Colorado Science and Engineering Fair

2024 Individual Project Abstract Form

Please print 2 copies of the completed form. Sign both copies, keep 1 for your notebook and submit 1 copy to your Regional Fair Director with your other paperwork.

Title of Project: Learning the Lie: Coding a Machine Learning Algorithm to Analyze Brain Activity for Lie Detection

Finalist's Name: Bode Monahan

School and City: Liberty School, Joes

Sponsor's Name: Ms. Linda Fogale

Category: Mathematics & Computer Sciences (MACS) Division: Junior (6th - 8th grades)

Abstract (250 words or less):

The purpose of this project was to build a better lie detector. Traditional lie detectors have an accuracy rate of around 67% accuracy. To test the lie detector the Electroencephalography (EEG) machine was placed onto the participants heads and connected wirelessly to the computer. The EEG machine was then fitted onto the participant. The participants were then asked a question that they answered truthfully and lied. This was to establish a baseline. After that the participants were asked ten questions at random. Those questions were then documented and graffed in Microsoft Excel. The amount of correctly identified truths and lies were then averaged out to get a total accuracy of 73.3%. If you give it six questions though the accuracy goes up to 90%. This percentage was higher than a traditional lie detector.

How the lie detector works is the EEG machine works by having small metal discs on the test subject's head. Those discs receive small electrical signals and then amplify them for data processing. The data is then sent off to a viewer. The levels are then displayed on a screen and then imported into a Support Vector Machine (SVM Classifier). The SVM Classifier works by plotting the data points on a graph and making a hyperplane in between the truths and lies. Then when a new point is added it says truth or lie depending on which side of the line the dot falls. An unexpected outcome of this project is that it has a deceit accuracy rate of 100%. The results show that the new lie detector was successful at detecting lies better than traditional lie detectors.

I hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I also attest that the above properly reflects my own work.

Finalist's Signature: Bode t Monahan Date: 3/04/2024

In addition, all students must complete the ISEF Student Checklist (1A), Research Plan, Approval Form (1B), and Checklist for Adult Sponsor (1), and any other ISEF forms required for this type of project. See the International Rules and Guidelines for form requirements. Return COPIES o all of these forms to your Regional Fair Director with you Finalist Verification/Permission Form. A signed copy of this form must be included in your notebook.