Age Detection with Facial Images

Prerak Agarwal

GA DSI-14 Capstone Presentation

29th June 2020

Problem Statement

- ➔ Can a computer guess a person's age just by looking at an image of their face?
- ➔ If yes, how accurately?

Potential use-cases - To study age-profile of guests at stores / venues with high volumes of guests

Agenda

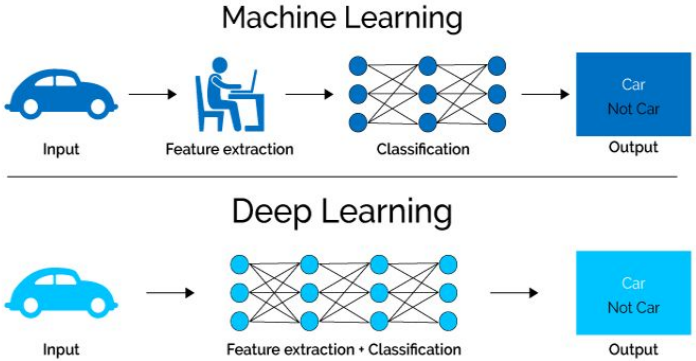
- ➔ Traditional ML vs. Deep Learning
- ➔ EDA
- ➔ Traditional ML
- ➔ Deep Learning
- ➔ Conclusion
- ➔ Demo

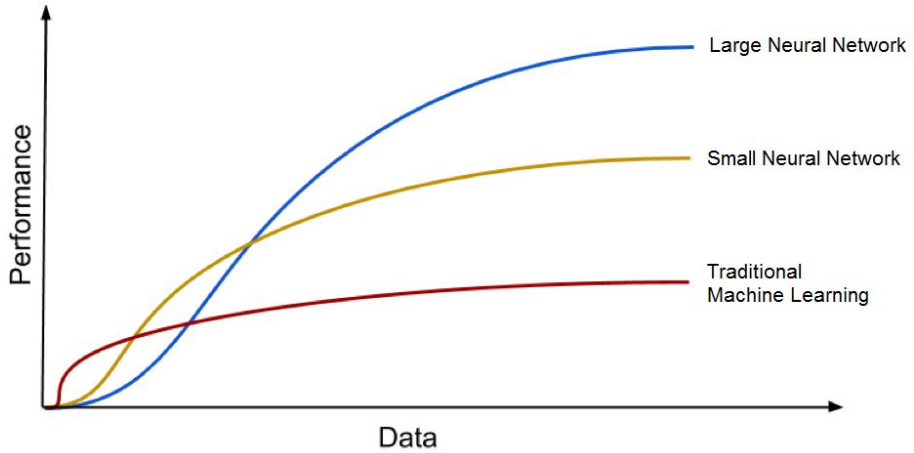
Approaches

- ➔ Traditional Machine Learning
  - Image feature extraction
  - Classification modelling with optimization

VS.

- ➔ Deep Learning
  - Building initial CNN model
  - Improving the model
  - Optimizing the model
  - Building final CNN model

