Facial Expression Recognition

Group - 1

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Outline

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Problem Statement

Video-based facial expression recognition aims to classify a video into one of seven basic emotions, i.e anger, contempt, disgust, fear, happiness, sadness, and surprise.

- Input
  - Video clip
- Output
  - One of seven expression classes i.e anger, contempt, disgust, fear, happiness, sadness, and surprise.

- Image source : https://unsplash.com/photos/ufK-deiLqY8

Dataset

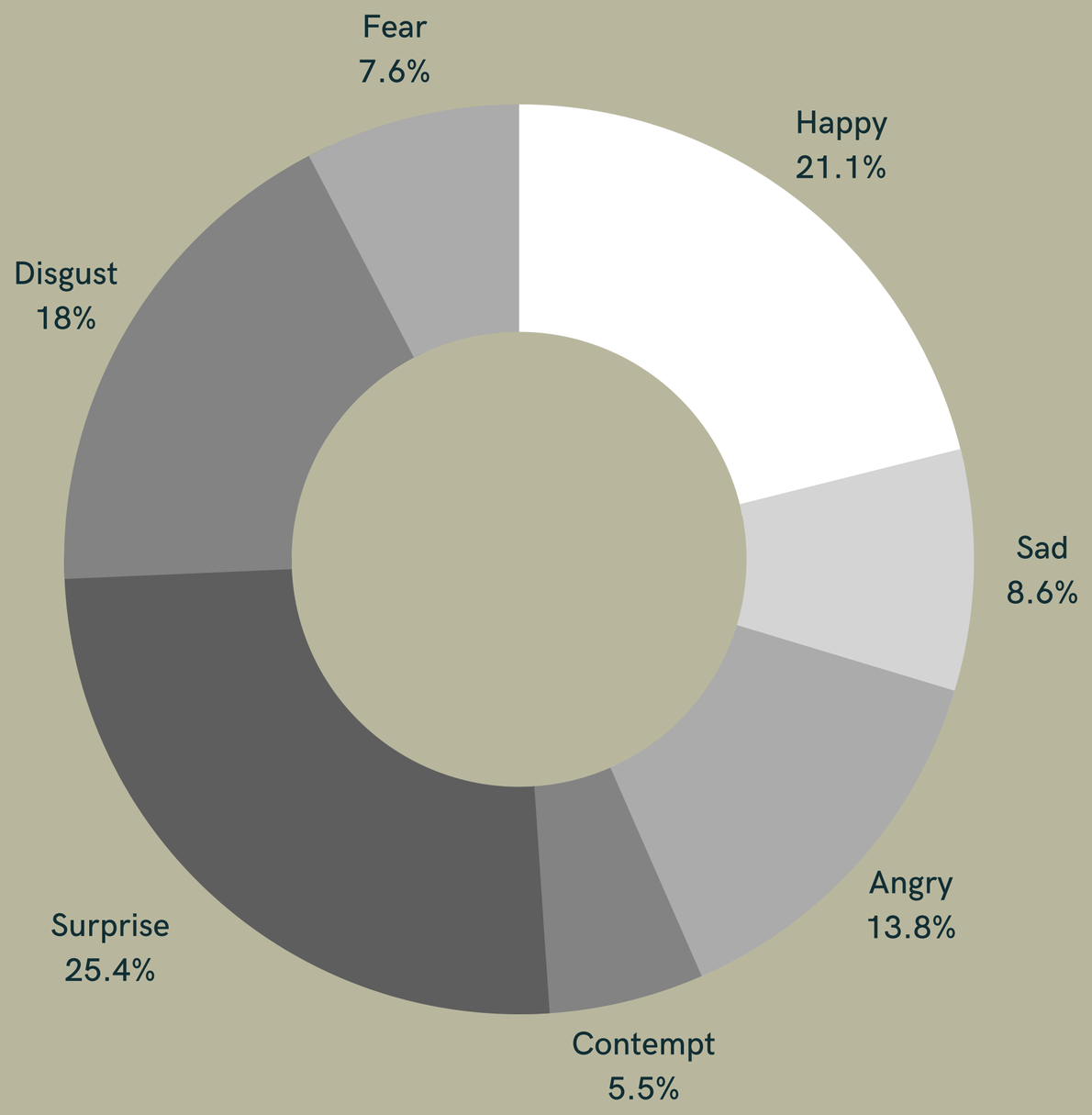
Extended Cohn-Kanade (CK+) dataset

Video Examples

- 593 video sequence
- 123 different subjects

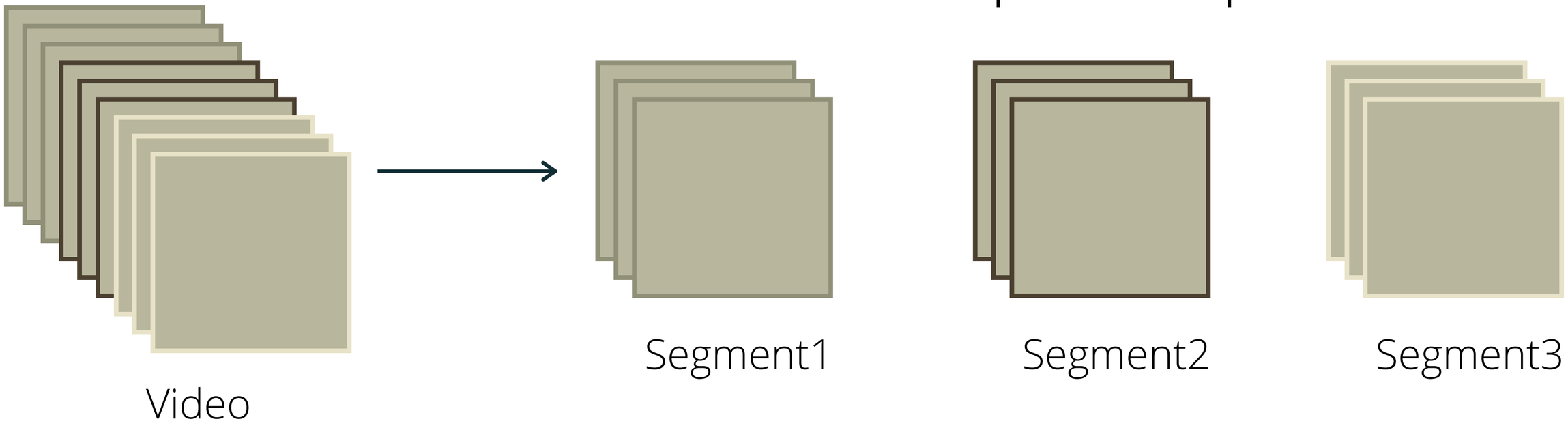
Frame

- 30 FPS
- 640x490 pixels


Fear
7.6%
Happy
21.1%
Disgust
18%
Sad
8.6%
Angry
13.8%
Surprise
25.4%
Contempt
5.5%

Data Preparation

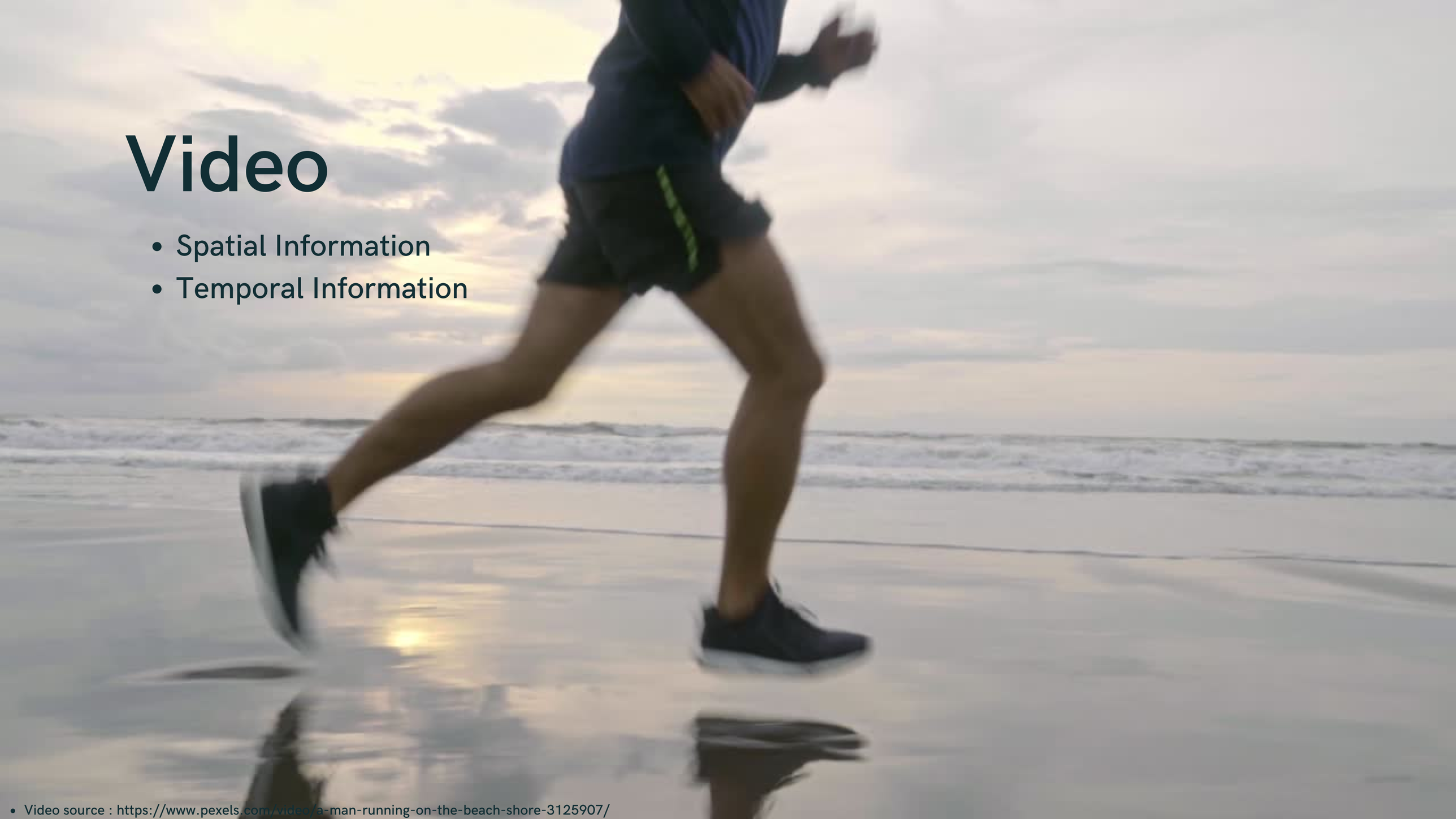
- Cropped faces from frames
- We have divided each video into 3 segments
- Randomly select one frame from each segment
- Create a stack of those selected frames
- Resize frames into 224x224 size and pass it as input



