Age and Gender Classification

(Specifications)

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Contents

1 Introduction

- This *Casptone Project 1* assits for my learning about Machine learning and Deep learning in training course of D-Soft company that Mr. Trung Anh is my supervisor.
- Through this project, i want to improve some skills about coding, researching relate to machine learning.
- It has a lot of interesting applications about machine learning but in this project i will choose topic **Age and Gender Classification** because D-Soft company where i am working, has a project relate to this problem.

1.1 Purpose

- Reinforce knownledge about machine learning learned from Coursera *Andrew Ng.* - Build a funny application that apply machine learning to the real world.

1.2 Scope

- This project in range of D-Soft's training course.
- The project focus mainly about:
  + Build a simple web frontend and backend.
  + Training a machine learning algorithm.

1.3 Definitions, Acronyms, and Abbreviations

AI	Artificial Intelligence
FNN	Feedforward Neural Network

References

1. https://talhassner.github.io/home/publication/2015_CVPR
2. https://talhassner.github.io/home/projects/cnn_agegender/CVPR2015_CNN_AgeGenderEstimat
pdf
3. https://gilscvblog.com/2015/11/19/age-and-gender-classification-using-deep-convolutio
4. http://dlib.net/
5. https://js.tensorflow.org/

2 Related Works

- In this section, I will introduce briefly about my overall system for Capstone Project 1.
- Project name: **Age and Gender Classficication.**
  + Input: Image
  + Output: Age, Gender information
  + Platform: Web App

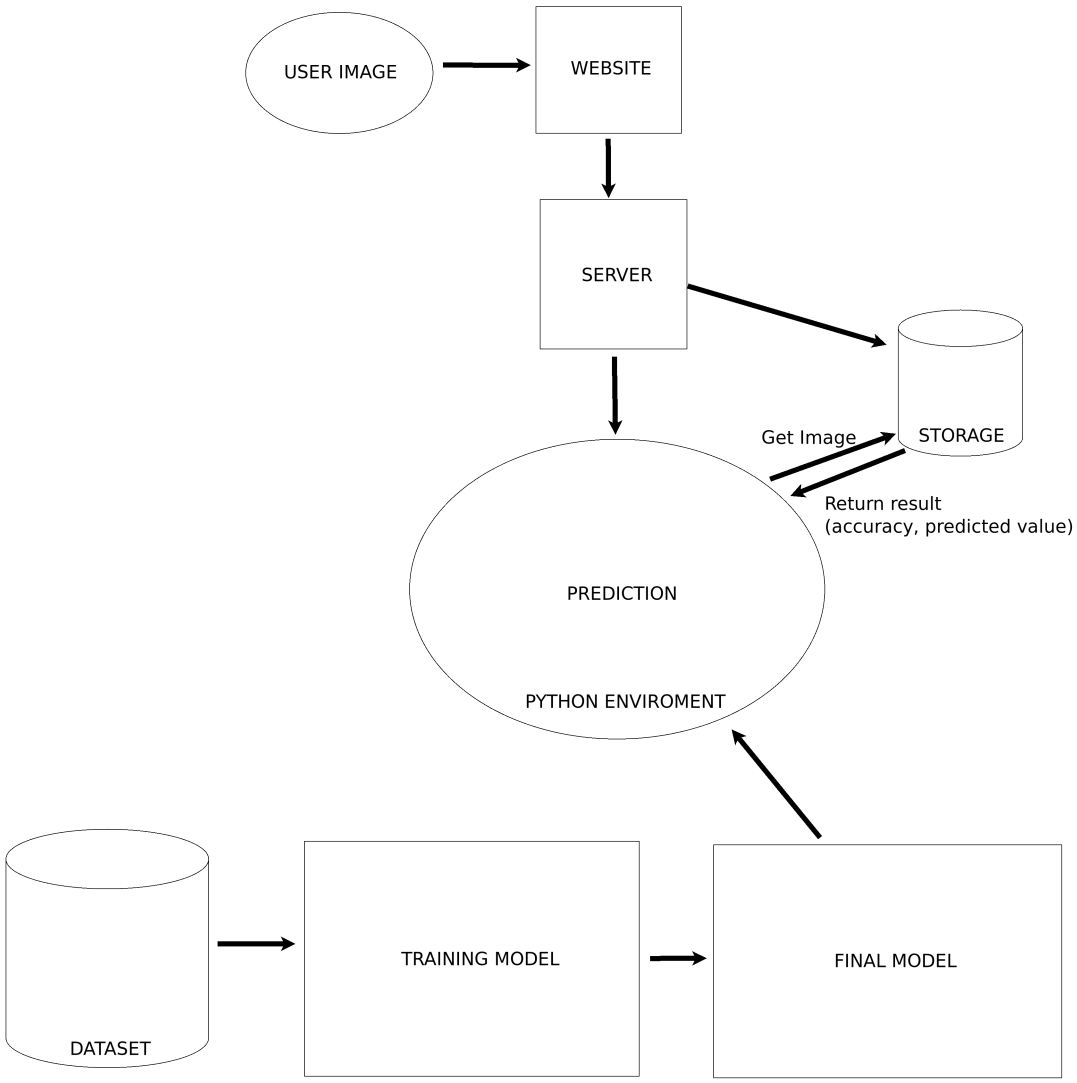

Figure 1: Overall System (A High level Diagram)

