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MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY
WEST BENGAL

Image Processing & Online Recommendation of Products Using Artificial Intelligence Techniques

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Presentation Planning

- Introduction
- Dependencies
- Flow of Control
- Architecture
- Model Training and Validation
- Model Testing
- Performance Measurement
- Accuracy Checkpoints
- Observation
- Result and Discussion
- Future Scopes

Introduction

- Customer's may not be influenced and controlled by the brand and firm, while placing an order or a request.
- They are influenced by interactions with search engines, recommendations, online reviews and other information while navigating around the digital environment.
- Facial expression and emotion analysis can help online product and service based companies in capturing their customer's expressions and hence emotions which may aid in their choose the right target consumers.
- Facial muscle generates monetary adaptation in facial appearance which can be recapitulated by incorporating action units.

Dependencies

- KERAS
- PANDAS
- NUMPY
- TENSORFLOW
- KERNEL
- KERAS CONV2D
- FILTERS
- STRIDES
- MAXPOOL 2D
- MAX POOLING
- RELU
- DROPOUT LAYER

Dataset Description

- The data consists of 48x48 pixel grayscale images of faces.
- The total data used for Training and Testing are 20962 and 6043 respectively.
- The facial emotions that we have worked with are:

<i>Emotion</i>	Angry	Happy	Sad	Surprise	Neutral
<i>Tag</i>	0	3	4	5	6

Dataset Representation

- Sample of Kaggle's tagged dataset



- Representation of dataframes in Pandas

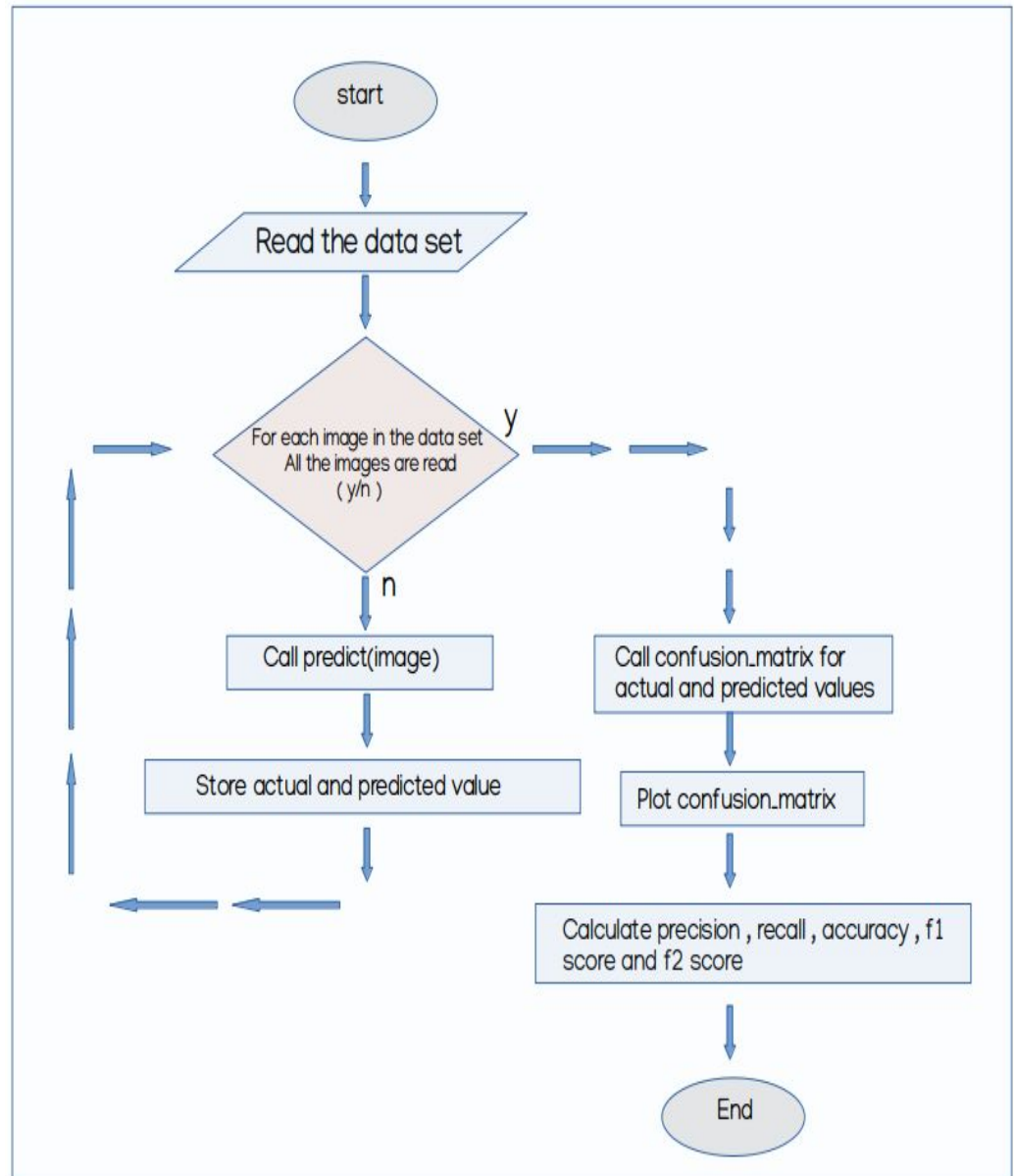
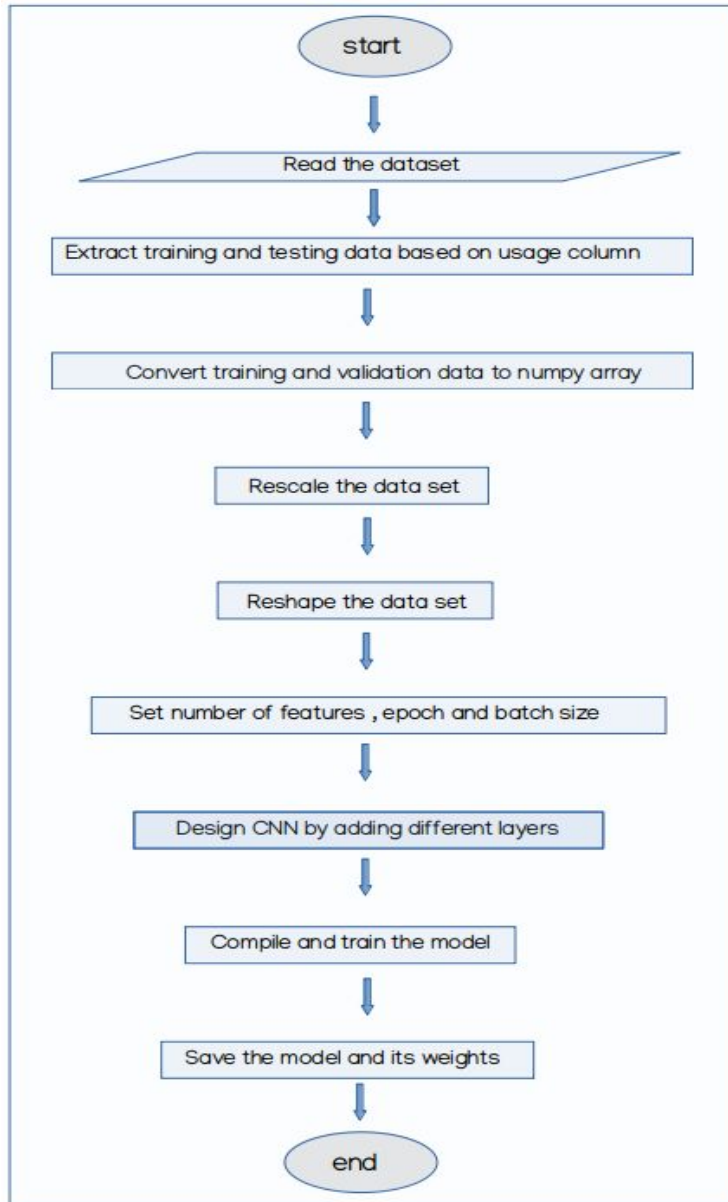
	emotion																pixels	Usage
0	0	70	80	82	72	58	58	60	63	54	58	60	48	89	115	121...	Training	
1	0	151	150	147	155	148	133	111	140	170	174	182	15...				Training	
2	2	231	212	156	164	174	138	161	173	182	200	106	38...				Training	
3	4	24	32	36	30	32	23	19	20	30	41	21	22	32	34	21 1...	Training	
4	6	4	0	0	0	0	0	0	0	0	3	15	23	28	48	50 58 84...	Training	

