

Yaa Andoh & Mariatou Diallo

Photocatalytic Recovery of Metals Using Polyoxometalates

Mentor: Professor Ivana Jovanovic

Department: Chemistry

Polyoxometalates (POM) are used as photocatalysts for the recovery of metal ions from aqueous solutions. The photocatalytic reduction process has financial and environmental benefits, such as obtaining valuable metals and degrading organic pollutants. Currently, large amounts of metals end up in wastewater and these metals act as bactericides, harmful to the environment and organisms. We observed reaction, where prolonged irradiation (exposure to UV light or sunlight) aides in the reductions of metals in the solution of POM, 2-propanol and aqueous solution of silver nitrate (AgNO_3) or copper sulfate (CuSO_4). These reactions result either in the removal of silver ions (Ag^+) seen as a black precipitate, from higher concentrated solutions (1 mM); or the synthesis of silver nanoparticles from low concentrated Ag^+ solution (0.1 mM). The formation of nanoparticles is detected in the UV- Visible spectrum as a peak at 420 nm. Copper ions (Cu^{2+}), from CuSO_4 , were also tested, however, there were no signs of reduction to metallic state Cu^0 . We suppose that Cu^{2+} may need a longer irradiation time. Our results showed that POM can be used for the reduction of Ag^+ ions to Ago metallic state, and potentially can also be implemented for the recovery of other metals.

Nusrat Bornona

Augmented Reality

Mentor: Marcos S. Pinto

Department: Computer Systems Technology

Augmented reality by definition “is an interactive experience of real world environment whose elements are “augmented” by computer generated perceptual information. It means you are trying to put the digital information into the real one”. This is done by having electronic devices display them. This is the combination between what we see vs with the computer. The importance of augmented reality is saving money time, Introducing new ways of technology to the new generation, less communication gap, giving us easier intersection of the world. Augmented reality relies on enhancing the real world and we are rely on our five senses to deal with it. We have freedom to stay home or whatever we want and feel free to see the world without being their physically though we are getting exactly same feelings because we are using our five senses. We are using augmented reality in many field like medical, engineering,

merchandising, shopping, advertising, gaming and so on. Graphics designer, game designer, optical engineers, web browser engineer, android or ios developer are also using the augmented reality for making their work easy and reliable. We can replicate the real world thing around us to see how it could be by spending less money and time. So in conclusion we can say that augmented reality giving us the feels like reality without physically being there.

Marlon Cameron Jr.

Web Application for Search Top IT Companies in New York and Brooklyn

Mentor: Marcos S. Pinto

Department: Computer Systems Technology

The search for a job within a convenient distance is a hassle for most people; whether it be in person or through the use of applications. During this research the programming languages Python and MySQL were used to program a web application that would assist the user in specifying the most suitable IT Companies in Brooklyn and Manhattan based on the entered zip code. This was done by using Python's commands to interact with the user; in which the user is asked to enter a zip code and a minimal acceptable distance from the zip code. The program is connected to SQL's interaction with a provided list. This list serves as a database, consisting of 36 companies; Conditions issued through Python, then initiate the programming's search through the database for the ideal IT company satisfying the conditions. Using the SQL Server Driver, the Python program can be connected to the MySQL database. We found that rather than using the SQL Server Driver, there were several other programs capable of connecting Python to the provided the SQL database as an alternative.

Stefan Falciglia

The Power of Progressive Web Applications

Mentor: Professor Marcos S. Pinto

Department: Computer Systems technology

Applications for smart phones come in three main types: native, web and hybrid. A native app is one that is installed directly on the smartphone, and in many cases work with little or no connectivity. A web app works via the web browser on the smartphone but calls for web pages to be "downloaded" from the server via Wi-Fi or cell signal. Progressive Web Apps (PWA) run web apps on a mobile device but behaves like a native app by way of caching. Progressive Web Apps are a new disruptive concept that bridges the gap between websites and mobile apps, they do this by applying modern web capability to deliver an app-like experience to mobile users. PWA's have the functionality of both websites and web applications in one, PWA's can work online and offline by caching, and can stay up to date by allowing push notifications

when necessary. All this is an effort to deliver a web app that feels like a native mobile app to all users of all platforms and devices.

