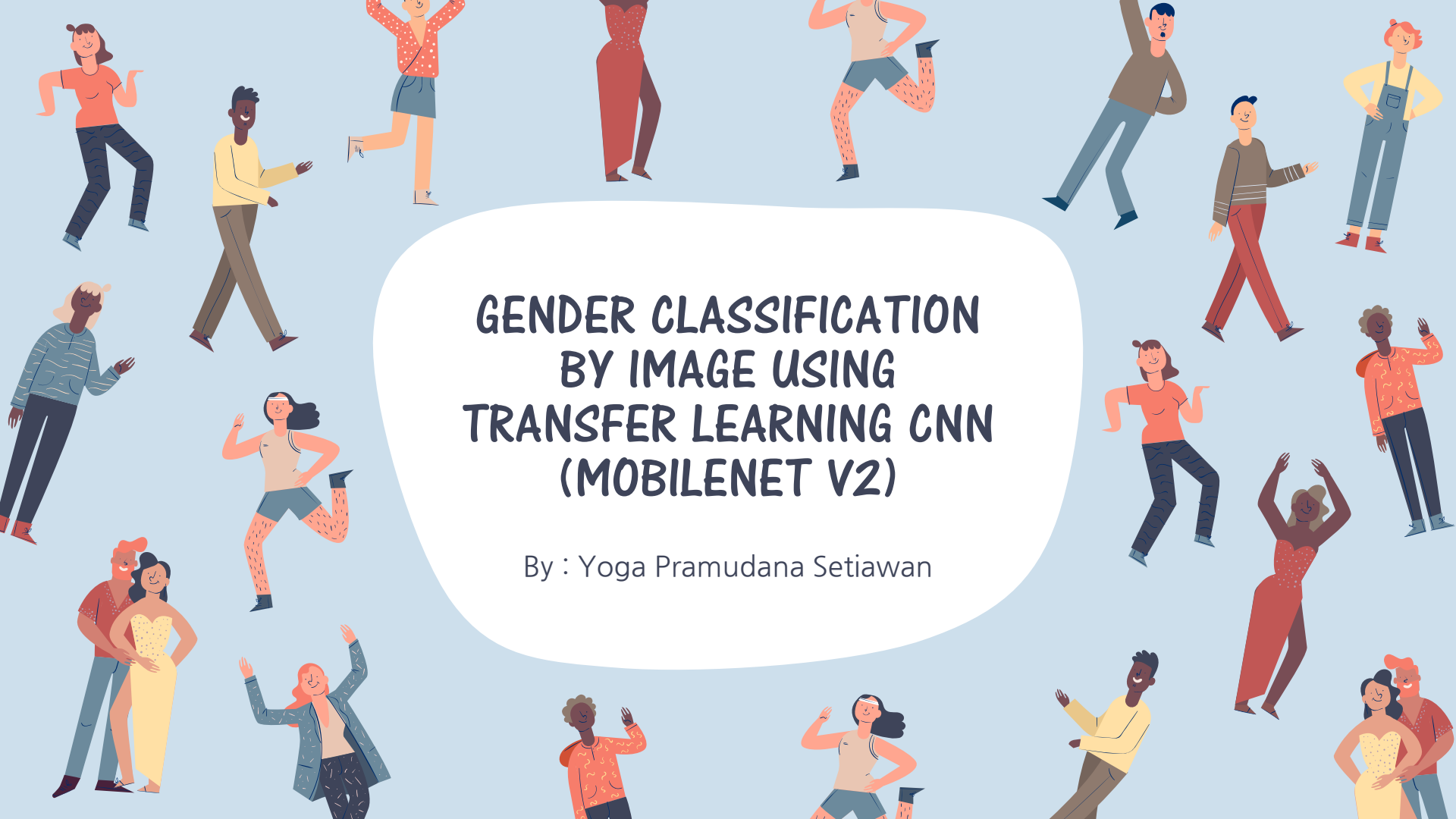


GENDER CLASSIFICATION BY IMAGE USING TRANSFER LEARNING CNN (MOBILENET V2)

By : Yoga Pramudana Setiawan

Tools

Here's some tools I used to make this project :

Python

Version : 3.7

Google Colab

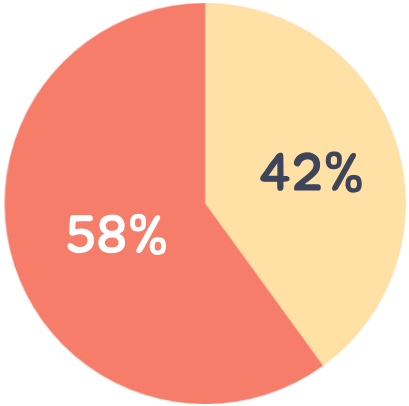
Runtime : GPU

Jupyter Notebook

Ms. Power Point

Dataset

I use data from Big Data Competition - Satria Data held by Puspresnas & IPB University.



