Presentation for SYS 6014

April 14, 2020

1 Proposal: A Decision Tool for Social Anxiety Disorder among UVA Undergrads

- University of Virginia, SYS 6014: Decision Analysis

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2 1. Introduction

2.1 To give some aid for social anxiety disorder

- **Definition of Social Anxiety:** Intense fear of being judged and scrutinized by others, beyond what would normally be expected.
- **Goal:** Providing immediate interventions to individuals when their Social Interaction Anxiety Scale (SIAS) scores rise.
- **Main Fields of Application:** Mental and physical health care

3 2. Experiment Design

1. The data of this experiment: collection of subjects' physical signal,including:

- ECG:
  - Heart Rate
  - Accelerometer
  - Gyroscope
- GSR:
  - Skin Conductance
  - PPG signal
  - EDA signal
- Audio Data:
  - Audio data features, pitch and energy

2. The design of this experiment:

- 13 survey questions, calculating SIAS scores ranging from 1 to 5
- 3 activities:
  - solo-video watching
  - dyad no-evaluation conversations

  - dyad evaluation conversations on specific topics
- 4 periods:
  - baseline
  - anticipatory
  - experience
  - post-event

3. Our mission: Identification of the user's social anxiety problem according to his or her signal conditions, and their SIAS score changes, then giving them treatment

3.1 Data Set

- 6 UVA undergraduate Students
- On 11/21/2019
- We assumed that they all provided their real feelings, and they are trained before, all these features are collected without any loss

3.2 Timing Sheet Provided Here

3.3 This is the Example Data

3.4 This is the Project Diagram

4 3. Data Processing Already Done

- For Accelerometer and Gyroscope Preprocessing: Using the Signal Vector Magnitude (SVM):

$$SVM = sqrt(x^2 + y^2 + z^2)$$

- For audio processing:

  two sources of data, the videos taken during experiences and the audio captured by the smartwatch. Both sources were converted into .wav files to standardize them, identified by type of audio, participant id, date and time stamp.

- For Features Extraction:

  Accelerometer/Gyroscope: mean, standard deviation, min, 25% percentile, median, 75% percentile, max, entropy, variance, skewness, kurtosis, Skin Conductance: number of peaks, and other fluctuation features

- For Windowing:

  Using the 2s windowing for Accelerometer, Gyroscope and Skin Conductance, 5s windowing for Heart Rate

4.1 What We Have Already Done (Cont.)

- Random Forest Classifiers for the selection of features, 12 features selected
- The achieved accuracy was very low for both of the classification algorithm Support Vector machines,

Random Forest Classifier: just above 30%, Accuracy was only 31.08. between the 5 classes was 33.4%, training and testing cross validation was in 60 to 40 ratios.

- More generalized method: According to score change (0, -, +)

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** These are our prior beliefs **

5 4. The Variables in this System

5.1 4.1 Variables from the Environment

- Features Extracted from ECG,GSR,Audio Signal: $F : \{f_1, ..., f_{12}\}$
- Subjects' activities: $Act : \{act_{00}, act_{01}, act_{02}, act_{03}, ..., act_{23}\}$
- Subjects' score changes: $S : \{s_{00,01}, s_{01,02}, s_{02,03}, ..., s_{22,23}\}$
- Subjects' main problem(desired problem): X_d

5.2 4.2 Variables for Decision

- Parameter Space (Probability of Score Change): $\theta = \{p(s_{00,01} = 1), p(s_{00,01} = 2), p(s_{00,01} = 3), ...p(s_{22,23} = 4)\}$
- Action Set: A1 = Cogitive behavioral therapies(CBT) = {promotion of exercise,exposure and social skills training, …} A2 = Pharmacological therapies = {Selective Serotonin Reuptake Inhibitors(SSRIs), etc.}
- Loss Function: Using the least square error to compute the difference of the actual score change and predicted score change

6 Thanks for watching!

7 Questions?