Book of Abstracts

CUNY Research Scholars Program

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Title: Design of Custom Made Implants

Student Researcher(s): Ehab Ahmad, Muhammad Ameen, David Amegavie and Harold Barreto
Faculty Mentor: Prof. Gaffar Gailani

Prosthetics are often used to replace, and in some cases enhance, injured or missing limbs. In most cases, implants follow standard sizes that will not be unique to the patient in need. Surgeons use these implants and are sometimes required to force fit – by making other incisions through trial and error - the implants into patients. This process is not only time consuming, but can be detrimental to progress. In order to rectify this, customized prosthesis enables the surgeon to complete the operation with full confidence that the implant will fit correctly. Ideally, the implant will be a perfect fit leading to a natural feeling prosthetic. Analyzing CT scans through mimics, a medical imaging software, the goal to make a custom fit prosthetic implant can be obtained. Scanning the files layer-by-layer allows us to isolate the targeting area for further analysis. Creating a threshold that emphasizes bone structure or soft tissue will clearly identify the points of interest. An implant created on 3-matic is 3D printed double checked for accuracy. With software capable of exacting proportions, custom prosthesis is a better alternative to people in need.

Title: Creating Active Learning Spaces in Virtual Worlds

Student Researcher(s): Zianne Cuff
Faculty Mentor: Prof. Reneta Lansiqout

City Tech has an island in Second Life, a three-dimensional virtual world created by its residents. As the largest ever virtual world, this application should prove ideal to conduct innovative engineering, science and technology research. Currently, however, City Tech's island is not widely used and is cluttered with select student projects that are generally unrelated to each other. This project seeks to create an active learning space that effectively facilitates student projects in interdisciplinary courses, namely, Weird Science: Interpreting and Redefining Humanity. As part of this course, which is team taught with a dozen guest lecturers, students animate, simulate, and design their avatars, as well as engineer their virtual space to meet the needs of their group project (i.e., the virtual human and its required interactions).

Title: Gender Differences in Vagal Tone Adaptation in an Expressive Writing Paradigm

Student Researcher(s): Cherishe Cumma, Dana Glatzer*, Daniel Rosales* and Saber Ventura*
Faculty Mentor: Prof. Jean Hillstrom

Research shows that writing about traumatic, stressful or emotional events is associated with improved health and well-being. We assessed the effects of a standard vs. meaning-making expressive writing format on autonomic nervous system function over time. Results indicate that heart rate and to a lesser degree, vagal tone, improved over time in both conditions but these results were moderated by gender. Men showed improvement in vagal tone for the standard but not the meaning-making condition.

Title: Mechanics of Biomaterials for Tissue Engineering Applications

Student Researcher(s): Andres Delgado
Faculty Mentor: Prof. Ozlem Yasar

Medical Fields has brought the importance of the Tissue Engineering as this field aims to do tissue regeneration as an alternative approach to the organ transplantation. In order to achieve success in Tissue Engineering, porous 3D man-made structures known as scaffolds must be fabricated accurately. Scaffolds let the cells grow in 3D when they are seeded with the cells. Ideally, scaffolds must show the same mechanical properties with the tissues. In this research, poly(ethylene glycol) diacrylate (PEGDA) which is a biocompatible and biodegradable material is used to do mechanical tests such as compression, tension and indentation. The preliminary research shows that, due to its mechanical properties, PEGDA can be used for orthopedic implant applications.

Title: 3D Nutrient Delivery Network Fabrication for the Engineered Tissues

Student Researcher(s): Eddy Garcia
Faculty Mentor: Prof. Ozlem Yasar

In the field of tissue engineering, design and fabrication of precisely and spatially patterned, highly porous scaffolds/matrixes are required to guide overall shape of tissue growth and replacement. Although Rapid Prototyping fabrication techniques have been used to fabricate the scaffolds with desired design characteristics, controlling the interior architecture of the scaffolds has been a challenge due to CAD constrains. This study aims to overcome these design and fabrication limitations. In this work, research is expanded fabrication of scaffolds which have

inbuilt micro level fluidic networks/channels. These channels serve as material delivery paths to provide oxygen and nutrients for the cells. Scaffolds with inbuilt hollow channels are fabricated with “photolithography” in layer by layer fashion to control the internal architecture. The preliminary research shows that, photolithography can be used to fabricate the scaffolds with the inbuilt 700µm channel sizes.

Title: Dipolariton-Based Nanophotonic Devices

Student Researcher(s): Andy He
Faculty Mentors: German Kolmakov and Roman Kezerashvili

I continue the progress of my research with professor Kolmakov in "electrical controlled dipolartiton switch for optical integrated circuits".What I did over this past semester was help my professor with some computer computation in trying to figure out how the change in temperature affect the over all end result, and what is the maximum amount of light particle or light energy is needed to see the full potential of these circuits. The result we got show that in high temperature, the reading of small amount of light particles can be seen scatter around, but this doesn't affect the end result we got. we also figure out the we don't need a lot of light energy to power up an electric circuit. The over all result we got back was good, and a poster presentation was present during the fall semester.

Title: Architectural Archeology: Archival Documents & Rhino 3D

Student Researcher(s): Ikrash Khan
Faculty Mentor: Prof. Alan Lovegreen

This project backs up investigation on the residence that the author John Steinbeck lived in from 1925 to 1926. The objective is to value the documents found to foresee what was once a brownstone home. We intend to use Rhino 3D to make the visualization more clear and precise for everyone to see.

