

## COE 379L Project 4 Proposal

### Introduction

The project aims to deploy image recognition software on a Ring camera to discern the identity of individuals approaching a household. The idea is to differentiate between “qualified” individuals, such as family members, and “others” such as neighbors, thereby enhancing the camera’s ability to identify familiar faces and potential intruders.

If the person identified *does* belong to the familiar dataset, then a text message will be promptly sent welcoming them home. If said person is recognized as *not familiar*, then a message will be sent to the homeowner saying that an unfamiliar person is at the front door.

### Data Sources

For data sources, we plan on using detection frames from the Ring camera. When the Ring camera is activated, it creates a 30-second video of who/what was interacting with the door that caused the sensor to go off. It also detects when different people are at the door. We plan on using these clips and separating them into individual frames. We will go manually into these frames and create bounding boxes around the faces of people to create the training data. We want to do this so the model can learn how to identify objects with the type of grain and visibility the Ring camera has built-in. Similarly, we plan on taking free images of people off the internet to create a large sample size of *nonfamiliar* people to classify against the *familiar*.

To create the familial dataset, we plan on taking several pictures of one of our family members from varying angles, locations, and orientations.

We do recognize that the number of images between the familiar and nonfamiliar datasets is significantly larger. To compensate for this, we plan on using several different filters, cropping, rotations, translations, and orientations, to create a large enough dataset that would match the size of the nonfamiliar set.

### Methods/Techniques/Technologies

For methods, we are planning on using either LeNet-5, or alternative LeNet-5. Because both of these methods apply a decent-to-deep neural network layer, they are both suitable for the data processing we are expecting. Because the data set will be a class of 4-5 people, to resemble a household, the task of identifying individuals becomes more manageable. The model will only need to distinguish between these 4-5 specific people, with the rest being classified as “other”.

We originally considered using VGG16 due to it being more suitable for complex image classification tasks with large datasets. However, we decided against using VGG16 as we are looking to recognize different images and label them rather than solely classifying images into existing categories.

However, even so, we would like to handle cases of complexity, such as when the person is at a far distance and it's a night-time environment. However, the Ring camera does a good job of visually showing the person in these different scenarios that we don't think it will be a problem. There is a high-quality camera on the Ring camera, which helps reduce the need for many filters that need to be applied.

After identifying a person correctly, IE. within a high enough confidence interval with low error, a text message will need to be sent to that person. A web API will need to be developed that will take the confidence interval as a signal to message that specific person. Similarly, if none of those "qualified" persons are identified and instead it is "other", a message will need to be sent to the homeowner.

### **Products to be Delivered**

For deliverables, you should expect a working model that properly identifies household members. While we would like to have our model integrated with the Ring camera, with the quick turnaround of our project being submitted, we recognize this as not a hard requirement. We will aim to achieve this but recognize that it may not be feasible. Instead, we would like this model to be implemented with a stationary camera for easier connectivity and testing. Similarly, the model when properly identifying a person from a household, should message them welcoming them home. On that same note, if a person is not of that household and is detected by the model, a message should be sent to the homeowner saying that someone is at the front door.