IMSAloquium

Student Inquiry and Research Program
and IMSA Internship Program

Friday, April 26, 2019

IMSA
Illinois Mathematics and Science Academy

April 2019

Dear IMSA Students, Faculty, Staff and Friends:

Welcome to IMSAloquium 2019! This is IMSA's 32nd year of leading in educational innovation, the 31st year of the IMSA Student Inquiry and Research (SIR) Program, and the first year of the newly imagined IMSA Internship Program.

The IMSA Student Inquiry and Research (SIR) program connects students with on-campus or off-campus professional researchers. The goal of the SIR program is to provide opportunities for students carry out scientific research investigation under the guidance of professional researchers in their field.

The IMSA Internship program connects students with on-campus or off-campus professional business, technology and/or entrepreneurial mentors. The goal of the IMSA Internship program is to provide opportunities for students to carry out industry, business or product focused investigation under the guidance of professional mentors in their industry.

Within this booklet, you will find a collection of abstracts from outstanding student projects from both programs. Project topics range from molecular biology and cancer research to particle physics, Alzheimer's disease, as well as Competitive Data Research, and Mobile App Development and many other interesting and important topics. Our students have worked long and rewarding hours on their projects, some working individually, some working in groups to examine, explore and discover the fields of inquiry of interest to their project areas.

Many of our students have worked with mentors off campus at leading universities, research laboratories, and in-company in Chicago. Other students have worked with IMSA faculty on campus. The SIR and Internship teams would very much like to thank all of the research and business mentors for their excellent work with our students. The IMSA SIR and Internship programs could not and would not exist were it not for the efforts of all the mentors collaborating, advising and working alongside our students.

This year, IMSAloquium is broken down into three sessions. Session I and II projects offer a mix of projects that are either in the preliminary or intermediate stages of development. Session III projects are exemplary work that reveals thorough outcomes and contributions to their field.

In addition to thanking the research and business mentors, we would like to thank all IMSA faculty and staff who helped support the running of our programs and in the coordination of hosting this year's IMSAloquium.

We hope you enjoy your day!

Sincerely,

IMSA SIR Program Team

Cathleen Cunz
Dave DeVol, Ph.D.
Don Dosch, Ph.D.
Eric Smith, Ph.D.

IMSA Internship Program Team

Sue Fricano
Jim Gerry, MSc.
Betty Hart, MA.
Kelly Page, Ph.D.

IMSA President

José M. Torres, Ph.D.

IMSA Principal

Robert Hernandez, Ph.D.

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Project Presentations *(10 min. + 5 min. Q & A)*

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9:45a.m. - 10:00a.m.
10:05a.m. - 10:20a.m.
10:25a.m. - 10:40a.m.

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Project Presentations *(20 min. + 5 min. Q & A)*

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1:40p.m. - 2:05p.m.
2:10p.m. - 2:35p.m.

Keynote

Silvia Alvarez-Clare

Tree Conservation Ecologist, Center for Tree Science Academic Mentor
salvarezclare@mortonarb.org

PhD, Interdisciplinary Ecology, University of Florida, Gainesville
MS, Botany, University of Florida, Gainesville
BS, Biology, Universidad de Costa Rica, San José, Costa Rica

Research Interests

Dr. Alvarez-Clare's research focuses on understanding the links between the carbon and nutrient cycles and how resource availability can influence biological processes, plant functional traits, and biodiversity preservation. As an ecosystem ecologist with a background in tree ecophysiology and biogeochemistry, she combines long-term monitoring, manipulative experiments, and innovative analytical techniques to examine patterns, processes, and mechanisms that will advance our understanding of how changes in the resources required by trees will affect plant-soil-microbial feedbacks. Most of her work has been conducted in tropical forests but as the Center for Tree Science Academic Mentor, Dr. Alvarez-Clare has the opportunity to actively work with CTS Undergraduate Research Fellows and other students involved with CTS and learn about temperate ecosystems both in a natural and urban context.

Accomplishments

In addition to being the academic mentor for undergraduate research at the Center for Tree Science, Silvia Alvarez-Clare is a guest researcher at Argonne National Laboratory. Her research in tropical ecosystems ecology has been funded by The National Science Foundation's Doctoral Dissertation Enhancement Grant (DDEG) and Postdoctoral Research Fellowship in Biology (PRFB), and her work published in top tier journals such as Ecology Letters and Ecology. Alvarez-Clare is the co-leader of a local group that supports Women in Science and is part of the Tree Board for North Central College.

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Session I 9:45a.m. – 10:00a.m.

Room: IN2 | Business Internship Panel 1
9:45a.m. – 10:00a.m.

Dealer Fox App Development
Presenter: Zoe Berthold
Mentors: Dan Trinidad, Dealer Fox
Abstract/Project intention:
Dealer Fox is a start-up that provides data visualization for advertisements of car dealerships online to help increase efficiency of sales. The business project was to create a mobile application to display car dealerships' individual data. The final use of this app was to distribute to individual dealerships, who would see their data on a company-given iPad. The deliverables were Swift development for iOS applications and database development. Other later deliverables included Google Authentication and graphic design to increase visual aesthetic of the app. Documentation was also used to clarify programming techniques and assist others with adding users to the database. The impact was an application which can be used in the future for dealerships to log in with Google and see their advertising data specific to them. As Dealer Fox acquires new clients in the future, there are instructions on how to add the users to the database and instructions for users on the app.

LEAP Innovations: Leaping Into Better Education
Presenter: Ann Lamptey
Mentor: Susan Liu, Edtech Programs Manager, LEAP Innovations
Abstract/Project intention:
LEAP Innovations is a non for profit aimed at promoting education in the Chicago Public Schools district. They do this by teaching their personalized learning framework to teachers in schools who have joined the program. They also facilitate the cooperation of schools with Edtechs such as BrainPOP and Renaissance. While researching the modes of communication that happen inside the LEAP office and the communications that happen in between LEAP Innovations and the Edtechs. During this time, the Edtech side of LEAP Innovation process was contributed to. During the internship process teachers had to come to the LEAP offices for teacher development. Some of the materials used to teach the teachers and by association the schools about the different Edtechs that they could work with were made. There were many PowerPoint decks and google sheets spreadsheets made or added to help with upcoming check ins and reports about what was happening at certain times during the program. In all the whole process of curation on the front end of the curation process with the teachers and the schools and the back end with the operations that go on in LEAP Innovation. This is also contributed to the UN Sustainable Goal of quality education.

The Face of IMSA Entrepreneurship for Tomorrow's Rockstars
Presenter: Natalie Sanchez

Mentor: Dr. Kelly Page, IMSA IN2

Abstract/Project intention:

The IMSA Entrepreneurship Program at the Steve and Jaime Chen Center of Innovation and Inquiry. The business phenomena for this project included examining the market for entrepreneurship learning and programs for youth (grades 7-12) locally (Kane County), across the state (IL), and nationally (USA) and well as develop our market knowledge, understanding, and provide recommendations on how to develop IMSA's Entrepreneurship Program for future IMSA youth (Sophomores, Juniors, and Seniors). Privately-owned universities have to charge so much for their youth entrepreneurial programs due to lack of state funding. A common product-offering amongst many youth entrepreneurial programs is some form of collegiate credit or recognition. This IMSA Entrepreneurship program is youth-led, which is a very unique trait of our deliverables and it i sets us apart from other programs internationally. Related national programs researched include Uncharted Learning, The New Bohemian Innovation Collaborative, Young Entrepreneur Learning Labs, University of Delaware Horn Entrepreneurship and Junior Achievement. Applied skills include market research and analysis, data analysis, professional communication. The conclusion of this project will offer program insight and produce a final competitor analysis national entrepreneurial program competitors.

Room: A113
9:45a.m. – 10:00a.m.

Neuroplasticity Training: What is it, and Does it Work?

Presenters: Charlotte Graves, Ishanpepe Jagusah

Mentor: Dr. Adrienne Coleman, Illinois Mathematics and Science Academy

Abstract:

Several existing programs claim to improve cognitive function through training that exercises different parts of the brain. Lumosity, My Brain Trainer, and Braingle are all online programs with exercises that test memory, reflexes, and other functions with the goal of making them faster and more accurate. However, some believe that because these programs rely on a computer screen, their effectiveness is limited due to the lack of involvement from senses besides sight.1 Therefore, a program that engages more of the senses should be more effective. Mr. John Kennedy of Combat Brain Training invented a brain training exercise that utilizes physical elements to involve the body and improve executive function, which is a set of high-order brain functions including focus, memory, and emotion regulation. His program differs from many available in that it does not use a computer or screen and consists entirely of a single sheet of paper and interaction with an instructor. This study seeks to test if this program is effective in improving executive function as demonstrated by a standardized executive function self evaluation. Subjects evaluated their own mental fitness, then participated in six weekly fifteen minute sessions of brain training, then take a posttest.

Room: A115
9:45a.m. – 10:00a.m.

Calculating the Kepler Detection Efficiency -- A Data Analysis of the Kepler Main Mission
Presenters: Ian Son, Mani Nagarathnam, Aaron Calhoun, Tyler Ptak
Mentor: Dr. Eric Hawker, Illinois Mathematics and Science Academy
Abstract:
The main focus of this study is to roughly estimate the number of earth-sized habitable planets within the Milky Way galaxy. Along with this, we will determine the detection efficiency of the Kepler space telescope. We already know the number of earth-sized planets that were detected by Kepler. However, the Kepler telescope's instruments are not perfectly precise, and in order to measure its efficiency, we will put in the data of a fake planet into the Kepler's star luminosity files and see if its transit gap is detectable. We will analyze the Kepler luminosity data by either looking at the visualized graphs, or putting it through a machine learning algorithm. Using the analysed data, we can determine the actual number of potential earth-like habitable planets in the Milky Way, including those which were not detected by Kepler. We will look at various characteristics of planets to determine their habitability: luminosity of the parent star(s), planet radius, orbital radius, and orbital inclination. From the planet radius we can estimate the mass and density of the planet, which will also help us determine its habitability. These calculations will create an accurate estimate of the number of potential earth-like habitable planets within the Milky Way galaxy.