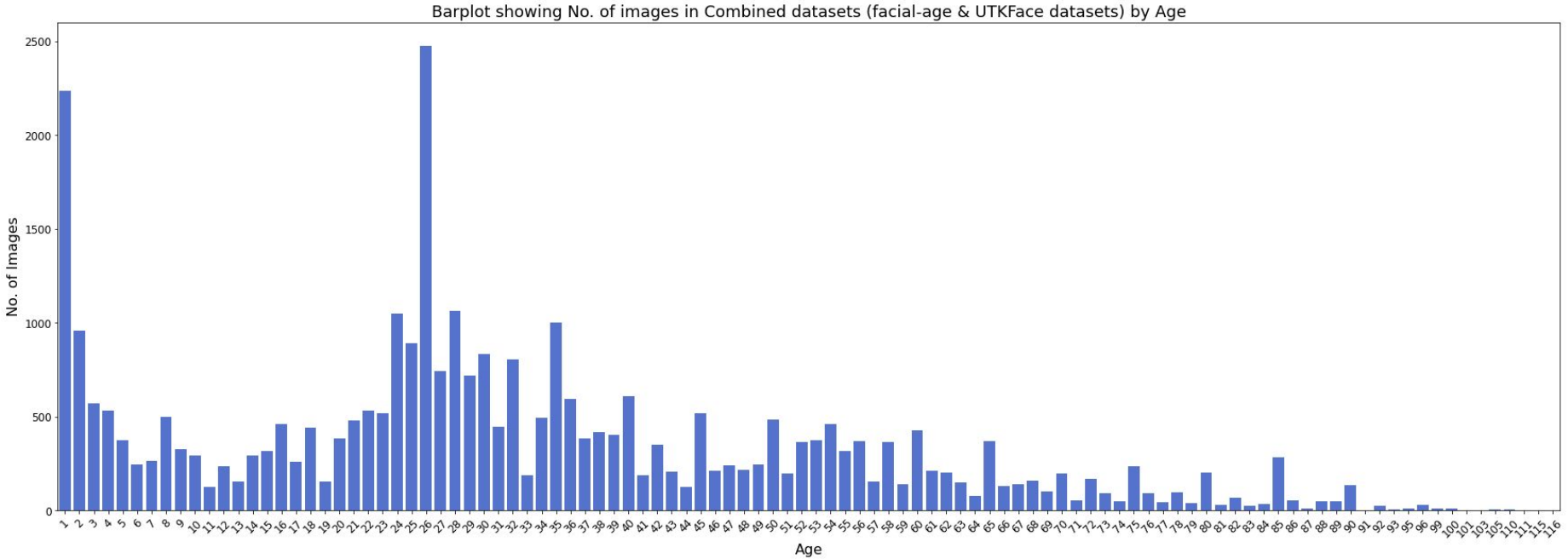




EDA & Model Prep

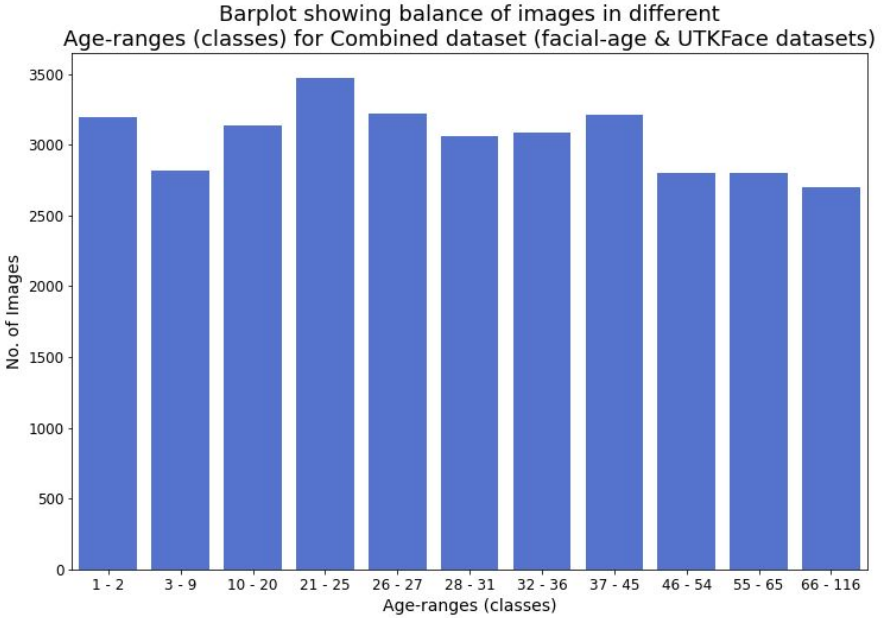
Total data: 33,486 images

- Training data (70%): 23,440 images
- Testing data (30%): 10,046 image

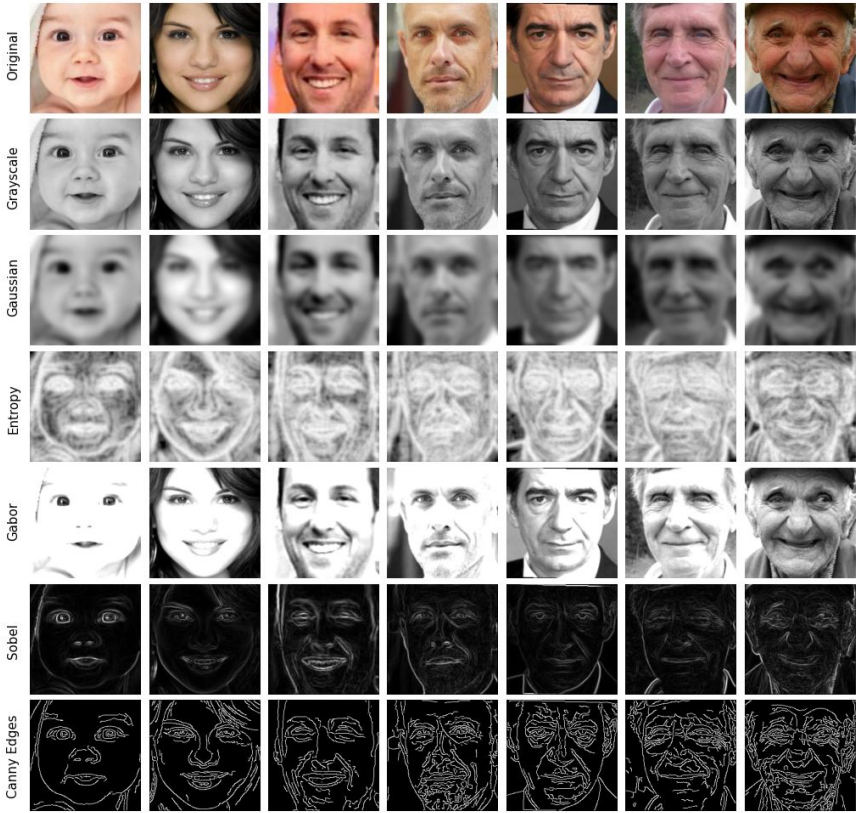


EDA & Model Prep

