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Introduction

- The Nerf Automated Defense System is an automatic turret using facial recognition to detect, identify, and decide whether or not to fire at targets.

Problem

- Personal security is a major issue.
- Without additional security measures, there's no deterrence for intruders.

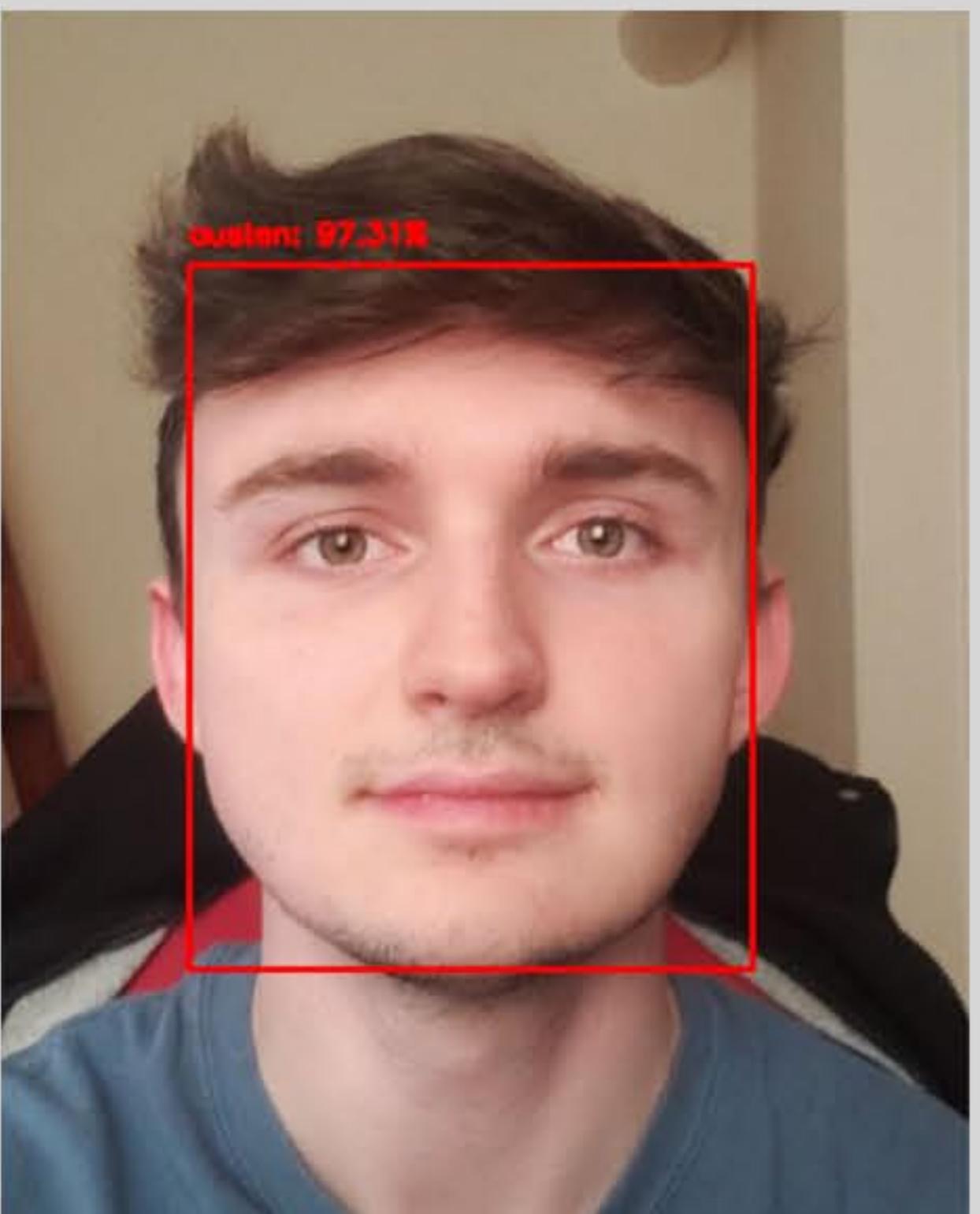
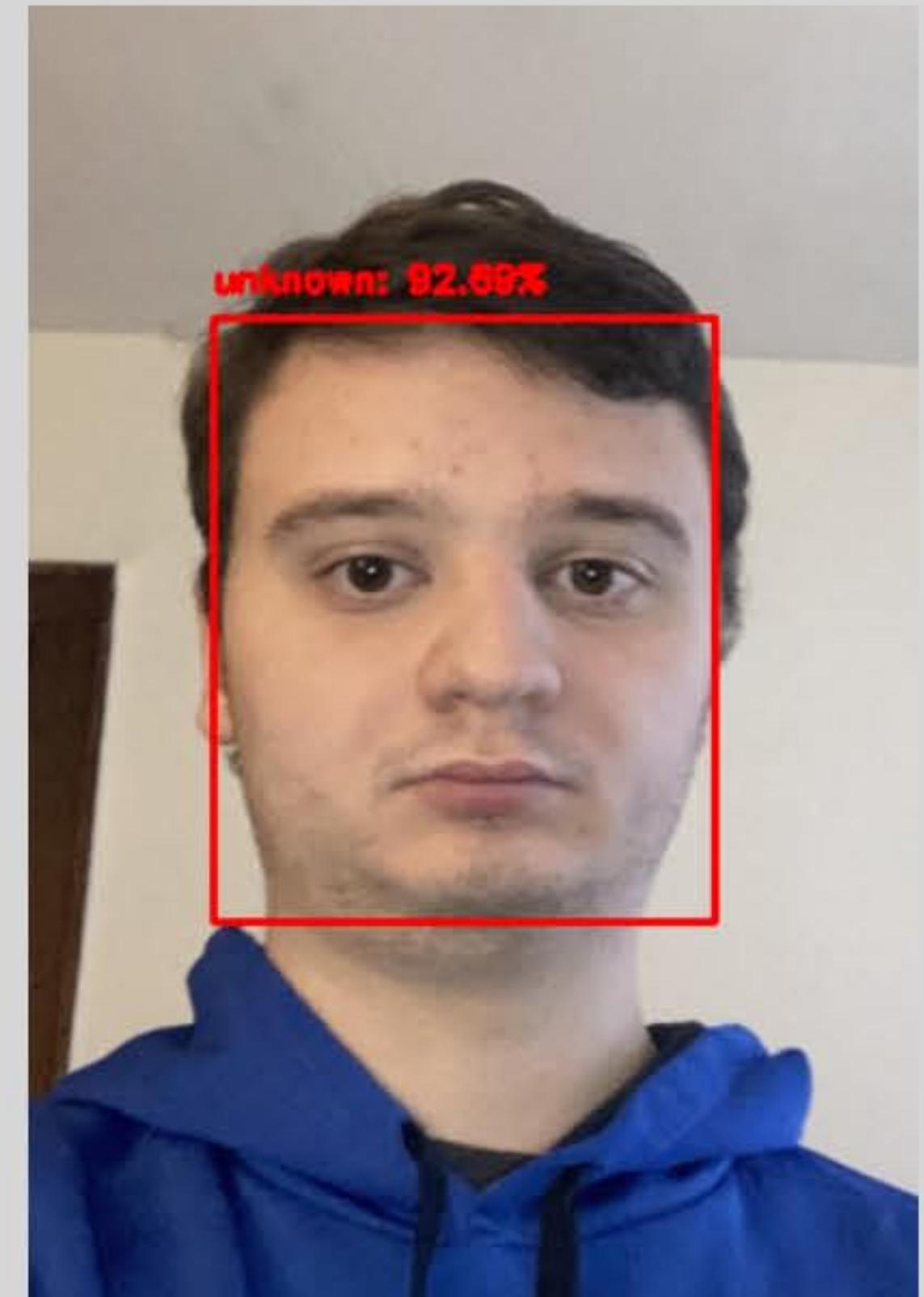