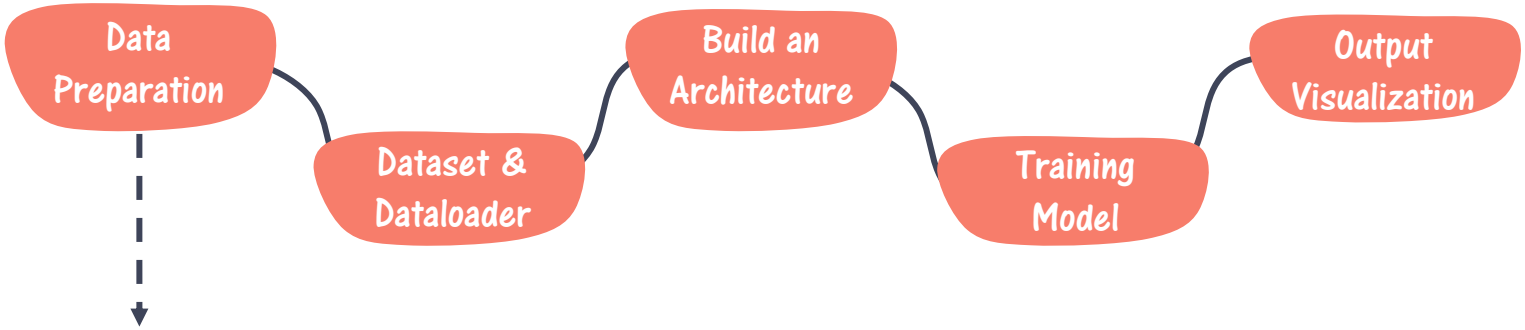
Male
969 photos

Female
1341 photos

Example :

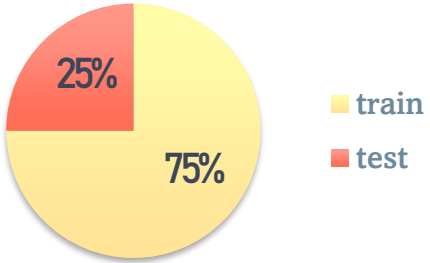
This data is balanced dataset because the percentage of male and female are slightly different.

Workflow

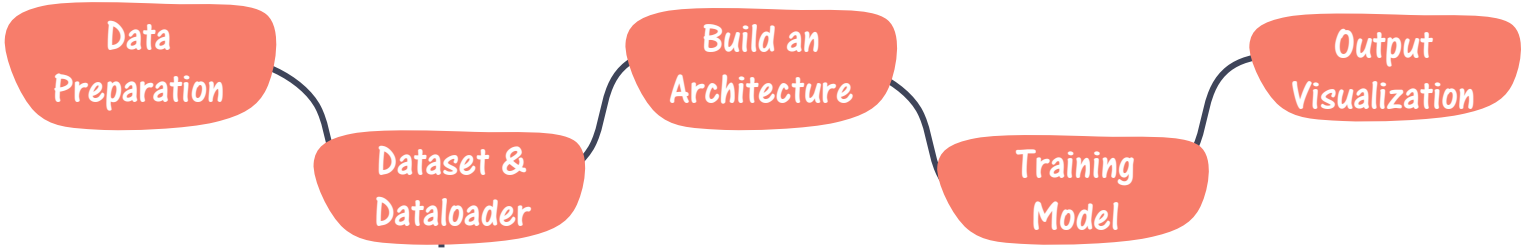


This steps is prepare my datasets before getting into Python. Make sure our datasets is organized in folders as required by datasets and dataloader in PyTorch. After that, I take some datasets into train and test folder for training and validate my model.

```
data
  train
    Boys  : img_1.jpg, img_2.jpg, …
    Girls : img_1.jpg, img_2.jpg, …
  train
    Boys  : img_1.jpg, img_2.jpg, …
    Girls : img_1.jpg, img_2.jpg, …
```