2.1 Neural Network

2.2 Python

2.3 Classification

2.4 Example: Dog and Cat Classfication

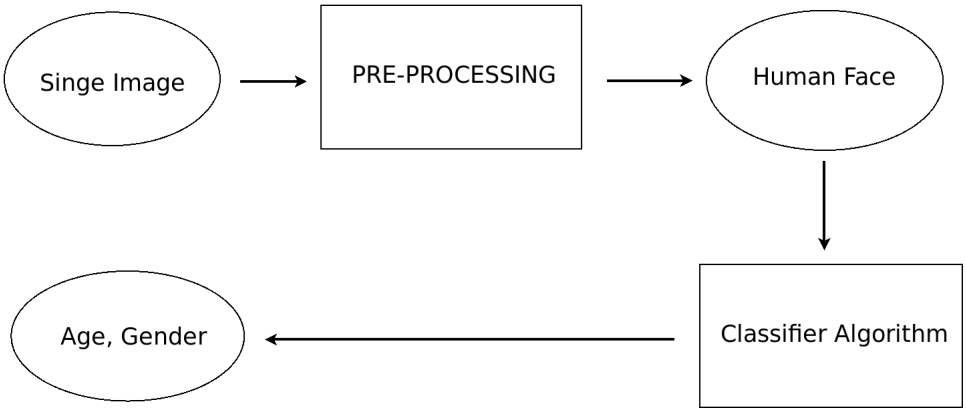

Figure 2: Classfication Pipeline

2.4.1 Dataset

- Preparing training dataset for classifier algorithm - Datasets that i am going to plan to use for my classifier algorithm as follows:
+ IMDB-WIKI (`https://data.vision.ee.ethz.ch/cvl/rrothe/imdb-wiki/`)
+ VISAGE (`https://www.forensicsandsecurity.com/visage.php`)
+ UTKFace (`https://susanqq.github.io/UTKFace/`)
+ Blog Posts Labeled with Age and Gender (`https://www.kaggle.com/tomlisankie/blog-posts-label`

2.4.2 Pre-processing

- Grey + crop images in dataset.

2.4.3 Neural Network as Classifier Algorithm

- There are a lot of classifier algorithms that we can use. But here, we will use **Neural Network (NN)** for our problem.
- Feedforward Neural Network *(FNN)* is NN architecture that we apply for age and gender classification. Below is basic architecture of it **(figure 3)**.

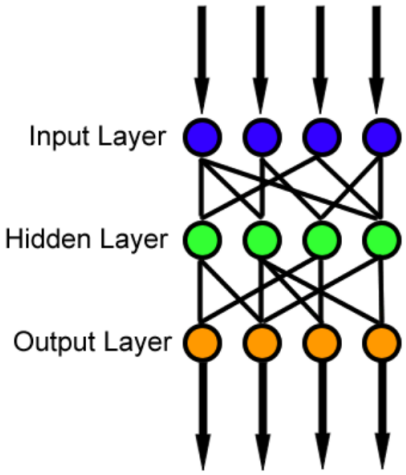

Figure 3: Feedforward Neural Network

- In this Capstone Project 1, we just only use FNN. The archictecture is not usually fit for **computer vision** because it has to have a very high parameters *(weights)* capicity in their model. These problems in computer vision field is often solved efficiently with Convolutional Neural Network *(CNNs)* because it can decrease dramatically large amount of weights in their model but accuracy of model is very high meanwhile still remaining *spatial arrangement* in addtional to *local connectivity*.
- Return our problem, our FNN architecture is namely as **figure 4**. That is a 2-layer neural network, the network's input is image. In training phase, we will use images from *training set* and in test phase, we use ones from *test set*. Maybe in hyperparameter-tuning phase, we can use *validation set* for regularization.

