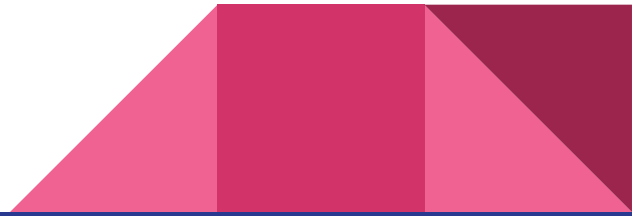
Age Classification

By: Shanshan Gong, Qichen Huang, Yushan Wang

Goals

We will be establishing, training and deploying models for getting the ability to automatically estimate the accurate age solely from facial images of a person.



Challenges/Concerns

Challenge 1

What data set to use?

- The current built data set in the Adience Benchmark Project
- Automatically generated human-faces

Challenge 2

Identifying the definition of face detection.

- Face detection has a different definition than face classification
- We need an individual module to achieve the need of face detection.

Challenge 3

What architecture or which classification model should we use to output the corresponding age to the input image.

Research and Related Literature Reviews

Adience Benchmark

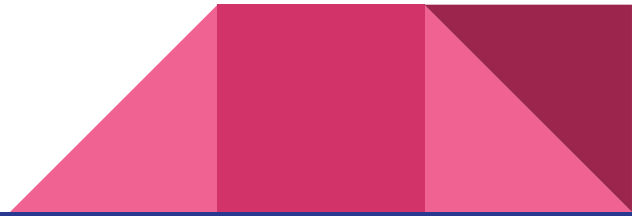
- Published in 2014
- Contains 26,580 photos across 2,284 subjects
- Partitioned into five splits
- Binary gender label & one label from eight different age groups
- Does not include extreme cases

Age Classification

Demand for age classification using facial images has increased in recent years

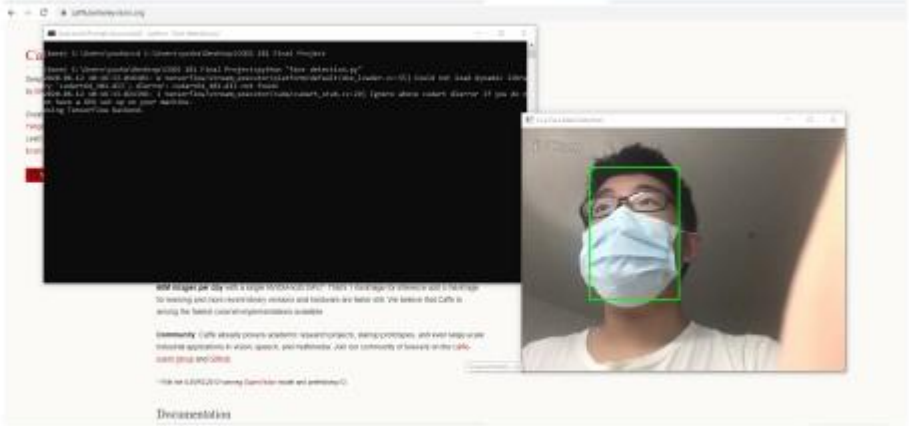
Age estimation methods in the early stage are based on the different measurement of facial feature landmark ratios.

As the regression and deep learning models being deployed, Tal Hassner deployed a deep convolutional neural network as a model for the classification.

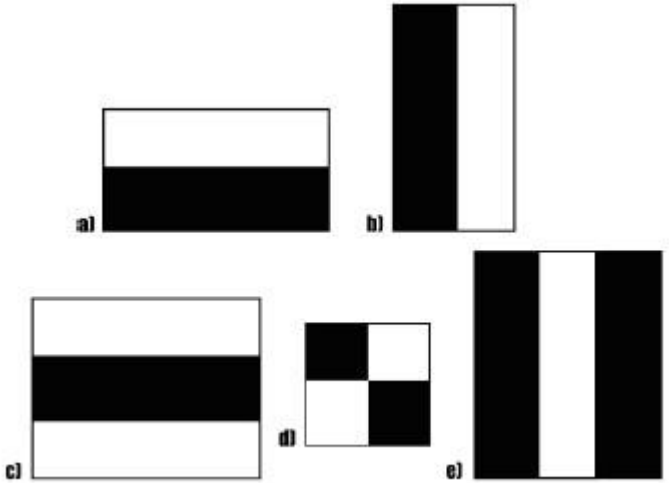


Face Detection

- Haar Cascades Classifier
- Deep Neural Network (DNN)



demonstration of the caffe-DNN working in the extreme condition.



