Facial Image Analysis for Age & Gender Prediction

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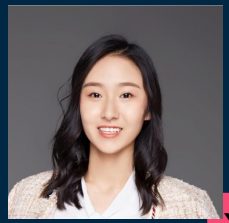
Nov 29, 2021

OUR TEAM

MC Kreps

Saiteja Reddy

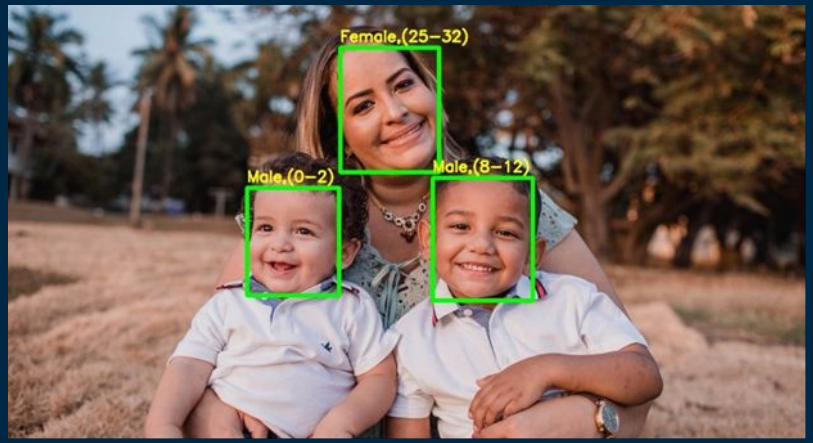


Yuyan Shi

Ramya Desineedi

Palak Agarwal

OBJECTIVE



01

Classify Image based on **Gender**

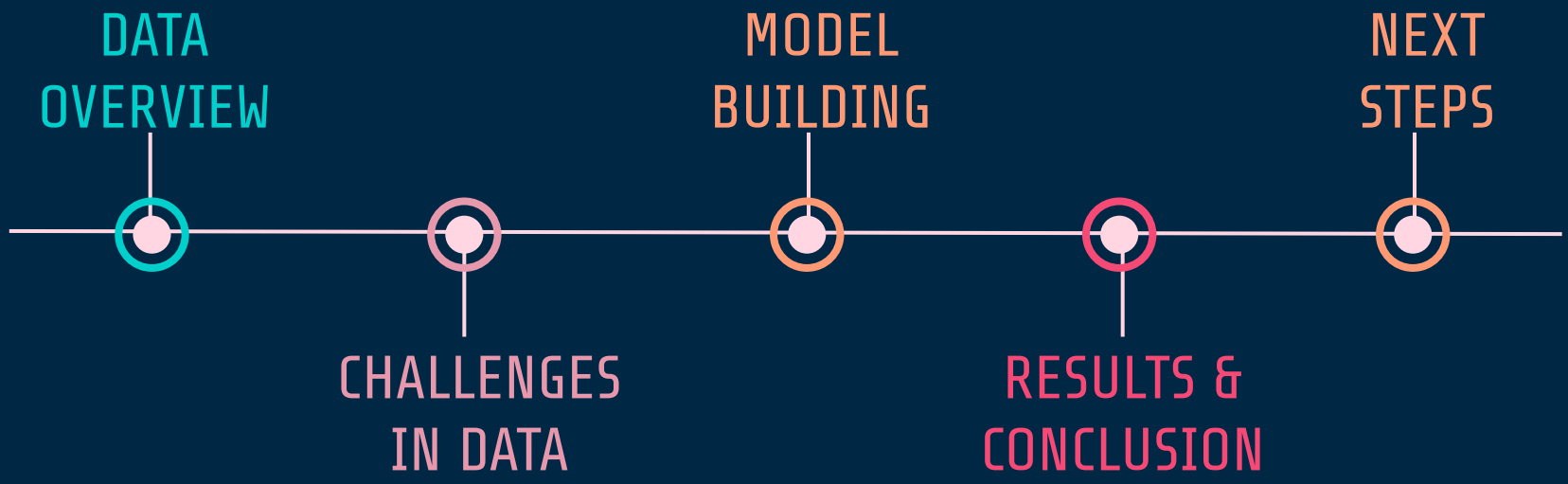
02

Predict Age from facial features

BUSINESS APPLICATIONS

- **Authentication**: Duo Security style feature for Gender & Age in Online Dating Apps
- **Fitness**: Comparison of Actual and Physiological age to understand degree of skin-aging
- **Marketing**: Automatic capture of in-store or event demographics
- **Music**: Music recommendation based on demographics in the crowd at restaurants, cafes
- **Security Surveillance**: Automatic screening at places where there is age restriction such as bars, pubs