Class label	Age-ranges (classes)
0	1 - 2
1	3 - 9
2	10 - 20
3	21 - 25
4	26 - 27
5	28 - 31
6	32 - 36
7	37 - 45
8	46 - 54
9	55 - 65
10	66 - 116



Traditional ML - Feature Extraction



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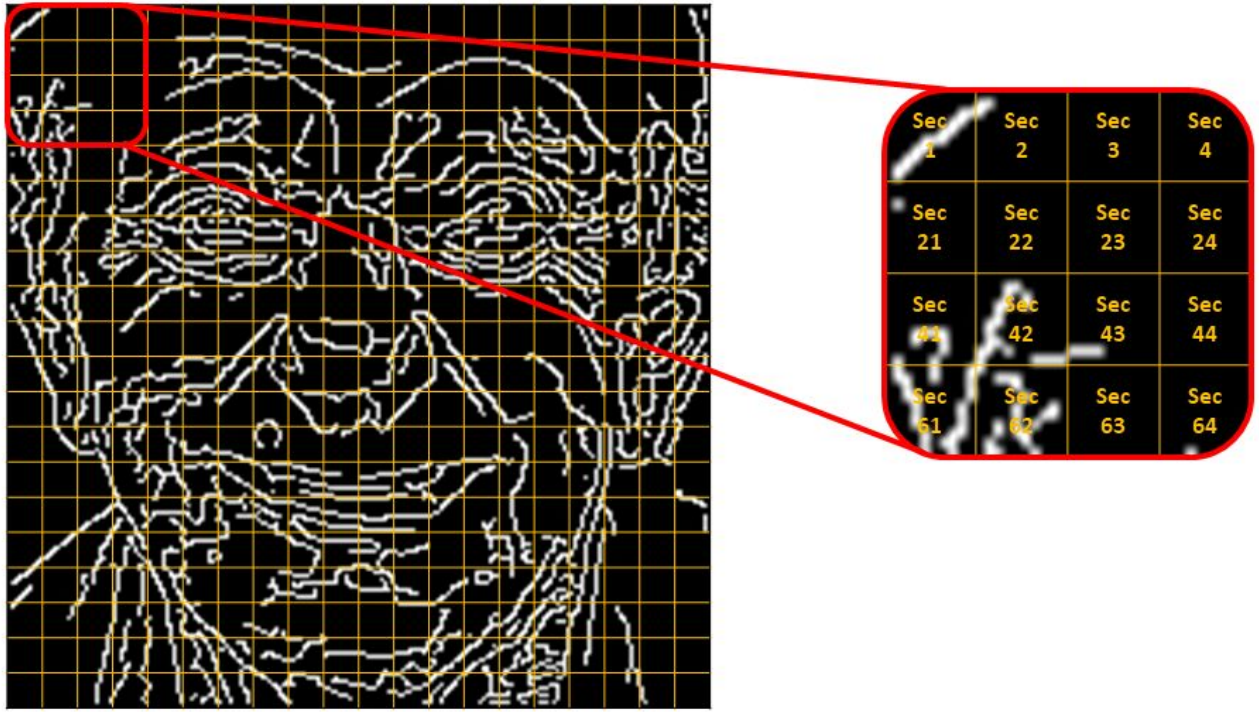


