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The Ethical Implications of Genetic Engineering and the Lack of Mainstream Media Coverage

Aliff Abad
Prof. Katherine Gregory

How do the media interpret reproductive interventions that involve genetic testing? When a scientist performed the first known genetic editing on twins, Lulu and Nana, he ignored ethical considerations of CRISPR use. This project provides a content analysis based on a review of popular science and newspaper articles. Our interpretation of these articles suggests that there is a lack of critical interpretation of this unethical procedure and a similar attitude towards future genetic developments. While the public is curious about the repercussions of genetic editing, not enough focus is applied to the ethics of conducting such a procedure.

Roboqueen 3D

Anny Baez Silfa, and Jency Maldonado
Prof. Farrukh Zia

Roboqueen is a persistent research project in the Department of Computer Engineering Technology. It is being designed as a full body interactive robotic mannequin in response to the needs of the fashion technology industry by using inexpensive cardboard slices and aluminium frame for the body and low cost open source hardware devices such as Raspberry Pi, Arduino and servo motors for head and arm movement. In the current phase of the project Roboqueen's circuits and hardware components will be improved and updated with the help of 3D printed circuits, integrated circuits, and sensors. Currently, the cardboard hands are being replaced with 3D printed fingers and wrist to add functionality that previously did not exist. Servo motors connected to Arduinos hidden in the forearm will be used to move the fingers and pick up and hold objects in the hand.

3D Printed Computer Circuits

Sultana Begum
Prof. Ohbong Kwon

3D printing technology has rapidly become a mature technology due to the availability of low-cost 3D printers based on open source designs and components. A wide variety of 3D print materials are now available with many different physical and electrical properties. This research project has explored novel and innovative ways to use 3D printing technology to create electronic computer circuits, sub-systems and devices by using a combination of conducting and

non-conducting materials and components. The 3D printed computer circuits will have a range of applications in creating systems such as IoT (Internet of Things) devices, toys, bio-sensors such as the motion sensors, wearable tech garments using Light Emitting Diodes (LED) and jewelry such as wrist bands, rings embedded with LEDs.

Talk and Roll Bot-Mind Control

BingFang Chen (Cornelia), and Yipenca Tang Liang
Prof. Farrukh Zia

Talk and Roll Bot is a mobile robot project which combines computer hardware, computer software, mechanical, electrical, data communication and networking subsystems to create a working prototype of a computer controlled robot system. In the current phase of the research project, background research is done to learn to use the Electroencephalogram (EEG) measurements of brain waves to control the robot. A modified Mindflex game controller is connected to Arduino and brain activity data is passed on to Processing code running on a PC in order to track and record brain wave patterns. The electrical activity of the brain is used to control open and off of the DC motors. In future, it will be control speed and direction of the DC motors in Talk and Roll Bot.

Degradation Rate Calculations of Polydimethylsiloxane (PDMS)

Ibrahim Chouman, and Matthew Sanchez
Prof. Ozlem Yasar

Tissue Engineering has been studied to develop tissues as an alternative approach to the organ regeneration. Successful artificial tissue growth in regenerative medicine depends on the precise scaffold fabrication as well as the cell-cell and cell-scaffold interaction. PDMS is a biodegradable and biocompatible material that is commonly used in the Tissue Engineering field. In this research, the degradation rate of PDMS is investigated by dissolving the PDMS within the water and ethyl alcohol. Outcomes are compared to decide the degradation speed of engineered scaffolds. Our preliminary results indicate that PDMS can be dissolved within ethyl alcohol faster.

The life of a fractal: Constructing and dissecting the Cantor Set

Showmik Chowdhury
Prof. Satyanand Singh

The Cantor Ternary set is created by iteratively deleting the open middle third from a set of line segments. We will illustrate this process by coding with the R software. We begin by deleting the open middle third ($1/3, 2/3$) from the closed interval $[0, 1]$; this leaves the two-line segments $[0, 1/3] \cup [2/3, 1]$. We then remove the open middle thirds of each of these remaining segments to get four-line segments. This process is repeated in an infinite way. The Cantor set contains all

points in the unit interval $[0,1]$ that are not deleted at any step in this infinite process. We will then decode the cantor set to illustrate some of its inherent properties, display its fractal nature and make connections to Sierpinski triangles and other important applications.