Methodology

Video

- Spatial Information
- Temporal Information



- Video source : https://www.pexels.com/video/a-man-running-on-the-beach-shore-3125907/

The Modules

01

deep CNN

We have used ResNet-18 as a deep CNN module.

02

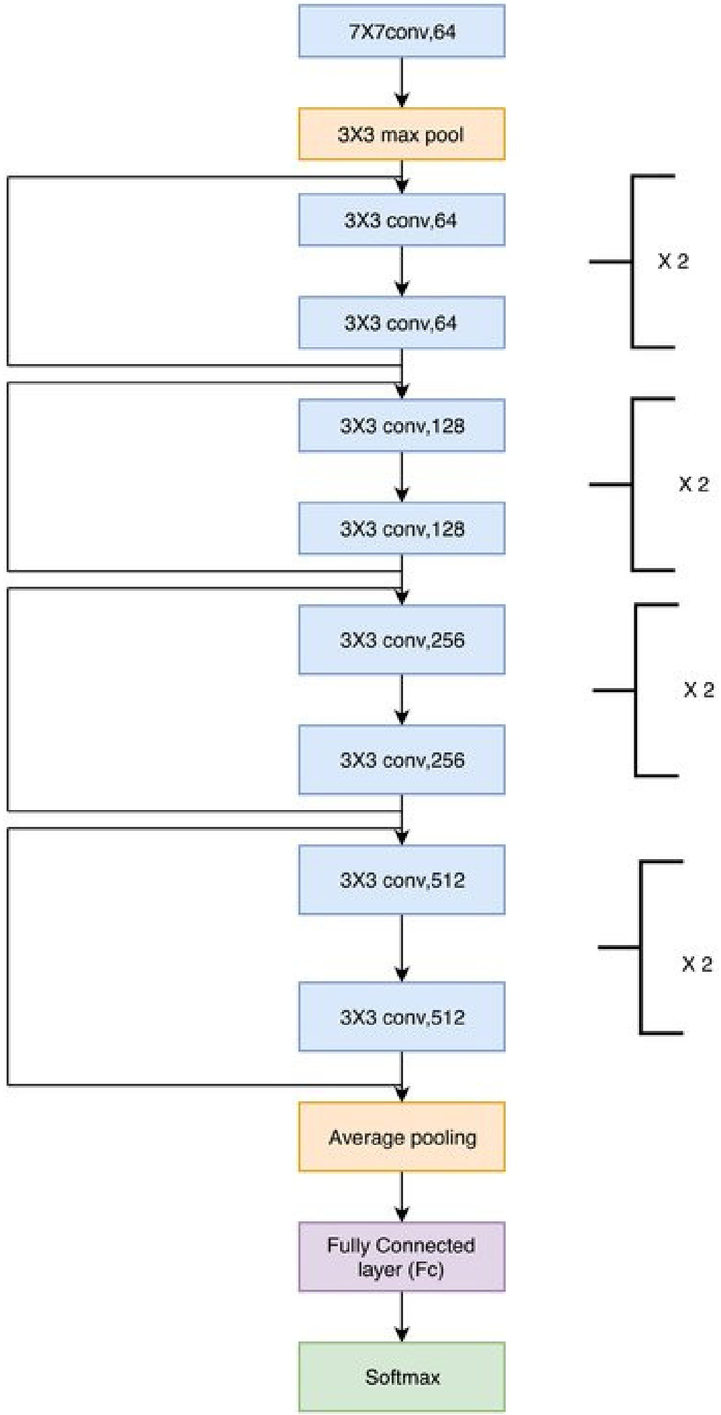
PAN

Persistent Appearance Network is used to capture temporal information.

03

Frame-Attention

To assign attention weights to frame of the video.