A demonstration of the Haar Cascade

Design Solutions

CNN for Age Classification

Reproduce the deep convolutional neural network architecture presented by Gil and Tal Hassner

Experiment with a few different architectures to see if could outperform the current result

Improve their models.

Train the model and choose specific parameters that are optimal

Test using sample images

Face Detection

experiment four pre-trained models, test and choose the optimal one

deployment

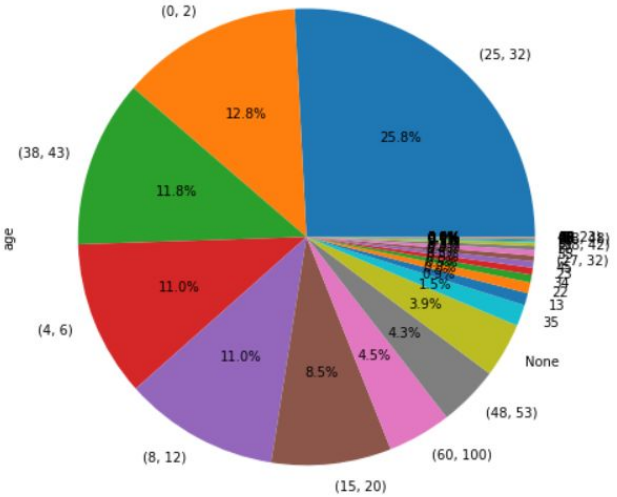
- Webcam
- IOS devices
- Cloud configuration

Implementation Steps

Adience Benchmark

Analysing the data set by creating a pie chart

Classifying the edge cases

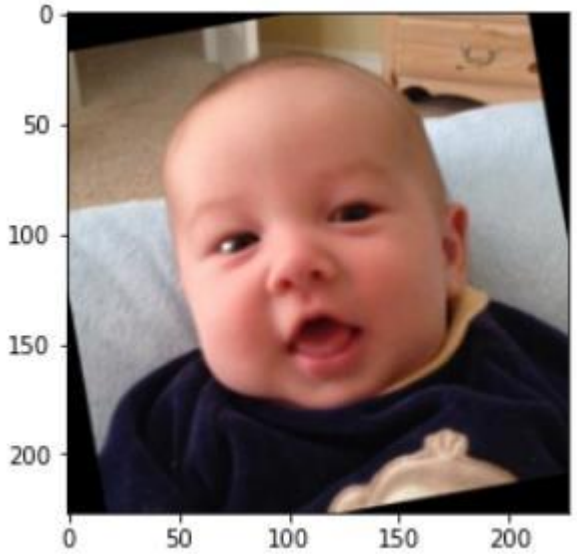


Note that we excluded the images that does not have a age label, total 17,721 images

Age	0-2	4-6	8-13	15-20	25-32	38-43	48-53	60-	Total
Image	2509	2140	2292	1792	5296	2776	916	901	17721
Comment									

Data Processing

Performed a center cropping with a uniform size of 227x227.