Traditional ML - Classification Modelling

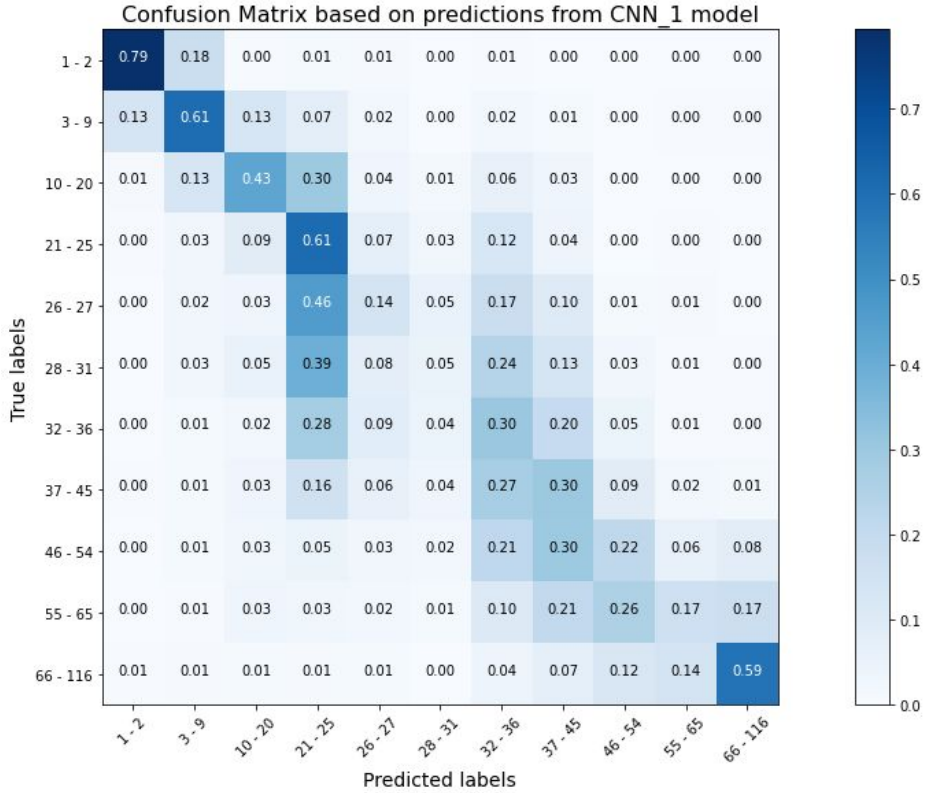
- ➔ *RandomForestClassifier* & *SVC* with *GridSearchCV*
- ➔ Severely over-fitting
- ➔ Long training time for *SVC* (>10 hours)

	GridSearchCV best score (cv=5)	Train Accuracy	Test Accuracy
RandomForestClassifier	39.3%	66.8%	39.8%
SVC	49.0%	92.9%	53.4%

Deep Learning - Initial CNN Model

Model Description	Epochs	Train Loss	Validation Loss	Train Accuracy	Validation Accuracy
CNN with grayscale images	Early stop at 28 of 30 epochs	1.5355	1.6252	41.40%	38.34%