Characterization of Staphylococcus Pasteuri isolates derived from human atherosclerosis plaque

Maria DeLeon

Profs. Niloufar Haque, and Nasreen Haque

Atherosclerosis has long been associated with a chronic inflammatory disease that affects mainly large and medium-sized arteries. It is defined as the building block of atherosclerotic plaque that consists of a well-defined structure of lipids, necrotic cores, calcified regions, immune cells, endothelial cells, inflamed smooth muscle cells, foam cells. Atherosclerosis can lead to serious problems, including heart attack, stroke, or even death. In addition, infection has been associated with atherosclerosis. Microbiomes in the atherosclerosis plaque were discovered by a pathogenic bacteria *Staphylococcus Pasteuri* (Haque,2019). *S.pasteuri* has been isolated from several sources along with vegetables, goat milk, naturally fermented Italian sausages, drinking water supplies, human vomit, urine, and blood. However, the basic understanding of plant growth is through auxin distribution. It is produced by the seed of the fruit or plant. It is known as a plant hormone that helps plants to easily adapt to their surroundings, and to their growth. One type of auxin, arising from nature is indole-3-acetic acid (IAA), is predominantly biosynthesized from tryptophan. Tryptophan is an essential aromatic amino acid, meaning that the body cannot synthesize it. Auxin benefits the plants to proliferate, however, itself is toxic to plants. The purpose of this study is to investigate the role of auxin activation in *S.pasteuri* derived from human atherosclerotic. The subsequent effect on smooth muscle cells, auxin (IAA) aids the plants to proliferate, it is possible that it might be the cause of the activation process.

Presence of Electron Donor/Acceptor Radiographic Contrast Media in Unusual Photosynthesis Environment of Fresh Plant Cells: Near-infrared and X-ray Characterization

Amina Shahbaz, Aldona Gjoni, and Tetiana Soloviova

Profs. Subhendra Sarkar, and Chen Xu

Photosynthesis is a chemical process through which light energy is used to convert inorganic material (water and carbon dioxide) into organic molecules. Anaerobic photosynthesis, also known as anoxygenic photosynthesis, is the process by which certain bacteria use light energy to create organic compounds but do not adequately involve oxygen. Our research aims to perturb the usual and the unusual photosynthesis that pineapple has kept maintained for millions of years during plant evolution. We experimented by injecting into pineapple Isovue (CT Contrast),

which could share an electron from its ring structure to biochemical reaction centers and affect electron transfer during photosynthesis. Additionally, MRI contrast Eovist was used with Gd³⁺ atom loosely bound to other negative structures like phenol ring. Such complex structures supply or absorb electrons. We were able to observe spectral peaks that could be due to NIR driven photosynthesis at precise absorption wavelengths in cut pineapple. Our current work involves perturbing the photosynthesis pathway (dark or light phase) by Gd and iodine complex and monitor the location, mobility and time course of electronic activity of the radiologic contrast medium using both X-ray and NIR spectroscopy in the model photosynthesis system.

Biotechnology and Reconstructing the Self through Genetic Health Markers and Elevated Health Risks

Nadia Gordon

Prof. Katherine Gregory

New commercial technologies promise personalized genetic information upon request. As these technologies become more popular, it is meaningful to understand how consumers interpret their results. Applications like 23andme, AncestryDNA, GEDmatch and Promethease grant consumer access to their individual genome and interpret data for health markers. Using these applications, participants have gained genetic knowledge that shifts self-concepts of ethnic/racial ancestry, health risks, and the potential meaning of genetic identity. This study examines in-depth interviews with users of these kits. This study aims to understand how consumers use the applications and tools to interpret results, and how those results are understood as a determinant of wellness and health knowledge. Based on interview findings, consumers are concerned about privacy issues, discrimination, and data hacking.