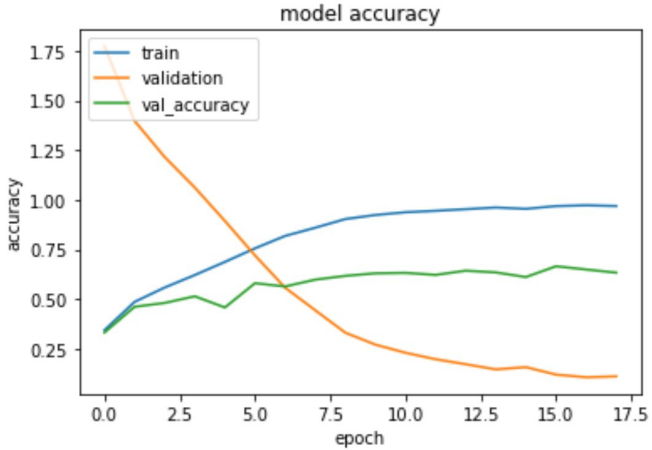


Simplification

Choosing AlexNet, which is a 5 fully connected convolutional layer network, published by Alex Krizhevsky.

reproduce the CNN architecture in TensorFlow

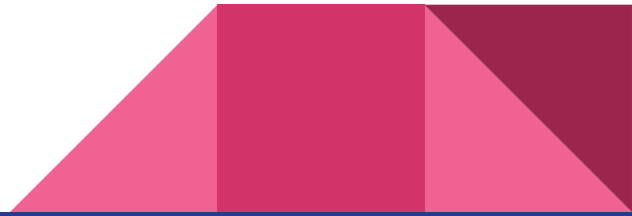
Initial training and monitoring



Training and Testing

with 2 more Convolutional layer, the model converges faster than the Tal’s model

the eventual test accuracy was between 60%-65%

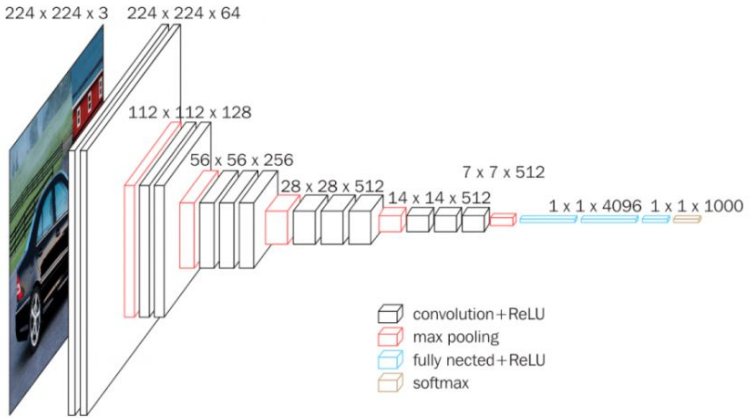


VGG-16 by K. Simonyan and A. Zisserman

used to cross-compare the result of our CNN classifier

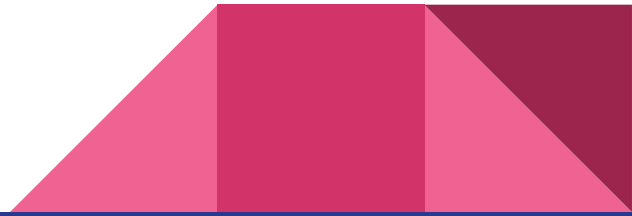
deployed this model to perform a transfer learning

we have achieved considerable accuracy using this strategy (higher than AlexNet)



Lessons Learned

- Working with Tal Hassner’s results and improved it.
- Learned a lot from The Adience Benchmark Project, we solved problems that exist in the original model.
- Acquired much useful experience in image processing when we are handling the image inputs
- Gained experience on using OpenCV



Next Steps

Increase Accuracy

- Experiment with more models
- More pre-processing procedures

Reduce Cost

- local machine with a 3840 CUDA cores and 16 Gigabytes of video memory.
- Training each network is about 10-15 minutes.

Deployment

Deploy on IOS devices using CoreML

Result

Github link/MVP:
https://github.com/yushan1089/ST8601_Age_detection

We finished building the age classification model, and successfully deployed to our webcam application.

We examined the CNN model architecture developed by the Gil and Tal's model. The accuracy was between 60%-65% and we found a little over-fitting of that model.

Our model based on the VGG-16 eventually could reach an accuracy between 67%-72%.

Our model outperform the convolutional neural network architecture in the Gil and Tal's model.