Room: A117
9:45a.m. – 10:00a.m.

Causal Relationships in 21st Century Chicago Gentrification
Presenters: Alex Sobczynski and Vincent McKibben
Mentor: Patrick Kearney, Illinois Mathematics and Science Academy
Abstract:
Since the mid-1990s, gentrification has been a popular area of sociological study, typically in discussion of the immediate and delayed effects of gentrification. There is a general consensus among professionals that gentrification is a natural economic occurrence motivated by low property value in desirable areas and a surplus of capital from investors. However, independent of governmental subsidies and tax incentives, we wanted to find how developers specifically pick from the variety of neighborhoods available to them. Entering into our analyses, we hypothesized that developers in Chicago prefer low property value, closer proximity to the loop (Chicago city center), lower crime rates, and buildings built before 1940. Thus, we have measured the causes of gentrification in Chicago over an eight-year period on a census tract level defining gentrification as an increase in median percent income attributed to housing and weighing the hypothesized factors.

Room: A119
9:45a.m. – 10:00a.m.

Title: Exploring the Potential of Cucurbiturils as Host Compounds in Host-Guest Complexes
Presenters: Hannah Daggett, Ethan Hudelson, Allia Lin, Andrew Tatum
Mentors: Dr. Laura Kopff, Illinois Mathematics and Science Academy
Abstract:
Cucurbiturils (CB[n]) are macrocyclic compounds made from glycoluril monomers. They have the potential to act as host molecules in the formation of host-guest complexes with an array of substrates, including amino acids, hydrocarbons, and halogenated aromatic compounds. Cucurbit[6]uril (CB[6]) and Cucurbit[7]uril (CB[7]) were synthesized and characterized. Their ability to act as host complexes with both coumarin-1 dye and biphenyl was explored using UV-vis spectroscopy.

We synthesized CB[6] and CB[7] compounds and made nine solutions to figure out when combined how the absorbance peaks might change. Three solutions made of Coumarin 1 dye and HCl, another three solutions were made of Cyclodextrin and HCl, and the final three solutions were made from Biphenyl and methanol. We combined Biphenyl solutions and Cyclodextrin solutions and the Coumarin 1 dye solutions with Cyclodextrin solutions, and ran absorbance tests. For the Biphenyl there were consistent peaks at 204, 244, 252, 291, and 346 nm. Coumarin 1 dye showed peak patterns corresponding to each molarity. The 20 uM solution had peaks at 244, 291, 327 nm; in the 10 and 5 uM solution there was a peak at 260 nm.

Room: A121
9:45a.m. – 10:00a.m.

The Effectiveness of a Cultural Competency Curriculum Taught to Middle School Students
Presenters: Grace Federici and Aabha Vyas
Research Mentors: Mr. David Lundgren and Dr. Sowmya Anjur, IMSA
Abstract:
The experiences that occur in the lives of students nearing adolescence greatly influence the way they choose to act. Therefore, a curriculum was developed for middle school students reaching the age of adolescence, aiming to educate and inform these students on what it means to be culturally competent and the importance of a culturally competent society which they have the ability to influence. Because being culturally competent is such an important life skill, allowing for a understanding of one's own view of the world, the goal is to make it a part of education to develop broader knowledge of culture and how to use it to more effectively communicate even when exposed to only an isolated environment like a middle school. We conducted research testing the effectiveness on this newly constructed curriculum by comparing the results of a survey given to the participants before and after being taught the curriculum. Data collected from these surveys was compared to analyze the impact of the curriculum.

Room: A123
9:45a.m. – 10:00a.m.

AIF and Cell Death Pathway Interactions in Viral Infections
Presenters: Ben Helmold, Jaimie Ryou and Tony Un
Research Mentor: Dr. Randall, Illinois Mathematics and Science Academy
Abstract:
The apoptosis inducing factor (AIF) affects cell death from an alternate pathway than usual. AIF is involved in important pathways in diseases such as HIV and in early childhood development problems. AIF content in cells can be seen by the resistance the cells have to serum starvation and other types of cell death. We can use this as a marker for induced apoptosis, and run plates with varying levels of media, first in a control with normal amounts of AIF present in a healthy cell. To measure the changes in AIF, we ran the same plates with the cells, but had plasmids inserted for different proteins or protein inhibitors. We inhibited VDAC and upregulated Heat shock protein 70, both of which have been previously shown to have effects on AIF levels in virally infected cells. Cell death was monitored with an MTT assay to show the relationship between the proteins and change in AIF levels which could explain how HIV and other viruses might be targeting the pathways.

Room: A147
9:45a.m. – 10:00a.m.

Multispectral Imaging and Unmanned Aerial Vehicles
Presenters: Klaybis Asllani, Alexander Domowicz, and Marcus Ludwig
Mentor: Dr. Eric Smith, IMSA
Abstract:
With recent technological advances, personal unmanned aerial vehicles are a cheap alternative for flight. The combination of UAVs and multispectral sensors have many benefits for the world. It can be used for search and rescue operations or even revolutionize calibrated photogrammetry 3D modeling. The research our group focuses on the benefits this combination has for agriculture. A drone can carry the sensors to analyze plots of farmland. The data received gives important information on crop stress, infestation, disease, nutrient deficiencies. It also enables farmers to act accordingly for a successful harvest. Our project works for the Morton Arboretum because of their interest in this ever-developing field of research. Using a commercially sold drone, we built onto its accessories for the camera and sensors. Utilizing Arduino, we can transmit and receive information with the drone. We can control the drone's movement and camera angle as well. The addition of the antenna increased its radius of action. Using 3D printing, we designed and printed reliable parts. This enhancement lowers the drone's overall weight and improves stability in flight. Stability is extremely important for high-quality photos and accurate data. In the future, we hope to use different materials and build upon our base.

Room: A149
9:45a.m. – 10:00a.m.

The Effect of Induced vs. Artificial RecA on Bacteriophage Lambda for the E. coli K12 Strain
Presenters: Ryan Talusan and Suraj Sunkara
Mentor: Dr. Sowmya Anjur, Illinois Math and Science Academy
Abstract:
The advent of antibiotic-resistant bacteria has prompted scientists to search for alternatives to combat infections. A leading alternative to antibiotics is bacterial viruses, or bacteriophages. A major drawback to the usage of bacteriophages are the potential for the virus to enter the lysogenic cycle. Bacteriophages go through the lysogenic cycle when there is a lack of potential hosts to infect causing them to enter a dormant stage and not infect other bacterial cells. The lytic cycle, which is more advantageous for phage therapy, happens when the virus replicates itself within the bacteria eventually lysing the cell and killing the host, releasing the newly replicated bacteriophages. This process occurs when there are readily available hosts. Though most phage researchers have explored the genetic and mechanical side of the virus, such as the effects of the RecA protein and ultraviolet light on the cycle the bacteriophage goes through, very few have investigated the application of those studies on phage therapy. We take a look at whether it is possible to induce bacteriophages to be more usable in phage therapy by adding RecA protein and using UV light and seeing which method works better.

Room: A151
9:45a.m. – 10:00a.m.

The '-ism' of Self-Worth: Analyzing Afrofuturism
Presenter: Zoe Mitchell
Mentor(s): Tracey Townsend, IMSA
Abstract:
There are plenty of books that are marketed as Afrofuturism, however, the definition of the genre is constantly changing. In addition, many of the papers in discourse about what Afrofuturism is are done by academics from outside of the community of Afrofuturistic writers. This paper asks the question: what are the forces that define Afrofuturism for both readers and for authors? Answering this question requires the in depth reading and analysis of both short stories and novels written by both Black and Non Black authors whose works have been classified in the afrofuture genre. Then, common themes and artistic stylings, as well as the context surrounding each work, will inform how this paper defines the term afrofuturism and how and if it can be applied in each piece.

Room: A155
9:45a.m. – 10:00a.m.

Crystal Structures of Large Volume Commercial Pharmaceuticals
Presenter: Shivang Bhaskar, Diana Gonzalez, Jerry Hong, Nilan V. Patel
Mentors: Joseph T. Golab, IMSA, James A. Kaduk, North Central College
Abstract:
The purpose of this project is to determine the crystal structures of commercial pharmaceuticals using synchrotron X-ray powder diffraction data and computational chemistry techniques. Currently, we are analyzing four molecules with unpublished structures used to treat common maladies: tamsulosin hydrochloride (benign prostatic hyperplasia), pantoprazole sodium (gastric reflux disease), ipratropium bromide (COPD and asthma), and doxepin (chronic depression). Knowledge of the crystal structure helps rationalize chemical and biological properties, and also facilitates qualitative and quantitative phase analysis. We have solved and refined the crystal structures using Monte Carlo simulated annealing, Rietveld refinement, and density functional theory (DFT) geometry optimizations. We will present the structures and discuss their intermolecular bonding in the solid state, particularly hydrogen bonding. By understanding the structure of these compounds and how they interact with themselves, we can predict how they might interact with human biological pathways, knowledge which is essential in the creation of new pharmaceuticals.

