CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Luke Anderson

Project Number

S0401

Project Title

Lights, Camera, Action-Reaction: Sympathetic Nervous System Response to Action Movies across the Decades

Abstract

Objectives

I compared older and newer horror movies, seeking to ascertain whether newer movies led to greater changes in vital signs.

Methods

Movie clips viewed were derived from the 1960s, 1990s, and 2010s. I recorded a real-time EKG along with the participant s heart rate, blood pressure, pupillary response, oxygen saturation, visual reactions, and respiratory rate. Measurements were taken before, during, and after viewing of each film.

Results

The average change in baseline heart rate was ten beats-per-minute (BPM) for modern movies of the 2010s. By contrast, this change in heart rate was only 2.5 BPM for older movies of the 1960s. I performed an analysis of variance test, (ANOVA) on various data sets to yield a P-value of statistical significance. The absolute change (?) in heart rate had a supporting P-value of 0.003, whereas the percent (%) change in heart rate was noted as a trend rather than as a statistically significant parameter.

Conclusions

I conclude that modern horror movies elicit a fight or flight response, characterized by incipient tachycardia (heart rate elevation). While vicariously identifying with victimized movie characters, I believe viewers enter into a survival mode, mediated by stress hormones such as epinephrine, norepinephrine, and cortisol. Moreover, increasingly graphic film techniques, reflecting cinematic and societal change, have resulted in a shock value that challenges not only our minds, but our very cardiovascular survival. One might ask if future horror movies, within decades, might be expected to result in cardiovascular decompensation, or even death. These are questions worthy of further study. Is your life worth a good scare?

Summary Statement

By use of real time vital signs monitoring, I have found the physical manifestations of the "fight or flight" response are more pronounced in viewers of modern horror movies than as seen in viewers of older films of a more measured era.

Help Received

My teacher, Victoria Acquistapace, helped me to apply and develop my project. My teacher's friend, Dr. Homburger helped to strenghten my statistical testing and data collection.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Mayra Arellano

Project Number

S0402

Project Title

Red Pill or Blue Pill? How Age Impacts Confirmation Bias

Abstract

Objectives

The objective of the project is to determine whether age has an impact on confirmation bias.

Methods

A random sample of adolescents and adults were given an adapted version of Wason's 2-4-6 task to assess confirmation bias.

Results

The total presence of confirmation bias for each group, measured as the proportion of times a subject tried to prove their hypothesis, was compared to determine whether the data was statistically significant using an independent t-test and standard deviation.

Conclusions

It was statistically significant at the 95% level that the adult group had lower confirmation bias than the adolescent group. The project provides evidence that age does impact confirmation bias.

Summary Statement

I found evidence that adults have lower confirmation bias than adolescents.

Help Received

I designed and conducted the experiment myself. My teacher, Jeffery Adkins, reviewed my work.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Gabriel Bacon

Project Number

S0403

Project Title

The Effects of Demand Characteristics on a Survey

Abstract

Objectives

My objective is to determine if, when a survey taker forms an interpretation of what a survey is testing, they will give different responses than they would if they did not think they knew what was being testing.

Methods

Google Forms, Google Sheets, Facebook, Instagram. A number of surveys were created that appeared to test the same topic, with changes in the way title and questions were worded. The surveys were posted to social media and each participant only took one of the surveys. The data from each survey was then collected into its own Google Sheet, and further sorted by a demographic relevant to the topic. The respondents who took the surveys titled Do Video Games Increase Aggression in Teens , and Do Video Games Calm Emotions in teens were stored in their own respective sheets, and then separated into the video game players, and non-video game players.

Results

Certain surveys did bring out specific responses depending on what hypothesis they alluded to. The results between demographics responding to the same survey varied as well. The non-video game players who took the survey that hinted the hypothesis was that video games lowered aggression, gave far more calm responses than aggressive ones. The video game players who took the same survey gave far more aggressive responses than calm ones.

Conclusions

Based on the results, I concluded that if a participant has an interpretation of what a survey is testing, they will give different results than if no interpretation was formed. Furthermore, the change in results is determined by the prior knowledge and beliefs that person has on the topic they think is being tested.

Summary Statement

I showed how, when a survey taker thinks they know what a researcher is testing, they will change how they respond to the questions

Help Received

None. I designed my survey, collected my data, and analyzed it myself

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Diogenes Angelo Bernal; Erin Hoffman

Project Number

S0404

Project Title

The Relationship between Deception and Altruism amongst Teens of Different Economic Status

Abstract

Objectives

This experiment was performed to investigate whether the economic status of young adults affect a tendency to lie for personal gain, or for the benefits of others. A preliminary survey was sent out to 58 high school-age teens to get a representation of the data the experiment could produce. The survey showed that 2.05% of people whose families struggled financially have a tendency to lie to benefit themselves, while 19.0% of people whose families are financially stable have the same tendency. The actual experiment, which included a survey that included multiple scenarios with decisions that allowed participants a choice between exuding a generous, honest behavior, or a selfish, deceptive behavior. A total of 105 teens in Ventura County took the survey, with about 28 of participants exuding a selfish, deceptive behavior. Out of these 28, 18 participants were of a high economic status, while 10 participants were of a low economic status. To determine whether a participant was of a high or economic class, participants were asked to state if their families owned more or less than $80,000, which is the average income of a Ventura County household. The original hypothesis that teens of a higher economical class were more likely to lie to benefit themselves was proven to be correct. Not only was the hypothesis proven to be correct, but the stereotype society has instilled on the behaviors of lower class teens was as well. Society thinks today that teens of a lower economic class are more likely to lie or steal, however the experiment has shown this to be invalid and solely based off one s opinions, not fact.