Data Sanitization and Cleaning

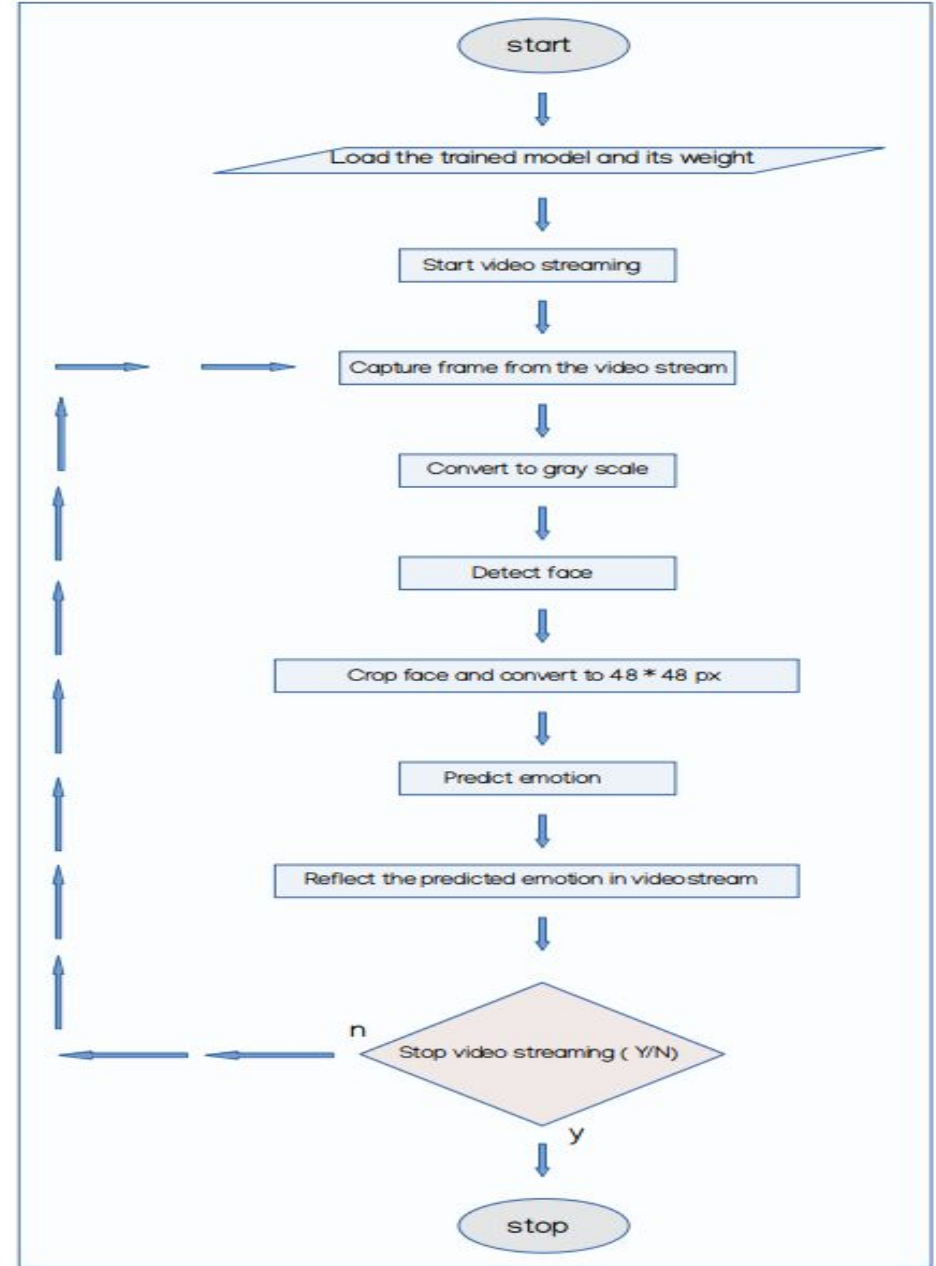
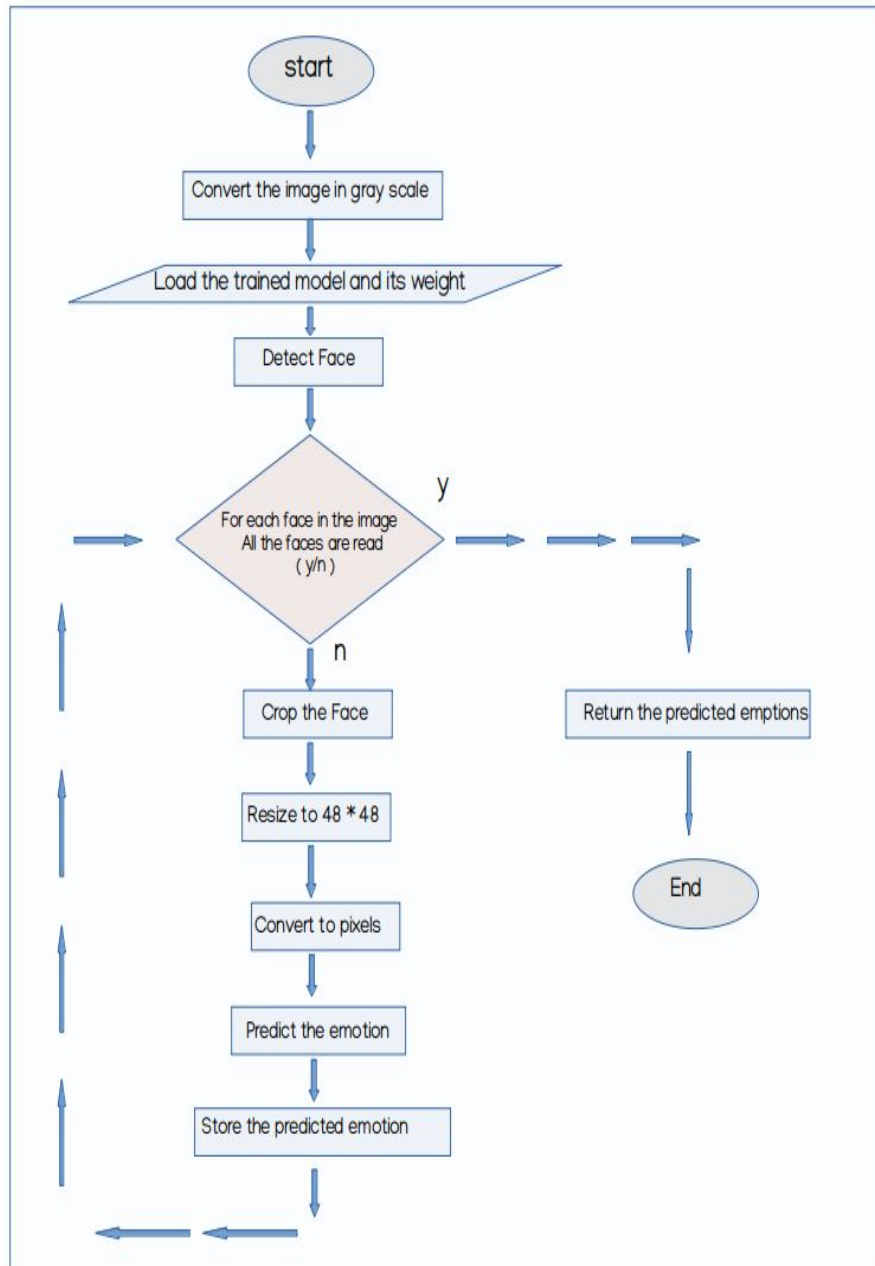
- The dataset was already clean that we have used from Kaggle,so no preprocessing was required
- Reduced the count of training data for the tag of Happy to around 4000.
- Finally the training and validation data counts boiled down to:

<i>Emotion</i>	Angry	Happy	Sad	Surprise	Neutral
<i>Training Count</i>	3995	4001	4830	3171	4965
<i>Validation Count</i>	958	1774	1247	831	1233

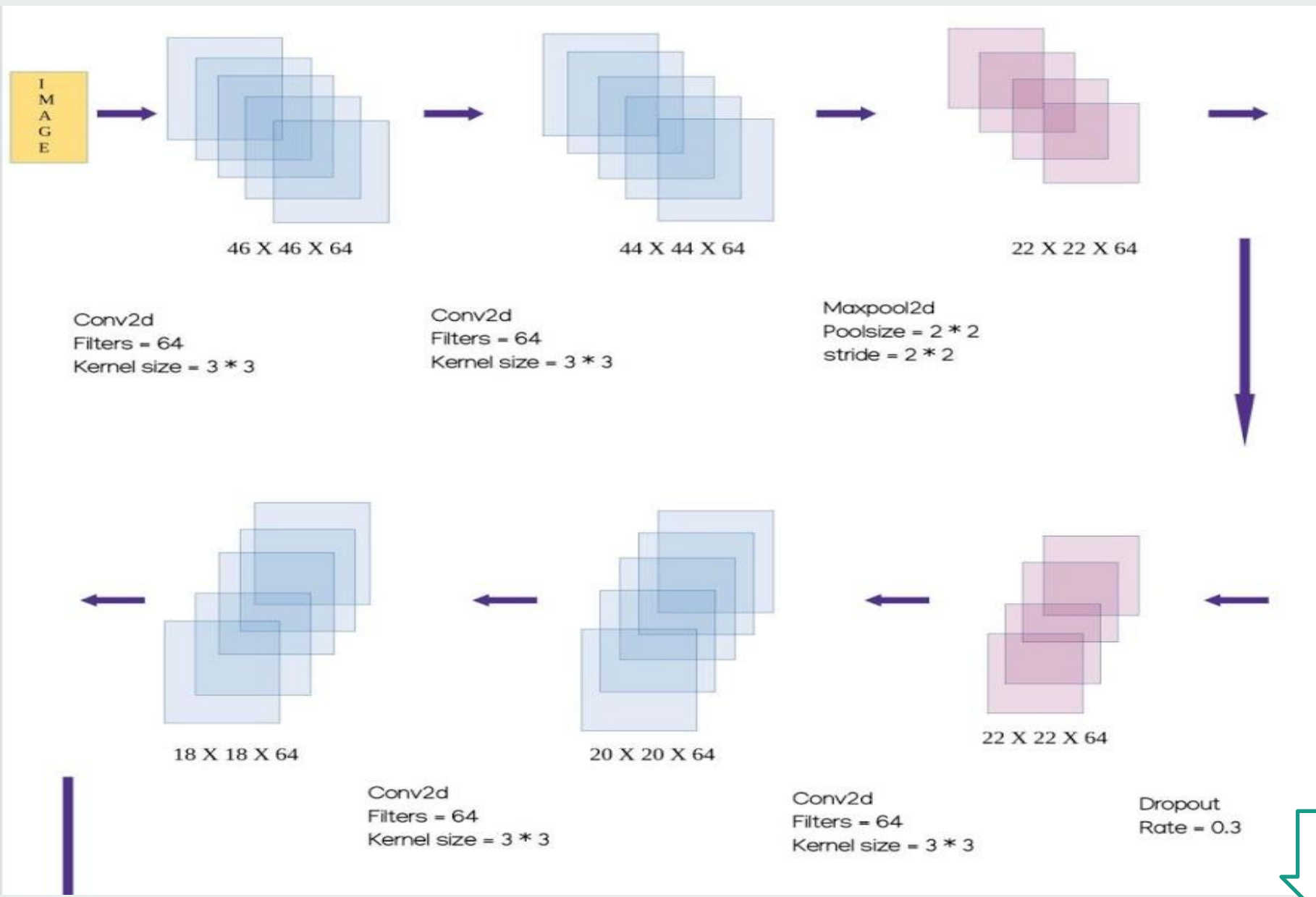
Flow of Control – Training and Performance Analysis