Room: B108
9:45a.m. – 10:00a.m.

Extracting Soil Cores and Using Geophysical Methods to Determine the Geology of IMSA's Campus
Presenters: Meghan Hendrix, Rachel Moreno, Ethan Phillips, Grace Sleyko
Mentors: Dr. Melissa Lenczewski, Ph.D., Northern Illinois University, Mrs. O'Leary, IMSA
Abstract:
Our goal was to investigate the geological makeup of IMSA's campus through drilling near No-Pond. First, the surficial geology of the area was examined using previously drawn maps of both the surficial and subterranean geology. From there, we were able to determine the ideal depth and location to drill: 25ft deep and west of No-Pond. Subsequently, when we went out to drill using the geoprobe, we successfully extracted a soil core that we then extracted DNA from to analyze the microorganisms in IMSA's soil. As of now, we have only begun the stage of running polymerase chain reaction (PCR), and have not obtained any data or analysis from said tests. We also extracted water with which we analyzed the effectiveness of Micros 20's. On our second drill date, we hit bedrock sooner than expected, hence interrupting subsequent drilling until the ground thawed. During which time, using the geophysical methods of refraction and magnetism, we determined probable cause for the unexpected drilling interruption. There is likely a sizable gravel layer before the limestone bedrock.

Room: B110
9:45a.m. – 10:00a.m.

GIGANTIC: Galactic Interpretive GANs To Identify Curiosities
Presenters: WonJun Park, Roshan Thekiniath, and Tejo Velagapudi
Mentors: Dr. Brian Nord and Dr. Joao Caldeira, Fermi National Accelerator Lab
Abstract:
GANs—generative adversarial networks—are neural networks that are composed of two parts, the generative network and the discriminative network, which compete to generate images or other forms of media. In GANs, the generative network produces images, while the discriminative network provides the probability that the image is real. As these networks compete against each other, they are both learning to be much better than normal neural nets, producing higher quality results. Our project is specifically concerned with applying GANs to strong gravitational lensing, a phenomenon occurs when the mass density of the lens is greater than critical density. The gravitational force of the lens can create multiple images, arcs, and Einstein rings. Training GANs on existing data of gravitational lensing could simulate more examples of these images. The other aspect to our project is deblending already existing images of lensing to reduce signal interference and create more accurate pictures. As of now, the work on the networks is still in early stages, but over the course of the next year, we hope to complete functioning nets. When the neural networks are complete, several diagnostics will be run on their efficiency, accuracy, and loss function to determine if they are viable options.

Room: B115
9:45a.m. – 10:00a.m.

Lightweight Reduction Unit
Presenter: Eunice Yoon
Mentor: Dr. Frank Harwath, North Central College
Abstract:
Harmonic gears, which consist of a fixed outer gear with a flexible inner gear that rotates around by a motor, causing the teeth of the gears to contact, can have many functions, but many of these functions cannot be done because the harmonic gears are too heavy to use for smaller machines and too expensive for consumers to regularly use. An inexpensive and lightweight gear could contribute to building a robotic actuator, while keeping the same structure and function as a harmonic gear. Additionally, if a part of the gear were to break, the whole harmonic gear has to be replaced while this gear would have interchangeable parts. In collaboration with Harmonic Drive Co., research is currently focused on finding a suitable control gear for smaller sized robots to compare how well our gear works. Using SolidWorks, we have made the design for an inexpensive, lightweight gear and eventually 3D printed our gear. Our gears worked just as well as the harmonic gear in the same size we used as a control. We decided to take things further and build a prototype of a SCARA robot arm with two of these gears.

Room: B116
9:45a.m. – 10:00a.m.

Title: A Study on Hypoxis hemerocallidea
Presenters: Eliza Apavaloaiei and Rachel Mason
Mentor: Dr. John Thurmond, IMSA
Abstract:
Approximately 80% of the global population still relies on medicinal plants. Medicinal plants are especially prominent in developing countries and isolated communities. One of the most common plants used to treat diseases such as tuberculosis, AIDS, and many other illnesses, is Hypoxis Hemerocallidea (African Potato). A powdered sample was acquired from a company rooted in South Africa and a capsule sample was acquired from a company based in New York. After testing the samples for purity with NMR and TLC tests, the samples were determined as being unpure and both samples were extracted using ethyl acetate. The purity of these samples was tested using TLC tests. The properties of both samples were studied by testing the antimicrobial properties against Bacillus subtilis, Enterococcus raffinosus, Acinetobacter baylyi, Pseudomonas putida, Pseudomonas fluorescens, and E. coli/DH5a using the Kirby-Bauer method. These tests showed that the African Potato was very effective against Acinetobacter baylyi.

Room: B125
9:45a.m. – 10:00a.m.

TNF: The Key To Preventing Type 1 Diabetes
Presenters: Bopo Taiwo, Peter Baffoe
Mentor: John Thurmond, IMSA
Abstract
Insulitis is caused by a pathway of inflammatory steps lead predominantly by Tumor Necrosis Factor (TNF), Interferon Gamma (INF-y), and Interleukin 1 beta (IL-1b). Within Type 1 diabetes, an inflammatory disease, these same cytokines have been linked to the progression of this condition both within the immune system, and at a cellular level. It has been determined that by neutralizing TNF, INF-y, and IL-1b, one can inhibit the development of Type 1 diabetes.By using SeeSAR to modify small-molecule inhibitors found in PDB, two potential archetypes of TNF-inhibitors have been found, both of which are drastically smaller than the monoclonal antibody competitors on the market, indicating potential for cost-effective treatment of rheumatoid arthritis and insulitis.

Room: B133
9:45a.m. – 10:00a.m.

Cloning, Expressing, and Purifying the IsoCitrate Lyase-1 Enzyme in Mycobacterium Tuberculosis
Presenters: Shikha Adhikari, Pouravi Banerjee, Liza Kuzmina
Mentor: Angela Ahrendt, IMSA
Abstract:
In this study, we chose to target the Isocitrate Lyase 1(ICL-1) gene as a possible target for the treatment of tuberculosis. We took this approach because ICL-1 allows the Mycobacterium tuberculosis bacteria to skip some of the steps in the KREBS cycle, which gives it the ability to survive in low-oxygen environments. The ICL-1 gene found in M. tuberculosis was amplified using PCR to prepare an expression system for testing drugs targeting the ICL-1 protein. In order to do this, primers were designed to clone the gene and give it restriction sites, which allowed us to insert the ICL-1 gene insert into a vector, and finally into E. coli cells. Since this work is still in progress, an expression vector containing ICL-1 was acquired and transformed into BL21 DE3. Protein was subsequently expressed and purified.

Room: IN2 | Business Internship Panel 2
10:05a.m. – 10:20a.m.

Ugliest Website Contest
Presenter: Trinity Coates
Mentor: Brandon Lyon, City Segment/Aurora Collective
Abstract/Project intention:
City Segment/Aurora Collective is dedicated to connecting the business community in the greater Aurora area in networking and educational events, serving a wide range of business verticals and industries. The work of this project included social media management of the business "Ugliest Website Contest" which is an offering to small business owners.
Emailing developers, researching why websites are important to small business owners and how that relates to tech success of their business. Strategies included performing research on web-design trends and target audience marketing preferences, generating and publishing related content on company social media pages and developing brand awareness. Key learnings include data analysis skills, market research and awareness of applications such as Hootsuite and Google Analytics. The contributions of this work will expand the reachability of Aurora Collective to continue their growth as a business incubator.

Guide Students to Become Stars
Presenter: Abigail Light
Mentor: Jill Ko, Kevelyn, CourseStars
Abstract/Project intention:
Coursestars is a startup business that offers tutoring services, consultations and study groups with the assistance. The owner of the business, Jill Ko, was inspired to create a project in which tutors either online or one-on-one are always available to help students. To network her business, she needed tutors who are highly educated in a subject at their college/university and are willing to tutor other students at their college/university. The core learning of this project was to find a way to reach out to students for services and recruit potential tutors. Website design was another key learning was of the project under the guidance of Kevelyn - CourseStars web design expert. The website was transformed update branding and marketing, tutor's profiles and information that is accessible to students. The users of this newly updated website will have the ability to students with qualifications register for a personal tutor. In conclusion, the website update has an impact to the business because now there is a clear goal for the business as well as easy access for students to learn more about Coursestars.

VisMed 3D - Internship Experience
Presenter: Grace Wulffraat
Mentor: Dima Elisa
Abstract/Project intention:
VisMed3D is a biomedical and technology company with a focus in the areas of determining concept viability with healthcare consulting, assurance services involving malpractice and IP patent review, and 3D printing services ranging from custom prosthetics and dental fabrication. The work included how to design and apply organization elements to the company website and social media medical pages for industry and business users. The research included social media marketing strategies used within bio-medical and bio-tech industries. Implementation of these marketing and advertising strategies was showcased on the VisMed3D social media calendar for publishing on Facebook, Twitter and LinkedIn. Additional learnings included marketing skills such as using color psychology, elements of graphic design, target audience language and communication techniques. Additional skills acquired include collaborating with industry experts in medical, biotech and 3D technology community. The work of research and reporting of new developments in the biocompatible 3D printing industry completed for VisMed 3D will contribute to their overall marketing strategies.

Room: A113
10:05a.m. – 10:20a.m.