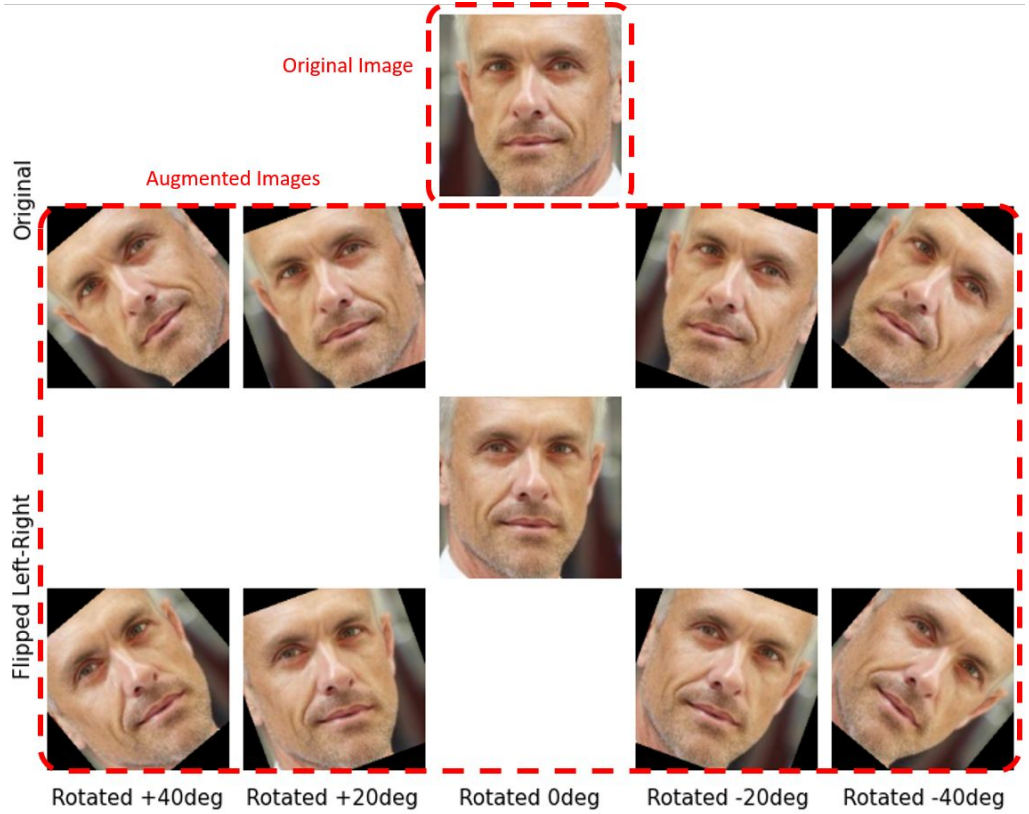
Deep Learning - Initial CNN Model



Deep Learning - Improving the Model

Original Training Data
23,440 images

Augmented Training Data
234,400 images
(10x)



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CNN with RGB coloured images	30 epochs	1.4672	1.5971	43.56%	39.46%
CNN with grayscale images & augmented training dataset	30 epochs	1.4710	1.4727	42.51%	42.52%
CNN with grayscale images & augmented training dataset	60 epochs	1.3793	1.4028	45.45%	44.85%