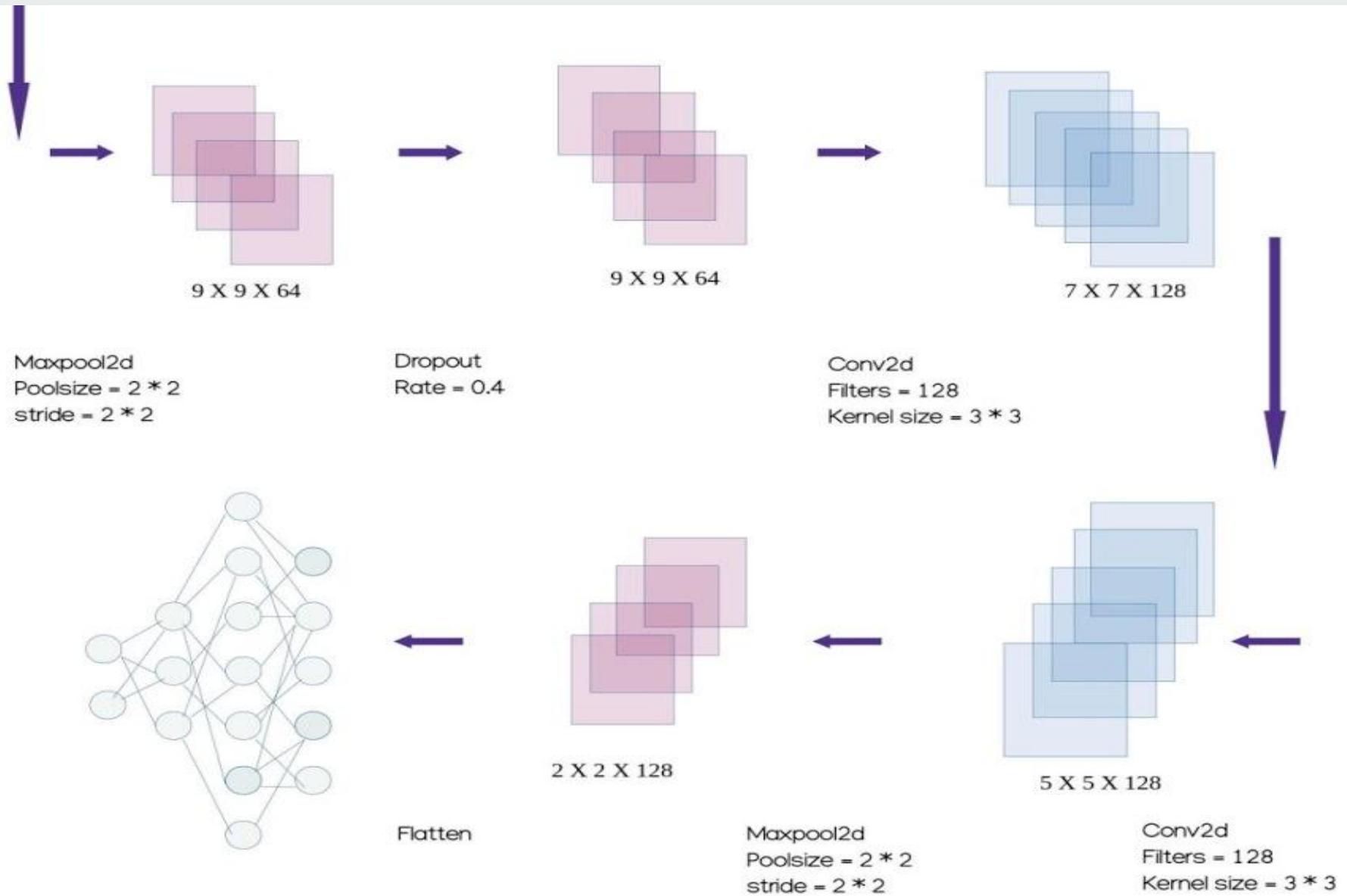
Flow of Control - Prediction on Real Time Data