Methods

Google survey (questions created by us), social media accounts

Results

A total of 105 participants in Ventura County took the survey on social media, however 89 participants were taken into consideration, due to insufficient answers or responses. Out of these 89 participants, 29 individuals families currently have an income less than $80,000 a year, while 60 individuals families earned more than $80,000. For the purposes of this experiment, results show that teens of lower economic statuses have a greater tendency to develop selfish, deceptive tendencies rather than teens of higher economic statuses. Out of these 89 participants, 28 teens communicated selfish, deceptive answers while 61 teens communicated altruistic, honest answers, out of a total of 7 different scenarios. Out of those 28 individuals who communicated selfish, deceptive answers, 18 were of a higher economic status than the average family household in Ventura County, while 10 were of a lower economic status.

Conclusions

Summary Statement

The stereotype that someone who is poor will steal more than someone who is rich is not aplicable and should not be taught to children to further advance to a unified society.

Help Received

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Diego Borgsdorf; Sarah Shapiro; Sarah Tran

Project Number

S0405

Project Title

The Language of Extremism: A Socio-Linguistic Analysis of Nationalist Content in the Context of Linguistic Purism

Abstract

Objectives

Linguistic Purism is a linguistic model that refers to rhetors who consciously purge words and grammar structures deemed unpure or foreign. In the English language, Linguistic Purism is manifested as Anglish, or English without any words whose roots are not Germanic, since pure English is the derivative of old Germanic languages, such as Anglo Saxon, Old English, and Old Norse. During periods of intense nationalism, many rhetors have historically used linguistic purism. Such diction was used by many pro-Brexit rhetors. Germanic diction is also characterized by its simplicity and emotional poignancy. We examined the connection between nationalism and Anglish diction in American literature, and the rhetorical impact of linguistically pure diction in comparison to composite standard English.

Methods

A random sample of 21 essays, tweets, and thought pieces from self-defined American nationalists were analyzed. On average, they contained 27.83% Anglo-Saxon linguistically pure diction, 3.8% higher than standard English. To examine the rhetorical impact of such diction, we conducted memory-testing within a distributed survey about political engagement.

Results

61% of respondents reported that essays with linguistically pure diction were easier to remember than those without. However, standard English essays were seen as more rhetorically effective.

Conclusions

We conclude that this is because non-Germanic diction is seen as more academic and objective than Germanic diction, appealing to our highly-educated, Democratic audience. Our results tell us that an effective use of diction must combine memorability and complexity to uncover our striking connection between memorability and Germanic diction while preserving a rhetor's perceived intelligence.

Summary Statement

We analyzed the frequency of linguistically pure, germanic diction in nationalist texts before testing its rhetorical impact.

Help Received

Name(s)

Noelle Brem; Aika Onitsuk; Jocelyn Reyes-Ordaz

Project Number

S0406

Project Title

Which Accent Is More Appealing to Americans?

Abstract

Objectives

The American ear will find the British accent more appealing because of the amount of representation it has in American media. The French accent will be the least liked accent because of the negative views that Americans have on the French. The second appealing accent was the Scottish accents because not many people hear Scottish accents or do not recognize the accent. The third appealing accent is the American accent because we are familiar with the American accent and use it every day.

Methods

4 videos, 1 script, 1 survey.

Results

Our results were that the british was more appealing then scottish then the american then the scottish accent.

Conclusions

Most of the participants believed that the British accent was the most appealing to them with over half answering it as the most appealing. The least appealing would be the French accent with a total of 58% of the participants surveying it as their least.

Summary Statement

Our project is about is which of the accents is appealing, the accents we used was British, Scottish,French, American

Help Received

We would also like to thank Noelle and Chris O Shaughnessy for the accents.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Sean Cai

Project Number

S0407

Project Title

Analyzing Stratified Ethical Behavior at Executive Levels Using Shareholder Regression Models and Firm Value

Abstract

Objectives

Objective: This experiment seeks to examine firm value drops in offending companies and suppliers as well as examine the role of gender diversity in anti-corruption measures using a variety of stock market indicator measures.

Methods

Used the Wharton Research Database Services (Eventus Query) and Scrappy Computer Program for Web Crawling Data from Stock Market Sites Downloaded for scrapy.org and modified for use in examining the experiment's selected websites for data collection.

SAS File Viewers and Converters were used for data analysis of Databases of Company Trade Dealings in International Regions as well as their Suppliers (~125 Companies Needed), Databases of Company female executives, gender employee distributions, news reports of announcements of company corruption Insider Trading database of most prominent corrupt countries as defined by results , and CSMAR database between 2010 and 2013

Shenzhen & Shanghai Stock Exchange Universal Access was required to access this data.

Results

Results: Offending Companies see no significant long term decrease in growth, but an average of 4% growth rates at the one year analysis. Suppliers of those companies experience the opposite firm value effects, at every time interval. Stagnation in growth is seen through control companies, but no decrease in firm value. Female presence in the workplace dampens corruption as only 12% of corruption cases involve females while they make up 16% of the workplace in the companies in the regions where corruption cases mounted highest. Males were 5.8 times more likely to commit corruption and Male opportunistic insider trading values for sales and purchases were 169% of those of women. Regression models indicate that there exists a significant relationship between female representation in a company and unethical behavior.

Conclusions

Conclusion: Female presence in the workplace in executive positions was inversely correlated to corruption. Firm value drops as a result of shareholder perceptions only caused company growth rates to stagnate in both offending and supplier companies, corruption was not deterred. The presence of females in companies moderated behaviors leading to corruption. Companies with widespread corruption or executive level corruption similarly saw worse ratings in the perceptions of shareholders and more growth stagnancy.