Figure 1: An example of the Facial Recognition model detecting and recognizing a face.

Figure 2: An example of the Facial Recognition model detecting an unrecognized face.



Solution

- Build an automated defense system to discourage trespassers using a nerf gun as proof of concept.
- Leverage facial detection and recognition to identify individuals.

Challenges

- Significant research into facial detection, facial recognition, and how best to implement these things.
- Considerable amount of time spent working with Raspberry Pi only to scrap it due to its weak computational power only allowing for ~2 fps on the camera feed.
- Substantial amount of time spent researching and installing packages to implement facial detection/recognition (OpenCV, dlib, imutils, etc.)
- Redesign of our system's firing mechanism due to complications with the nerf gun's wiring.
- Considerable amount of time spent building the physical turret.
- Balancing the rotating part of the turret.

Figures 3 and 4: A working prototype.



Technologies



Teams Meeting:



Results

- We have created a fully functional prototype, and have planned improvements for the final version.
- We have begun testing the use of a turntable to improve balance in order to increase the size of the aiming cone.

Conclusion

- We have created a working version of our project, and with more time and a proper budget, we could vastly improve on our current model.
- Our Facial Recognition model could be improved with a larger set of training images.

Improvement Ideas

- The Prototype, while functional, has a lot of room for physical improvements, such as balance improvements and an easy way to remove the gun.
- The wiring we used could be improved, and given more time, we could create a housing unit for the arduino, breadboards, and wires.
- The facial recognition model we used, while functional, could be much better. Due to processing power limitations, anything more than ~750 pictures took too long to train to be feasible given our limited meeting times.
- Instead of using a laptop computer, we could attempt to use a more powerful device, such as multiple raspberry pis linked together, an intel neural compute stick, or a more powerful computer.

References

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