Senior Project Proposal

1. Project Name: Boggle Solver
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1. Abstract

The purpose of this project is to solve a boggle board using a combination of computer vision techniques, a neural network and threading; then it will return the results to the user. This will allow them to do very well in a game of boggle.

1. Background & Prior Knowledge

* I have experience in Python, which is the language I plan to use for this project.
* I have a decent amount of experience in computer vision systems. This includes working with OpenCV libraries, NumPy, and matrix manipulation.
* I have done several projects in dataset creation for AI training data and feature detection.
* I have experience using various types of machine learning techniques including neural networks, which is something I plan on using in this, but I am not familiar with TensorFlow, which I plan to use for efficiency reasons.

1. Description

This program will lay a foundation for various Computer Vision techniques and will solve a simple issue for humans, but something which is usually very difficult for computers. That being the ability to understand something using a visual input.

* + Why?

The reason for doing this is to learn about the processes involved in object detection, recognition, filtering, matrix math, and neural networks to improve the detection of objects in an image. In the end, boggle will be solved and all possible words will be provided to the user.

* + What?

As mentioned earlier, this program will do the seemingly simple task of playing a game. It will provide the user with the answers to a game of boggle. The libraries I will create will hopefully allow for recognition of characters in a grid. Potentially allowing for scrabble solving, sudoku solving, or other games which have letters and numbers in various orientations to be recognized and have a way to be solved using efficient algorithms.

* + Who?

This program will be targeted towards hiring managers and interviewers. The practical use of a boggle solver is low at best. The technical challenges to be solved will be a showcase of my ability to create a complex program which works well.

* + Where?

I will be using my computer and if enough time is available then it could be ported to an android phone.

* + How?

The user will hold the boggle board inside of a square on their camera feed. After a few moments it will show the user all of the solutions it found.

* + When?

This project will be complete when it can view a boggle board and provide results. Additional polish can be applied to make it faster, more accurate, better interface, or more efficient.

1. Significance

The significance of this project goes far beyond the technical challenges involved. The most significant part of this project is learning how to use these technologies in such a way that they come together and work with each other to sole a fairly complex problem.

Another reason this is a significant project is because it shows that I am capable of self learning complex systems and connecting them to each other.

1. New Computer Science Concepts

While I have dabbled in each of the technologies I plan to use, Matrix manipulation, NumPy, and TensorFlow are not things I am very familiar with. OpenCV Is a little more familiar but still far from fully understood. The biggest thing I will learn from this is how to convert raw data into useful information using a combination of technologies.

1. Interestingness

I feel that this project will be of interest to a lot of companies and people alike. The novelty of this project will stand out. It isn’t a new version of something someone else has done. It involves technologies which are emerging and fairly new or only practical due to the recent advances in computing power.

It also shows that I can use GitHub, learn complex processes, come up with creative solutions and more.

1. Tasks and Schedule

* Research libraries involved and come up with a basic idea of how to segment the program. (Approx 6 hrs)
* Design interfaces, classes, and design documentation to a basic level (Approx 8 hours.)
* Learn how to show the images and results using a good layout and GUI (Approx 20 hours)
* Implement a board finder algorithm, (including filter algorithms, math to compute edges etc..) (Approx 25 hours)
* Implement a character finding and filtering algorithm (Approx 20 hours)
* Create datasets for AI training using data from from character finding algorithm (Approx 11 hours)
* Design and train the Neural network algorithm (Approx 15 hours)
* Design boggle solving algorithm (Approx 10 hours)
* Connect trained netowrk and image systems to boggle solving algorithm to print final results and show images (approx 15 hours)

**Total Hours: 130**

* I feel that while some of these tasks may take longer than these initial estimates, other tasks may end up taking less time and should result in around 130 hours of total work.

1. Resources

Game of boggle

Video Camera

GPU for accelerated image processing and recognition

Computer to host the code on

VSCode

Python with various libraries installed

TensorFlow

Nvidia CUDA toolkit

GitHub

Lots of patience.