Selective Breeding for Flower Color Using Pigment Analysis
Presenters: Mara Adams, Maxine Alexandre-Strong
Mentor: Dr. Jayaraj Alappat, Ball Horticultural
Abstract:
Many flower breeders require hues that do not exist in the breeds that they are working with. Three pigments -- anthocyanins, betalains, and carotenoids -- along with pH, chemical structure, metal ions, and copigmentation all work together to contribute to flower color, and the analysis of these factors can provide the information needed to produce novel colors with selective breeding. This project aimed to create deep reds in roses and orange in geraniums. To produce these colors, it was necessary to identify and quantify the specific pigment compounds in the petals of different flowers. After processing organic powders of petals taken from several different samples, the concentrations of various types of anthocyanins and carotenoids were determined using spectroscopy and High-Performance Liquid Chromatography (HPLC). The pH was also ascertained with a pH meter. Using the results from these tests, recommendations were given to the breeders that described which flowers they should breed together in order to produce the desired color.

Room: A115
10:05a.m. – 10:20a.m.

Role of plasmacytoid dendritic cells in persistent inflammation after eradication of hepatitis C virus
Presenter: Eric Errampalli
Mentors: Lucas Fass1, Alyx Vogle1, Zhibin Zhu1, Miran Kim1, and Costica Aloman1
1Department of Internal Medicine, Rush University Medical Center
Abstract:
Hepatocellular carcinoma (HCC), a type of liver cancer, is the second leading cause of mortality by cancer worldwide. Advanced or chronic stages of the hepatitis C virus (HCV) infection have exacerbated the lethal effects of HCC. Direct-acting antivirals and other interferon-free (IFN) therapies have successfully treated HCV. However, there is increasing evidence of patients who have received these treatments experiencing persistent hepatic inflammation and an increased risk of developing HCC. For 25-66% of patients, who developed HCC after being cleared of HCV, an increased level of IFNα mRNA is present compared to the amount observed prior to the HCV cure. Given that the main cellular sources of IFNα are the plasmacytoid dendritic cells (pDCs), the current study used immunohistochemical (IHC) staining on samples of explanted liver tissue to identify certain cell markers and characterize the hepatic microenvironment in patients with HCC and de novo HCC. The grand scheme of the study aims to clarify the role of pDCs in the pathogenesis of HCC, which could lead to novel targeted therapies against pDCs that may prevent the pathogenesis of HCC.

Room: A117
10:05a.m. – 10:20a.m.

Using Remote Sensing to Measure Impact of Bison on Restored Prairies
Presenter: Patrick Li
Mentor: Dr. Holly Jones, Northern Illinois University
Abstract:
Bison are a keystone species of native grasslands, and their effects on them are well documented. However, native prairies in the United States are shrinking. and remnant prairies are spreading. Due to differences in soil composition, plant and animal diversity, and other factors, how exactly bison impact remnant prairies are unclear. Recently, advancements in drone technology may have opened up new ways to collect data on the impact of bison, also called remote-sensing. Remote sensing may allow for more complete yet precise analyses than conventional ground-truthing would allow. Our project seeks to answer how bison grazing, restoration age, and fire interact and affect different indices of the prairie, including NDVI, biomass, and diversity. We used different wavelength cameras, which are then analyzed to obtain such indices. Little is known on how human-managed phenomenon such as bison reintroduction and controlled fire impact plant communities on a landscape scale. In addition, our project attempts to verify whether remote sensing can obtain accurate information. We have finished data collection, yet further analyses remain to be done on the indices themselves. This includes working with Erdas Imagine and R software.

Room: A119
10:05a.m. – 10:20a.m.

Marking artifacts in images using machine learning
Presenter: Michelle Wang
Mentor: Chihway Chang, University of Chicago
Abstract:
With the utilization of machine learning, computers have been able to efficiently classify data. Deep learning, a division of machine learning, uses multiple nonlinear processing units. Convolutional neural networks are a machine learning model patterned after the structure of an animal's visual cortex. In our project, deep learning and convolutional neural networks were both used to distinguish cosmic rays, artifacts characterized by high-energy radiation, in images taken by the National Optical Astronomy Observatory's telescopes. Once we had constructed a deep convolutional neural network, this network was trained and fine-tuned continuously until its classifications reached maximum accuracy.

Room: A121
10:05a.m. – 10:20a.m.

The Effects of the Ndc80 Complex on the Kinetochore Attachment to Microtubules
Presenter: Katie Si
Research Mentor: Dr. Dileep Varma, Feinberg School of Medicine
Abstract:
In past years, several arguments have been made about the molecules that affect chromosome separation. This SIR investigation focused on the recent advances in primary interface between the kinetochore and kMTs. Prior research has shown that proper mitotic chromosome alignment and separation require kinetochore-microtubule attachments, which are mediated by Ndc80, a kMT binding complex, as well as the molecular motor dynein. The Rod-ZW10-Zwilch complex is crucial to the coordination between these complexes and kMT attachments because it has an essential role in dynein recruitment and activation of the spindle assembly checkpoint. The project focused on learning the mechanism by which protein complexes control kMT attachments in order to drive the chromosome motility during early mitosis. The experimenters used in vitro total internal reflection fluorescence microscopy to observe the concentrations of Ndc80 inhibited dynein function. They observed that the higher the concentration of Ndc80, the higher the levels of inhibited dynein function. This result provided evidence that Ndc80 negatively affects the function of the molecular motor dynein.

Room: A123
10:05a.m. – 10:20a.m.

Targeting the MLL1 gene as a form of cancer treatment for MLL1-Rearranged Leukemia
Presenter: Shvetali Thatte
Research Mentor: Dr. Crystal Randall, IMSA
Abstract:
The Mixed Lineage Leukemia gene (MLL gene) is classified as a histone methyltransferase in the family of histone-modifying enzymes (Shilatifard 2012). It directly influences developmental regulation by controlling the gene expression necessary for embryonic and hematopoietic stem cell development (Shilatifard 2012). While the normal MLL1 gene, a member of the MLL gene family, functions in development, the mutated version has been found to lead to cancer.
With MLL1-rearranged leukemia, the first identified fusion partner of the MLL1 gene is TET1, a founding member of the TET family of enzymes. TET1 has shown to play an oncogenic role in the development of MLL1-rearranged leukemia by upregulating the transcription of the genes that are critical for the induction and maintenance of leukemia stem cells in MLL1-rearranged leukemia. Because TET1 plays an essential oncogenic role in MLL1-rearranged leukemia, there is potential for the TET1 gene to serve as a target in MLL1-rearranged leukemia treatment (Huang 2013). In this research, an altered epigenetic state has been initiated in MLL1-rearranged cells by inducing a TALE-TET1 fusion; by doing so, it was observed whether apoptosis increases in cells. The ultimate goal of this research is to evaluate the effectivity of epigenetic editing in treating MLL1-rearranged leukemia.

Room: A147
10:05a.m. – 10:20a.m.

Creating an Efficient and Useful Ntuple for Analyzing Dilepton Data for Contact Interactions and Large Extra Dimensions
Presenters: Evan Blad, Matthew Hokinson, Rustom Ichhaporia, and Harry Smith
Research Mentors: Peter Dong, IMSA, Leonard Spiegel**,** Fermi National Accelerator Lab
Abstract:
In the search for contact interactions and large extra dimensions, one of the first steps is organizing large amounts of raw data from the CMS (Compact Muon Solenoid) experiment and Monte Carlo events. A data management structure called an ntuple was created to select only variables of interest. We made substantial changes to the existing program to make it easier to use and to include additional functionality, including invariant mass calculation, Collins-Soper angle calculation, and left-right/right-left helicity reweighting. Furthermore, we updated this program for a new analysis framework so that it would be compatible with new data and Monte Carlo samples. We will present the functionality of the new program and the automated generation of ntuples using the CRAB parallel-processing framework.

Room: A149
10:05a.m. – 10:20a.m.

Generation and Validation of Monte Carlo Dilepton Events for Large Extra Dimensions
Presenters: Ayush Agarwal, Chetan Reddy, Grace Yu
Mentors: Dr. Peter Dong, IMSA; Dr. Lenny Spiegal, Fermi National Accelerator Lab
Abstract:
The idea that the universe may have more than three dimensions originally assumed the extra dimensions appeared at the scale of the Planck length. However, Arkani-Hamed, Dimopoulos, and Dvali proposed a theory of extra dimensions as large as a millimeter that could help explain why gravity is much weaker than other interactions in the Standard Model. Large extra dimensions modify dilepton interactions by allowing for graviton exchange as well as photon and Z exchange for high-mass events. This causes a non-resonant enhancement in the rate of dilepton events. Our study generates Monte Carlo events to determine how large extra dimensions would modify expected distributions, laying the groundwork to search for them.

Room: A151
10:05a.m. – 10:20a.m.

The Effect of Pitch Usage on the Whiff Rates of Major League Baseball Pitchers
Presenter: Austin Shwatal, IMSA Class of 2020
Mentor: Christopher Jones, Chicago Cubs, IMSA Class of 2002
Abstract:
With the rise of the Sabermetrics era in modern Major League Baseball, the sport has shifted toward statistics and quantitative data science as a way to measure performance and predict future outcomes. Specifically, one area that has not been studied in depth is the relationship between pitch usage and whiff rates (analyzing how much different pitches are thrown compared to the success rate of pitchers). To compare the relationship for each pitch, we used data for all Major League starting pitchers from 2018. Using the statistical programming language R, a year-long average was found for each pitcher, and the changes in the usage rates for each month were compared to the changes in whiff rates. Currently, we have not found much evidence that there is a significant correlation, although all correlation values were positive. In further analysis, we studied horizontal movement, vertical movement, and velocity for each pitch as a way to analyze the quality of the pitch compared to pitch usage and whiff rate. The correlation values for changeups were the highest overall, but for the most part, there are no league-wide trends which were worth considering.