Summary Statement

I showed that current anti-Corruption law does not dissuade unethical behavior in companies, and provide results that show gender diversification has a significant impact in reducing company corruption through moderating unethical behavior.

Help Received

I designed all regression models and analyzed all database data from myself, along with all the control variables. I obtained governmental data from the University of San Diego. Professor Phil Zhu of USD also reviewed my regression analysis for validity.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Brianna Camero; Bhjan Kaur

Project Number

S0408

Project Title

Erudition Identification: Using Computer Science to Find Literacy Levels

Abstract

Objectives

Our nation s report card for reading is at an all-time low. This is due to the failed ways to improve students reading levels. These methods do not push the students enough and they keep the students in their comfort zone which thwarts academic growth. Kids should be given a challenge zone and the questions from STAR Reading should be different, not the same every single time. Since the questions are the same for every test to determine the student s reading level, the student is susceptible to just memorizing the questions and answers rather than working through it themselves and learning from the experience. What is needed within our society in order to improve our education system is a method that will actually allow for students to grow - a method that pushes students but doesn t push them too much to the point that they give up and progress becomes nonexistent. We need a method that will allow for students to improve their comprehension, understanding, and expansion of their vocabulary by keeping them just out of their comfort zone, which does not allow them to improve since they are not expanding their current knowledge. This method is creating our own reading level. Our reading level would take into account more variables than the current reading level, such as the number of syllables per word, number of words per sentence, number of letters per word, word frequency, and sentence length. By creating this method, we would be improving the overall welfare of the constituents due to becoming more competitive in the global economy.

Methods

First in this experiment, a program was created that can measure the number of sentences contained in the text, the number of words per sentence, the number of letters per word, the average number of words per sentence, and the average word length and the excerpts from 48 books are put into the program to calculate these properties from the books. After that, the data was plugged into the Fry Readability Graph, the FOG/ SMOG Readability Graph, the Dale-Chall readability test, and the Spache readability test in order to come to a conclusion on what the reading level, which has been named the Enlightened Literacy level, ought to be. Once the conclusions were made, a recommendation list was created inside an original app so that the lists can be easily accessed by literate individuals. Furthermore, we created a formula which converts all levels of Lexile or ATOS to the Enlightened Literacy reading level, which allows us to convert all reading levels of Ridgeview High School into the Enlightened Literacy reading level. After doing so, we created a plan that allows for students to advance because Enlightened Literacy represents a more accurate and precise version of Lexile and ATOS. Basically, the Enlightened Literacy reading level will help students advance in their reading level due to the accuracy and precision the reading level consists of due to taking

Summary Statement

In order to enhance the reading scores of students, we created a new reading level and program to achieve better results than the current reading level and program.

Help Received

We designed and built our own program, but in order to better understand JavaScript programming overall, we received help from Arashjyot Sidhu, an engineer, and Mike Brasier, our science teacher.

Name(s)

Anna Chang

Project Number

S0409

Project Title

Study Jams: The Effect of Words in Music on Reading Comprehension

Abstract

Objectives

The objective of this study is to determine the effect of music, including the presence of words in music, on reading comprehension in high school students.

Methods

3 short reading comprehension quizzes of similar difficulty, 30 test subjects (high school students), 2 audio files. 3 quiz trials per test subject -- each tested while listening to music without words, music with words, or no music. Time per quiz determined by length of audio file (4 minutes) or 4 minute timer for trial without music. Grade quiz questions to measure comprehension.

Results

Listening to music with words results in the worst reading comprehension. Listening to no music results in the best reading comprehension.

Conclusions

Multiple trials with different test subjects prove that listening to music with words has a negative effect on reading comprehension. It is concluded that studying with music, especially music with words, is not ideal for the majority of high school students.

Summary Statement

I proved that listening to music with words negatively affects reading comprehension.

Help Received

None. I designed and performed the experiment independently.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Nathan Chiu; Swasti Jain; Joe Lin

Project Number

S0410

Project Title

The Design and Construction of a Patch with an Application for People that Alerts the User When They Are Slouching

Abstract

Objectives

The goal of our project is to improve the posture of users by creating a device with a constant alerting system to phase out incorrect posture. We aim to refine our device, so that it will better one s posture 85% of the time.

Methods

Our product is composed of elastic bands, velcro, and electrical components, such as the Arduino 101 with Bluetooth capabilities. We used techniques ranging from soldering to iOS Development in order to put the circuitry together and establish a user-friendly interface. During our testing period, we used materials such as a multimeter, skin tape and also gathered participants through surveys. We were able to obtain results using our product by testing participants to collect data about the effectiveness of the alerting over a duration of time.

Results

Our limited data shows that through our product s alerting system, the user is able to improve their posture 100% of the time. The trial from the second day showed that the average participant slouched about 50% less than the first day, which shows that our product allows the user to develop better posture.

Conclusions

We conclude that our product is able to train one s posture effectively through alerts from our application. Our participant testing results support our conclusion as it shows that users improve their posture 100% of the time.

Summary Statement

The goal of our project is to create a continuous alerting system that will allow the user to improve their posture.

Help Received

Our overseeing mentor taught us how to solder with smaller electronics. In addition, we consulted a pediatrician to help us understand the benefits of good posture and the characteristics of the correct posture.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Elizabeth Enad; Angelheart Rogel

Project Number

S0411

Project Title

Myers Briggs and Behavior Prediction

Abstract

Objectives

The objective of this study is to determine if we can use the Myers-Briggs Type Indicator to predict people's responses.

