Final Project Proposal

Definitions

Team name: ***MASK ID***

Team members: Michael Chen, Miranda Mo, Matteo Lunghi, Dev Ramesh
Note: Once one person uploads the report to Gradescope, please add all other team members to the submission within the Gradescope interface (top right on your submission).

If you need to find team members, please use the 'Search for Teammates!' top-level post on Piazza—pitch an idea!

Project

Please write a one-two page document including:

- What are the skills of the team members? Conduct a skill assessment!
- What is your project idea?
- What data will you use?
- What software/hardware will you use?
- Who will do what?
- How will you know whether you have made progress? What will you measure?
- What technical problems do you foresee or have?
- What is the socio-historical context that this project lives in? (2-3 sentences)
- Who are the stakeholders for this project? (3-4 sentences)
- What are the benefits of a technology such as this? (2-3 sentences)
- How might a bad actor misuse this technology and who would it harm? (2-3 sentences)
- Is there anything that we can do to help? E.G., resources, equipment.

Feel free to use these as paragraph headings, and also please include any media, references, etc.

Brainstorm 3/27/2021

- Lane path prediction. Map out the path a car should drive on. Feed in a video. Potential steering prediction
- Medical CV - map out body/joints, angles (personal trainers)
- Arc detection for basketball, any sport with ball detection
- Chosen idea: mask-resistant Face ID. We want to build a Face ID capable of recognizing you even with a mask on! The pipeline will entail the following:

  1) Gather a dataset of face images
  2) Pass these images through a model that puts a mask on all of these faces to generate the face-dataset
  3) Build a model to do Face ID without a mask
  4) Build a model with a different region of interest/perhaps different architecture to do Face ID with a mask on
  5) Combine them into a webpage for the end user

Skills of team members:

- Michael - Computer engineer so hardware experience if we wanted to do anything with Arduino.
- Miranda: Front-end development, UIUX design
- Dev: Software, reinforcement learning, front end development and design
- Matteo - Software Engineering (full-stack), deep learning, and machine learning experience

What data we'll need:

- Face dataset: Face Recognition on Olivetti Dataset
  Kaggle
  iPhone X Implementation
  Masked Face Dataset
  Deep-Learning Face ID

Software/Hardware

- Python libraries (openCV, scipy, numpy/pandas, flask, etc...)

- GCP
- UIUX (Figma)
- Camera/web-cam

Who does what

This is very rough/informal. Very subject to change.

- Michael - datset cleaning/preprocessing
- Matteo - model design (implementation, training)
- Miranda - model design (implementation, training)
- Dev: UIUX (webpage)

Progress measurements

- Obtaining the dataset
- Write code to place masks on images
- Build a working model to do face detection with masks and without
- Achieve a reasonable accuracy on both

Problems Foreseen

- Training the model with a smaller region of interest (the features not obscured by masks) will make it less accurate. Therefore, it may be problematic to achieve high accuracy when classifying images of people with a mask on.
- Face IDs typically map geometrically your entire face; we are just using single-angle 2D images to train our models. This would lead to a less accurate classification because facial reconstruction is not occurring.
- We need to ensure that the dataset we rely on to train our models is as unbiased as possible, meaning it will need to include faces of people from various different backgrounds.
- Writing code that is generalize to the task of placing masks on images of faces may be tricky.

SRC Questions

- Socio-historical - Face ID is a very relevant technology nowadays, being on most smartphones. At the same time, COVID-19 is an on-going issue that people have to deal with, which entails mask wearing. Thus, there can be useful implications for Face ID with masks.
- Stakeholders - If this Face ID algorithm misclassfies, the potential stakeholders at fault could include the engineers of the algorithm, the companies using the algorithm, users for allowing the use of the algorithm. In practice, the users will be liable because they will likely sign a terms of service that covers any harm caused by misclassification. Ethically, the engineers (us) should take most of the blame because a faulty algorithm was implemented.
- Benefits of the technology - Facial recognition even with a mask on can be used such that a user doesn't need to remove a mask if they aren't comfortable doing so given COVID-19 circumstances.
- Bad actors - We expect that our with-mask Face ID model will be less accurate than a standard Face ID, since the region of interest we will be training the mask-resistant model on is smaller (it will include only the upper part of faces not covered by the mask). As a result, a bad actor could exploit this to break into devices more easily while wearing a mask. This isn't directly relevant to our project, but it would be something to consider if we were to release our model to the public. This would harm the users whose devices are compromised, as well as the companies relying on this model to ensure the safety of their customers.

How can CS1430 help?

Questions we have for the TAs:

- Is this project within the scope of the class?
- What have other groups with this similar project done? With what degree of success?
- Can we use software/libraries not used in CS1430?