

DLR Internship Summary

Peru Dayani

During my six week stay at the DLR, Braunschweig I was working under Ph.D. student Esther Bosche and DLR research scientist Klas Ihme on F-RELACS. This project aimed to create an autonomous model to predict the frustration levels of drivers and/or passengers using facial video, pose video, EEG data, ECG data, skin conductance levels and eye tracking. An extensive data set of these points was obtained along with a subjective frustration rating using a dynamic driving simulator at DLR Braunschweig

The first project I worked on was building a python application to allow participants to efficiently rate their frustration levels at 50Hz while rewatching their driving simulation. In addition, I automated the tedious process of restarting for every case reducing the time and effort required of all parties involved. As the data was collected from numerous sources sorting the files into their respective cases was tedious work, automating this process was my second project as we started collecting data from the studies.

Then we worked on post processing the data, which broke into two sub projects. The first task was normalizing the timestamps from each source(eye tracking, subjective rating, ECG, facial video, etc) to build a master table with all data points together at every timestamp and optimizing this algorithm. The second task was cleaning this data based on discrepancies in Heart Rate and InterBeat Intervals and visualizing to get preliminary understanding of obtained data.

At this point we had a few clean user studies completed therefore enough data to begin coding the models but not enough to effectively train them. To decipher the facial video, we used the Facial Action Coding System (FACS) to breakdown the videos into usable Action Unit data points. While the FACS algorithm was running I wrote scripts to build and optimized Random Forest Classifiers and XGBoost Classifier attempting to predict frustration levels using the heart beat, interbeat intervals and skin conductance levels. Upon obtaining one clean sample of FACS data I proceeded to write scripts to build and optimize three NN's and two LSTM RNN's to predict frustration based on facial video. Due to the short time frame, there wasn't enough data to train these models but all the code is well documented and I'm still in touch with Esther to ensure the models work once the user studies are completed.

I would like to end by saying that it was an amazing experience, both professionally and personally. The opportunity to dive deep into machine learning in such a professional and supportive environment and apply it to human emotion theory was a novel combination and great learning experience. I will forever treasure the relationships formed with both people and work and outside and am thankful for the opportunity to experience the German culture. I believe my desire to return next summer is a thought shared by my superiors at the DLR and I hope this can happen!