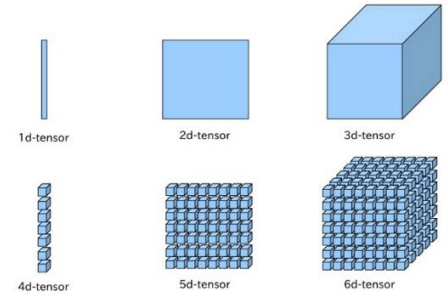
Workflow



Next step is input data into python then perform data augmentation and convert datasets into tensor form. In this step also set batch size to reduce computational load and reduce overfitting.

Illustration :

Tensor



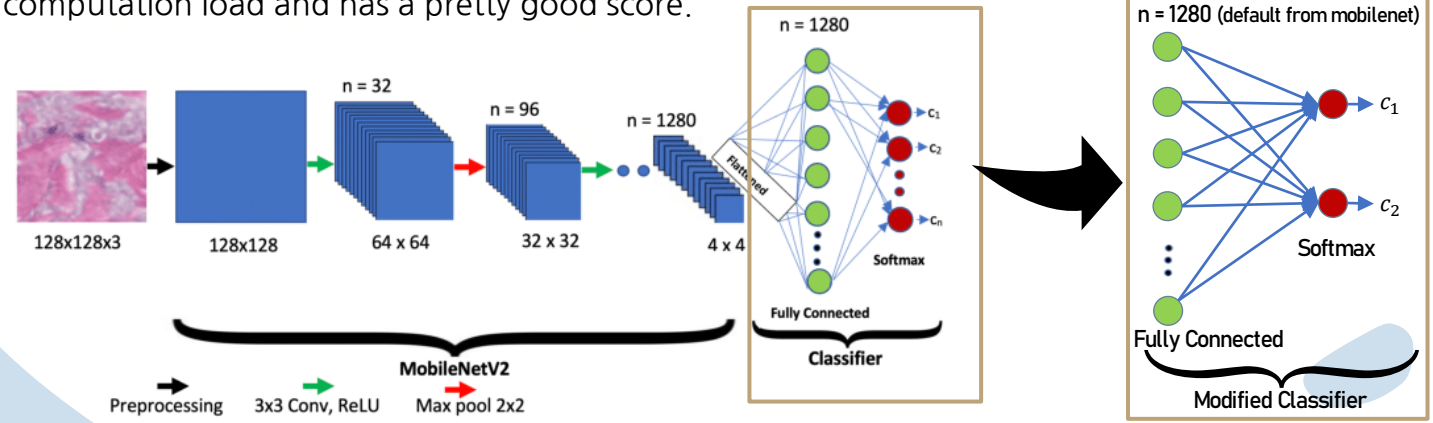
Data Augmentation

Original | Random Rotation | Random Resized Crop | Random Horizontal Flip | Center Crop

Workflow

Data Preparation → Dataset & Dataloader → Build an Architecture → Training Model → Output Visualization

Here I'm using mobilenet v2 transfer learning with a few modified, because mobilenet v2 has a light computation load and has a pretty good score.



Workflow

Data Preparation → Dataset & Dataloader → Build an Architecture → Training Model → Output Visualization

Visualize image with predictive label and comparison to real label.

1^{st}

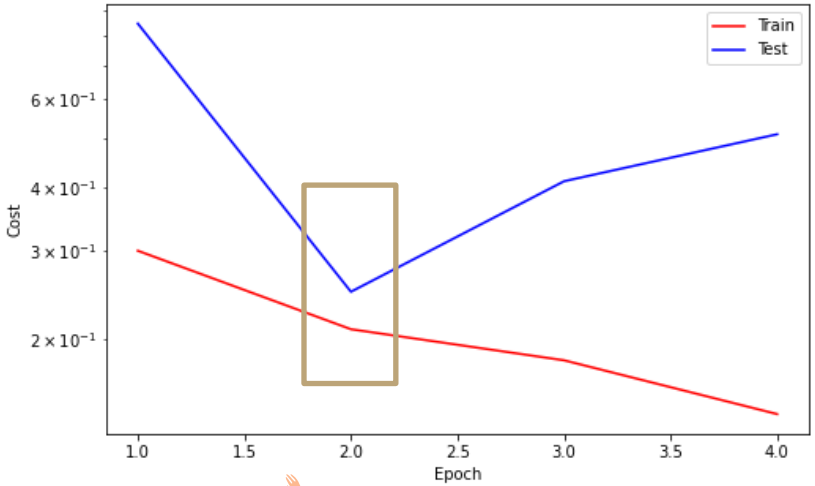
- Train to find optimal classification weight with condition no changes in factor extraction weight.
- Use only small epoch or low tolerance. I use 2 tolerance in this project which mean stop training if accuracy not greater than 2 last epoch consecutively.