Room: A155
10:05a.m. – 10:20a.m.

Developing effective high school pedagogy for machine learning
Presenters: Eden Gorevoy and Ashley Tin
Mentor: Tom Meyer, IMSA
Abstract:
The data we have at our disposal is massive, and for years industry has been at a loss for how to process the data we have into a meaningful story. Machine learning is a crucial method that has recently been changing how we interpret that data, making more efficient and informed products and services.
It's important to develop effective pedagogical methods for creating the next generation of computer scientists who will utilize and expand upon these tools.
In order to do this, we looked at introductory collegiate-level classes in Machine Learning and Aurelien Geron's Hands-On Machine Learning with Scikit-Learn & Tensor Flow as guidelines for what to include. In creating the elective, we attempt to follow the same structure as these college courses while keeping the information accessible at a high-school level. As a seminar class, the course also includes a degree of self-guided exploration into deeper topics.
Currently, we have conducted enough research to formulate a preliminary lesson plan for next year's Machine Learning Seminar Elective. We are further developing our lesson plan with numerous activities and projects to ensure the students understand the concepts covered in the elective.

Room: B108 -1)
10:05a.m. – 10:20a.m.

Chemoresistant Ovarian Cancer Cells
Presenter: Winny Liu
Mentors: Tong-Chuan He, Ling Zhao, The University of Chicago
Abstract:
Among cancer deaths in women, ovarian cancer ranks fifth in lethality. Survivors often experience relapse where the cancer comes back due to chemoresistant cells, allowing some cells to survive the initial treatment. The overall goal of this study is to research the IL-13Ra1 gene and its role in chemoresistant ovarian cancer cells. Using quantitative PCR (qPCR), we know that IL-13Ra1 is highly expressed in chemoresistant cell lines and tissues. To test the significance of IL-13Ra1 in ovarian cancer, we will construct a plasmid, a strand of DNA found commonly in bacteria that can replicate without the chromosomal DNA, with a sequence inserted that can suppresses the expression of IL-13Ra1. The fragment silencing IL-13Ra1 expression will be inserted into another plasmid that can be packaged into adenovirus. Using adenovirus, we can infect the cancer cell lines and treat them with paclitaxel–a drug used to treat ovarian cancer–to determine if IL-13Ra1 plays a significant role in the survival of ovarian cancer cells.

Room: B108 -2)
10:05a.m. – 10:20a.m.

Carborane-Appended Adenine as a Novel Drug Delivery Agent in Boron Neutron Capture Therapy
Presenter: Lily Li
Mentor: Dr. Narayan S. Hosmane, Northern Illinois University
Abstract:
Glioblastoma multiforme (GBM) is a highly invasive brain tumor that exhibits a resistance to all the current forms of cancer therapy, therefore making it virtually untreatable and lethal. A potential effective treatment for GBM is boron neutron capture therapy (BNCT), a binary cancer radiation therapy involving the irradiation of 10B-enriched compounds introduced into cancer cells. Unfortunately, BNCT lacks a suitable drug delivery agent. The goal of this research is to synthesize carborane-appended with adenine as an effective drug delivery agent for BNCT. Carborane derivatives have long been considered as an ideal BNCT drug delivery agent due to their high boron content and stability to catabolism. The adenine is utilized as the organic compound to attach to carborane to facilitate the transportation the carborane into the cancer cell. The method involves the synthesis of carborane-appended azide compounds, the alkylation of adenine using propargyl bromide, and the conjugation of the adenine derivative with the polyhedral carborane cage using a click reaction. The synthesis of the carborane-appended adenine is currently being investigated. In the future, the carborane derivatives be purified, isolated, and characterized. The result is the potential candidate for a new and effective drug delivery agent that may be utilized for the treatment of GBM in BNCT applications.

Room: B110 -1)
10:05a.m. – 10:20a.m.

Searching for Primordial Black Holes with Machine Learning
Presenter: Mehr Kaur
Mentors: Dr. James Annis, Fermilab Dr. Brian Nord, Fermilab
Abstract:
The idea that Primordial Black Holes (PBHs) constitute the majority of dark matter was revived in 2015 by LIGO's detection of the merger of two ~30 solar mass black holes. We can search for PBHs via gravitational microlensing, a phenomenon which occurs when a PBH passes in front of a star, forming an Einstein ring and increasing the apparent brightness of the star. When an observed star undergoes a microlensing event, the apparent magnitude data graphed over time form a Paczynski curve. We are participating in a Dark Energy Survey (DES) project to detect microlensing in the DES data. PBHs of 10-100 solar masses have microlensing events of time duration t ~> 2.5 years and can be observed in the DES. We employ both the traditional astrophysics toolkit as well as machine learning (ML) methods including RNNs, LSTMs, and DNNs. By testing different ML structures, we can find the ideal structure for this novel application. The structures are trained and tested with generated Paczynski curves of varying complexity. They will then be tested on supernova data with minimal noise before being used on DES data. If our observed number of microlensing events is far less than the expected number of microlensing events, we can rule out PBHs as dark matter.

Room: B110 -2)
10:05a.m. – 10:20a.m.

Characterization of the rgg499 locus in Lactobacillus acidophilus
Presenter: Daniel Soto
Mentors: Ahsan Adil and Tiara Perez Morales, Benedictine University
Abstract:
Bacterial communities present in diverse environmental conditions can respond to signals or stresses using quorum sensing (QS). QS involves production of a signal that can be recognized via cell surface or internal receptors. We are focused on a small family of transcriptional regulators called Rgg and their cognate small hydrophobic peptides (SHP), specifically, three predicted QS systems present in the human commensal Lactobacillus acidophilus. Rgg QS systems have been described in other Gram-positive organisms and they can promote responses such as biofilm formation and toxin production. We aim to characterize the Rgg499 predicted QS system. Our preliminary work suggests rgg499 is in a six-gene operon with another regulator (496) and a potential peptide (495). This predicted operon is located next to a carbohydrate utilization locus. We hypothesize that Rgg499 may have effects on this operon given that sugars have acted as signals for other Rgg QS systems. We are currently testing the effects of various carbohydrates and small molecules on L. acidophilus and changes in rgg transcriptional expression using luciferase reporters in a heterologous host.

Room: B115
10:05a.m. – 10:20a.m.

Peri-Implant Osteolysis Effects on Local and Remote Tissues
Presenter: Meghana Karan
Mentor: Meghan Moran, Rush University Medical Center
Abstract:
Orthopedic implant loosening is one of the main causes for the high number of revision surgeries after primary hip and knee joint replacement surgery (arthroplasty). Implant loosening is often the result of implant wear particles that trigger peri-implant bone loss (osteolysis). There has been growing evidence suggesting that changes in the gut microbiome can induce changes in bone. The gut microbiome consists of a variety of different microorganisms. This study aims to determine if the progression of peri-implant osteolysis due to implant wear particles induces changes in the gut, specifically in the tissue and composition using in-vivo rat models. Rats underwent implant surgery with titanium implant placed in the intramedullary canal of the femur. Study groups included control animals, animals that received knee injections of either a vehicle/control treatment or lipopolysaccharide (LPS) doped polyethylene (PE) particles, which are wear particles to induce peri-implant bone loss. Histological analyses were completed on local tissues at the knee joint to identify particle presence and changes in cell type and activity as well as remote tissues, specifically in the intestine (proximal and distal colon). The goal of this study is to identify a novel mechanism for intervention of failed orthopedic implants.

Room: B125
10:05a.m. – 10:20a.m.

Discovery of Antimicrobials from Soil Samples
Presenters: Katya Romanov, Gowri Warikoo, and Lauren Pickett
Research Mentor: Dr. John Thurmond, IMSA Faculty
Abstract:
Superbugs are becoming more and more of a problem in the modern world. These superbugs, resistant to most known antibiotics and antimicrobials, cause well known drugs to be less effective. Though there are corporate pharmaceutical companies developing new drugs, many of these companies are focused on products that will make them the most money rather than what is required by society. The purpose of this study is to identify possible antimicrobials from soil samples around the IMSA campus. The soil samples were diluted to isolate its different bacteria, and master plates were made from these colonies. These master plates were subjected to spread-patch testing to test for any visible inhibition against safe-to-handle ESKAPE pathogens. At least three zones of inhibition were spotted against the specific bacteria, though more testing is needed to see if the samples will produce the same results with different bacteria. After this, certain samples of each plate were PCR tested to be seen if they could be identified. After some preliminary testing, these samples were sent off to a laboratory. We have yet to receive our samples back from the testing laboratory.

Room: B133
10:05a.m. – 10:20a.m.

Computer Aided Drug Design for Mycobacterium Tuberculosis
Presenters: Alyssa Daniels and Rebecca Ellington
Research Mentor: Dr. John Thurmond, Illinois Mathematics and Science Academy
Abstract:
Mycobacterium Tuberculosis (MTB) is the pathogenic bacteria responsible for Tuberculosis (TB). In recent years, the bacteria has become drug-resistant, which is a severe problem because of the deadliness of TB in developing countries. One of the enzymes that is responsible for spreading TB in the body is Isocitrate Lyase (ICL). In this study, our goal was to edit the ligands of ICL to optimize the binding affinity of MTB drugs. Using SeeSAR and SwissADME (Computer Aided Drug Design programs), we were able to design and evaluate hundreds of possible ligands to replace the original molecule. We identified 6 new ligands that we believe, based on criteria such as binding affinity and druglikeness, could improve ICL by replacing the current ligand. In a continuation of this study, we will synthesize and test these edited molecules in the lab, with hopes to create a better defense against MTB.