Summary Statement

Using the Myers-Briggs Type Indicator, we can predict a person's responses, which was tested through the research and surverys we've done for our project.

Help Received

Mr. Callaway, our science fair adviser, suggested that we should do a study about Myers-Briggs Type Indicator as a tool to predict people's responses.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Audrey Ha

Project Number

S0412

Project Title

Fostering Racial Tolerance in High Schools: Researching Correlations between Tolerance, Activities, and Demographics

Abstract

Objectives

In 2017, 4,832 race-bias hate crimes occurred in the U.S. (FBI, 2017). Previous research showed that high schoolers receiving character education became more accepting as adults. However, the research only studied a small sampling of student tolerance exercises with gaps in demographic effects. The goal of this project was to identify effective high school racial tolerance activities and the demographics that may benefit.

Methods

Online surveys were created for U.S. high school students and faculty and approved by the school IRB. After collecting informed consent, both surveys identified participant demographics, student body tolerance levels, and a diverse range of current tolerance activities. The nationwide surveys received responses from 1,095 students and 359 faculty throughout 46 states. Using the R statistical programming language, a Spearman Rho test was conducted to find r-value correlations between tolerance levels and activities/ demographics. The r-values were converted to p-values.

Results

Moderate ($p<0.05$) to significant ($p<0.01$) correlations existed between higher tolerance levels and various activities/implementations, including student and faculty diversity, English Second Language classes, studying human rights, and studying historical racial injustices. Male students observed less race-based friend group exclusion among peers and perceived teachers as more dedicated to decreasing race-based exclusion. Older students noticed more interracial interaction opportunities. Students who were American Indian, Black, Latino, Middle Eastern, and Pacific Islander were moderately to significantly comfortable befriending students of other races.

Conclusions

The findings suggested modifications to interracial interaction, language programs, and social studies programs could lead to more student tolerance. The results suggested male students were more tolerant due to faculty focus on males and that older students took more initiative to engage with other races. Providing female, younger, and Asian/European-American high schoolers with opportunities for tolerance activities could be beneficial. The trends studied in this project, including successful racial tolerance activities and groups that benefit, may serve as a model for high schools to effectively foster tolerance and shape a more inclusive generation.

Summary Statement

I studied effective methods of fostering racial tolerance in U.S. high schools by researching successful tolerance activities and the demographics that may benefit.

Help Received

My science teacher assisted me by reviewing the survey and aiding with survey distribution. Statistical analyses were conducted under the supervision of a professional statistician.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Mahum Khan

Project Number

S0413

Project Title

Practice Makes Permanent: How Does Repetition Affect the Human Ability to Adapt to New Forms of Writing?

Abstract

Objectives

The goal of this project is to determine how efficient repetition is.

Methods

Materials:
30 volunteer within an age range of 10-19
Timer
3 sets of 3 codes written in Aristocrat limited of 40 characters. Each set follows the same alphabet patterns.
An additional 10 for practice limited of 40 characters
Sample 1 requires 1 practice and 3 tests
Sample 2 requires 3 practice and 3 tests
Sample 3 requires 6 practice and 3 tests
A description of an Aristocrat
20 half sheets of scratch paper for each participant

Methods:
Bring each testee in the room. Make sure it is a room with minimal noise level throughout the entirety of the experiment.
Hand the sheet that explains an Aristocrat to the volunteer and have them read through it to understand. Also provide each testee with as much paper as needed.
For Sample #1, hand them 1 code for practice, allowing them to take them as much time as needed to complete the cipher completely. Once the testee completes each practice, show them the answer before they go onto the next practice.
Give testee the designated tests of Aristocrats for Sample #1. Each Aristocrat from the set must be given individually and be individually done.
As soon as the testee states that (s)he is done stop the timer and record the time. Repeat this step for the three tests in that set.
Provide a 5 minute break in between Sample #1 and Sample #2.
For Sample #2, hand them 3 codes for practice. Hand them each code individually and the next after completion of each practice. Allow them to take as much time as needed. Once the testee completes each practice, show them the answer before they go onto the next practice.

Summary Statement

Examining the importance of repetition in learning a complex topic.

Help Received

Jasmine Vo, a colleague, helped me evaluate the question and design an experiment that will answer the question. Mandy Chocky, another colleague, helped me design and correct the ciphers. Additionally, I would like to acknowledge all 15 people who helped with the completion of the trials.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Kaelyn Luebke

Project Number

S0414

Project Title

Personal Comfort and Therapy System (PCATS): Wearables and Jedi Mind Tricks

Abstract

Objectives

Reduce pain levels for patients, using a Personalized Comfort and Therapy System (PCATS) which leverages a Genetic Evolution Machine Learning Optimizer (GEMLO) to determine optimum real-time local pain therapy and patient intervention.

Methods

Test Subject response to Cold Therapy was measured, using various sensors including eSense sensors measuring skin conductivity, an ECG Watch measuring electrical heart activity and a Mindwave EEG Headset measuring brainwave activity. To assess and predict the optimum pain therapy for a specific patient, a theoretical computer model was developed, incorporating an AI algorithm from an online software library. To apply the PCATS Pain Therapy recommendation in a specified sequence, a connected device (based on Arduino) was developed to accept PCATS optimized instructions.

Results

None of the tested sensors reliably measured Patient Comfort. Mindwave and the ECG Watch both were unable to detect response to the Cold Therapy. eSense detected a response to Cold Therapy, though it appeared to measure external and internal stimulus, and is unlikely to be a good sensor to measure Patient Comfort. Fortunately, eSense may be used to study response to stressful stimulus as well as calming activities.