Deep Learning - Re-thinking the Problem

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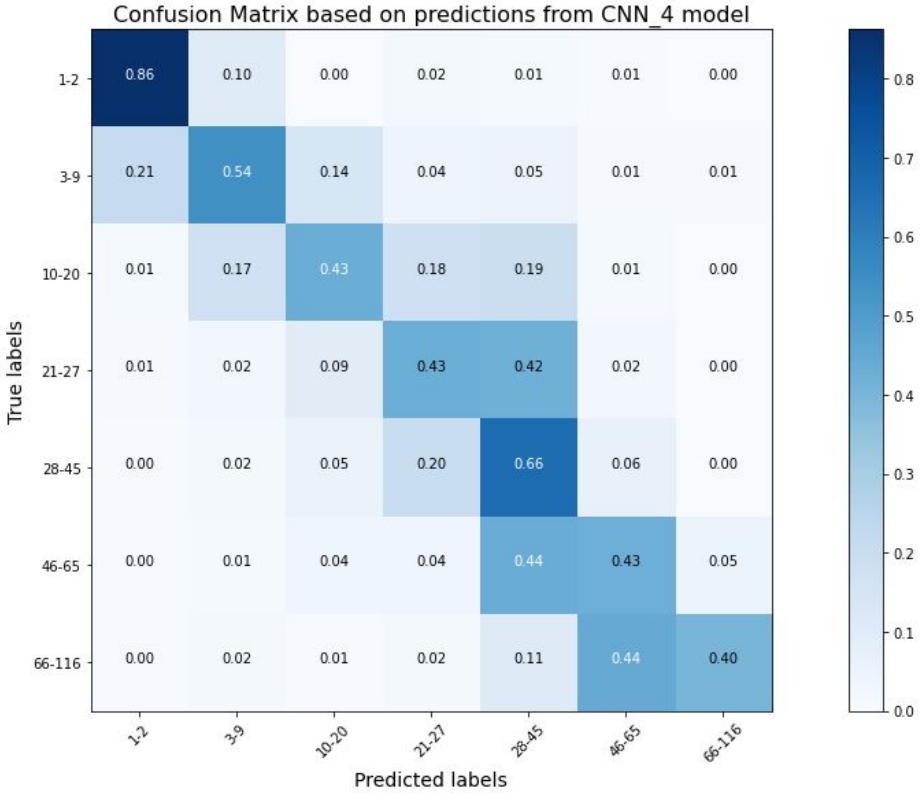
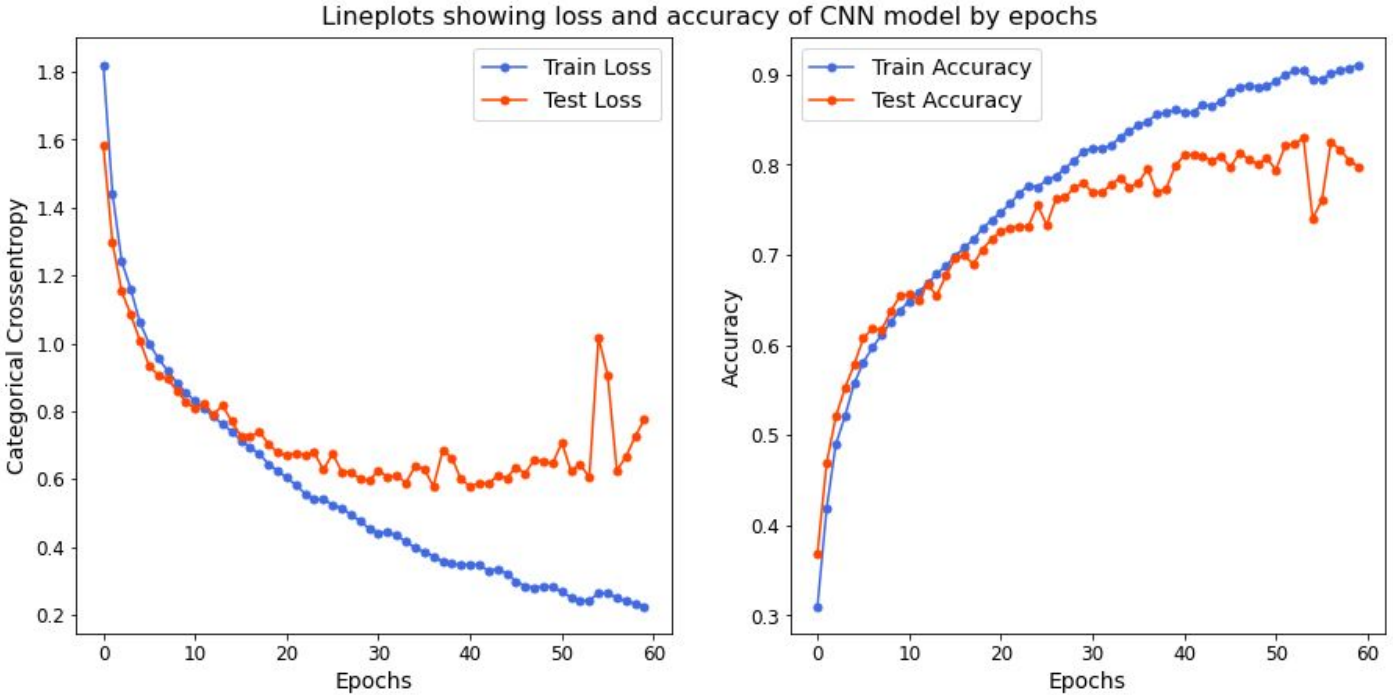