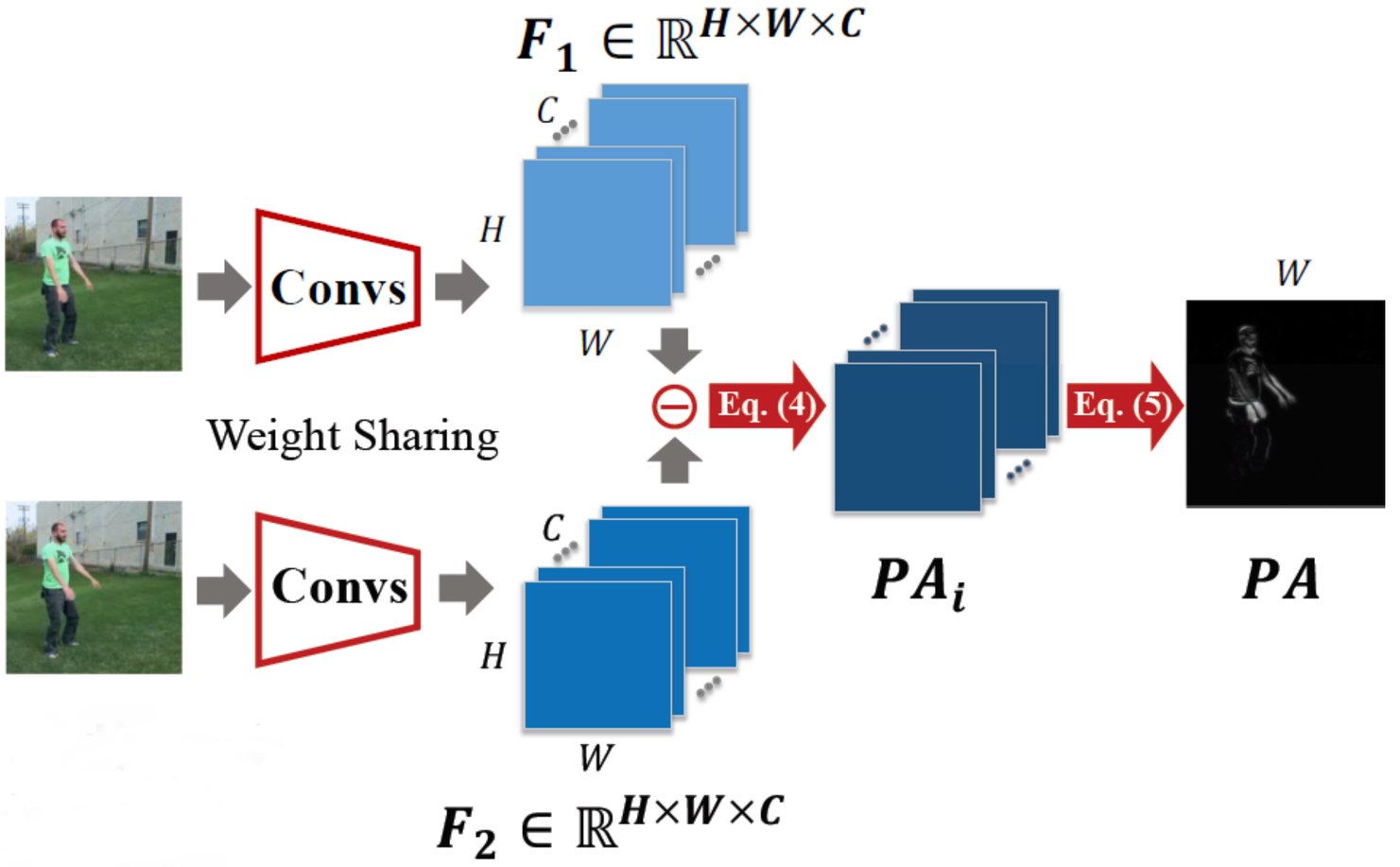
ResNet-18

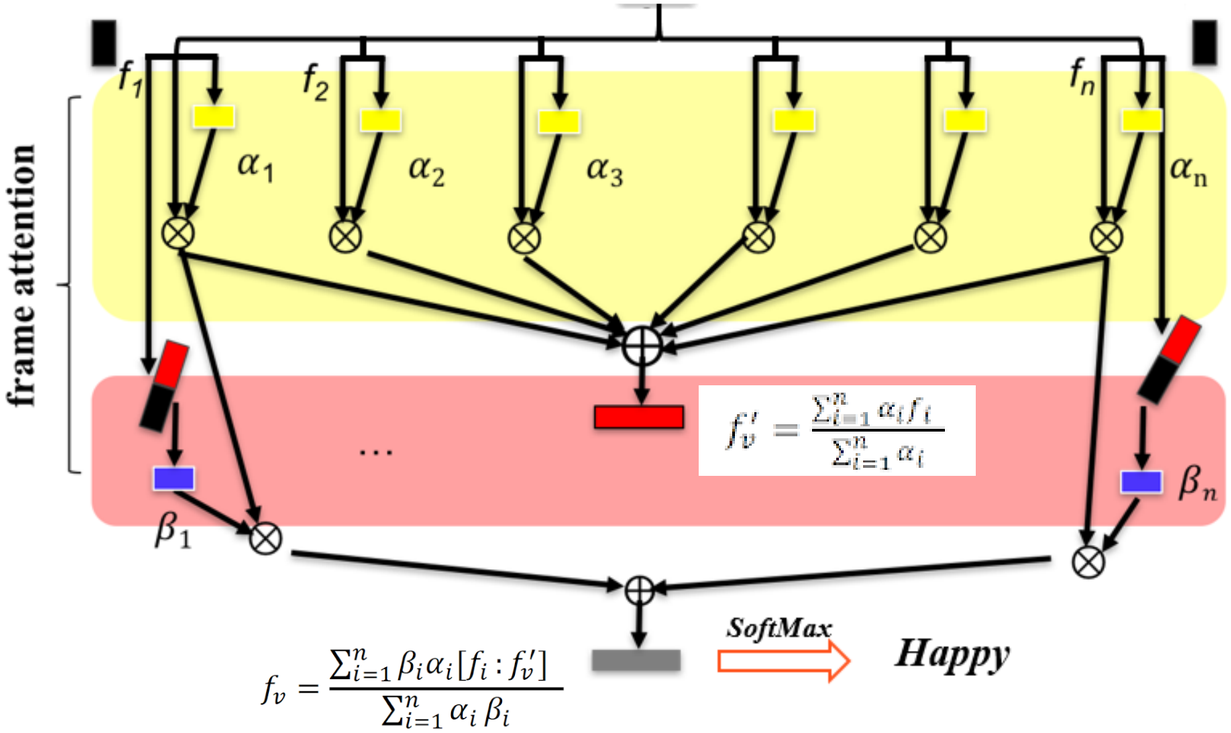
- Deep
- High Accuracy
- Advantage of residual block

PAN

Persistent Appearance Network

- PAN can model small displacements between frames.
- In FER, small displacements are mouth, forehead and eye's displacement.