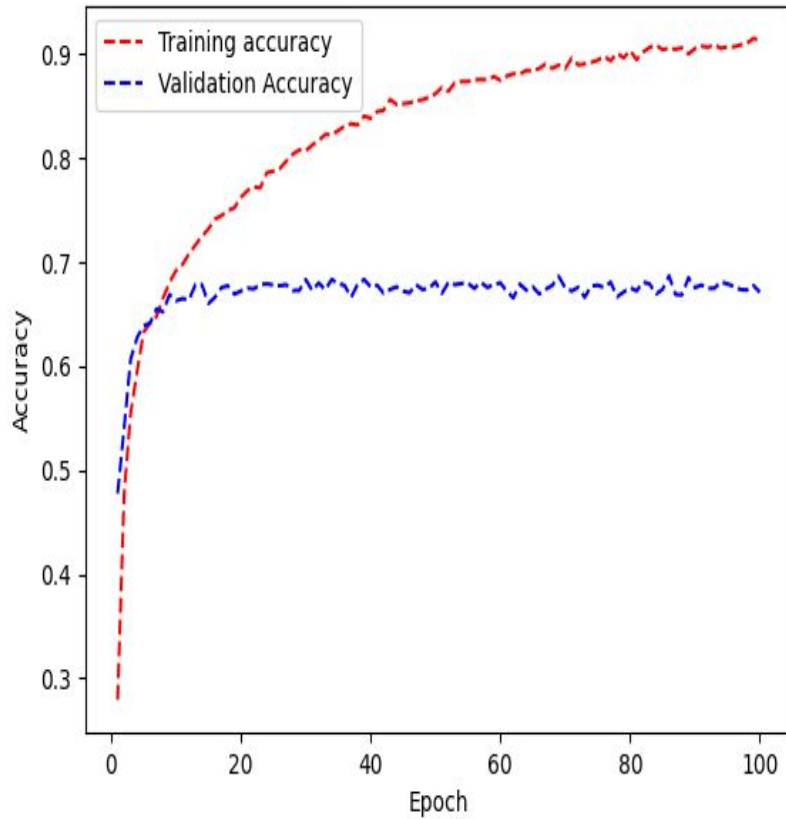
Architecture



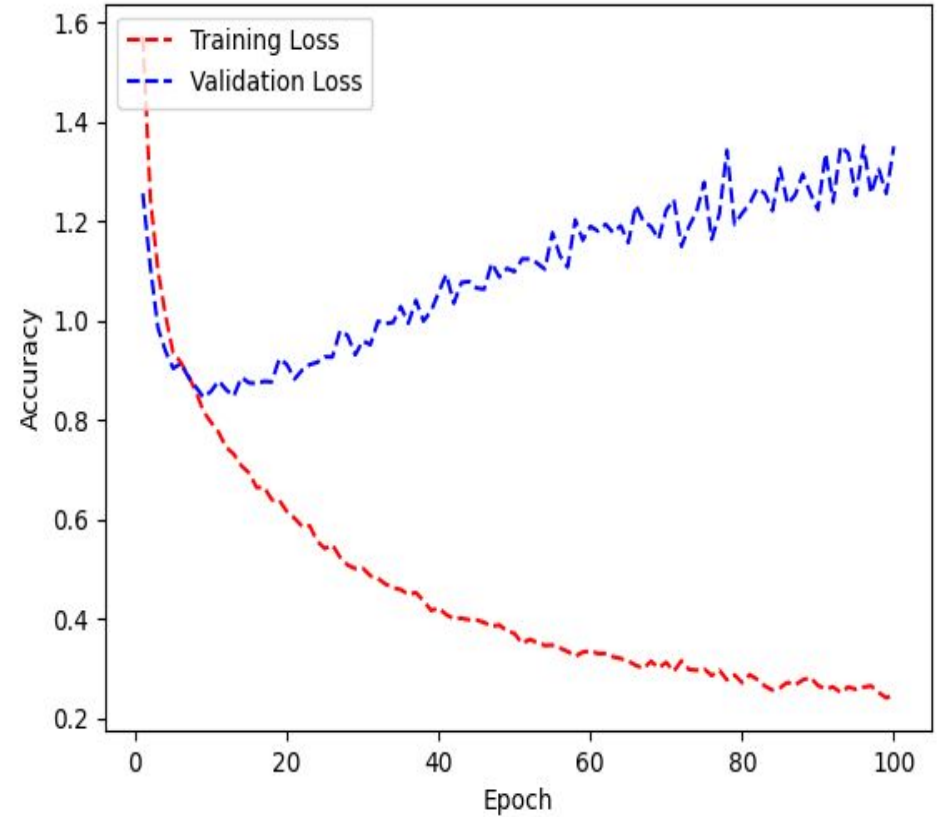
Architecture (contd.)



