



# Real Time Emotion Detection to Help Children With Autism Display Emotions

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## Introduction

I am in the USC Interaction Lab under Professor Mataric. The Interaction Lab researches Socially Assistive Robotics (SARs). I worked with Brandon Thai Tran, a PhD student in the Interaction Lab. My project focuses on helping children with Autism Spectrum Disorder (ASD) to display emotions by using a computer program to detect emotions. Some children with ASD have problems detecting when someone is feeling a certain emotion and that makes it harder for them to display their own emotions. For example, if someone is happy, mad, or sad they might have trouble trying to mimic them. I have created a program that reads a human face and tells if the face is displaying an emotion like happiness, sadness, or anger. I have implemented a game where the child with ASD would use the program to practice displaying their emotions. The program detects their face then you ask them to make your happy, sad, mad, surprised, or neutral face. The program will detect if they are displaying it correctly.

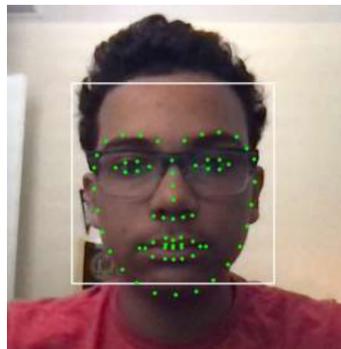


Figure 1: My face with a bounding box and facial landmarks

## Objective & Impact of Professor's Research

The objective of Professor Mataric's Interaction Lab focuses on developing computational principles and techniques to enable SAR systems for human-robot interaction. The goal of SARs is to improve health and wellness, learning, and autonomy for stroke patients, older adults, children with special needs, and more.

## Skills Learned

During the SHINE program, I first learned about terminal. In terminal, I set up the Python environment on my computer using Pyenv, Poetry, and Pip. This is what makes my project work by providing packages and avoiding runtime errors. I also used terminal to navigate through folders and files. Next, I learned how to use GitHub. It is a web-based hosting service for software development projects that use the Git revision control system. At the same time, I had to learn more about the coding language Python. Lastly, I used Jupyter Lab where all the code would be put together in Python Notebooks. Python Notebooks make data science projects easier by letting users control input sources for code and provide feedback directly on the browser.

## How It Works

This project was implemented in Python. The program turns on your camera and searches the room. When detecting a face, it will put a box around the area. After setting the box it will put facial landmarks on your face that will go over your mouth, eyes, nose, and cheeks as shown in Figure 1. The program uses the location of the facial landmarks to determine the emotions that are being displayed. The program uses machine learning to determine what facial expression maps to which emotion.



Figure 2: Emotions detected in the game

## My STEM Coursework

My last experience with Python was in a program called The Hidden Genius Project. It taught me the basics of python. My new experience with Python helped me make a program to detect emotions using computer vision and machine learning. I will use these skills to create more robust robots and programs in the future.

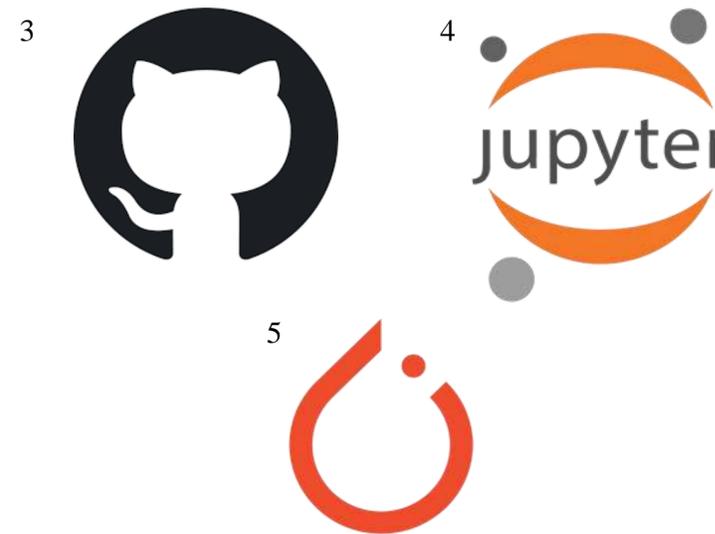


Figure 3, 4, & 5: 3.GitHub, 4.Jupyter Lab, and 5.Pytorch icons

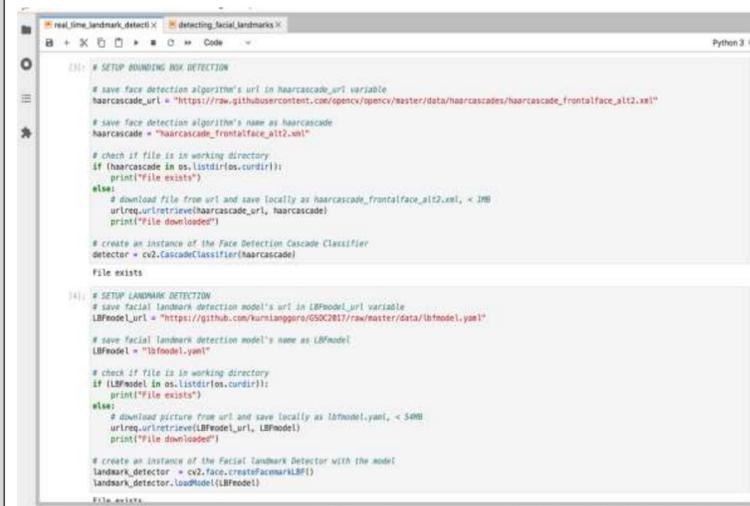


Figure 6: Two pieces of code the first showing the setup of the bounding box and the second is the setup of the facial landmarks

## Advice for Future SHINE Students

My biggest piece of advice to future SHINE students would be to not stress yourself out. The work at SHINE might be hard sometimes, but it makes it a whole lot easier if you just ask for help or speak up when you are overwhelmed. The people at SHINE are nice so don't be shy. You should be proactive and take initiative in your learning, especially since everyone around you wants to help!

## Acknowledgements

I would like to first thank Dr. Mills and Ms. Lopez for leading this program, Professor Mataric for opening her robotics lab to high school students, Brandon Thai Tran for being my mentor throughout the SHINE program, my lab partner Alondra Cardenas for the collaboration, my center mentor Cassandra Jeon, and lastly, my parents for helping me through processes.