**Capstone Proposal - Kelli Kennedy**

**Cheeri-yo!**

**Business Understanding**

I often participate in many startup businesses i.e. restaurants, events, and such. I’ve always wondered how to tell when someone is truly enjoying themselves, or when they are just trying to be nice. This is always a concern for a business when selling/presenting something new for the first time, whether a new dish at a restaurant, a new lecture style at school, or even when viewing a real estate property.

**Data Understanding**

I have two datasets: first is the industry standard Cohn-Kanade (CK and CK+) database. I will use this database to train my model. Once the model is trained, I will test it against the second dataset.

The second dataset was collected by Tufts University, referenced on Kaggle. Tufts Face Database is the latest, most comprehensive, large-scale (over 10,000 images, 74 females + 38 males, from more than 15 countries with an age range between 4 to 70 years old) face dataset that contains 6 image modalities: visible, near-infrared, thermal, computerized sketch, a recorded video, and 3D images. I will be specifically using the TD*RGB*E and TD*IR*E image datasets for testing.

**TD*RGB*E**: The images were captured using a NIKON D3100 camera. Each participant was asked to pose with a neutral expression, a smile, eyes closed, exaggerated shocked expression, and finally wearing sunglasses.

**TD*IR*E**: Images were captured using a FLIR Vue Pro camera with participants posing as in the TDRGBE dataset.

**Data Preparation**

There are basically two stages for my project: 1) face detection and 2) emotional detection. I will train a cascade classifier from OpenCV and use the Viola & Jones method for the face detection. For the second step, I will match the face image (using Eigenfaces or Fisherfaces method) to an image in a SQLite database, built from the Tufts Face Database. For the closest matching image, I will assign a probability for the particular emotion.

In order to protect the data, I will implement EncryptedPickle to protect the model and data while in use. The database content and metadata will be encrypted with the SQLCipher extension.

**Modeling**

This will be a supervised learning model as the data in my dataset is tagged. I will choose a statistical approach to modelling and therefore fit a PCA model initially. I will add a Feed Forward Neural Network, to increase model accuracy. Then I will test a Convolutional Neural Network to increase the model efficiency.

**Evaluation**

I will initially split the data from the Cohn-Kanade dataset into train and test portions. After the model is trained, I will generate classification reports to test the accuracy while tuning the model. After the model is trained, I will refit the data to the full Cohn-Kanade dataset and test against the unseen data in the Tufts Face Database. If possible, I’d like to test against both the TD*RGB*E and the matching infrared dataset TD*IR*E.

**Deployment**

The model will be deployed as a Flask app that users can upload a previously taken photo or by activating a web cam to send their picture. The app will then use the model to predict the emotion of the person. As the model is used by others, their data can be saved, tagged, and then used as future training data.

**Danger Areas**

A lot of work

Time constraints

Complex libraries

Large datasets take time to train