PRESENTATION TIMELINE



DATASET

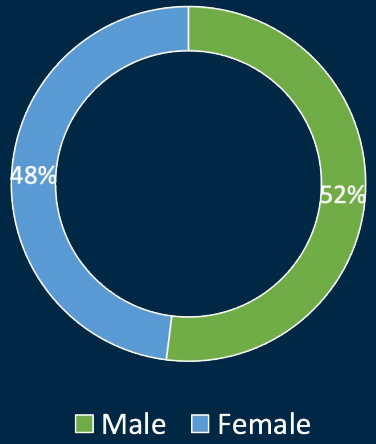
Data: UTKFace dataset

Highlights:

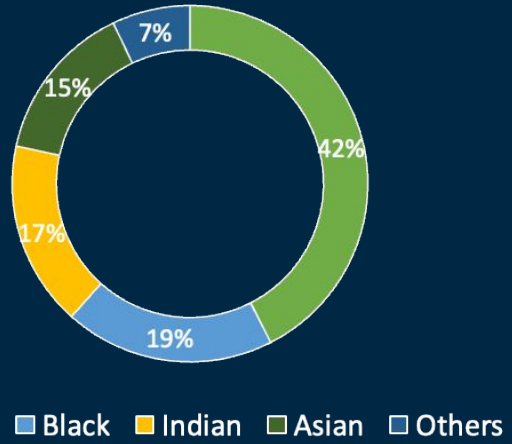
- 23k+ face images (only single face in one image)
- Aligned and cropped faces
- Images labelled by age, gender, and ethnicity

DATA OVERVIEW

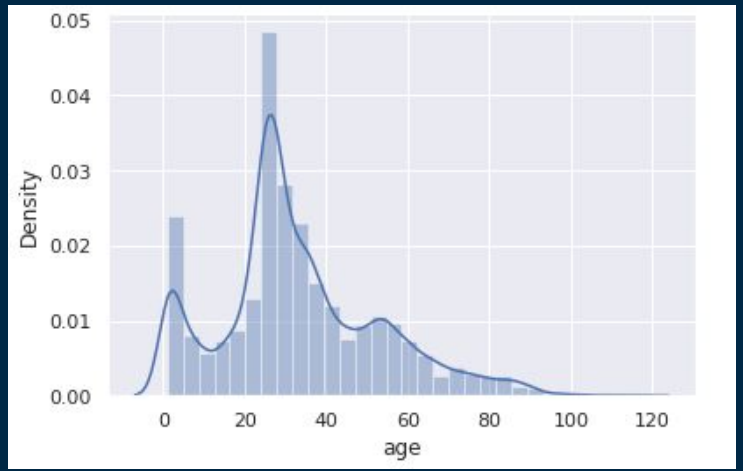
GENDER



ETHNICITY



AGE



23,000+
Facial Images

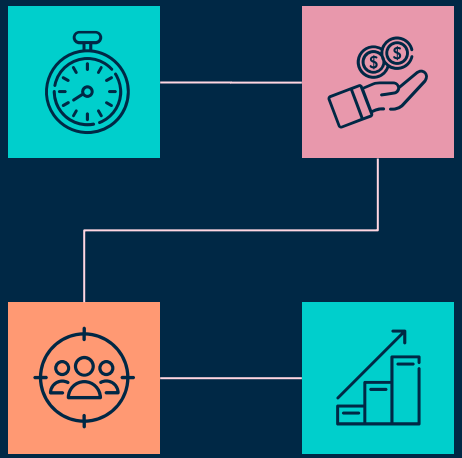
CHALLENGES FACED IN DATA

- Different exposure levels
- Make-up
- Race/Ethnicity
- Auto-correction
- Filters in Images
- Not all age the same

