Countenance Classifier : How are you feeling today?

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PROBLEM

Facial expression classification:

- **Capture live stream** from a video camera attached to a laptop for our experiments.
- **Apply** and **Benchmark** different machine learning models for facial expression recognition
- **Classify** three different facial expressions: **Neutral**, **Happy** and **Surprise**.
- Final predicted facial expression is displayed via a **live feed** using the laptop camera.

Applications of facial expression classification:

- Customer Engagement
- Virtual Reality Avatar

DATASET SOURCES

- Initial models trained on the Kaggle Dataset with 35,000 facial expression images
- Limited computation resources makes it infeasible to experiment with Kaggle Dataset
- CK Dataset supplemented with our self-created images is used in our final experiments
- Class such as **Neutral** and **Sad** appeared to be very similar to each other.

kaggle

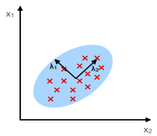
CK Dataset

Supplemented with self created images

Traditional Approaches

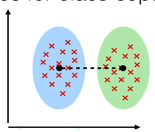
EigenFace

PCA:
component axes that maximize the variance

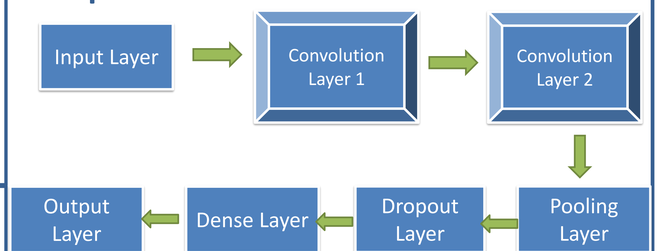


FisherFace Technique

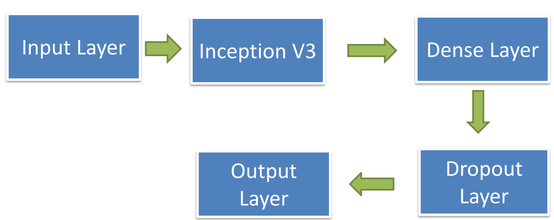
LDA:
maximizing the component axes for class-separation



Simple Convolution Neural Network



Convolution Neural Network with Inception V3

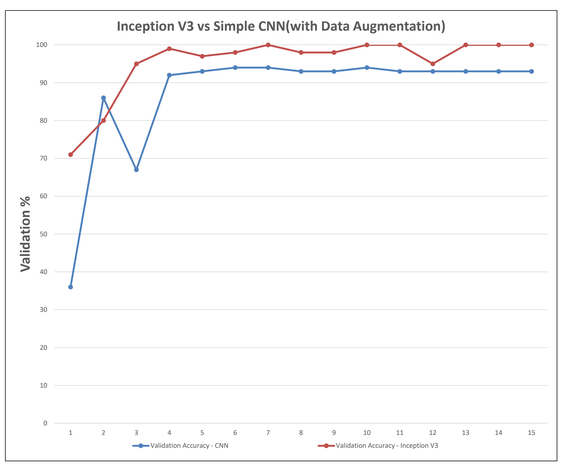


EXPERIMENTS

Summary of Results

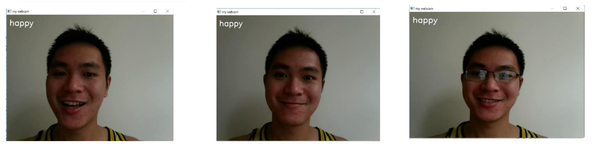
Method	Accuracy without data augmentation	Accuracy with Data Augmentation
EigenFace	**66%**	**68%**
FisherFace	**87%**	**88.2%**
Simple CNN	**94%**	**94%**
Inception V3 (Inception training disabled)	**91%**	**91%**
Inception V3 (Inception training enabled)	**99%**	**99%**

Validation Accuracy by Epoch



LIVE DEMO

- **Happy Expression**



- **Neutral Expression**

- **Surprise Expression**

LIMITATIONS

- Due to computing resource constraints, training the Inception V3 model on CPU'S is time consuming.
- Hence, small data set is used in our experiments
- Live demo is more challenging because of different conditions (lightning, blur, angles, glasses)

CONCLUSIONS

- Out of the two traditional approaches, **FisherFace** technique outperforms **EigenFace** technique.
- **Convolutional Neural Network** outperforms traditional techniques.
- Enabling **Inception V3** training improves model performance significantly.