Final Project Proposal

Please make this document anonymous. Your team name should be anonymous.

Team name: ***Visioneers***

Note: when submitting this document to Gradescope, make sure to add all other team members to the submission. This can be done on the submission page after uploading (top right).

If you need to find team members, please use the thread under 'Final Project - Find Teammates' on Ed—pitch an idea!

Proposal Instructions

For your project proposal, please submit a one-to-two page document answering the questions below.

- What is your project idea?

  We will be creating an emotion detector using classification and deep learning. Our current plan is to implement one model using a combination of pre-trained and custom models as in homework 5; if time permits, we plan to experiment with a second architecture (e.g. CNNs) and compare performances. We also plan to test our models on custom images that we take.

- What is the socio-historical context that this project lives in?

  This project is situated within the broader socio-historical context of the increasing integration of computer vision into human-computer or human-robot interactions. The application of these technologies has become more prevalent in recent years, from assistive learning technologies to virtual agents (therapists, informational assistant, etc). As such, it is important for computers to recognize emotional states and signals and ultimately understand the function of emotional signaling in social interactions. However, because facial recognitions are related to human faces, personality, and cultures (as different cultures may have different ways of expressing emotion), they are inherently tied to ethical challenges of privacy, bias, and discrimination. In particular, emotion detection model like ours could potentially reinforce harmful stereotypes and perpetuate discrimination against minority groups as they are not well-represented in our dataset. There are also discussions around the accuracy and reliability of these systems, since emotions are very complex and can be expressed in many different ways even within the same culture or group of people – but the consequences of these models' mistakes can be severe, since recognizing the incorrect emotion may lead them to take action that harms the person they are interacting with, physically or emotionally.

- Please list three stakeholders that your project could impact, and describe how it could impact them.

  Emotion detectors can be used to assist individuals on the spectrum who may have difficulty identifying emotions in other people. With the assistance of emotion recognition technology, such individuals may be able to better identify how people around the might be feeling and thereby evade uncomfortable situations by responding accordingly. The stakeholders in this situation would be the individual on the spectrum, the people that this individual interacts with, and perhaps therapists or psychiatrists that work with the individual to help them respond appropriately to emotions and situations. The individual on the spectrum would have an easier time leading a relatively normal lifestyle without constant human supervision if they had technology to assist them in identifying how people around them are feeling. In turn, people who interact with the individual on a regular basis, particularly family members, would be more at ease knowing that the individual has a way to identify and navigate social scenarios through technological assistance and also avoid uncomfortable encounters. Lastly, therapists and/or other professionals who are providing support to the individual could use this technology in tandem with the strategies they coach the individual on, such as how to respond to situations where people are presenting certain emotions.

- What are the skills of the team members? Conduct a skill assessment!

  Team Member 1 - This member has background in deep learning from previous courses and therefore is well versed in building deep learning models.

  Team Member 2 - This member has experience doing sentiment analysis in a previous data science class, which similarly dealt with large datasets and classification.

  Team Member 3 - This member is good at designing and presenting ideas in a clear and concise manner. They are also good at being organized and convening people together to work.

- What data will you use?

  We will be using this Kaggle dataset that contains 35,685 examples of 48x48 pixel gray scale images of faces that are categorized based on the following emotions: happiness, neutral, sadness, anger, surprise, disgust, fear.

- What software/hardware will you use?

  We will use Visual Studio Code to preprocess the data and build the model architecture locally, and connect our GitHub repo to Colab for faster training. We will likely use TensorFlow for the model/data processing, but might switch to PyTorch if it's easier to use it for data loading and loading pre-trained models.

- Who will do what? [For anonymity, please use ''Team member 1 will..." or, alternatively, take on daring pseudonames.]

  Team member 1 will be responsible for designing the architecture of the model, which involved researching different neural network architectures and selecting the best one for out project. They will also be responsible for implementing the architecture, making sure that it is optimized for the data.

Team member 2 will be responsible for tuning the hyperparameters of the model and training it on the existing data. They will also be responsible for evaluating the performance of the model and making any necessary adjustments.

Team member 3 will be responsible for evaluating the model's performance on a test set and analyzing the results. This will involve calculating evaluation metrics, visualizing the performance of the model, and identifying any additional areas for improvement. This member will also be in charge of scheduling meetings to work together and spearhead poster design and presentation. All three team members will be helping each other with the tasks necessary for each step of the project.

- How will you know whether you have made progress? What will you measure?

  Currently, the most straightforward metric we are thinking about using is accuracy on the test set. However, it is possible that some facial expressions in the dataset are ambiguous (e.g. maybe it looks both sad and angry) – because accuracy does not take these subtleties into account, using just this metric might be too harsh of a measurement. To see how much progress we have made, we can also look at the misclassified images and determine whether they were reasonable mistakes or not (maybe using LIME to help us, as in homework 5). We also want to try evaluating the model on custom images that we take ourselves.

- What technical problems do you foresee or have?

  We're worried about compute resources the most. The dataset itself is very large and because the task is more complicated than the ones we usually deal with in homeworks, our model will likely need a lot of parameters and therefore require long training times on the GPU. We might also run into some difficulties if we evaluate our model on custom pictures that weren't in the original dataset, since these will need further preprocessing before it can be input into our model.

- Is there anything that we can do to help? E.G., resources, equipment.

  N/A as of now – we will probably end up using a lot of gmail accounts in order to use more GPU, but we would need to try loading in the data and doing some initial training to see how much data/how large of a dataset we can handle.

After Proposal Submission

Proposal Swap

After handing in your project proposal, your team will receive another team's proposal, and they will receive yours (remember to make your document anonymous).

Given the other team's proposal, your team must critique their understanding of their project's impact, and devise a list of what you think are the three most important potential socially-responsible computing concerns with their project. These should be written up in a document, and submitted on Gradescope the same day Progress Report 1 is due. The other team will do the same for your team's proposal and project idea.

Your team will then receive the other team's critique of your project proposal. Your team must respond to this critique as a graded part of your Final Project Report.

TA Assignment

After handing in your project proposal, your team will be assigned a TA to assist you. You should aim to meet with your TA once a week; this replaces TA office hours.

If you haven't heard from your TA a few days after the project proposal handin, please make a private Ed post and let us know which team you're on.

In your first meeting with your TA, your goal is to have your idea sanity-checked:

- Do you actually have the data?
- Do you actually have the compute?
- Is there code you need but don't have access to?
- Is there an area where you need help?

Some of these things will be outlined in your proposals, but talking through it with your TA as soon as possible will help you find potential road blocks and get the ball rolling.