Title: The effect of oxidative stress on Calpains in Tetrahymena thermophilia

Student Researcher(s): Robin Koiner
Faculty Mentor: Prof. Ralph Alcendor

For the purpose of this research, we focused on one calpain, calpain 1. We were particularly interested on the role of Calpain 1 in cells exposed to high levels of oxidative stress. Oxidative stress damages cells, tissues, and organs. Inducers of oxidative stress are paraquat, starvation, and hydrogen peroxide. Hydrogen peroxide is a Reactive Oxygen Species (ROS). In humans, ROS is an induced antimicrobial defense. It is important to maintain a balance between antioxidants and ROS to prevent illness. Many studies shows that Oxidative stress plays a major role in various neurodegenerative diseases such as Parkinson's diseases, Alzheimer's disease, and Huntington's disease. It has been shown that ROS plays important roles in many of these diseases.

Title: Design and Analysis of Orthopedic Implants and Prosthetic Devices

Student Researcher(s): Rachid Moumni
Faculty Mentor: Prof. Gaffar Gailani

The design and development of implants requires multi-disciplinary inputs and presents many challenges. The joints have to provide the desired functionality (movements and load-bearing), which has to be ascertained by extensive bio-mechanical and gait studies. They have to cater to different anatomical situations such as size and shape. The implant materials must be light, strong, wear and corrosion resistant. Today, instead of producing the implant to fit the person, order mass production of implants used widely where the surgeons have to continuously construct bone cuts on the patient (because of restriction on size, either it is too large or small) so the implant can fit. This can cause unnecessary cuts, an uncomfortable and long surgery and longer recovery stages. In our Project we are focusing in designing and fabricating custom-made bone implants by using Two softwares (Mimics software and Autodesk Inventor) and The pre-scan images of the patiens bones.

Title: Lagrange and the Calculus of Variations

Student Researcher(s): Yen Pham
Faculty Mentor: Prof. Andrea Ferroglia

By examining the brachistochrone problem, we studied how this particular problem led Euler and Lagrange to the calculus of variations. This problem was first solved with the help of an ingenious but ad hoc method by Bernoulli; however, a general method to solve this class of problems was made possible by the development of the calculus of variations. Furthermore, we applied variational methods to determine the equation of the catenary, another classic problem first solved by means of variational techniques. The outcomes of brachistochrone problem and catenary problem respectively are the cycloid and the hyperbolic cosine. Finally, we used variational methods in order to study the solution of the brachistochrone problem in presence of

friction. The calculus of variations plays a fundamental role in physics: in particular it can be used to reformulate mechanics in terms of “Lagrangians” and Euler-Lagrange equations of motion.

Title: Prediction of hydrodynamic vulnerability of costal to extreme storm surges

Student Researcher(s): Jarren Sanderson and Jonathan Akujobi
Faculty Mentor: Prof. Gerarda Shields

To predict the effects of a rising sea level on costal bridges of New York City. First, a Qlood model (a virtual depiction of the occurrence of a Qlood in a certain area) of the New York City area is generated. Next, bridges on the coastline are selected. The Qluid forces on these bridges, and the erosion potential of the soil around the foundations of these bridges will be calculated using the data from the Qlood model. Finally, we determine if the bridge is functional after enduring the effects of the simulated storm.

Title: Analysis of Energy Consumption and Efficiency Of Green Data Centers

Student Researcher(s): George Vanishvili
Faculty Mentor: Prof. Masato Nakamura

Contemporary application of personal computers including all types of information and communication devices assumes to use of the Internet. In general computers may be divided into two different sub-groups: client-side desktops and server-side computers, or servers. At the same time, as far as the Internet services provides information for twenty-four hours and seven days a week. Also and this information needs to be kept on line in electrical storage devices, and being able to be transmitted at huge distances. Therefore, server hardware and its storage devices consume a substantial amount of electric power. Generation and consumption of electrical power in Datacenter results in increase and contemporary sources of electric power carbon dioxide emission and the growth of greenhouse effect.

Title: Micro-molding Fabrication of Engineered Tissues

Student Researcher(s): Xavier Williams
Faculty Mentor: Prof. Ozlem Yasar

The field of Tissue Engineering bridges different research areas including engineering, medicine, life sciences and materials to replace the damaged tissue or organ. The key components of the engineered tissues are known as scaffolds, which are the artificial building blocks. Scaffolds provide the mechanical as well as the structural support to the cells. They also guide the overall shape and morphology of cell growth. Once the cells are seeded on the scaffolds, they attach, migrate to different locations on the scaffold and grow to form functional tissues. In this research micro-molding is used to fabricate the different size and shape scaffolds. Parameters of micro-molding are UV exposure time, polymer concentration and photo-initiator concentration. In this research, these parameters' effects on the scaffolds are investigated. The preliminary research shows that, micro-channels can be generated precisely by controlling the fabrication parameters.

Title: Student's Matchmaker: An Internship Finder

Student Researcher(s): Hector Feliz
Faculty Mentor: Prof. Marcos Pinto

. Identify resources to support the project
. Web services:
. scope – campus-wide, host identification, management of the service
. users – only enrolled students, campus access only - Intranet
. security – dedicated server, server management
. Java programming:
. compact program: avoid unnecessary variable creation, memory leaks, do not ignore exceptions, make use of identified variable type, etc
. server & client or a compact program
. Research areas of expertise for internships (contact prof. Elhadary – CST dept's Internship):
. Internship Areas of student's interest
. Available internship areas
. Most common student's IT skills