Correlation of Open Lab X and Student' Final Grades

Fahameda Hassan, and Mary Lee

Prof. Zoya Vinokur

Open ended laboratory or open lab as it is known to the Radiological Technology students is an invaluable tool that the Radiological Technology Department provides to help the students become better radiographers. During the 2nd and 3rd semester, open labs become a total hour commitment which means the students have more flexibility to complete their open lab requirement. However, in the fourth semester, there is no requirement for an open lab for the second year students.

Through surveys and final grade assessments, we can study how utilizing this department resource impacts both the first and second year students. In surveying the Radiological students, we will investigate whether outside factors impact how both first and second year students use this resource. As the semester progressed during Spring 2020, two of the rooms became

inoperable, did this impact attendance and utilization of the open lab. Do radiological students continue use if there is no open lab requirement.

In addition, we can compare data from other years and see what trends and commitments impact the use of open lab. In other universities that use open lab, they have demonstrated that using this resource pushes students to self-think and to formulate their own strategies while applying their understanding of concepts. In the end, students are self-directed, reflective, who can think critically, all the while building on the skills that are highly desirable in the field of medical imaging. In the end, is the student a better technologist with the additional open lab hours or does open lab not reflect the reality of the healthcare field.

Replacing a Single Tooth: Single Implant vs. Three Unit Bridge

Aneeza Hussain, and Ibeth Erazo
Prof. Daniel Alter

There are more than two options for restoring a single tooth, but our research include three unit bridge and single-tooth implant. In this paper, we discuss the advantages and disadvantages of these methods and factors that must be considered when choosing between them for the replacement of a single tooth. Although in some cases a three unit bridge is the most appropriate choice, implants have the advantage of allowing preservation of the integrity of sound teeth adjacent to the edentulous area. Many factors must be considered when choosing between a 3-unit bridge and an implant for the replacement of a single tooth. Often the bias of the dentist plays a role rather than objective appraisal of the treatment options. There are advantages and disadvantages to both forms of treatment.

Key words: three Unit Bridge; dental implants; single tooth; dental prosthesis, implant-supported; tooth loss

Machine Learning Application in Physical Computing

Joan Beatrice Ladaban
Prof. Farrukh Zia

Machine learning and physical computing are important areas of research. This project involves the use of machine learning and physical computing to control an autonomous robot. Machine Learning refers to writing code that learns from data and improves its performance and is a topic related to Software Engineering. Physical computing refers to writing code to interact with the physical environment by using sensors and physical devices. This is a topic related to Hardware Engineering and where one can use open source hardware such as Arduino and Raspberry Pi. This research project combines the Software and Hardware aspects into one working system. In the current phase of the project a voice command recognition app is used on a mobile device to control an Arduino based smart car through Bluetooth wireless connection.

Augmented Reality Gaming: Harnessing Real and Virtual Environments with Game Interactions

Steven Li

Prof. Benito Mendoza

In the second part of this project, an animated character will be displayed over objects from the real-life environment. To make a character appear, users would scan a specific object where they want it to appear. The character will move around and the users can control the character with the keyboard. When the user leaves the area of the object, the character will disappear or fall off if it is off ground. The reason to make the character appear after it is being scanned is because it can be easier to be put around the environment. For instance, if the specific object is a special paper with QR code on it, it can be placed anywhere, and it does not take up much space. After the paper is scanned, the character will pop up. This, for example, can be used in the subway where an interactive map could be shown or a virtual tourist guide character. The paper is easy to carry around and is like carrying a simple mechanism to display virtual object over the real world. This method can also be used for instructional material, for example, when teaching or learning how photosynthesis works. Through augmented reality, not only virtual objects can be brought out but also short video clips.