The PCATS model and optimization code rapidly optimizes simulated Therapy for an Individual Patient. Final predicted therapy sequence provides very high comfort response, making rapid progress toward the optimum, and consistently reaching it. Rapid convergence to final predicted therapy sequence occurred for most cases. An Arduino system was developed to successfully apply PCATS / GEMLO instructions.

Conclusions

The Personalized Comfort and Therapy System (PCATS) provides a means for assessing and predicting Patient Comfort. The GEMLO optimization code was successful in optimizing patient comfort over time, and provides a robust system to evaluate multiple discrete therapy options in future research. Additional research is needed to identify accurate Comfort sensors and incorporate this real-time input. In addition, the Arduino controller demonstrated a viable future controller concept.

Summary Statement

A Personalized Comfort and Therapy System was developed including an Arduino controller to apply local pain therapies, sensors to measure comfort response, and a Genetic Evolution Machine Learning Optimizer to optimize in real-time.

Help Received

My brother Marcus inspired my interest in Machine Learning and helped me learn about its applications. My mom helped me with data taking and provided input on my presentation. My dad lent me some of his equipment and helped me learn about different sensors for measuring body response.

Name(s)

Arjun Neervannan

Project Number

S0415

Project Title

Combating Cyberbullying and Toxicity by Teaching AI to Use Linguistic Insights from Human Interactions in Social Media

Abstract

Objectives

Social Media is replete with toxic comments. AI algorithms built to identify toxicity often exhibit bias as they associate identity terms with toxicity, lacking an understanding of context. Current approaches to bias-free toxic classification in forums do not scale due to manual identity term selection and un-interpretability. Automatically detecting the identity terms associated with toxicity, and surgically removing those biases by adding more non-toxic comments containing those terms will help to make a more accurate and less biased toxic classifier. Thus, the objective was to develop a targeted AI algorithm to scale the identity term identification in removal of bias and to improve toxic comment classifiers.

Methods

Linux computer with GPUs, Python 2.7, Python libraries, such as Keras, Tensorflow, Pandas, Spacy. Since bias primarily arises from over-representation of identity terms in toxic comments, prior papers debiased toxic classification models by manually adding non-toxic comments with manually selected identity terms. Also, many identity terms in social media were used as nouns and adjectives, leading to the noun-adjective rule. This project used an Hierarchical Attention sequence learning neural network to show what terms influenced toxic classification and applied the Noun-Adjective filter to automatically detect large number of identity terms. Though adding non-toxic comments helped debias, there existed an optimal number of non-toxic comments that had the largest impact on the performance. Thus a grid search across the number of comments and percent of identity terms was run to determine the optimal point. The Area Under Curve (AUC) was used as a measure of accuracy and the False Positive Equality Difference (FPED) Improvement, which measured equity of model performance across identity terms, was used as a bias metric.

Results

The model achieved an AUC of 0.98, compared to 0.95 in a prior Google paper and achieved an FPED Improvement of 44%, with 200+ identity terms to debias compared to 50 terms in prior paper.

Conclusions

The results supported the hypothesis; the FPED Improvement of 44% supported that the automated model was able to scale better to fix the bias on 200+ terms with a high accuracy. Unlike prior papers, this model did not have comment length limitations, was language agnostic and automated, thus likely extensible to other languages.

Summary Statement

Devised a less biased, scalable AI algorithm to combat cyberbullying in social media by using linguistic insights from human interactions in social media to identify toxic comments better than prior approaches without curbing free speech.

Help Received

I designed and implemented the model myself after understanding the Hierarchical Attention Network. I reviewed results with Prof. Sameer Singh, Computer Science Department at UCI, received guidance on improving key aspects of the project, and implemented best practices when validating my methodology.

Name(s)

Pranav Patil

Project Number

S0416

Project Title

Determining the Effectiveness of Video Games in Cybersecurity Education

Abstract

Objectives

Cybersecurity is this generation's biggest challenge, and when 95% of cyber attacks are based on human error, educating the general public about online safety needs the highest priority. Mistakes like clicking links in phishing emails are based in habits from a young age, suggesting that cybersecurity education should begin with elementary school students. During a cybersecurity lecture, only a few students seemed actively engaged, but upon transitioning to a game, they were not only engaged but excited to learn. This disparity prompted an investigation of the effectiveness of different teaching methods, specifically various types of video games compared to the more conventional lecture. The objective was to determine what features make a game effective in cybersecurity education. The hypothesis was that a game that was individualized and interactive would be the most successful at teaching cybersecurity, and the game Cyber Champion was designed with this in mind.

Methods

Cyber Champion was developed with a text editor in JavaScript. During lessons, a projector was needed to display lecture slides and laptops for students to play games. The overall study included 3 stages with improvements to Cyber Champion based on findings after each stage. Cybersecurity lessons were given in classrooms, library sessions, and focus groups. Qualitative data of the teacher's perspective was gathered by observing the students' engagement and learning based on criteria like questions asked or level of discussion and responses. After classroom lessons, quantitative data of the student's perspective was gathered through a survey.

Results

91% of students learned more after receiving the same content in a game format. 93% of students preferred both the game and the lecture rather than either individually.

Conclusions

The results verified the importance of an interactive and individualized game, but also highlighted the need for discussion and a reward system, and content relevant to all ages. This was implemented through a variety of new features, such as an improved tutorial, achievement system, and discussion prompts on Game Over pages. In addition, it distinguished the role of educational video games as a supplement to the lecture, rather than a replacement. These findings can then expand to any cybersecurity lesson and can shape how educational curricula are created in the future.

