

## **Final Project Proposal**

We intend to create a program that manipulates images by switching people's heads and faces in a photoshop-like style. The program will allow users to input a picture or take a photo or video and will then automatically edit the picture. In this project, we will further explore the uses of OpenCV, as it will help us to detect and crop around people's faces. We hope to have facial recognition in the shape of a face (not a square). Currently, we are considering utilizing various machine learning algorithms in order to teach the program the shape and structure of an individual's face in order to avoid choosing extra pixels or leaving pixels out when performing the face swap. We will then use these cropped faces to swap the faces of the two people found in the image. In terms of deliverables, we are setting our minimum viable product at the ability to swap faces with two people and our stretch goal at the ability swap more than two faces and potentially crop the entirety of a person's head in a photograph.

Our learning goals for this project are as follows:

Daniel Connolly → I hope to gain experience working with machine learning algorithms and programs as well as with integrating front- and back-end development in terms of creating a final deliverable website or mobile application. I would like to continue to work on my ability to work with a team on programming projects.

Raquel Dunoff → Make a cool app that is fun to interact with and easy to use.

Lydia Hodges → Learn more about what machine learning entails and how to do it, and develop more skills in team programming.

### **Implementation Plan:**

We plan to utilize OpenCV to implement the basic architecture of our program. As we improve our comfort with more advanced image processing, we will move from simply detecting faces to learning how to select pixels from photographs in order to meld multiple images or parts of an image together into a single coherent image. To begin, we will work on detecting faces and cropping the faces in their natural shapes, which are far more subtle than the basic squares we currently know OpenCV can

detect. We may potentially use a machine learning module such as sklearn to teach the program these shapes. Next, we will learn to find multiple faces in a single image and how to manipulate both at the same time, gradually moving to swapping the faces entirely. Finally, we may push for greater accuracy by looking at the more minute details of the image and learning to more subtly combine the faces into one, possibly even swapping the entirety of a person's head.

**Project Schedule:**

- Week 1: Install necessary libraries, complete research about how to implement and accomplish this project.
- Week 2: Set up basic facial recognition software.
- Week 3: Refine facial recognition so that it is face-shaped and start cropping/copying faces.
- Week 4: Figure out how to swap/overlay faces.
- Week 5: Continue with the above, or if completed, work to be able to swap more than two faces or swap faces in videos.
- Week 6: Clean up the code, complete documentation for the project, and present.

**Collaboration Plan:**

Currently, we intend to utilize a group chat to communicate when we are unable to meet in person. As we proceed into the project, we will break the project up into components in order for each team member to contribute to different parts of the project based on their interests and may meet to try pair programming at times. In terms of the actual code, we will work to improve our git skills by utilizing GitHub branches to divide up different elements of the project and learning to better deal with merging files.

**Risks:**

The greatest risks we face include our interest levels in the project, our ability to motivate ourselves to work on the project regularly, and our ability to effectively schedule times to work on the project individually and to meet as a team. We have all run into problems with the scoping of our projects in the past, and thus we hope that we have adequately scoped this project. We believe our minimum viable product is quite achievable and expect to have a significant amount of time to add more interesting and exacting details to the program.

**Additional Course Content:**

We believe that we could benefit from the class covering machine learning and image processing in greater detail.