MODELS

MODEL 1
CNN 1

MODEL 2
CNN 2



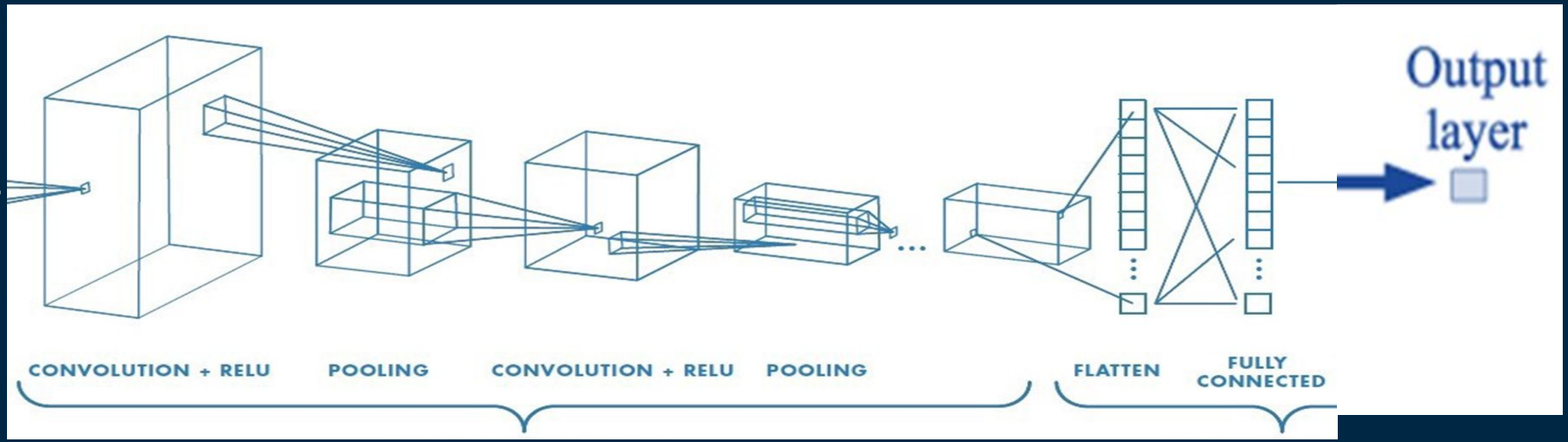
MODEL 3
VGG16,
Mobilenet

MODEL 4
AlexNet +
XGBoost

CNN ARCHITECTURE

3 Convolution + ReLU with max pooling, 1 Feed Forward network
Output layer : Sigmoid for gender classification, Relu for age prediction

Input



Feature learning

Classification / Prediction

CNN1 RESULTS

3 Convolution + ReLU with max pooling, 1 Feed Forward network
Output layer : Sigmoid for gender classification, Relu for age prediction