Summary Statement

I determined that educational video games must be interactive, individualized, motivating, and promote discussion to be the most effective at teaching cybersecurity and developed a game to accomplish this.

Help Received

Some other students helped deliver lessons and reach out to schools.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Harshini Ravi; Harshita Ravi

Project Number

S0417

Project Title

The STEM of the STEM Gap: Exploring the Gender Gap in STEM

Abstract

Objectives

This experiment is a two-part analysis of the existing gender gap in STEM careers. The extent to which a gender gap exists is studied, and two factors that may be contributing to this disparity are explored; the effect of growth vs fixed mindsets in students, as well the impact of the gender of a teacher.

Methods

First the impact of growth vs fixed mindset, which was accomplished through a short questionnaire connecting a student s gender with a student s mindset. Second the impact of a teacher s gender, which was understood through comparing the scores of students on the California Science Test based on student gender and teacher gender.

Results

The test comparing the average mindset score of all 6th-grade males and all 6th-grade females did not indicate a significant difference between the two groups The average score of both groups fell into the Growth Mindset range. A significant difference was indicated between the average number of male and female science teachers at a given school in California. The test comparing the performance of all 8th-grade males and all 8th-grade females on the CST Life Science exam indicates that overall males achieved higher scores. Further analysis shows that the performance of both males and females increased when being taught by someone of the same gender.

Conclusions

A thorough analysis of the acquired data indicates that males outperform females in STEM subjects since there was shown to be a significant difference in male and female performance overall. When analyzing male performance under male teachers and female performance under female teachers, it was observed that each gender did perform better when taught by the same gender teacher. An analysis of mindset scores among 6th graders did not indicate a significant difference between male versus female mindset scores, suggesting that one gender is not more growth-minded than another and therefore, that mindset is not heavily influencing the current gap within the STEM field. The performance gap within STEM, therefore, seems to stem from an already existing lack of female representation within the teaching space. However, there are likely other factors influencing this disparity in achievement. Based on already existing research concerning the benefits of a gender-diverse work environment, it is of crucial importance to improve the pathway from school to STEM careers for females.

Summary Statement

This project is a two-step analysis to explore the existing gender gap in STEM careers and to determine the impact of factors such as mindset and a teacher's gender on the probability of students later entering STEM careers.

Help Received

Name(s)

Gabriel Reder

Project Number

S0418

Project Title

Arbitrary Altruism Actions' Effects on the Possible Downturn of Aggression on Subjects with Contrasting Spectrums

Abstract

Objectives

The objective of this project was to see if random acts of kindness could effect the aggression level in male and female subjects. These subjects would range from low to high levels of aggression and participate in this study for a six month period.

Methods

Each subject was categorized into low, medium, or high levels of aggression,by gender,Buss and Perry aggression test which was formatted into a computer program. Over a six month period half of the subjects, in each aggression level, agreed to participate in random acts of kindness. Every two weeks these subjects returned and filled out the computerized questions that recorded their new levels of aggression.

Results

The results showed that males showed the lowest change in their levels of aggression. There was no significant change in the lower levels of aggression across the board while there was a slight change for those that were female and high aggression.

Conclusions

Through this study I was able to find that random acts of kindness do not have a significant impact on a persons level of aggression long term. While there was a slight change for the high levels there was barely a change for the low and med levels. Random acts of kindness actually are not important, free standing, in regard to the aggression levels for people.

Summary Statement

Will aggression levels for male and female high, med, and low level aggression subjects, recorded through the Buss and Perry Aggression tests, be effected by random acts of kindness over a six month period?

Help Received

Professor Graham PIke

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Aubrey Robinson

Project Number

S0419

Project Title

A Study of Connections between Synesthesia and Creativity

Abstract

Objectives

This project surveys individuals, testing for synesthesia and its potential correlations to creativity. The hypothesis was that there is a correlation between those with synesthesia and creativity, however, currently there is further testing that is being performed, and therefore a conclusion cannot yet be drawn.

Methods

Materials List

1. multiple surveys interviewing and testing individuals for synesthesia and its correlations
2. multiple individuals willing to participate in the survey
3. A computer for recording results
4. At least 30% of the individuals must have synesthesia in order to test for correlations

Results

I am currently furthering my research, however, I originally completed another study on Synesthesia, and came up with the following results:

The original intent of my experiment was to test a potential correlation between synesthesia and musical ability. The results of my experiment showed that approximately 50% of those with synesthesia reported that they were musically inclined, compared to the 67% of nonsynesthetes that reported musical inclination. However, about 89% of synesthetes reported that they were creative people, while only 79% of those without synesthesia reported creativity. Other correlations include the following: 100% of synesthetes were allowed pain/fever reducers as children, and only 92% of nonsynesthetes were. 100% of synesthetes enjoyed the act of swinging, while again, only 92% of nonsynesthetes enjoyed the activity. 67% of synesthetes reported having experienced childhood trauma, where only 29% of nonsynesthetes reported experiencing it. 50% of synesthetes reported experiencing migraine headaches, yet only 24% of those without synesthesia reported having experienced them. 44% of those with synesthesia reported mathematical inclination, however, 58% of those without synesthesia reported that they were mathematically inclined. 28% of synesthetes reported being left-handed, while only 12% of nonsynesthetes reported being left handed. Finally, 28% of those with synesthesia liked Michael Jackson, while 44% of those without synesthesia liked him, and 11% of those without synesthesia were indifferent.

Summary Statement

I contrived this study to show that those with Synesthesia are creative people.

