Age Estimation: A Convolutional Neural Network Based Regression Approach

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*Abstract*—This document is the technical report of CS559 Deep Learning Course Homework. The main purpose is to build a CNN (*Convolutional Neural Network*) based regression model to accurately estimate ages of people from their facial images.

Keywords—convolutional neural networks, age estimation, regression

# Introduction

In the last decade, Convolutional Neural Network (CNN) has achieved promising results in computer vision tasks due to its self-learning power and ability of working with very large data. In our task, we employ CNN models to estimate human ages from given their face images. Different types of CNN architectures are employed and compared in our study. Another important point regarding deep network models is the process of validating hyperparameters. We applied a set of values for each hyperparameter to result with the best model.

This paper is organized as follows. Section 2 describes the background and previous studies that we took advantage of. Section 3 gives brief information about our dataset. Section 4 describes our model. Section 5 gives the implementation details. In section 6, experiments regarding hyperparameters of the model are shared. Section 7 describes the performance of our finally tuned model. Finally, Section 8 presents our conclusions.

# Background

With the recent developments for last 10 years, deep learning has achieved a success in most of the computer vision tasks. This is due to the fact that deep learning can deal with a large amount of data and explore it by itself.

# Dataset

With In our study, we used a modified version of UTKFace Dataset[[1]](#footnote-1). The original dataset includes samples of people with an age range from 0 to 116 years old. It also has some additional information such as age, gender, and ethnicity. But for our case, the dataset includes people aged in a range of 0 to 80 with no additional information.

Our dataset consists of 5400 training, 2315 validation and 1159 test samples. The histogram of age distribution in our dataset is available in Figure 1.

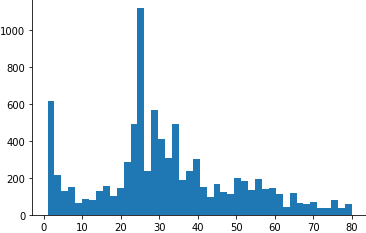


Figure . Histogram of Age Distribution in Our Data

# Our Model

We start with convolutions then continue with fully connected layers. To keep the number of parameters in a reasonable range, we need to reduce the parameters before fully connected layers.

There are three different mostly used ways to decrease the number parameters: pooling, 1x1 convolution with less filters and convolution with an enough amount of stride.

For example, let's say we have a layer with 40x40 dimensions. Applying 2x2 max pooling with stride 2 or applying 8 filters 1x1 convolution with stride 1 will result with a 20x20x32 layer. Using 32 filters 5x5 convolution with stride 2 will produce a 19x19x32 layer. At the end, all of them will end up with a layer having less parameters.

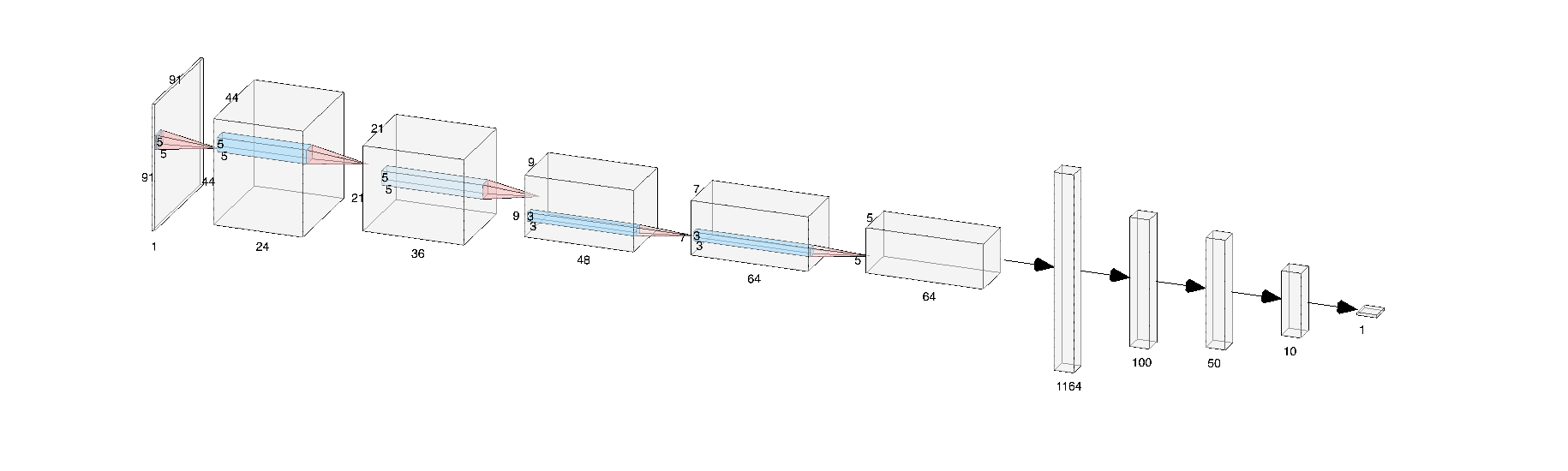


Figure . Structure of Our Model

In our model, we employ the last way by using 5x5 convolutions with stride 2 at the beginning and using 3x3 convolutions with stride 1 towards the end of convolutions.Figure 2

# Experıments

As required in the description of homework, there are some methods & hyperparameters to explore so that we can improve our model. Effects of each improvement will be discussed in this section step by step.

## Batch Normalization

## Loss Function

## Initialization Type

## Regularization (Dropout & L2)

## Adam Optimizer & Early Stopping

# Conclusıon

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##### References

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