Room: IN2 | Business Internship Panel 3
10:25a.m. – 10:40a.m.

CourseStars Marketing Intern
Presenter: Matthew Halliman
Mentor: Jill Ko, CourseStars
Abstract/Project intention:
Coursestars is a business that currently helps college students to have easy access to tutor help. The owner of the business, Jill Ko, was inspired to create a project in which tutors either online or one-on-one are always available to help students. To network her business, she requires tutors who are highly educated in a subject at their college/university and are willing to tutor other students at their college/university. This project has consisted mainly of market research to establish the foundation for a college representative program, website development and refining different marketing techniques used within the company. The core tasks included refining and redesigning the CourseStars Website under the guidance of marketing expert Kevelyn Belden. Key learnings include market research and analysis, enhancement of skills in website design, digital communication techniques, designing for mobile applications, themes and typography. The conclusion of this project will result in incorporating this work into the new CourseStars website to promote recruitment and services and aide in the development in a Mobile App.

LEAP Innovations: An Internship Experience | Pilot Network Cohort 3 Internal Technical Report
Presenter: Nathan Lee
Mentor: Mr. Jake Williams, LEAP Innovations
Abstract/Project intention:
LEAP Innovations works with educators to unlock the unlimited potential of every learner using personalized learning. They recognize that it's time to transform the one-size-fits-all model by tailoring the teaching methods to the students' needs in order to create the ideal learning experience in every classroom. At LEAP Innovations, the internship is focused on Data & Research Analysis. It primarily includes work on our Pilot Network Cohort 3 Internal Technical Report. This taught me how to compile and interpret data, create tables to compare variables and find correlations, and provide a fresh perspective for providing personal insight. By attending meetings and touching base with my mentor, the Internship afforded me the ability to further my communication skills and ensure that assignments were completed successfully. Ultimately, the report developed allows LEAP Innovations to acknowledge what aspects of Cohort 3 went well and what aspects can be improve the implementation of personalized learning in the classroom setting.

Enovation Partners
Presenter: Brennan Shapiro
Mentor: Linda Zabors
Abstract/Project intention:
Enovation Partners is a clean-tech and energy storage consulting company. The business project for Enovation Partners has included the completion of market research into trade expos or conferences for the company to attend. The information obtained is then filed and made into social media posts about the expos that they decide to attend. In addition, the internship has included the development of graphics for banners at the expo booth, competitive research into the other companies attending the expos, and potential client research to be included CRM database. The key deliverables from the internship have included workflow charts mapping out various processes for example, the process from finding out about the expo, to getting a client and the process a customer goes through once deciding to use Enovation for their energy storage consulting needs. The charts have helped to make the processes easier for the company and the customers. The social media posts help generate awareness about energy storage research and expos Enovation will be attending to attract potential clients. Secondary market research, social media, and graphic design are important parts of a business.

Room: A113
10:25a.m. – 10:40a.m.

A Tree's Life in its Neighborhood
Presenter: Alana Depaz
Mentor: Silvia Alvarez-Clare, Morton Arboretum
Abstract:
Trees play an important role in the global carbon cycle since they use carbon to build biomass and they release oxygen as a by-product of photosynthesis. Thus, understanding which environmental factors influence tree growth and survival is important to predict how forest ecosystems will respond to global changes. Two factors that can affect a tree's growth are 1) the availability of the most limited soil nutrient and 2) the competition within the tree's neighborhood. I created computer models of data from a long-term, large-scale forest fertilization experiment (EFFEX) in a lowland tropical forest in Costa Rica through different programs: R, RStudio, Geany, and Excel. With these programs, I investigated how the neighborhood of a tree affects its nutrient intake and its growth. I have made location maps and have done some spatial analyses on the data. Yet, I am still continuing to analyze the data of the forest and therefore I do not have any results about growth at the moment. Although, my future results will portray how different aspects of a tree's neighborhood affect the growth of trees, and this can implicate ways to preserve forests.

Room: A115
10:25a.m. – 10:40a.m.

Na+/K+-ATPase α3 and Amyloid-beta Oligomers in the Developing Chick Retina
Presenters: Faris Shaikh, Allen Chen
Mentors: Kirsten Viola, Dr. William Klein, Samuel Bartley, Northwestern University
Abstract:
The AβO hypothesis of Alzheimer's Disease (AD), which states that brain damage in AD is instigated by the soluble form of ligand-like oligomeric Aβ has emerged from the discovery that fibril-free preparations of AβO's led to rapid LTP inhibition, as well as neuronal cell death. Since this observation, AβO's have been determined to accumulate in human and animal CNS tissue in a manner that mimics AD, however, recently, it has been determined that these AβO rely heavily on enzymes such as the Na/K ATPase, specifically the α3 subunit, in exuding their toxic effect. While this theory has been supported in human and mice brain, it has not been confirmed in the avian model. Proving that the same kind of interaction exists in the chick retina would give a more straightforward idea of AβOs and their role in cellular processes within the chick retina. This would allow us to further establish that the chick retina model is similar to that of both the rest of the chick central nervous system and the human central nervous system and also give us the go-ahead to perform further ATPase α3 experiments in our chick retina model.

Room: A117
10:25a.m. – 10:40a.m.

Effect of Obesity on the Wound Healing Process
Presenters: Pratibha Bhalla, Tanmayee Vegesna
Mentors: Irena Levitan, Yedida Bogachkov, University of Illinois at Chicago
Abstract:
Obesity is a common health condition where there is an excess and often dangerously high amount of fat in the body, measured by a Body Mass Index (BMI) above 30.0. We hypothesized that obesity may have a significant negative impact of the process of wound healing, the process of wound closure by the formation of new tissue. This hypothesis is based on recent studies in our lab showing that elevation of blood cholesterol in genetically modified mice results in a delayed wound closure and delayed angiogenesis. Our current study investigates how diet-inflicted obesity alone affects the wound healing process. The study compares wild type mice (B6/C57 background) that were fed either a normal chow diet or a high-fat diet. After 24 weeks on diet, wounds were inflicted via skin punch biopsies on the dorsal side of the mice and the area of the wound was measured over the course of ten days. Our results show, however, that there was no noticeable difference in wound closure between the normal and obese mice. These results suggest that in contrast to hypercholesterolemia, obesity alone does not have significant negative effect on wound healing in a mouse model of skin wounds.

Room: A119
10:25a.m. – 10:40a.m.

Tensile Strength of Niobium-Tin Film
Presenter(s): Kaleigh O'Brien
Research Mentor: Dr. Sam Posen, Fermi National Accelerator Laboratory
Abstract:
All superconducting cavities must be submerged in liquid helium cooled to 2-4 degrees Kelvin where they have good superconducting properties. The ability to cool these cavities requires significant cryogenic resources. Using niobium-tin as a film on the interior of the cavity reduces the heat generated allowing the cavities to operate at 4 Kelvin, thus saving money and resources. This project focuses on testing the tensile strength of a niobium-tin film over a niobium cavity. The samples of niobium coated in this film are placed in an Instron to be measured and photographed through a laser confocal microscope, where they are searched for cracks. The film must withstand 2.5% of accumulated strain in order to be considered viable for cavity tuning, during which process the cavity is repeatedly compressed and stretched. Should the film crack during this process, its surface resistance will greatly increase and limit its usefulness as a film on the interior of the cavity.

Room: A121
10:25a.m. – 10:40a.m.

The Relationship between Air Quality and Health Outcomes
Presentor(s): Breanna Yang
Mentor(s): Dr. Marynia Kolak, Univeristy of Chicago
Abstract:
Compelling evidence suggests that a relationship between air quality and health outcomes has already been established but has not been studied on a census-tract level. The objective of this research is to identify the phenomenon in the observed trends in a more specific manner and to measure and explore relationships of multiple health outcomes with particulate matter in the Chicagoland area using spatial data integration and analysis techniques, thus allowing for a more formulaic understanding of the correlation. The air quality data used in this project is a 2018 yearly average of PM2.5. This data is interpolated from nearby Environmental Protection Agency (EPA) monitoring stations using geostatistical kriging methods. The census-tract level data is taken from the 500 Cities project by the Centers for Disease Control and Protection for 2018. The specific health outcomes we looked at were current asthma, coronary heart disease, diagnosed diabetes, mental health, and physical health among adults aged greater than 18 years, as identified from an extensive literature review. We explored data relationships using scatterplots, choropleth maps, and box plots using Rstudio and Geoda and identified bivariate hotspots of high air pollution and poor health outcomes to identify priority areas. Preliminary results show that correlations persist, though remain complex, between poor air quality and worse health outcomes, even at a small area resolution.

Room: A123
10:25a.m. – 10:40a.m.

Duopoly Competition in Advertising-Sponsored Wi-Fi Provision
Presenters: Moksh Shah, Bharath Sreenivas
Mentors: Haoran Yu, Ermin Wei, and Randall A. Berry, Northwestern University
Abstract:
It has been increasingly popular for venues (e.g., restaurants) to collaborate with advertisers on the provision of public Wi-Fi services. The venues' visitors can watch the advertisers' ads in exchange for free Wi-Fi access, and the venue owners charge the advertisers for the ad display. In this work, we consider competition in advertising-sponsored Wi-Fi provision. Two venue owners with overlapping coverage compete for users and further sell the ad slots generated by the users to an advertiser. We model the strategic interactions among the venue owners, advertiser, and users as a three-stage game, and analyze the game equilibrium. Our results show that the venue owners' advertising densities affect their market shares as well as the advertiser's overall payment.

Room: A147
10:25a.m. – 10:40a.m.

