Train Different Parameters
more Architecture

# Future Work

Different Preprocessing technique



Train Different Parameters

# Thank you!