Model Training and Validation

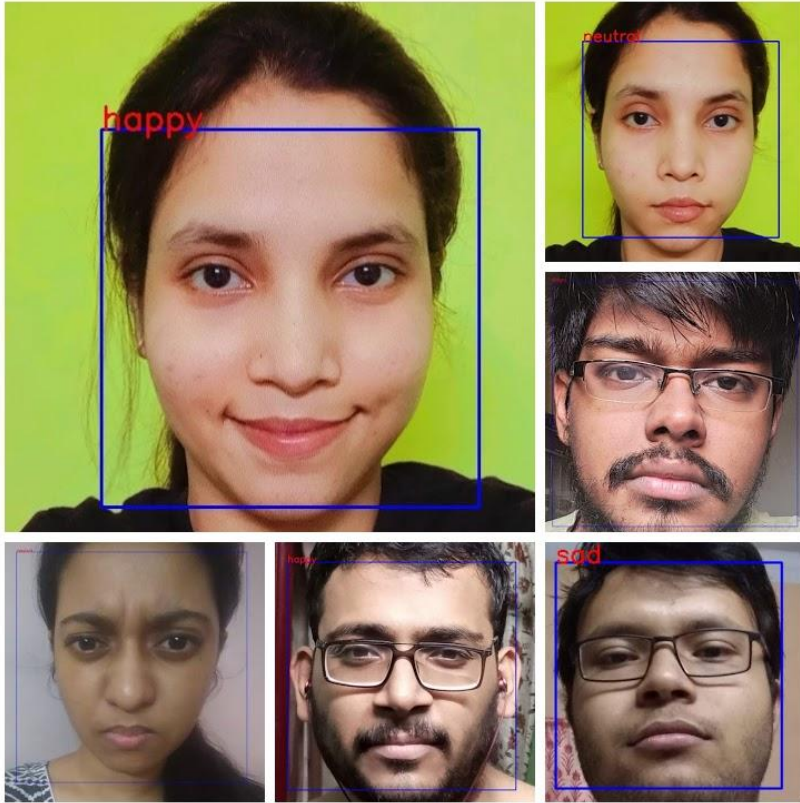


Accuracy plot



Loss plot

Model Testing



Test on Offline Images



Test on Live Video:

Multiple image frames are extracted from live video stream and fed to the Model for Predictions

Performance Measurement

		Predicted Class	
		POSITIVE	NEGATIVE
Actual Class	POSITIVE	True Positive (TP)	False Negative (FN) Type II Error
	NEGATIVE	False Positive (FP) Type I Error	True Negative (TN)

General Binary Classification Predictions:

True Positive (TP)

True Negative (TN)