Effect of Silicon Carbide and Inorganic Glass Particles on thermal and mechanical properties of Geopolymers

Aaryan Nair

Prof. Akm S Rahman

Geopolymers are the results of geosynthetic reactions between aluminosilicates and strong bases. This results in chemical bonds between aluminum (Al), Silicon (Si) and oxygen (O) composing polymer rings in tetrahedral coordination. These bonds give them widespread useful applications such as high heat bearing ceramics, and base construction material whilst being far more environmentally conscious. The purpose of the experiment is to examine the effect of Silicon Carbide whisker and inorganic glass particles on thermal and mechanical properties of Geopolymers. This study will help understand the effect of various compositions and concentrations of SiO₂ in mechanical strength. In this experiment, the major source of Aluminosilicate material to make the geopolymer paste was fly ash, potassium hydroxide, Potassium silicate, Glass silica and water. A variety of concentrations of Silicon Carbide Whisker and glass particles will be added into geopolymer paste in order to evaluate their performance specifically on compressive strength and thermal conductivity. These are essential

properties of cementing materials in energy or heat extraction process. Therefore, the material under investigation has potential to geothermal energy extraction and subterranean structures.

Non-Destructive Testing of Concrete

David Mastalerz, and Shaylin Venitelli
Prof. Navid Allahverdi-Pur

The use of concrete in the world's infrastructure dates back centuries. Builders in Ancient Rome used limestone and volcanic rock to create structures more durable than many of those erected today. In order to assess the strength of existing structures the construction industry utilizes Non-Destructive Testing. Non-destructive testing applies to a diverse array of techniques used in science and technological fields in order to evaluate the properties of a material, component or system without causing damage. Non-destructive testing is applicable to many fields and circumstances in which properties are unknown or have changed due to time. It allows analysts to determine how strong structures are without destroying their integrity and preserving their form. With the use of devices such as the Schmidt Hammer, the elastic properties, or strength of concrete, are determined through the rebound resistance that the tested material exerts on the device. The accuracy of non-destructive testing results will be assessed through comparison with results obtained from destructive techniques. With comparative data describing the benefits of non-destructive, the industry can focus on efficiency and productivity.

Image Classification–MNIST

Saminur Miah
Prof. Marcos Pinto

MNIST is a dataset of single digits from 0 to 9 and it is used in image classification. It is considered as a problem that can be solved with high degree of accuracy using machine learning techniques. Machine learning techniques are methods that rely on the fact that one can build systems that can learn from data ,identify patterns and make decisions with minimal human intervention. MNIST serves as the basis for benchmarking classification algorithms and If you're building an image classifier these days, you're probably using a CNN (convolutional neural network) to do it.

Small Solar Powered Self-Driving Car

Suleyman Turac
Prof. Benito Mendoza

Our research focuses on building a student affordable platform for scale model self-driving cars that are powered by solar panels. The goal of this project is to explore current developments of Open Source hardware and software to build a low-cost platform consisting of the car chassis/framework, sensors, solar panels and software for the autopilot. Our research will allow other students with low budget to enter into the world of Deep Learning, self-driving cars, and autonomous cars racing competitions.

MQTT Protocol for Application of Internet of Things (IOT)

Yani Acham Yaou Zakari
Prof. Xinzhou Wei

The Internet of Things (IoT) refers to a vast number of “things” that are connected to the internet so they can share data with other things. Things Board is an open-source IoT platform that enables rapid development, management and scaling of IoT projects. With Things Board, we can collect and visualize data from devices and assets. We also can analyze incoming telemetry and trigger alarms in our system. MQTT is a publish-subscribe-based messaging protocol used in the internet of Things. It works on top of the TCP/IP protocol, and is designed for connections with remote locations where a "small code footprint" is required or the network bandwidth is limited. The goal is to provide a protocol, which is bandwidth-efficient and uses little battery power. So, it's the perfect solution for Internet of Things applications. In our research project, we adopt the MQTT protocol with an open source platform, Thing board, to collect real time data and display them in real time with user design dashboard.