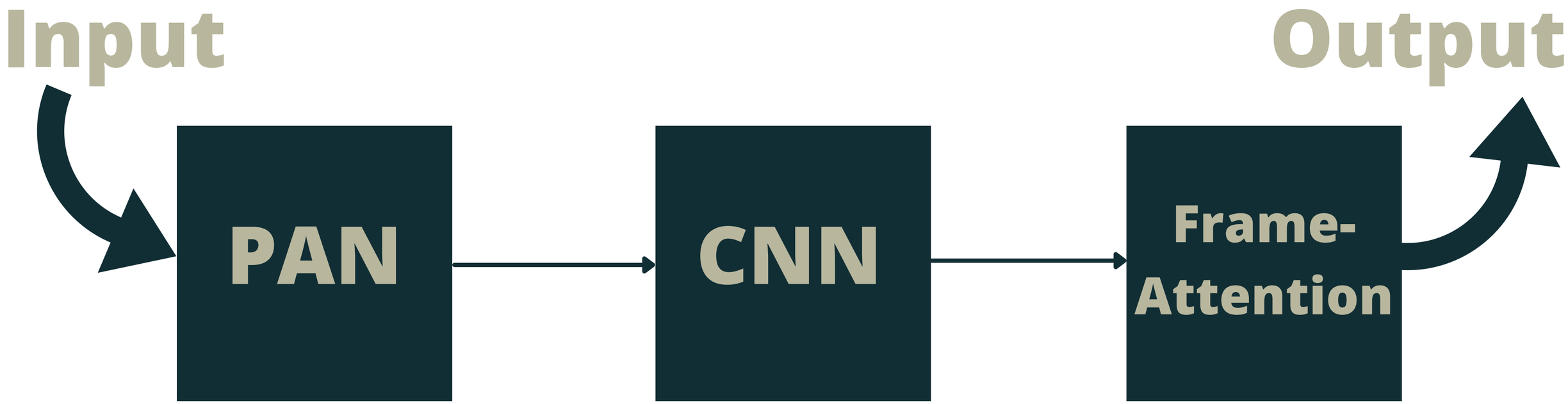




Frame-Attention

- Assign attention weights to the frames
- Generate a global feature vector f'_v
- Creates a final feature vector f_v