Darius Freeman

IoT Doorbell Using Raspberry Pi 3

Mentor: Professor Xiaohai Li

Department: Computer Engineering Technology

This project is to create a device with the same functionality as an ordinary doorbell with the addition of sensors, a camera and with access to cloud based data and communication services, that is what will make this doorbell qualify as an Internet of Things device. The purpose of such a device will be to give new features to an age old invention. Instead of having to open the door or actually be present to know who is at the door, the camera will transmit a photo or a live video of the person at the door to the user's smartphone.

Fatoumata Gamby

Embedded Automatic Video Player with Temperature Control

Mentor: Professor Xiaohai Li

Department: Computer Engineering Technology

With this project, we aim to design and develop a small embedded video looping player device with an automatic temperature adjustment feature. The device can automatically play video clips stored on a SD, microSD card and/or USB. We can customize a 3D printed box that will contain a Raspberry Pi and a cooling system that is controlled by an Arduino and a temperature sensor. The cooling system will monitor the temperature in the box and will cool the box if a certain temperature is reached.

Kyaw Htun

Concrete Mixed Design for Concrete Canoe

Mentor: Dr. Navid Allahverdi

Department: Construction Management & Civil Engineering

This research is to identify the composition of materials such as lightweight aggregates that are very important for the concrete canoe mix design. All ingredients including lightweight aggregates, cement matrix, chemical admixtures, and cementitious materials should interact in order to result in a light but strong concrete canoe. Besides, the strength of lightweight concrete are based on the water/cement ratio, chemical usage, ratio of fine aggregates, quality and quantity of cement. The optimal concrete mix design should have a high performance, possibly with unit weight less than that of water. The mix design must be light enough to float on the water, and strong enough to support the weight of four paddlers. The canoe must be capable of holding all stresses based on the strength test obtained from compressive strength test, and three point reinforced flexural test. The concrete Canoe's strength depends on all composite of materials in mix design. Mix design can improve the setting time, workability, and durability of concrete. This research investigates a suitable mix design for light weight concrete canoe which can withstand the stress and provide durability.

Warren Hunter

Remote Home Automation Using Android (IoT system)

Mentor: Professor Yu Wang

Department: Computer Engineering Technology Department

The Internet of Things (IoT) is a set of products, tools and technologies that bring convenience to end users by mating previously 'dumb' devices with increasingly 'smart' technology. Many of the most useful IoT creations give users control over the products that they use, even when they are not nearby, and allows users to monitor their homes and work spaces remotely and take actions based on that data. This project sought to create a functional home automation system using a small board computer (Raspberry Pi) as the control hub. There were multiple goals of the project. First was to create a system that measures changes in conditions in the home and relays that information via a web service to the user (via an Android application). Second was to create functionality that would be useful to a user, such as a remote door lock/unlock functionality, as well as a remote light switch. Third was to create a video doorbell feature. Finally, an Android application was to be created to provide the user the ability to easily read all the data being gathered by the system, and control the functionality of the system, as well as provide the UI for the video doorbell. The project was only partially successful in that a type of local home automation system was achieved. Wireless control of the home automation hub (the Raspberry Pi) via an Android device was successful. Specifically, the remote door lock and the remote relay-controlled light switch, as well as the remote door sensor. An attempt was made to create a video doorbell, but only a partial functionality was achieved. The challenges of the project included there being too broad a scope for the timeframe, as well as too many sub-components of the project. In addition, the creation of the proposed Android application proved to be time-consuming and therefore was not completed, however, some basic functionality was achieved. Even though the ultimate goals of the projects were not fully achieved, valuable knowledge was gained

and the groundwork was laid for further research that will hopefully result in a complete home automation system using Android in the future.