Improving CMS Contact Interaction Limits using Bayesian Statistics
Presenters: Nikita Elkin, Kaushal Gumpula, Timothy Mou
Mentors: Dr. Peter Dong, IMSA; Dr. Lenny Spiegel, Fermi Lab
Abstract:
In the Standard Model, quarks and leptons are understood to be fundamental particles. However, they have been theorized to be composite, made up of constituent particles called preons. These constituent particles would interact in contact interactions according to an energy scale Λ, which would result a non-resonant enhancement in the dilepton invariant mass spectrum when compared to current Standard Model predictions. Data from the CMS detector is used to set lower limits on Λ.

Our analysis aims to improve the current method of limit-setting. The problem with the current method is that in cases of destructive interference, the yield in the signal bins can be less than the Standard Model prediction, making it impossible to interpret contact interactions as a signal process. In our approach, we combine the yields of the signal and Drell-Yan processes, as the total number of events will always be positive. We do this by parameterizing the combined signal and Drell-Yan yields as a function of 1/Λ^2 and setting a limit directly on Λ. We will present the promising progress we have made on this method and discuss the challenges still remaining with calculating expected limits.

Room: A149
10:25a.m. – 10:40a.m.

Parametrization of the Compositeness Energy Scale in Invariant Mass Distributions:
Presenters: Jay Reiter, Anisha Sharma, Michael McKelvie
Mentors: Dr. Peter Dong, IMSA and Lenny Spiegel, Fermilab
Abstract:
Calculating the lower limit on the energy scale Λ of preon interactions requires a parameterization of the number of expected events in a bin as a function of Λ. Monte Carlo invariant mass distributions are generated for different values of Λ for each helicity, interference, lepton type, and detector location. These plots can be fit in each bin to the function f(x) = a + b/x^2 + c/x^4. We will show the results of code which takes all available events, applies left-right/right-left helicity reweighting, scales each mass sample by its cross-section, and extracts a parametrization for each mass bin. These parameterizations, which number in the thousands, allow reliable calculations of the limit on Λ.

Room: A151
10:25a.m. – 10:40a.m.

Analyzing at the Role of Mrgpra3 neurons through Mrdgprd3+ neurons in the pathogenesis of Painful Diabetic Neuropathy
Presenter: Sidharth Panda
Mentors: Dr. Richard J. Miller and Nirupa D. Jayaraj, Northwestern University, Feinberg School of Medicine
Abstract:
Affecting nearly 25% of diabetes patients, Painful Diabetic Neuropathy (PDN) is a complication of diabetes that occurs due to the hyperexcitability of dorsal root ganglion (DRG) receptors. Much like hyperalgesia, PDN is accompanied with high, excruciating levels of neuropathic pain and the development of small-fiber degeneration. Previous studies have linked DRG neurons expressing the Nav1.8 sodium channel with the feeling of pain. However, many subsets of neurons exist within the DRG that express the Nav1.8 sodium channel. Currently, it is not known what specific type(s) of neurons are directly involved with the sensation of pain. This study targets one group of neurons, the Mrgprd3+ neurons, which are in a similar subset as the MrgprA3 neurons. Through the use of confocal imagery and transgenic mice embedded with mCherry, a fluorescent protein that tags certain components in a cell, this study was able to determine the concentration of MrgprA3 neurons within the DRG. Although various tests are required to determine sources of pain, the results of this study will play a role in determining the role of specific neurons in the pathogenesis of PDN, potentially allowing for new treatments to be created to counter the effects of this condition.

Room: A155
10:25a.m. – 10:40a.m.

Modulation of unfolded protein response to endoplasmic reticulum stress causes a potent antiviral response in HSV infection corneal epithelial cells.
Presenter: Akash Gandhi
Mentor: Dr. Deepak Shukla, Lions of Illinois Eye Research Institute, University of Illinois at Chicago
Abstract:
Herpes simplex viruses (HSV) are one of the most ubiquitous pathogens with approximately 90% global seroprevalence. Recurrent infections lead to painful ulcerative keratitis and lesions in the ocular, oro-facial and genital regions in latently infected individuals. Currently there is only one approved treatment, acyclovir, which acts via the inhibition of a single aspect of viral life cycle, viral DNA replication. Among the many cellular pathways tightly regulated by the virus during its infectious life cycle, the unfolded protein response (UPR) to endoplasmic reticulum (ER) stress is an important pathway that regulates viral protein synthesis and folding. In this study, we tested multiple small-molecule inducers and alleviators of ER stress to understand its effects on HSV-1 infection. Through immunofluorescence, western blotting and quantitative PCR, our results showed that while external induction of ER stress using tunicamycin reduces HSV viral spread and protein

synthesis, the alleviation of ER stress using salubrinal increases and promotes viral replication and protein synthesis in human corneal epithelial cells. Our results align with the existing hypothesis that HSV requires host ER machinery to effectively translate and fold viral proteins during its life cycle and inhibition of this pathway can result in a potent antiviral response.

Room: B108 -1)
10:25a.m. – 10:40a.m.

Does the Phospho-state of AZI1's Proline-Rich Region Affect Its Localization to Chloroplasts?
Presenter: Ishan Nikam
Mentors: DeQuantarius J Speed and Dr. Jean Greenberg, University of Chicago
Abstract:
Recognition of microbes or microbial products by plant receptors induces signaling cascades that prime broad-spectrum defense responses to suppress subsequent infections. In the primed state, plants are prepared to activate stronger defense responses more quickly than unprimed plants when challenged by pathogens and other stresses. An essential component of systemic priming is the protein AZI1, a member of the lipid transfer protein superfamily. Like AZI1, the regulatory kinase MPK3 is essential for priming. During infection, AZI1 accumulates in chloroplast outer envelope membranes via a mechanism that depends on MPK3, which suggests AZI1's localization to chloroplasts is essential for priming defense responses. AZI1's chloroplast association requires a novel bipartite targeting signal that consists of an N-terminal hydrophobic region and an internal proline-rich region (PRR). To better understand the molecular basis of priming, I am making unphosphorylatable and phosphomimetic mutations within the PRR of AZI1. Using Arabidopsis thaliana and Nicotiana benthamiana, I will assess how these mutations affect AZI1's subcellular localization with an emphasis on localization to the chloroplasts.

Room: B108 -2)
10:25a.m. – 10:40a.m.

Machine Learning in Autonomous Driving Simulated through Duckietown Platform
Presenter: Ajay Jayaraman
Mentor: Dr. Matthew Walter, Robotics Intelligence through Perception Lab, Toyota Technical Institute at Chicago
Abstract:
In order for robots to safely navigate their environments, they must be able to utilize a variety of sensory input to determine proper actions to take. Through the use of advanced perception algorithms, robots are able to analyze multi-modal observations about their environment. The Duckietown project serves as a way to simulate this artificial intelligence process on a simpler and accessible platform. The Duckietown platform uses a tangible robot comprising of a Raspberry Pi and PiCamera along with a chassis. The other primary aspect of the project are the Duckietowns themselves, which are environments filled with other Duckiebots trying to traverse a cityscape. I work to better understand the software platform created for Duckietown, initializing and controlling the robot using Python through Ubuntu Linux. We heavily utilize ROS (Robotics Operating System) and Docker (a container platform). The Duckietown Project was conceived as an

MIT graduate class in 2016 and has since then become a worldwide multi-university program. I also am working towards simplifying this project for use with younger children by compartmentalizing the program into a system akin to programming languages like Scratch and Blockly. This project is a large undertaking that is still in process, encountering and solving problems like providing proper calibration for a simpler system.

Room: B110
10:25a.m. – 10:40a.m.

Salensy: Using RISE to Create Saliency Maps of Strong Gravitational Lensing Images
Presenters: Max Knutson and Kara Warcup
Mentor: Dr. Brian Nord, Fermi Lab
Abstract:
A convolutional neural network is a system of interconnected information nodes that is used for image recognition and classification problems in computer science. Random Input Sampling for Explanation of Black-box models, otherwise known as RISE, is a program that generates a saliency map indicating how important each pixel of an image is for the classification algorithm of a convolutional neural network. Saliency maps transform the opaque "black box" of image classification networks into an explicitly defined process, allowing researchers to fine tune their model and build trust in their network. In our project, we will implement RISE with maps of astronomical images demonstrating strong gravitational lensing to allow further research into computationally constructing a model of the lensing process.

Room: B115
10:25a.m. – 10:40a.m.

The genetic basis of bone density and its application to osteoporosis treatment
Presenter: Sabrina Meng
Mentors: Frank Ko, Rush University and Meghan Moran, Rush University
Abstract:
Osteoporosis (loss of bone mass) is a common disease that leads to a loss of bone mass and an increase in risk of bone fracture. Current drugs stop the progression of bone loss; although teriparatide and abaloparatide do promote bone growth, they increase osteosarcoma risk (Forteo) and have limitations on treatment time (Tymlos), so a new therapy is needed. The current study aims to determine the heritability and genetic basis of high bone mass (HBM) in Carworth Farms White (CFW) mice. In vivo x-rays were taken for 30 female and 30 male mice, and the distal portion of the femur was analyzed for bone density. Accordingly, three breeding groups were created: normal bone mass (NBM) x NBM, HBM x HBM, and HBM x NBM, with offspring bone densities measured using contact x-ray at 8 weeks of age. No significant difference in bone densities was found for the offspring groups ($p = 0.752$). After preliminary data analysis, it appears that the phenotype for bone density is polygenic and may be heritable. Ultimately, understanding the genetic basis of this HBM may lead to novel osteoporosis therapeutics, which may include gene therapy and personalized medicine for those suffering from the effects of osteoporosis.