Deep Learning - Final CNN Model



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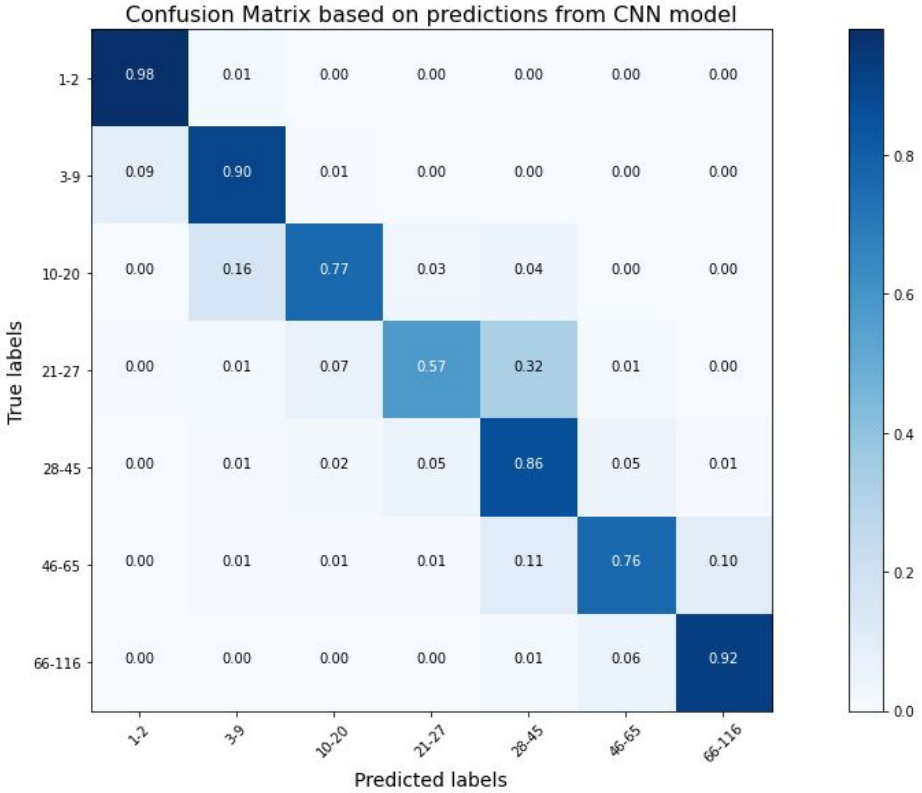
CNN with grayscale images & re-distributed age-ranges	30 epochs	1.0265	1.1075	57.58%	54.17%
CNN with grayscale images, augmented training dataset, re-distributed age-ranges & optimized architecture	Peak at 54 of 60 epochs	0.2430	0.6052	90.44%	82.97%