Final Model



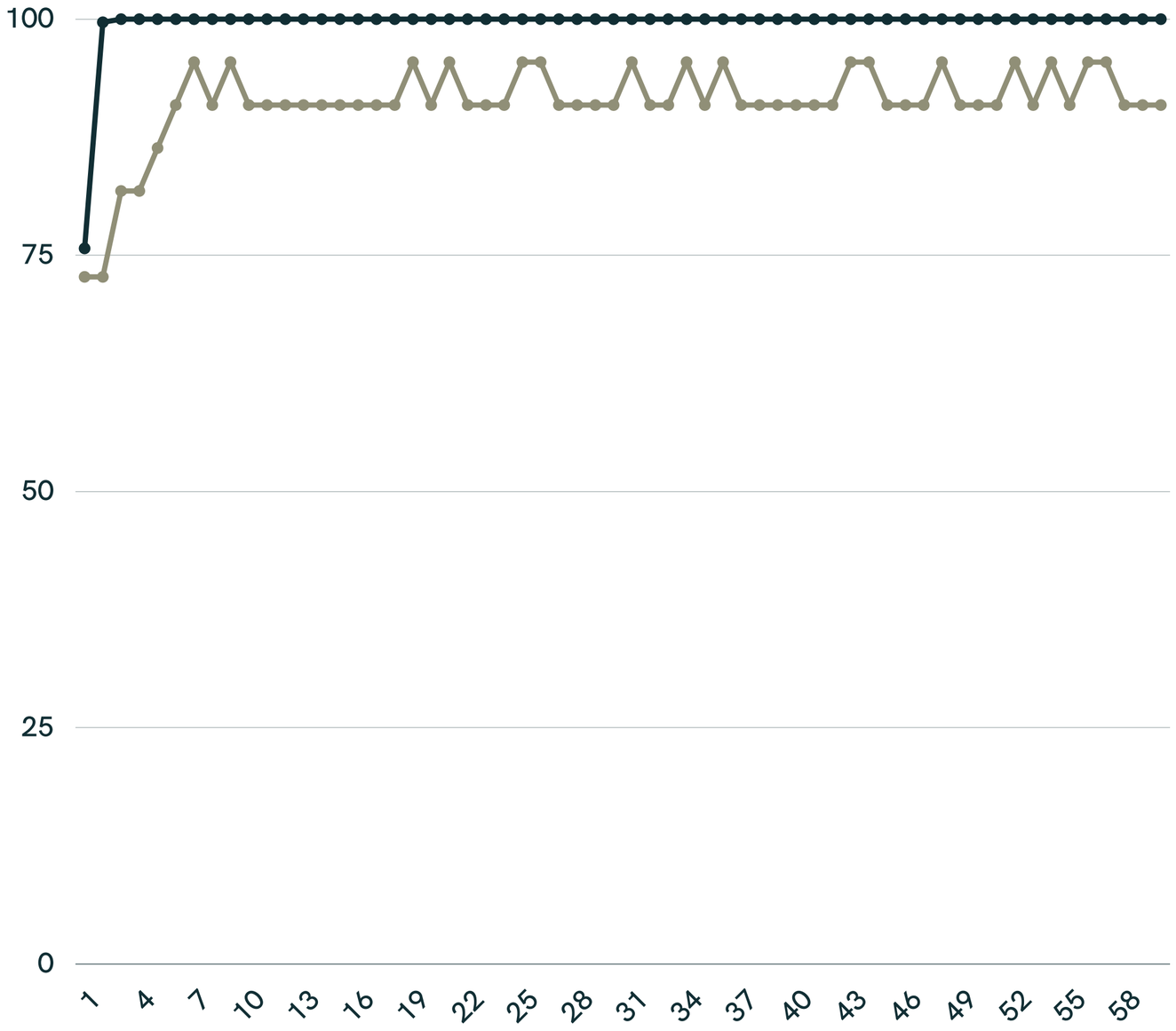
Trasnfer Learning

- We have used a ResNet-18 model which was pre-trained on the FER+ dataset.
- In our model, we trained Frame-attention network and PAN from scratch.

Optimizer and Hyperparameters

- SGD optimizer with momentum
- Learning rate - 0.02
- Epochs - 60
- Batch size - 48