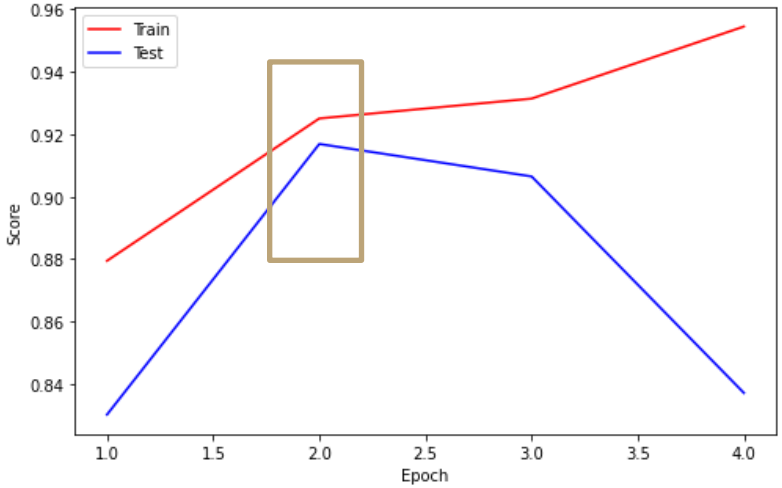
2^{nd}

- Fine tuning to increase overall accuracy model.
- Use more epoch than before or high tolerance. I use 5 tolerance in this train step.


Result

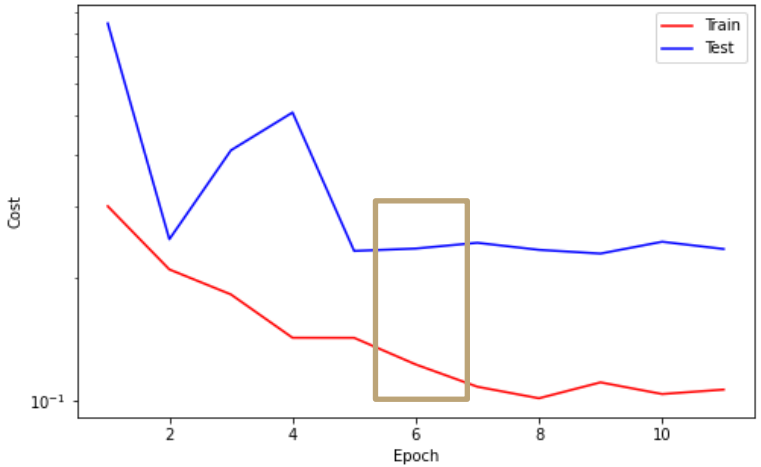
Training Model – Adaptation Phase

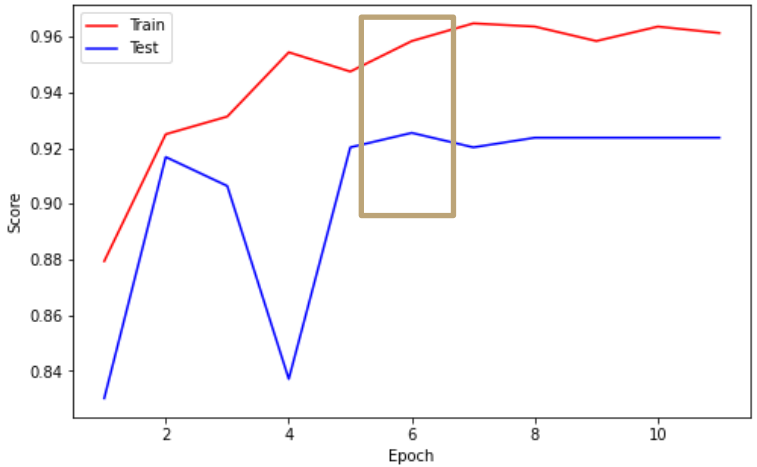




Maximum accuracy score in 2^{nd} epoch, the value is almost 92%. Well I can said this is very good prediction even I do not change anything in feature extraction weight.