Faiza Hussain

Works In Process

Mentor: Professor George Garrastegui Jr

Department: Emerging Media Technologies

Works in Process is a podcast that aims to delve into the method and process of the creative individual. Most creatives at some point become stuck in their process of becoming successful. With the podcast, Works In Process, we are able to see how each creative individual got through this bump and succeeded in their field of getting their work done. For the research, I worked with Professor George Garrastegui Jr. to give feedback of the podcast through the eyes of a student. Giving feedback would help bring importance to the parts that would help students with their work and ways to inspire them to implement the techniques that are spoken about in the podcast to help bring them success. To help students, I listened to each episode and listed important information and the similarities between each episode. Through this process, I learn about how the podcast works. Through testing out, the method given in the episode prove to be a new way to handle creative work. Work in Process is one of those podcast that a student can use to help themselves feel motivated through the different method that each episode shows.

Phyleisha Kirnon-Osborne

Image Processing for Engineering Inspections

Mentor: Professor Navid Allahverdi

Department: Architectural Technology

There has been an increase in software developments used to solve many different tasks such as engineering inspections. This research investigates the abilities of imaging software's being able to develop a 3D object from photos taken at different angles and elevations. The method of getting a quality meshed image that displays detail is to take the photos of the desired object at every 5-10-degree angle until the complete 360 degrees has been photographed. Because the software has restrictions, a minimum of 20 photos is required for a desirable 3D mesh. However, depending on the size the object, 50-60 photos can reasonably give outstanding results. While using Autodesk Recap Photo to develop a 3D object from the selected photos taken, the intended outcome is for the software to show the flaws, faults, or cracks that the visual eye would not usually recognize. The constant durability of a structure or an object is significant

in an inspection as to what can be fixed if needed to avoid any mishaps. With this research we hope to show individuals the possibilities and the different results you get when inspecting an object more in depth.

Christian Lopez & Daniela Bautista

Lost Cost Drone for Medical Applications

Mentor: Professor Andy S. Zhang

Department: Mechanical Engineering Technology

The purpose of this research is the development of a gas detector device capable to work in conjunction with an unmanned aerial vehicle (UAV). Regular gas or flame detectors are common, however, the market lacks drones with these capabilities. Furthermore, the investigation proposes a framework and a beginner's guide for students with the intention to learn basic programming skills, and how to use simple electrical components. This study explores the adoption of Arduino as base code writing tool. MQ-2 Sensor for ambient readings and the adaptation of a range of actuators to issue a visual, and an audible alert of high concentrations of flammable gases. Findings of this month-long study suggest that measurements are reliable for hobby and even professional applications. More importantly, the device could be produced at a reasonable price, which could be a competitive and economical option in the market.

Gamal Mansour

Design & Fabrication of Prosthetic Hand

Mentor: Professor Gaffar Gailani

Department: Mechanical Engineering Technology

The main goal for this project is to design and fabricate a prosthetic hand. By conducting a research for a prosthetic hand. Understanding the concept of the bionic hand function and previous problems designers faced when they designed prosthetic hand parts. In general when we design any prototype for an existing problem. For instance, we design a prosthetic hand for a person who lost part of his body. Person who lost a part of his/her body through trauma, disease, or congenital conditions will benefit from these bionic or prosthetic hands. Bionics means the replacement or enhancement of organs or other body parts by mechanical versions. Bionic implants differ from mere prostheses by mimicking the original function very closely, or even surpassing it. As mechanical engineering students, we focused in mechanical area, which is design, and fabricate prosthetic hands. As I mentioned the aim of this project is to use what we learn such as 'mechanical drawing software' in order to design, and use fabrication machine such as 3D printer for fabricate our project in medical devises lab. In addition to this project work we participate in enable the future program that is a group of individuals from all over the world who are using their 3D printers to create free 3D printed prosthetic

hands and arms for those in need of an upper limb assistive device. The e-NABLE Community is made up of teachers, students, engineers, scientists, makers and everyday people who just want to make a difference and helps to “Give the World a Helping Hand.”