False Positive (FP) – Type 1 error

False Negative (FN) – Type 2 error

Accuracy Checkpoints

- Precision

$$\text{Precision} = \frac{\text{TP}}{\text{TP} + \text{FP}} .$$

- Recall

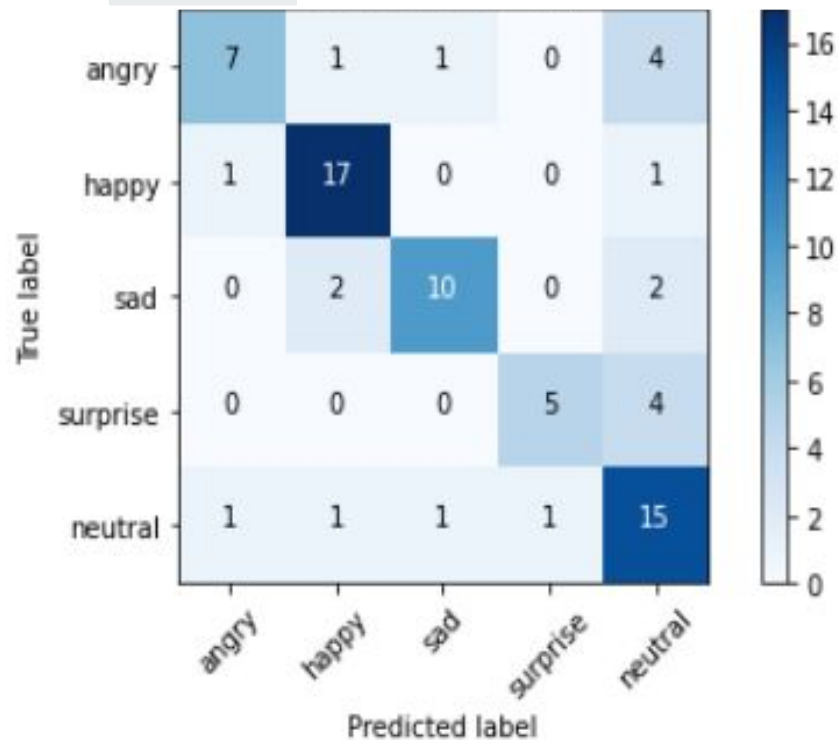
$$\text{Recall} = \frac{\text{TP}}{\text{TP} + \text{FN}}$$

- F1-Measure

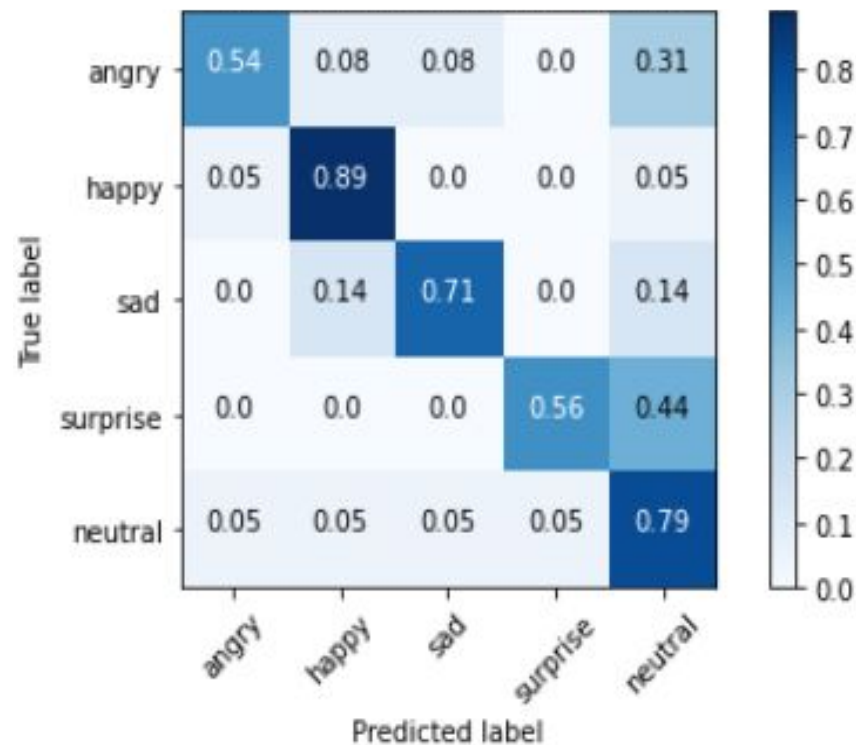
$$\text{F1 - Measure} = \frac{2}{\frac{1}{\text{Recall}} + \frac{1}{\text{Precision}}}$$

Observation

Confusion Matrix generated for this Model.



Confusion Matrix



Normalized Confusion Matrix

Result and Discussion

Accuracy : 73%

	Emotions	Precision	Recall	F1 Score
0	angry	0.78	0.54	0.64
1	happy	0.81	0.89	0.85
2	sad	0.83	0.71	0.77
3	surprise	0.83	0.56	0.67
4	neutral	0.58	0.79	0.67

The correctness of Predictions of each individual emotion is analysed in terms of Precision, Recall and F1-Score.

Future Scope

- Real-Time quality prediction for online shoppers.
- In order to achieve better accuracy, we need to integrate both audio and facial based systems into a single system.
- Unable to show a mixture of two or more basic emotions (like Surprise with Happiness).
- This will push researchers in the future to build larger databases and create powerful deep learning architectures to recognize all basic and secondary emotions.

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Thank You