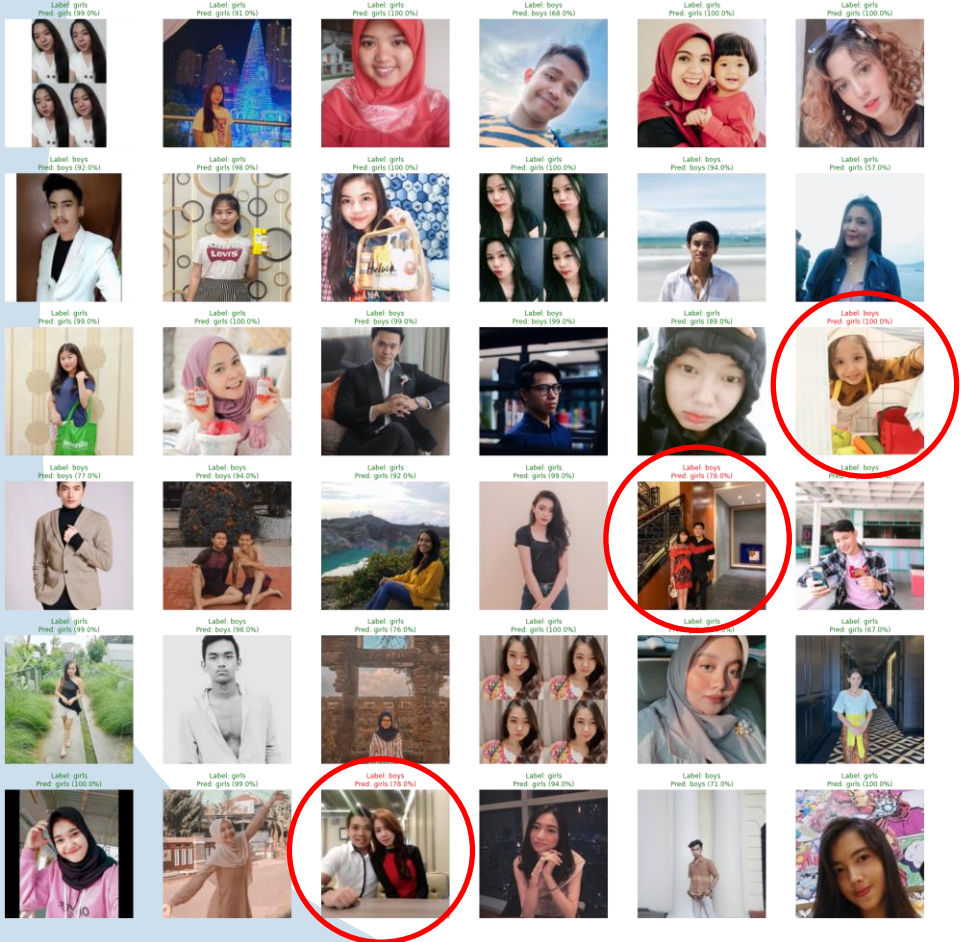
Training Model – Fine Tuning Phase





Maximum accuracy score in 6^{th} epoch, the value is slightly over 92%. This fine tuning doesn't affect the model significantly. It is possible maybe caused by the mobilenet v2 filters already very well trained to human faces.

Result



Label: boys
Pred: girls (78.0%)

Label: boys
Pred: girls (78.0%)

I think this is not the machine's fault because two images above are ambiguous where a boy and a girl in one frame, so whatever the predictions, still correct. So the accuracy should be higher.

Label: boys
Pred: girls (100.0%)

At my first impression I also think he is a girl, but well I admit this could be include machine fault.

But overall my model is very well to classify gender by image with 92.55% accuracy.

Conclusion

Convolutional Neural Network with mobilenet v2 Transfer Learning was proven can make a gender classifier by image very well. This classifier can be used in business analysis to give a right ads to customer by their profile picture for example and maybe many things other.

Please go to my Github for full code


slidesgo