Gene Nadala & David Oppong

Smart Capsule – An IoT Medical Monitoring Device

Mentor: Professor Xiaohai Li

Department: Computer Engineering Technology

Our project focuses on two specific goals: a system that is able to read and recognize a physician’s instructions on prescription bottle labels, and a system that is able to keep track of the amount of medicine within the container. We explore computer vision and image processing to interpret the physician’s labels as well as recognize the use of the prescription medication in the form of pills. A load sensor that keeps track of the pill bottle’s weight is also explored as a means to supplement the tracking of the use of medication.

The information gathered using cameras and sensors are then used in conjunction with IoT and embedded computer technology for analysis to determine patient adherence, and in the future, help inform family, friends or the patient’s clinician as to the current state of a patient’s use of medication. We expect this to help a patient take their medication as prescribed, improve overall health outcome, and hopefully mitigate the problem of nonadherence.

Katherine Parra, et al.

Elucidating new species of *Distichopathes* (Cnidaria: Anthozoa: Hexacorallia: Antipatharia) from the Flower Garden Banks National Marine Sanctuary (NW Gulf of Mexico)

Mentor: Professor Mercer R. Brugler

Department: Biological Sciences

Black corals (Phylum Cnidaria: Class Anthozoa: Subclass Hexacorallia: Order Antipatharia) inhabit all the world’s oceans, yet are a largely deep-water group with 75% of the 247 currently recognized species occurring at depths >50 meters (shallowest: 4m; deepest: 8,600m). The order Antipatharia currently includes 7 families, 43 genera and 247 species.

During a September 2017 research cruise to areas being considered for sanctuary by the Flower Garden Banks National Marine Sanctuary (NW Gulf of Mexico) aboard the NOAA Research Vessel Manta, we deployed the remotely operated vehicle Mohawk to collect two individuals of species putatively classified in the black coral genus *Distichopathes* (Family Aphanipathidae; Subfamily Acanthopathinae.) The two individuals were collected from Elver. To date, there are only two

described species within the genus *Distichopathes*, both of which were created based solely on morphology (*D. disticha* and *D. filix*) Preliminary morphological analysis of the specimens by co-author DMO suggests that one or more individuals may represent new species of *Distichopathes*. We are currently obtaining a genetic signature for these newly collected antipatharians using a combination of three mitochondrial gene regions (cox3-IGR-cox1, trnW-IGR-nad2, nad5-IGR-nad1; IGR = intergenic region) and four nuclear genes (ITS2, SRP54, 18S and 28S). We will also explore the secondary structure of nuclear ITS2 to help refine inferred phylogenetic relationships based on mtDNA. All newly generated sequence data will be made publicly available on GenBank and any new species will be described and named. The data generated herein will add to our growing knowledge of mesophotic communities and help inform policy makers that are currently assessing the proposed expansion of the current boundaries of the marine sanctuary.

Stephan Patoir & Langston Clark

FROM PASSIV HAUS TO AKTIV HAUS: The HYBRID, a combination of two conscientious design methods

