Machine Learning I: Image Regression - Hand Pose Recognition

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Introduction:

This project delves into the physical automation application of Machine Learning. The aim of this project is to create an image prediction CNN that can take in images from a Raspberry Pi and predict the finger joints. This output would then be represented on servo controlled hands.

Background

A convolutional neural network (CNN) is a machine learning classifier that works by taking several inputs and entering them into a "black box" which is comprised of a multitude of layers to output to a set number of labels. The application used in this project is regression, which differs from classification because classification aims to recognize specific information, and see what's "correct". This project needs approximation rather than a linear output.

Constraints

- Google Colaboratory
- Hand picked data from a large dataset, leading to a smaller dataset
- Limited axis of movement due to single servo control
- Weaker Servos to reduce cost of the project
- Bad Prototyping Material

Methods

The Model was tested with three different loss methods:
Huber
- Root Mean Square Error
- Mean Average Error

The graphs were compared and RMSE was found to work the best.
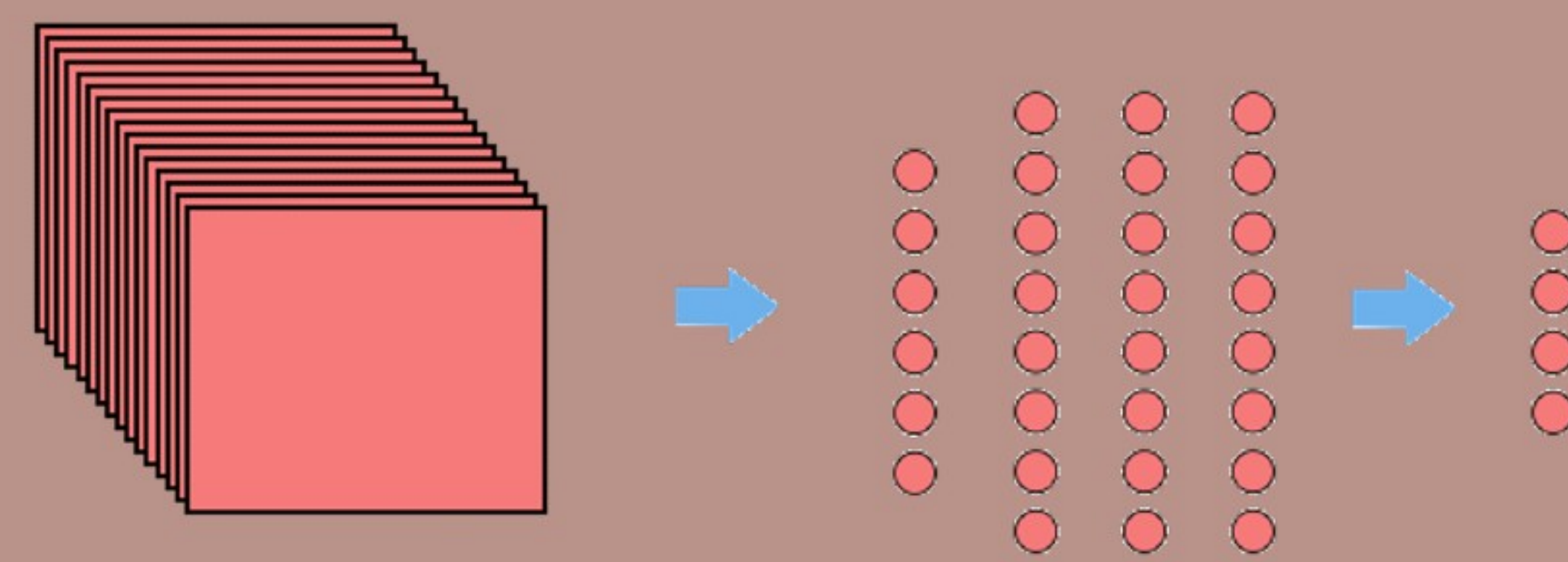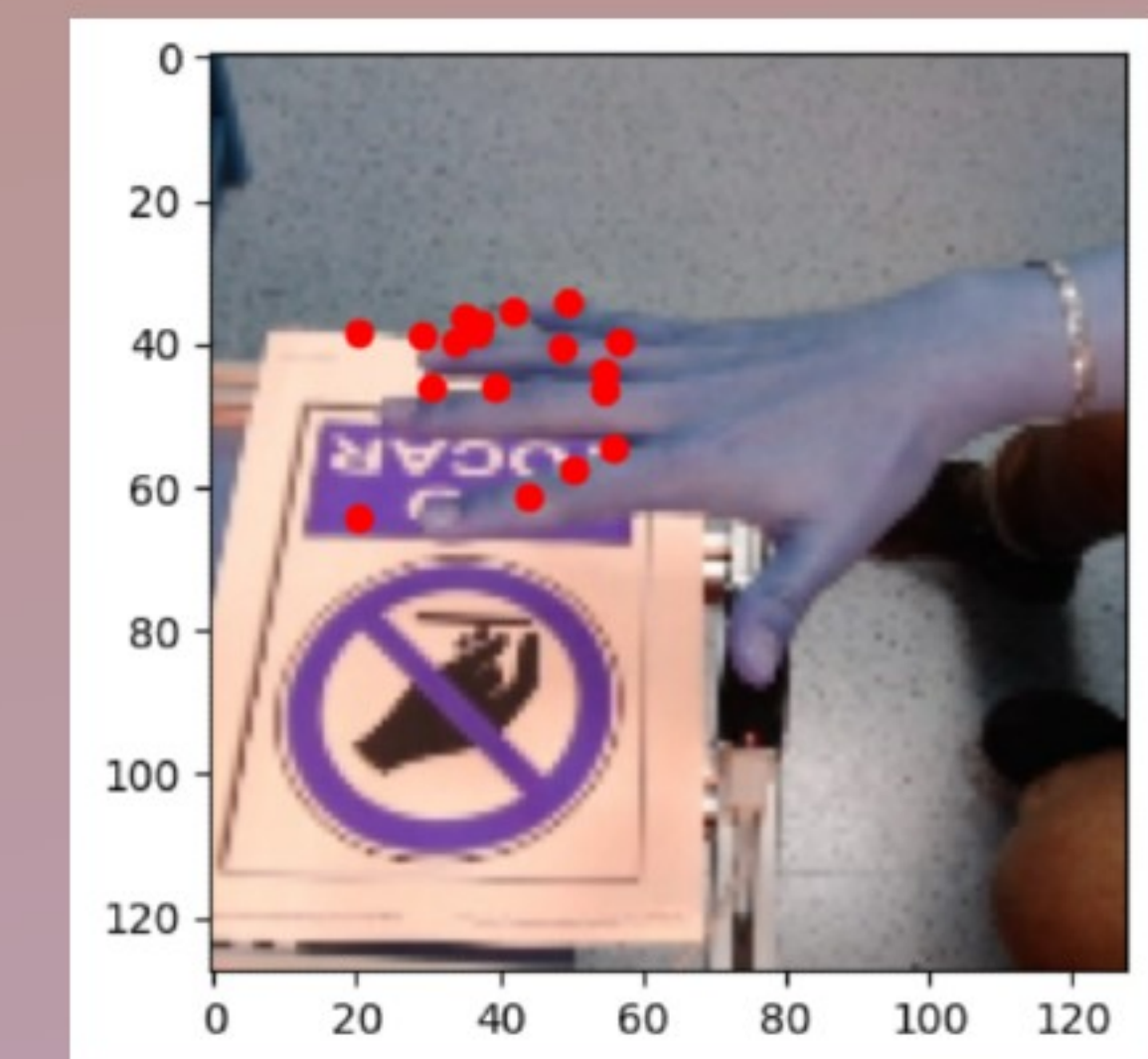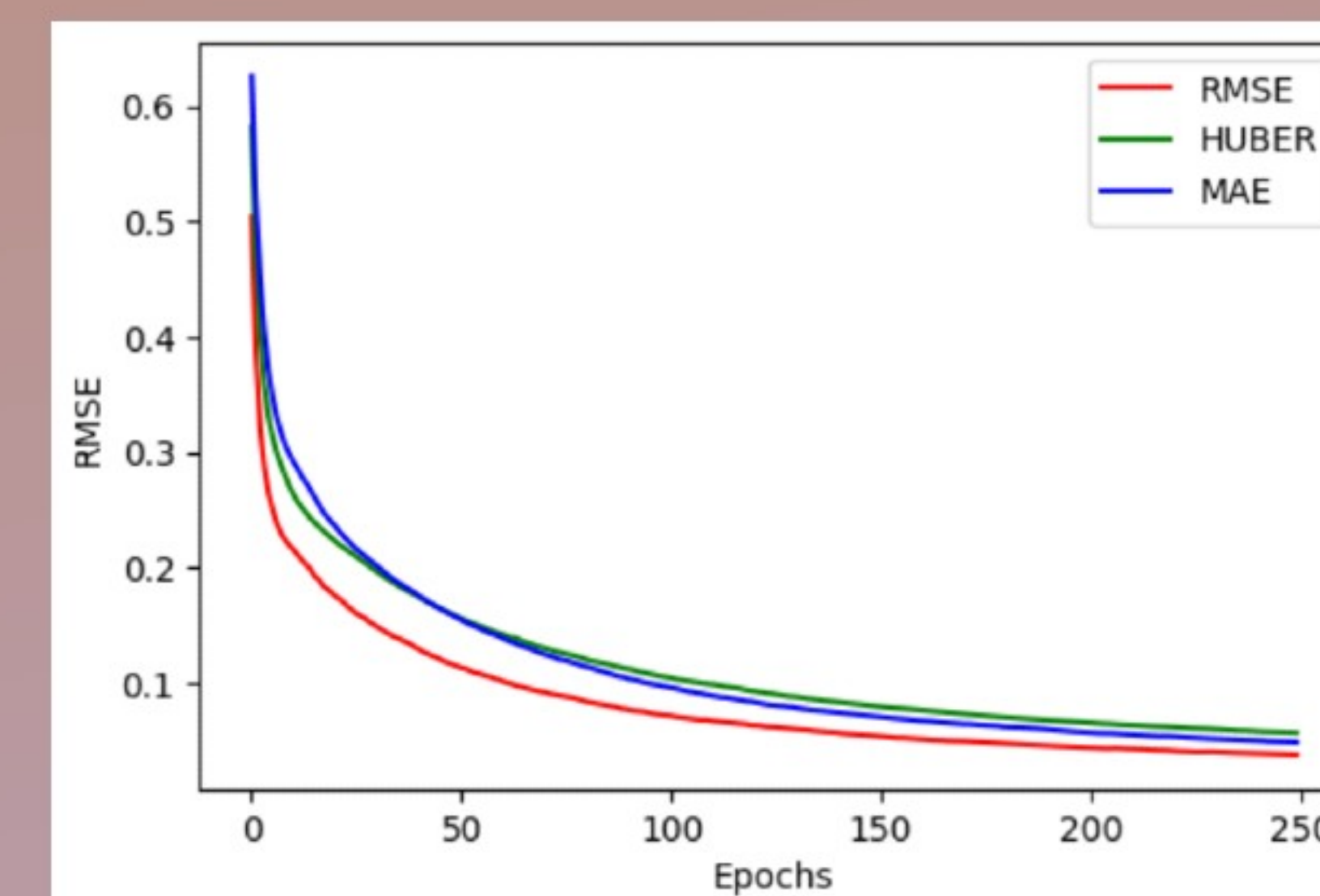

Impacts

Global, Social, Cultural, Environmental: None of these impacts were taken in consideration of this project.

Economic: This project cuts down on the need of a multitude of 3 Axis sensors and can simply function with a Rpi and a camera alone.

Health & Safety: Identification and automative controls can always make a factory/industrial workplace safer by removing human components

Future

- Further Integration with physical applications such as a Gantry.
- Full finger bend
- Better Machine Learning Environment will be used.