Deep Learning - Final CNN Model

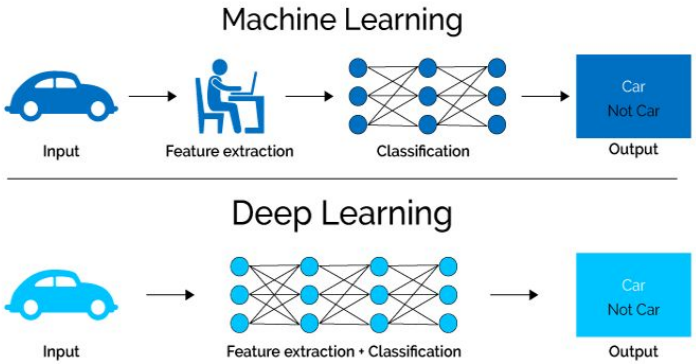


Conclusion & Limitations

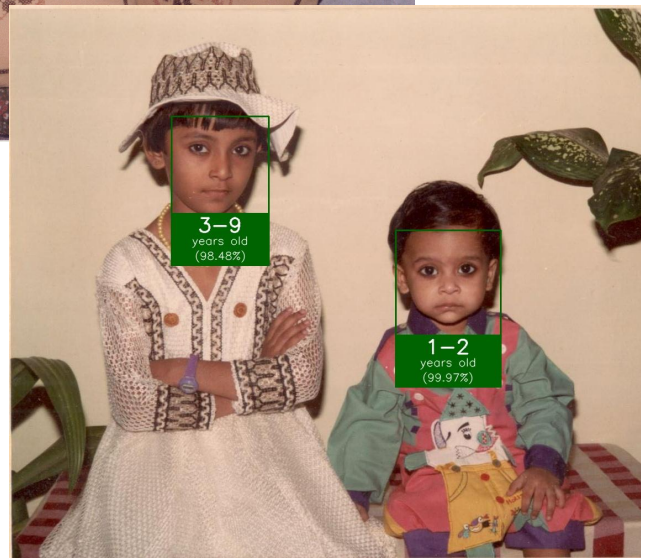
- ➔ Traditional Machine Learning
  - Low accuracy
  - Requires expertise for feature extraction
  - Time intensive

VS.

- ➔ Deep Learning
  - High accuracy
  - No need for feature extraction



Some testing...

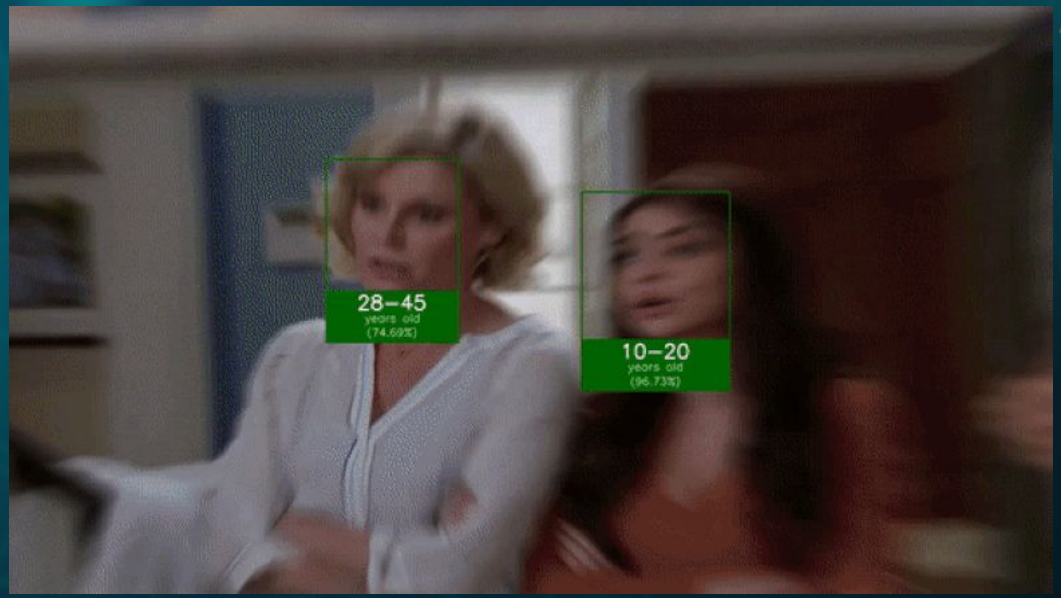


Try it yourself!

- ➔ Google Colab notebook
  [https://colab.research.google.com/drive/1rAQ_n-7--A10afVTB8Sg6RkYTfe-qkJB?usp=sharing]
  - Sign in to your Google account.
  - Click on “Copy to Drive” button at the top.
  - Run cells one-by-one.
  - Grant permission to access webcam.
  - Take a picture and detect your age.
- ➔ Jupyter notebook
  [https://drive.google.com/file/d/18eG9nXqmlCHLp_DkFg-d0IReh34Kr3AG/view?usp=sharing]
  - Download the ZIP file.
  - Unzip.
  - Run the Jupyter notebook.
  - Try age detection on **LIVE webcam video!**
- ➔ Share your results with me! :)

Still curious?

- ➔ Read about my project on *Towards Data Science* [https://towardsdatascience.com/age-detection-using-facial-images-traditional-machine-learning-vs-deep-learning-2437b2feeab2]



Thank you!

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