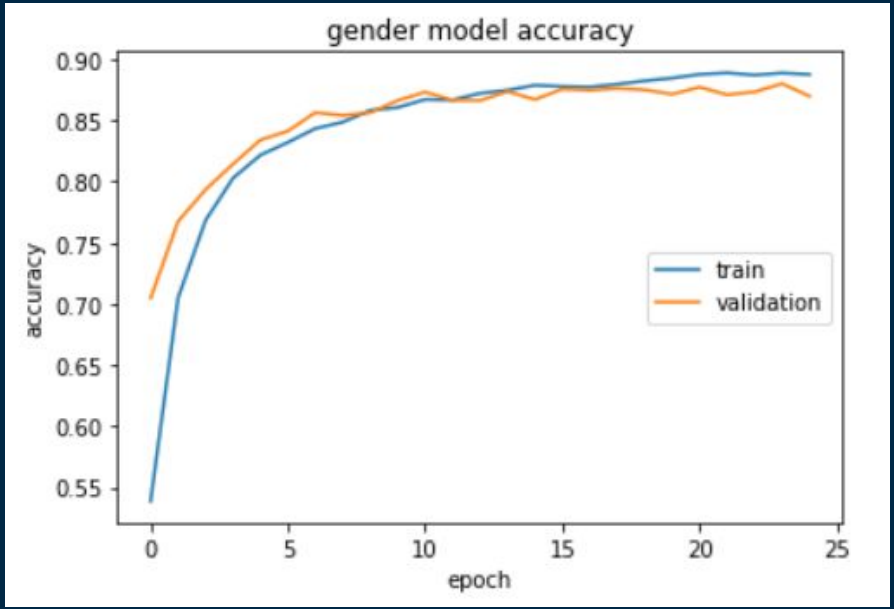
Gender Classification

Age Prediction

75%
train data

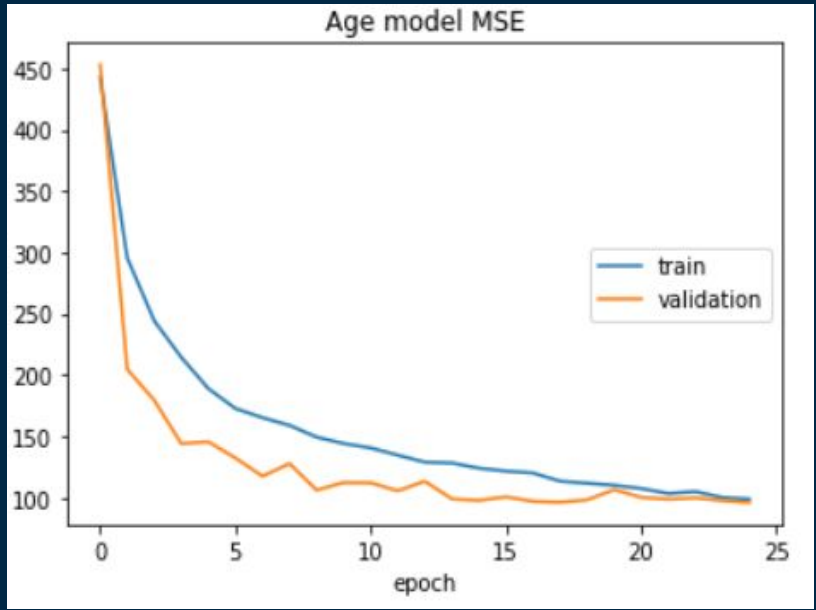
25%
test data

CNN1 RESULTS



Accuracy on test data

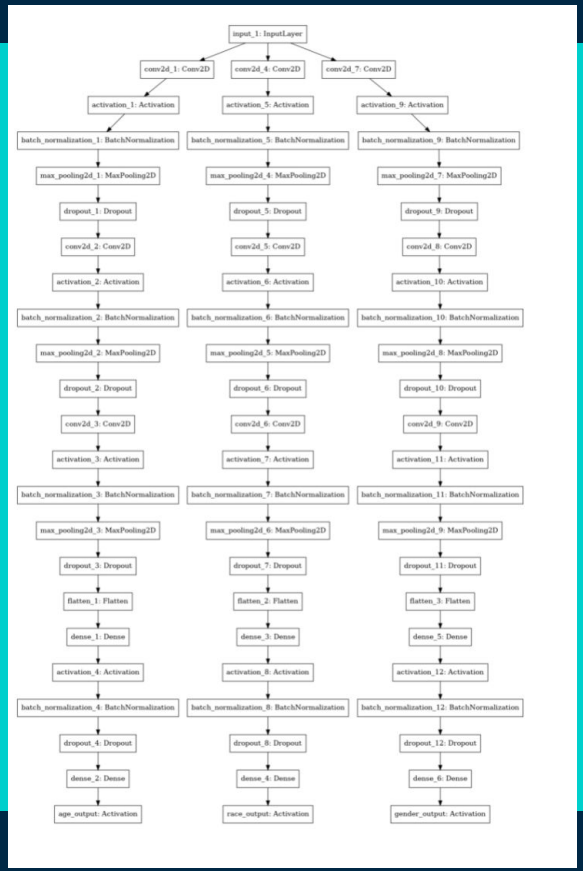
88.2%



Test data MSE

99.6

CNN 2: MULTI-OUTPUT MODEL



Branches: 3, 2 Used: Age, Gender
Custom weights & loss function

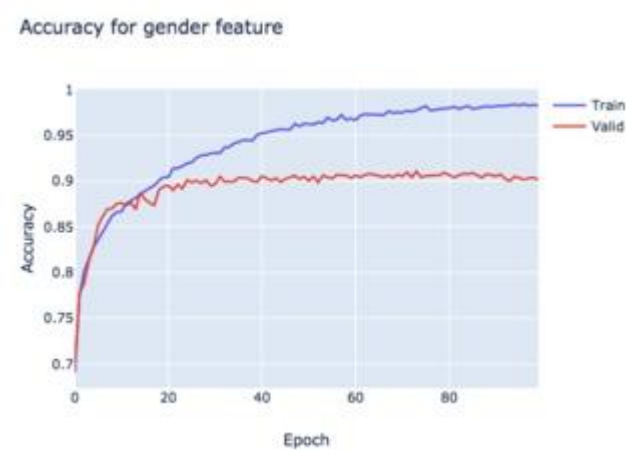
Model Architecture:

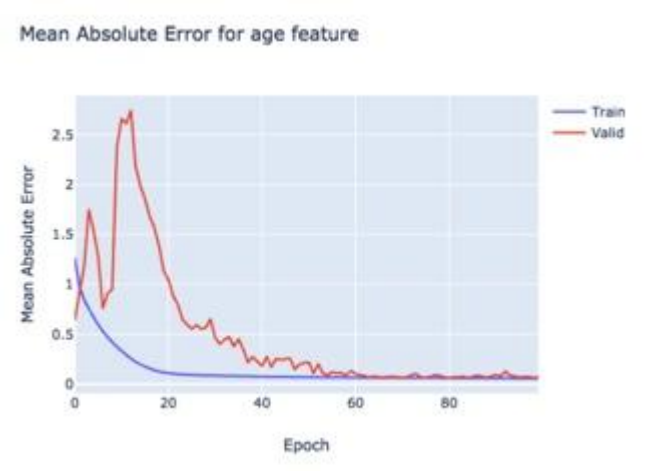
- Conv2D layer with a ReLU activation
- BatchNormalization layer