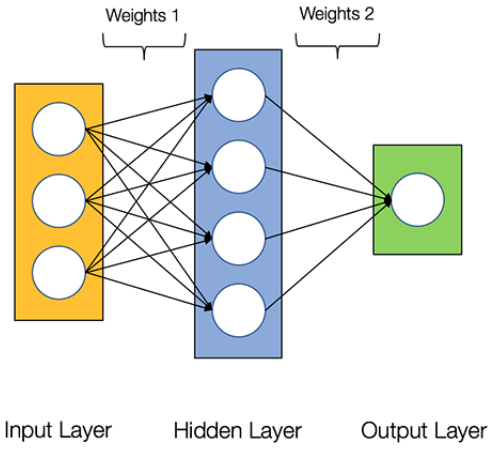

Figure 4: 2-layer Neural Network

2.5 Web Application

2.5.1 Client

- Clients are some members in our teams :)
- User can access to our website for testing purpose.

2.5.2 Server

- *Server language*: **Nodejs**
- *Server Framework*: **ExpressJS**

- RESTful APIs with Nodejs and Expressjs Diagram *(non-blocking IO)*:

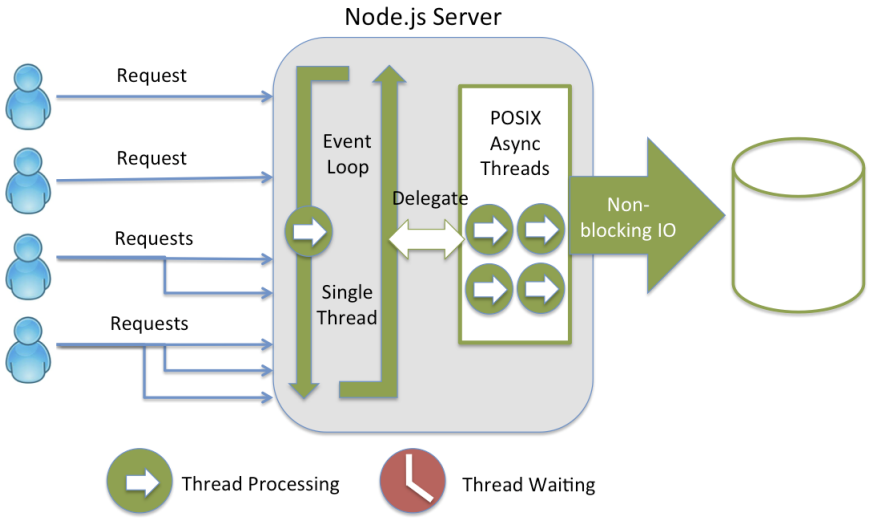

Figure 5: Internal Process of Nodejs

- My server will reiceives requests from users and holds their images taken from user my local storage. When user submits an image in a given form, it will be sent to my local server through RESTful API. Then, Nodejs server will send it to my Python script for predict Age and Gender with above 2-layer Neural Network depicted such as above.

- This figure below is high-level diagram for my backend architecture:

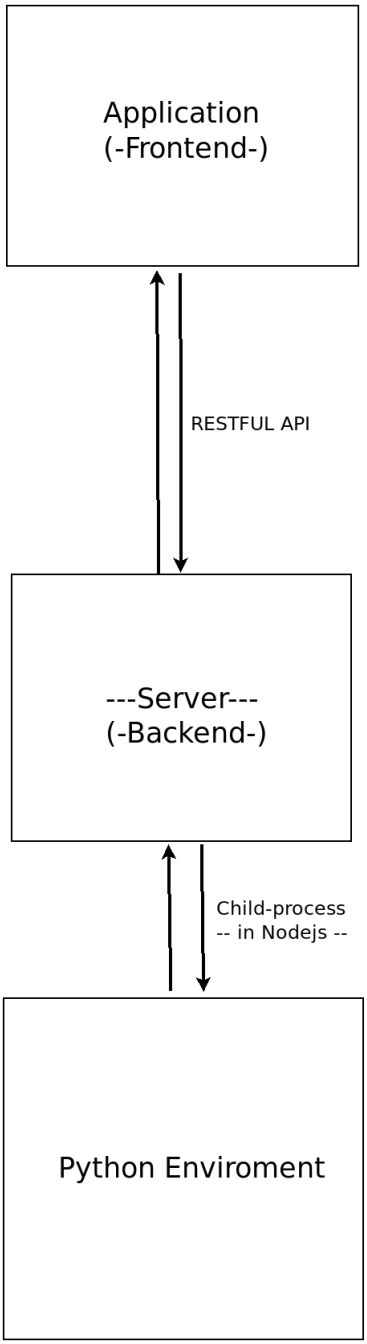

Figure 6: Backend Architecture

3 Proposal

3.1 Fronted

3.2 Backend

3.3 Machine Learning

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Work Breakdown Structure & Estimate				
#	Activities			Expected (man-days)
1	**Preparation**		**1**	
	1.1	Setup the development environment		0.5
	1.2	Search + Pre-processing Dataset		0.5
2	**Design and Implement**		**3**	
	2.1	Training + Testing model		2
	2.2	Frontend + Backend		1
		Total (man-days)		**4**