Mentor: Professor Kenneth Conzelmann

Department: Architectural Technology

How great would it be to live in a home that was so comfortable and intuitively designed, that you never needed to spend money to turn on the AC or crank up the thermostat for heat. No matter how extreme the weather was! Over the past several weeks, we've been conducting research on (German-spelled) Passive PASSIV & AKTIV Haus designs. To determine the most efficient ways that a house can perform, reducing the costs of living and energy use. We are proposing a HYBRID which makes use of the best of both worlds. Most houses require external sources of energy from "the POWER grid" (a huge chain network that supplies electricity, MAINLY FROM FOSSIL FUELS I.E. PETROLEUM, NATURAL GAS, COAL) to run THE HOMES. Not only can this be inefficient use of these energy sources, but it also results in the depletion of earth's natural resources and result in organic waste and off gassing from power plants that contribute to the pollution of mother earth, and not to forget global warming. By designing a house that has no need for traditional methods of energy generation we can decrease the amount of pollution generated in the U.S, conserve natural resources, and last but not least, keep more money in our pockets. The PASSIV HAUS is successful because it is built to be airtight, ventilated and to with super thick insulated walls floors and roof, requiring less energy to cool and heat. AIRTIGHT, VENTILATED AND WITH SUPER THICK INSULATED WALLS FLOORS AND ROOF, REQUIRING LESS ENERGY TO COOL AND HEAT. Also important, is its SETTING ORIENTATION AND BUILDING MATERIALS. The AKTIV HAUS is successful because it can produce all the energy that is required for it to perform, BY PRODUCING ELECTRICITY AND HOT WATER VIA SOLAR PANELS, HARNESSING/CAPTURING KINETIC POWER OF WIND AND WATER FLOWS, AND TAPPING INTO THE EARTH'S OWN CONSTANT TEMPERATURE FOR HEATING AND COOLING. We have found that it is possible to be completely independent of "the POWER grid" with these solutions. As a matter of fact, you can design a house that produces more energy than is required for it to run and even sell it back to the grid! By designing sensitively to the

surrounding environment and using alternative nontraditional building methods it is possible to live in harmony with nature and improve the conditions of the environment.

Ja-Yuan Pendley

Predicting Students Grade Using Machine Learning

Mentor: Marcos S. Pinto

Department: Computer Systems Technology

In order to test the hypothesis that Using Machine Learning to Predict Student Grades , we assessed using python, different google version of AI, and MS Excel. While machine learning gets all the attention, it often comprises a small part of a data science project. Most of the work — and most of the value — comes in obtaining, cleaning, and exploring the data. Only once we have a firm grasp on the structure of our data and the relationships within it should we proceed to building machine learning models. I wanted to show the entire process in for this project to demonstrate a typical data science workflow. Machine Learning (ML) is a subfield of artificial intelligence. It concerns giving computers the ability to learn without being explicitly programmed. Over the years, machine learning’s popularity and demand has certainly been on the rise. The ability to predict a student's performance could be useful in a great number of different ways associated with university-level learning. In this paper, a grammar guided genetic programming algorithm, G3P-MI, has been applied to predict if the student will fail or pass a certain course and identifies activities to promote learning in a positive or negative way from the perspective of Multiple Instance Learning (MIL). Computational experiments compare our proposal with the most popular techniques of MIL. Results show that G3P-MI achieves better performance with more accurate models and a better trade-off between such contradictory metrics as sensitivity and specificity. Moreover, it adds comprehensibility to the knowledge discovered and finds interesting relationships that correlate certain tasks and the time devoted to solving exercises with the final marks obtained in the course.

Mdzafar Sadak

Cloud Computing & Data Security

Mentor: Professor Aparicio Carranza

Department: Computer Engineering Technology

Abstract – Cloud Computing is one of the most important advancements in technology since the invention of the Personal Computers. Cloud Computing refers to manipulating, configuring and accessing the applications via the Internet and provides various kinds of services to its users. One of the principal concerns of Cloud Computing is security “How secure is a cloud computing environment?” - Security is then one of the parameters that need to be tackled

deeper before enterprises embrace this popular technology to greater degree. With the cloud technology paradigm enterprise data are stored at a remote location and must be assured that is safe and be available at any time. Our effort is to report security feature results of our evaluation carried out on Public, Private, Community and Hybrid Cloud Computing; which includes differences between their services, architecture, deployment and development of services and the way to mitigate those security risks and issues.

Cheryl Thomas

Attorney Client Privilege

Mentor: Professor Angela Redman

Department: Law and Paralegal Studies

Historically attorney client privilege was sacrosanct, a principle that assured attorneys and clients absolute protection against forced disclosure of their legal discussions or communications. Privilege which is one of the oldest recognized principles in English Common Law was upheld by the United States Supreme Court beginning in 1906. Attorney client privilege belongs to the client but exists only if the client claims it. For attorney client privilege to exist a client must seek legal advice from an attorney in his/her capacity as a legal advisor. Said communication must be made in confidence by the client with the attorney.