- MaxPooling layer
- Dropout layer
- Dense layer

Hyper parameters:

- Learning rate: 1e-3
- Optimizer: Adam
- Batch size: 20

CNN 2 RESULTS





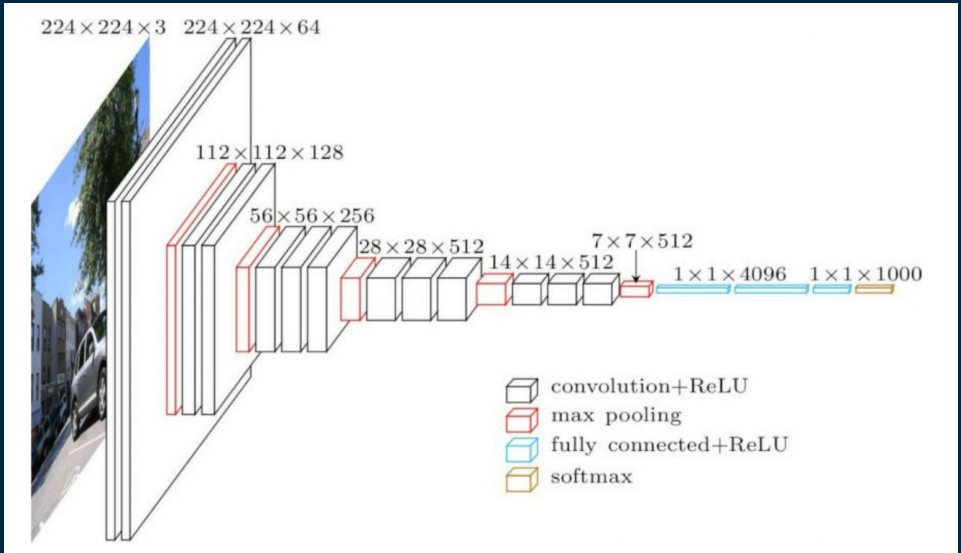
Gender Accuracy

91%

Age MAE/R2

0.09/ 66%

TRANSFER LEARNING: VGG16 ARCHITECTURE



- A convolutional neural network
- Proposed by K.Simonyan and A.Zisserman from the University of Oxford
- 16 learnable layers deep - 3 fully connected and 13 hidden layers
- 3x3 filters across convolutional layers
- Approximately 138M parameters