Help Received

I received guidance from my colleague Mr. Jonathan Scharrer, who assisted with statistic representation.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Katelyn Santa Maria; Lorelei Santa Maria

Project Number

S0420

Project Title

Can We Psyche You Out? The Study of the Effect of Positive and Negative Encouragement on Physical and Mental Activities

Abstract

Objectives

The objective of this study is to discover whether positive or negative encouragement is most effective in a learning and a physical environment. The overall question is "Which type of encouragement is most effective: positive or negative?"

Methods

Mental: Stopwatch, recording device, three classrooms found in a school environment, timer, slideshow on selected topic of instruction, and positive and negative recordings.

Physical: timer, stopwatch, one classroom or open space, positive and negative recordings, recording device.

Results

Physical: Results indicated that the test subjects in the negative encouragement experiment, on average, performed more jumping jacks than those in the positive and neutral.

Mental: Results indicated that the test subjects in the positive encouragement experiment, on average, performed better (by scoring higher) than those in the positive and neutral.

Conclusions

According to the data collected, the hypothesis, "If positive encouragement is used to motivate the test subjects, then said test subjects will perform better on their test," appears to be rejected in the physical by an extremely small margin. These results may have occurred because students felt more motivated when negative encouragement was used. Students may have used the negativity to fuel their motivation in finishing with their maximum amount of jumping jacks.

This is important as both sports coaches and teachers have one thing in common: the constant desire to improve, as they know that their increased performance will lead to better comprehension and better execution.

Summary Statement

We learned that positive encouragement is significantly more effective than negative encouragement to use in a learning environment, while discouragement is slightly more effective than positive in a physical environment.

Help Received

Thank you to Carmen and Marie-Julie Santa Maria for supporting Katelyn and Lorelei Santa Maria throughout this experiment, Melissa Mouchamel and Natalie Mendez for photographing the experiment, Anisa Khan and Rachel Lee for counting the number of jumping jacks in the physical aspect of this

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Sophia Santoso

Project Number

S0421

Project Title

What Effect Does Smartphone Usage Have on High School Students?

Abstract

Objectives

The objective of this study is to evaluate the associations between smartphone usage and the well-being and academic performance of high school students. The null hypothesis is that excessive smartphone usage is negatively correlated with the academic performance and well-being of high school students.

Methods

A cross-sectional study was conducted by distributing a one-page, self-designed, anonymous questionnaire randomly during the month of December 2018 among 743 American high school students in Riverside, California. Participants were instructed to report demographic characteristics, the amount of time spent on their smartphone each day, the percentage of that time spent for each particular activity, a self-reported GPA for two years, and the user's perception of whether or not their smartphone use has a negative effect on academic achievement, sleep, stress, time for other activities, and general happiness. Responses were inputted manually into an Excel spreadsheet. By using an exclusion criteria, poor data were excluded from the statistical analysis. Regression analysis was conducted comparing multiple variables.

Results

This study has found a strong positive correlation between the amount of time spent on the smartphone and the time spent using social media. As time spent using social media increases, students are also more likely to be unhappy. On average, social media is also the activity that high school students spend the most time on while using their smartphones. As the time spent on the smartphone increases, the amount of sleep and the average GPA decreases. No correlation was found between the time spent using social media and stress.

Conclusions

The strengths of the study include a large number of participants, strict exclusion criteria, well-represented demographics, and anonymous design. The results of my study reinforced my hypothesis, which predicted that excessive smartphone usage is negatively correlated with academic performance and well-being of high school students. The information obtained from this study can be used to inspire high school students, parents, and teachers to develop new ways of using smartphones wisely without prompting negative effects.

Summary Statement

By using self-reported data from a large student population, I found that excessive smartphone usage is negatively correlated with the academic performance and well-being of high school students.

Help Received

I designed the project, collected and analyzed the data myself. A mathematics mentor helped me run a statistical regression analysis.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Shay Sharma

Project Number

S0422

Project Title

The Impact of a Skin Care and Skin Cancer Prevention Lesson on the Knowledge and Behaviors of High School Students

Abstract

Objectives

1. To create a lesson plan aligned with the California Health Education Content Standards that teaches high school students skin care and skin cancer prevention practices.
2. To incorporate this lesson plan into the health education curriculum of a California school district.
3. To identify the impact of this lesson plan through a school-wide study on high school students knowledge and behaviors toward skin care and skin cancer prevention practices.

Methods

I created a Skin Care and Skin Cancer Lesson plan aligned with the California Health Education Content Standards, obtained approval to incorporate this lesson into the health education curriculum of a California school district, and evaluated its impact through school-wide written surveys on the knowledge and behaviors of high school students.

Results

Written surveys were distributed to 2,688 high school students. A total of 1025 correctly completed surveys were returned resulting in a return rate of 38.1%. I defined an increase from Survey 1 to Survey 2 (knowledge gain), a decrease from Survey 2 to Survey 3 (knowledge decay) and, an overall increase from Survey 1 to Survey 3 (knowledge persistence). A statistical analysis of the data was performed using paired t-tests within each grade level and among the overall population of students providing 30 pairs of means and standard deviations. The calculated test statistic was compared to a critical t-value yielded a conclusion to the hypothesis test. The paired t-test hypothesis test was repeated for all 30 sets of data at the 95% confidence level. For student behaviors the number of students reporting wearing sunscreen zero days a week decreased by approximately 12.5%, the number of students reporting wearing sunscreen 5-7 days a week increased by more than half, and the number of students who examined themselves for changing moles increased by approximately 9.8%.