Results

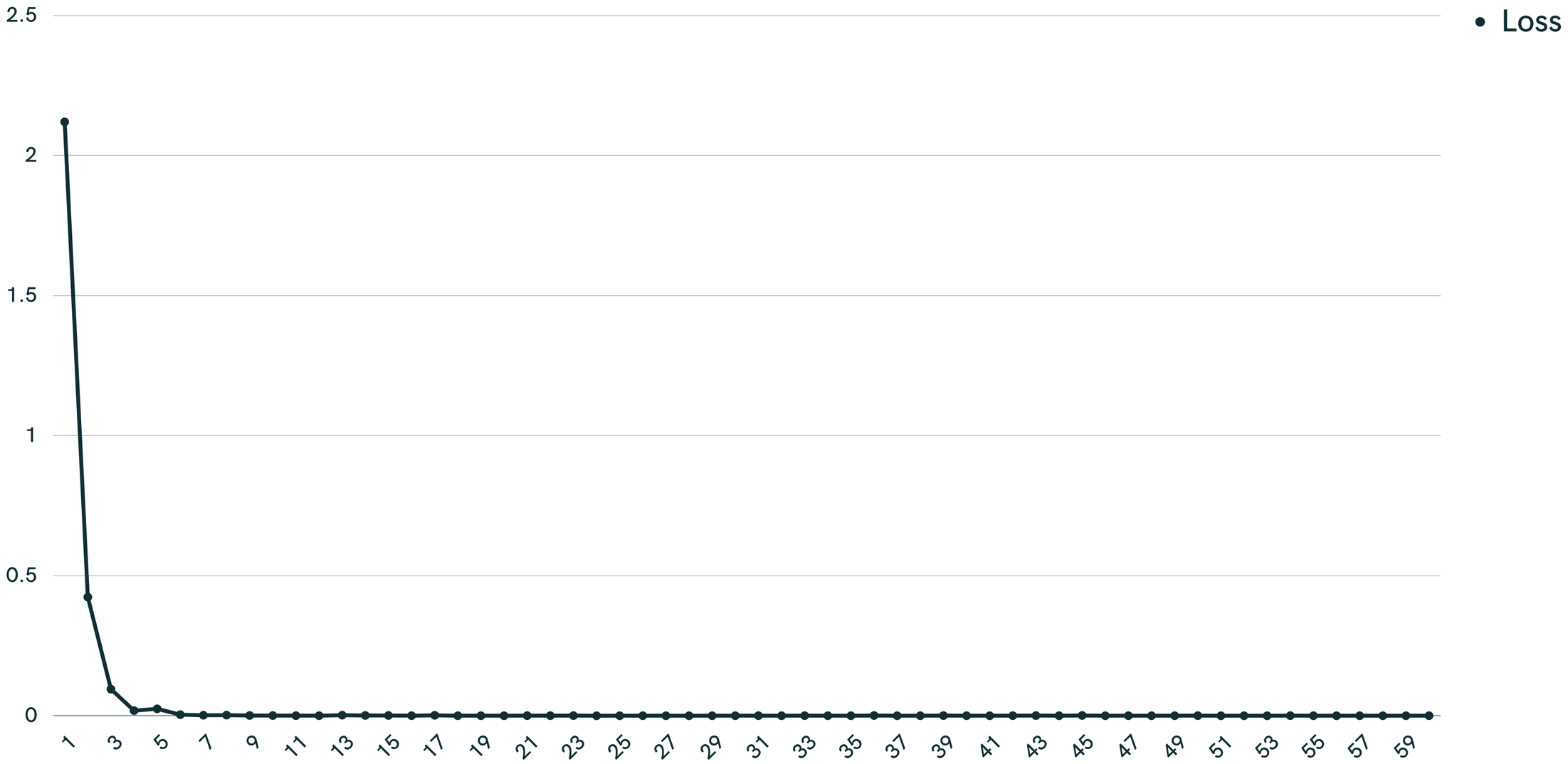


- Traning accuracy
- Validation accuracy

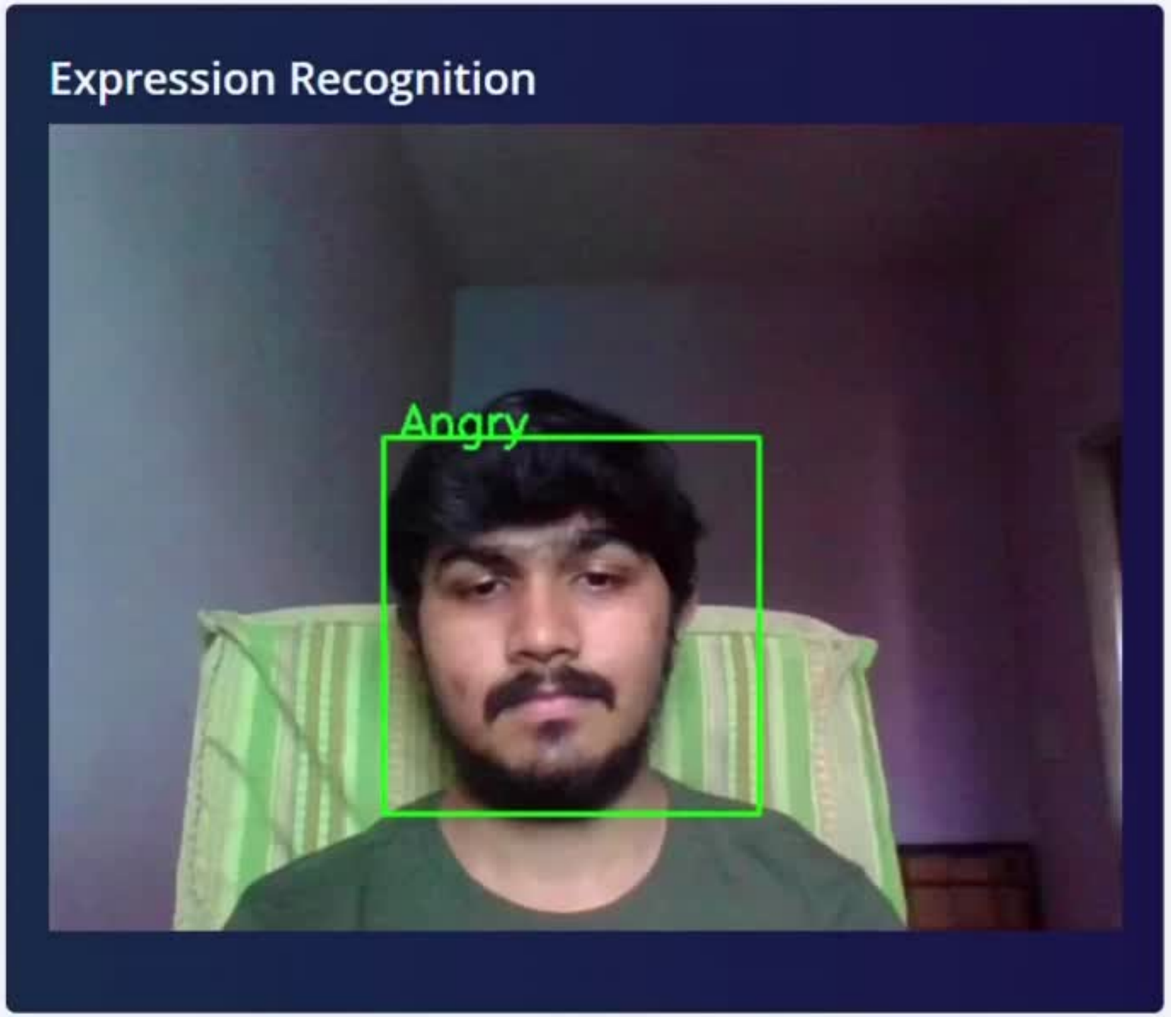
Accuracy

- We have achieved accuracy of 95.455

Cross Entropy Loss



Project : Facial Expression Recognition



Final Result

References

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Thank You