TRANSFER LEARNING: VGG16

Gender Classification

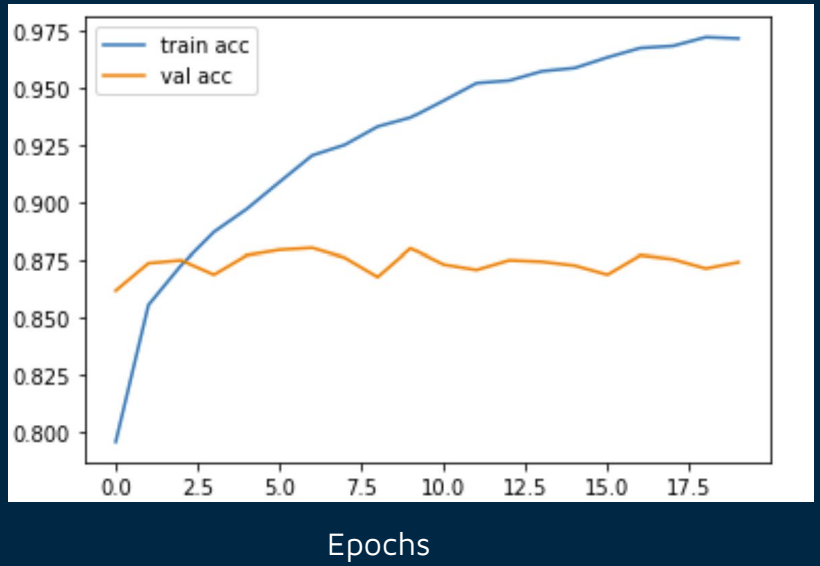
Age Classification

Age Classification
(granular binning)

80%
train data

20%
test data

VGG16 RESULTS - GENDER CLASSIFICATION



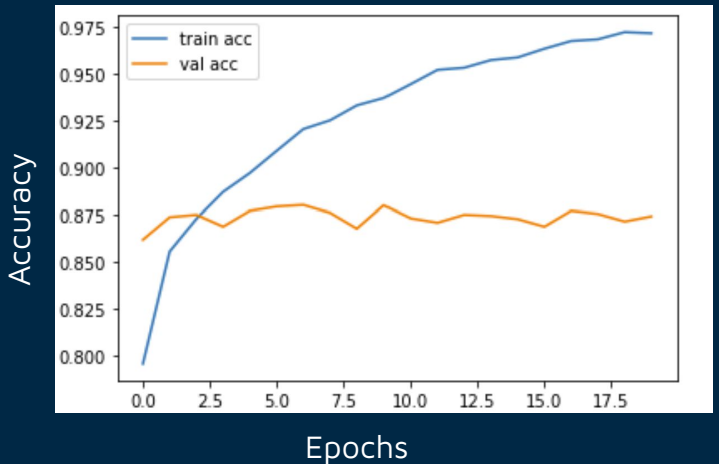
Accuracy on the test data

86.8%

VGG16 RESULTS - AGE CLASSIFICATION

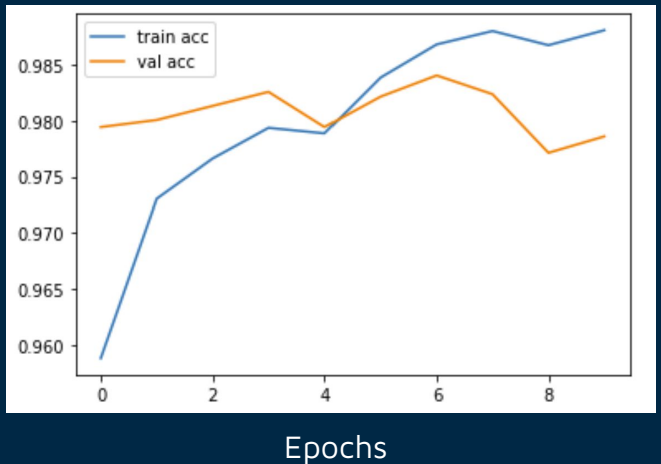
Less granular bins (range of 10 years)
Accuracy on the test data