Conclusions

I recognized the serious problem in the lack of knowledge of skin care and skin cancer prevention practices in high school students, created a concise instructional lesson plan, obtained approval for its use by all teachers, and conducted a school-wide study identifying the impact of the lesson on high school students. The Skin Care and Skin Cancer Lesson was well received, minimally disruptive and increased students knowledge and behaviors of skin care and skin cancer prevention.

Summary Statement

I created a concise instructional lesson plan on skin care and skin cancer, incorporated into the school district curriculum, and conducted a school-wide study of 2688 students to evaluate the impact of the lesson on high school students.

Help Received

I was advised by my mathematics teacher and a university statistician on the ideal tests for the statistical analysis of my study but the analysis was done by myself.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Vanessa Tieng

Project Number

S0423

Project Title

Traditional Paper and Pen Testing vs. Progressive Online Computer Testing

Abstract

Objectives

The purpose of this project is to find out if students perform better on written or online math tests.

Methods

I asked 40 volunteers, 20 boys and 20 girls, to participate in the experiment. Then they were split up evenly, 10 boys and 10 girls took the traditional paper and pen test and the other 10 boys and 10 girls took the online computer test. They were allowed a calculator and scratch paper

Results

The results showed that in every category the written test always had the highest average. The girls written, and boys written test had higher averages than their online counterparts. Also, the overall written average was higher than the overall online average. However, the standard error bars were shown as well to emphasize if they were statistically different or not.

Conclusions

I concluded that students score higher on the traditional paper and pen test compared to the online computer test. Thus, my hypothesis was proven correct.

Summary Statement

Traditional paper and pen testing yield better results than online computer testing

Help Received

I created the written and online questionnaires myself. My biology teacher reviewed my experiment.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Caneel Young

Project Number

S0424

Project Title

Is Lactobacillus rhamnosus the Solution to Anxiety Relief?

Abstract

Objectives

The purpose of this experiment was to try and distinguish whether or not Lactobacillus rhamnosus could make for a solution for average people who feel the need for anxiety relief, or if it could even supplement prescription medication for those with actually anxiety-disorders. In my experiment I used mice to test this.

Methods

I used basic mice care supplies to ensure that the mice were comfortable throughout the duration of the experiment. I constructed an elevated plus maze by hand using cardboard, tape, and plastic wrap to test the anxiety levels of both groups of mice both before and after treatment with the probiotic. I used cat hair to make anxious the second group of mice. I used Lactobacillus rhamnosus supplements (specifically the culturelle LGG type) to try and decrease anxiety levels in both groups after the baseline test.

Results

I found that the difference in anxiety levels between the baseline test and the final test after the consumption of L. rhamnosus over two weeks was significant only for the average mice (no cat hair group) and not for the stressed mice (cat hair group).

Conclusions

These results provide evidence for the conclusion that L. rhamnosus could be used as a solution for the average person who feels anxious, but not for someone clinically diagnosed with anxiety.

Summary Statement

By testing anxiety levels in mice using an elevated plus maze, I found that Lactobacillus rhamnosus significantly decreases anxiety levels only in average mice compared to stressed mice.

Help Received

My mother helped me with taking care of the mice. Other than that I designed and executed the project by myself.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Rhitishah Yuva Raju

Project Number

S0425

Project Title

The Reduction of Stress: A Novel Digital Intervention Method Utilizing Neural Oscillation Analysis & Scanning Techniques

Abstract

Objectives

The World Health Organization (WHO) finds that 110 million people die every year across the world as a direct result of STRESS. That is seven people in every 2 seconds. Thus, the WHO has determined that STRESS is a worldwide health epidemic for the 21st century. This project aims to develop methods to help people to effectively manage the stress. This project is split into two phases:
Phase 1: Determining and analyzing the global rate of Stress in students and working adults through two survey instruments. Phase 2: Conduct an experiment to find the best method to reduce stress.

Methods

Two Digital Survey Instruments were created to conduct a global study on stress level. Survey conducted for a period of 30 days. Subjects were selected using Random Sampling Method from 14 countries. IBM-SPSS and R Programming were used for deep level data analysis. Android Development Studio was used to develop relaxation apps. In phase 2, I conducted an experiment for a period 35 days with 20 subjects ((10 experimental and 10 control). Additional 5 subjects on Trial 1&2.

Results

Phase 1:The stress levels in both students and working adults are at critically high level. The overall global student s stress level is at 59.34% and working adult is at 40.72%. Students face significantly ($p < 0.05$) more stress than working adults. US Female students have the highest stress levels (72%) and Indian female students have the lowest stress levels (39%), US female stress levels are significantly ($p < 0.05$) higher than their counterparts in Malaysia and India. In Phase 2, the stress was measured in two domains and in three ways: The Domain of Behavior/Psychology (Behavioral Improvement Assessment and Perceived Stress Scale) and The Domain of Physiology (Average Heart Rate). The experimental group has a significant improvement ($p < 0.05$) in all these measurements compare the control group.

Conclusions

The results from the Behavioral Improvement Assessment show that the longer the subjects practiced the Body Scanning Relaxation Exercise (experimental group) over the period of 35 days, the more their stress reduced compare to control group. There is a significant ($p < 0.05$) positive difference between Body Scanning Relaxation Exercise and Control Group.In all three methods of measuring Stress, Body Scanning Relaxation led to the most significant ($p < 0.05$) stress reduction. Hypothesis was supported by the data collected in Phase 2. When subjects practiced the internal intervention method, they were able to cope with their stress better.

Summary Statement

A global study on stress level among students and Adults. In Phase 2, I conducted an experiment to identify the best intervention method to reduce stress.

Help Received

My Biology teacher reviewed the research methods. Worked with behavioral experts to review the questionnaires and research methods.