96.1%



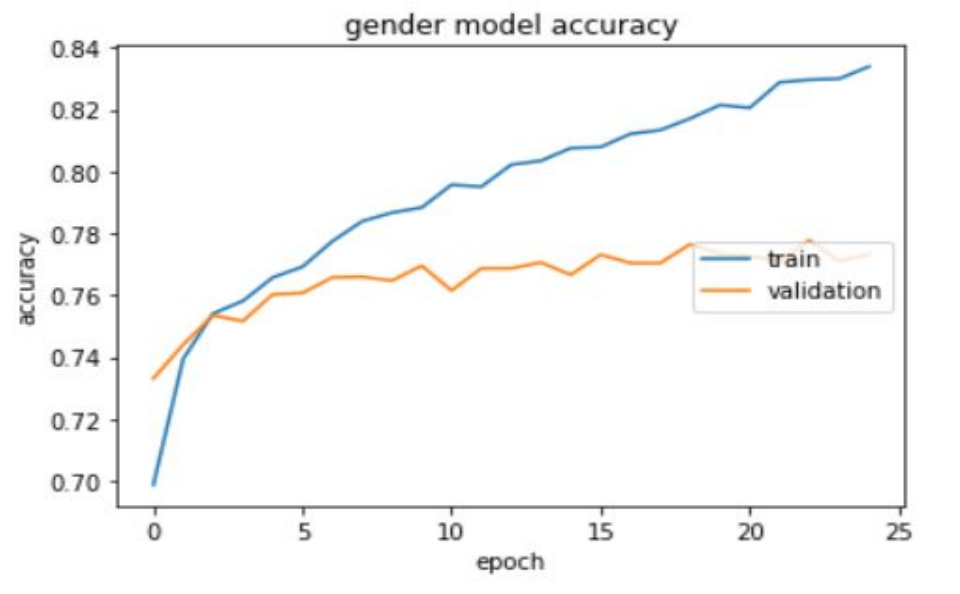
More granular bins (range of 5 years)
Accuracy on the test data

97.4%



TRANSFER LEARNING: MOBILENET

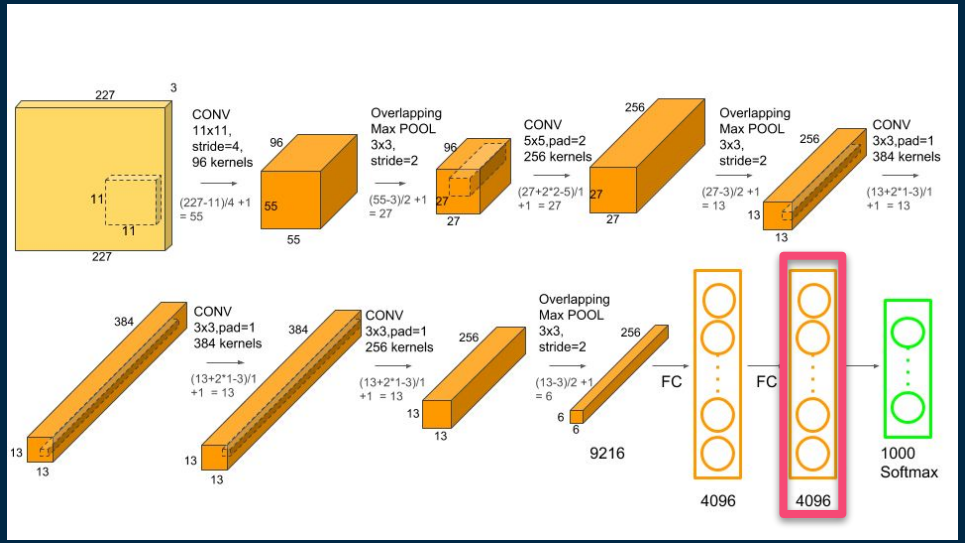
Results – Gender Classification



Accuracy on the test data

76.1%

ALEXNET + XGBOOST



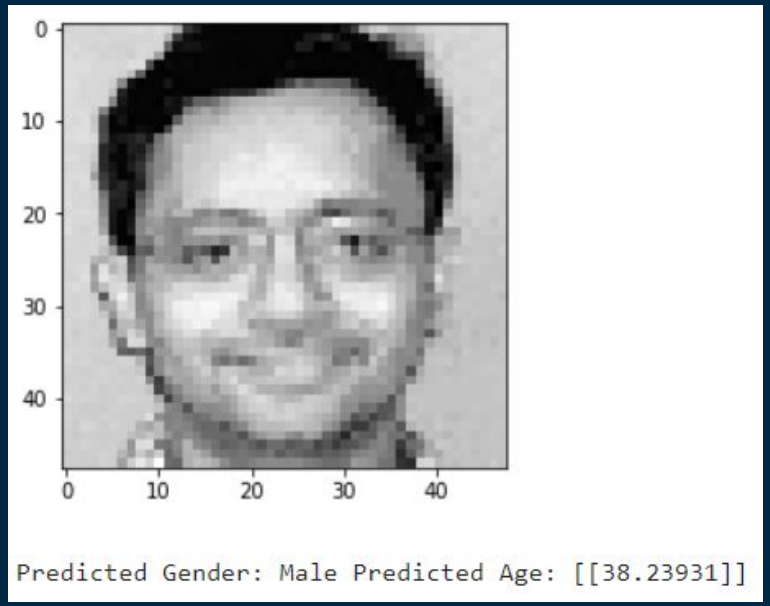
- Why we chose AlexNet as pre-trained model:
  - ReLu Activation Function
  - Overlapping
  - Drop out
  - Local Response Normalization
- Still tuning the model
- Base Model:
  - 79% for predicting gender
  - 50% for predicting age

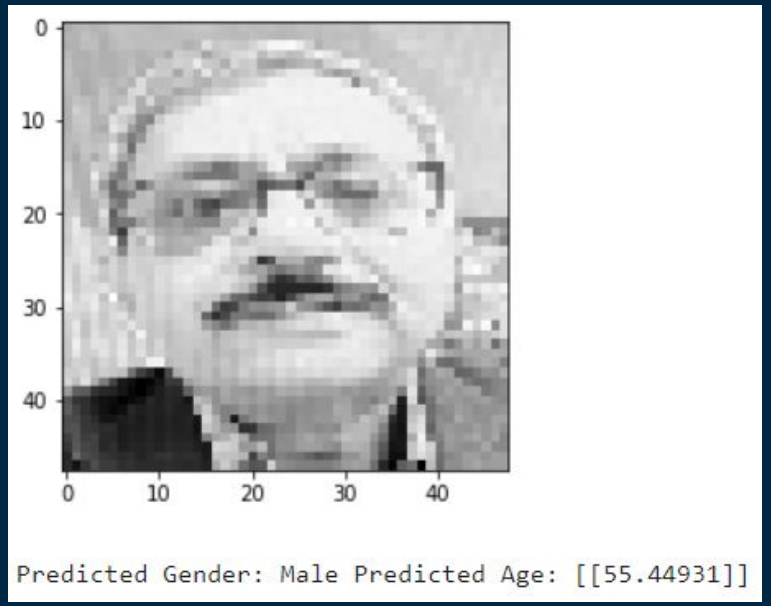
Comparison of RESULTS from various models

Model	**Accuracy** (Gender classification)	**Accuracy** (Age classification into bins)	**MSE/R2** (Age prediction)
CNN1	88.2%	-	MSE : 99.6
CNN 2	91%	-	R2 : 0.66
VGG16	86.8%	97.7%	-
MobileNet v2	76.1%	-	-
XGBoost	79%	50%	MSE : 209

Gender and age prediction of.....

Professor Ghosh !!!!





Next Steps

1

Tune XGBoost models to improve accuracy

2

Check how the accuracies of models vary across ethnicities

THANK YOU!