Room: B133
10:25a.m. – 10:40a.m.

Pathogenic Resistance in Soil Microbes
Presenters: Saachi Dalvi, Neha Maddali, Maahum Hamayat
Mentor: Dr. John Thurmond, IMSA
Abstract:
Antimicrobial resistance has become a prevalent phenomenon and now poses a great threat to public health. To combat the growing threat of such illnesses, several researchers have tested for new microbes from the soil that exhibit antimicrobial properties against these newly resistant pathogens. Our drug discovery project expands on the work of these previous studies and aims to identify novel soil microbes with pathogenic resistance that will be viable candidates for new drugs. In our approach to addressing the issue, we collected soil samples around Illinois and used the serial dilution method to extract individual bacterial colonies. After creating master plates from the isolated bacteria, we screened the samples against 6 pathogens utilizing the spread-patch technique. In our second soil sample, we found four bacterial colonies that were resistant against Acinetobacter Baylyi, with the zones of inhibition ranging from 1 mm to 3 mm. To determine whether the bacteria are novel, we have extracted their DNA through PCR amplification and have sent them for sequencing. The results have yet to be released.

Session II 10:45a.m. – 11:40a.m.

Room: IN2 | Business Internship Project Presentation Group 1
10:45a.m. – 11:55a.m.

Technical Development at AutoPair, Inc: What University Can't Teach.
Presentor: Isaiah Crews
Mentor: Mr. Ken Koger, CEO, AutoPair, Inc
Abstract/Project intention:
AutoPair, Inc. is a company that serves as a layer of transparency between car dealerships and clients. It is a window for clientele to interact with business personnel to collect on the best service for the best prices that their area has to offer in the way of car repair. The internship was focused mainly on training vital skills that will aid in finding a job in my projected field of work. The project that developed from my own core goals as well as the goals of AutoPair, Inc. transformed into a learning opportunity in technical development, Content Management System [CMS] manipulation, and Customer Relationship Management on the global stage of modern business. Common curriculum in computer science up to the Undergraduate level does not apply these skills, nor are they developed at the Mastery level. These skills are becoming increasingly popular at a quick rate, and they approach a point of requirement as the worker's scope move closer to the wider populus. With these new abilities, businesses around the world will more easily be able to tend to the issues of the world efficiently, quickly, and tidily.

Dealer Fox: An Internship Experience
Presenter: Andrew Lennox
Mentor: Dan Trinidad, Dealer Fox:
Abstract/Project intention:
Dealer Fox is a data analysis focused social media management company which helps dealerships maximize their digital marketing budget. The focus of the business project for Dealer Fox changed over time and included social media management, secondary market research, web development, and database design. Over the course of six months, the company provided opportunities to work with clients through the management of their social media accounts, as well as opportunities to gain experience in web and database design through the development of company websites and backend databases. Over the course of the business project, the company was benefitted through the deliverance of integration software, research, and social media management. The most significant impact of these deliverables was the backend automation provided to the company's daily processes through software integrations undertaken during the business project.

Programming and data analysis in a startup
Presenter: Lucas Milavec
Mentors: Jeff and Joe Talamantez, Cab Dash
Abstract/Project intention:
The internship focused on the implementation of new features and analysing data for the app CabDash. The app is indented to help rideshare and taxi drivers efficiency between riders by displaying times and potential riders. Most of the time was focused on gathering and analysing data about competitors, potential markets, and data about events usable by the app. This includes creating predictive models for check outs at different hotels in Las Vegas, compiling data about competitors, and evaluating the viability of expansion into new cities. The program side focused on initial testing of API and features that could potentially be integrated into the app. This includes the research and testing of event API's like eventbrite and initial implementation and testing of a change language feature.

Raising the CancerIQ of Youth
Presenter: Vidhi Singh
Mentor: Christopher Bun, CTO, CancerIQ
Abstract/Project intention:
CancerIQ, Inc. is a company which helps to prevent people from developing late-stage hereditary cancers by informing them of their risk, and what they can do to lower that risk by educating them on lifestyle changes which could help. The main project of this school year has been to create an interactive web application for users that will take in input about various lifestyle choices and other pertinent information, then compiling them into a final product personalized based off of the choices they made in the initial pages showing the user how they can change their lifestyle to lower their current risks of various cancers. Key deliverables for this internship have included documents detailing research about the risks of cancers and their correlation to lifestyle factors, as well as web pages that serve a part in the application. The impact that this project has on the company's development is the possible usage of our application in their software, as it will help solve another aspect of raising awareness by notifying them of possible faults in their lifestyle. As a result, it will also serve a long term impact on the users as well by increasing their awareness of cancer risk.

VisMed3D/Symptomatic: An Internship Experience
Presenter: Doreen Xiao
Mentor: Dima Elissa, VisMed3D/Symptomatic
Abstract/Project Intention:
VisMed3D is a biomedical and technology company with a focus in the areas of determining concept viability with healthcare consulting, assurance services involving malpractice and IP patent review, and 3D printing services ranging from custom prosthetics and dental fabrication. The work completed for VisMed3D includes in-depth research for "The 2018-2019 Medical AM Highlights" journal. The research has produced over two hundred case studies involving three-dimensional innovation in the changing world for composition into the journal. The overall completion of the

research has created ease for experts in the biomedical field to write a highlight article for publishing. In addition, another business project involved with this internship included another business made by the founder of VisMed3D, Symptomatic. Symptomatic is a public health software that is able to connect health records from a multitude of providers with the use of FHIR endpoints for patients with chronic illness. The work completed for Symptomatic was focused on the creation of a marketing strategy plan based on the National Health Calendar days. This plan includes graphically designed images, data, and social media posts for every month of 2019. The marketing strategy will be implemented for ease in marketing for the company as well as a vigorous foundation for marketing in the future.

Room: IN2 | Business Internship Project Presentation Group 2
10:45a.m. – 11:55a.m.

LEAP Innovations: An Internship Experience
Presenter: Micah Casey-Fusco
Mentor: Chris Liang-Vergara, LEAP Innovations
Abstract/Project intention:
LEAP Innovations is a company that strives to make learning more personalized and tailored to the individual. To organize the ideal system of education, LEAP innovations has laid down a framework for their company creating 4 separate categories that contribute the the overall learning experience: Learner Led (student driven learning), Learner Connected (real world application), Learner Demonstrated (competency-based learning), and Learner Focused (passion driven learning). Annually, the framework forgoes a reconstruction to ensure it is relevant and comprehensible. Educators and learners from across the country gather to criticise and compliment the framework through various activities LEAP has organized. The project as an intern is to analyze the transcripts from the interactions between these influencers to find trends and report to LEAP innovations how and where they need to improve their company. To do this I created a template to organize key quotes from the transcripts into categories such as “needed clarity” and “examples of robust curriculum” to make is easier to find where LEAP needed to improve and where it was already sufficient. In addition to presenting my findings to the LEAP community, my work will also be used to create evidence memos for their business partners.

Solo iOS Development at Interpreter Tap
Presenter: Ian Fowler
Mentors: Victor Abundis, Jon Morse, Victor Arellano, Interpreter Tap
Abstract/Project intention:
Interpreter Tap is a startup looking to create a service in which clients can connect to trained interpreters via video chat through the convenience of a mobile application. After the minimum viable product was developed for Android devices, Interpreter Tap was in need of an equivalent for iPhone users. Although they began development on the project in previous years, the front-end wasn’t optimal and the back-end was outdated. Slowly over the past year, the front-end of the app has been redeveloped to use the latest technology and interface guidelines. Apart from the code, work was done in the form of site-flow diagrams and wireframes to document the flow of the

service to provide clarity to developers in the future. Additionally, the business is left with a comprehensive task-list for completing the development of the iOS app. For Interpreter Tap, this provides technical support to a less technically-minded founder, increasing the business's capability to communicate with the future team of professional developers necessary to turn their great concept into a reality.

Social Media Marketing with Cleancio
Presentor: Ashley Homecgoy
Mentor: Rocio Lane, Cleancio
Abstract/Project intention:
Cleancio strives to provide high-quality, low cost cleanings for vacation rental properties. The goal of the business project was to build Cleancio's brand, through the integration of more frequent and targeted social media marketing. Other than social media, it aimed to use other digital avenues to continue to reinforce the company's image. Content created ranges from blog posts, social media posts, and secondary research for internal use. These deliverables can be utilized, reworked, and continued in the future. The impact of this work has given Cleancio a stronger presence in the Chicagoland area, both online and offline. Additions to the company blog and social media pages have helped to solidify the brand.

Improving the World One Fact at a Time
Presenter: Carter Maxwell
Mentors: Ethan Kent, Andrew Tang, CancerIQ
Abstract/Project intention:
CancerIQ sells a "cancer risk clinic in a box", allowing hospitals to quickly find out their patients' risk for hereditary cancer through an intuitive quiz. The business project attempts to tackle the problem of getting patients into the hospital by offering a free intuitive version of the company's product. By informing users (based on their daily activities) about the chances of getting cancer, along with the survival rates based on time of treatment, hopefully they will be inspired to go to their doctor and become more informed. Optimally, people will take the quiz, decide to get tested, and stop a cancer before it becomes a problem. The overall deliverable was an intuitive web app that asks the user some questions and then provides statistics/advice based on their responsive. Creating it required research into statistics on cancer survival rate based on stage and actions that affect the chances of getting cancer. It also required different web app technologies including React and material-ui. The final product should lead the user to using CancerIQ's overall product, but at least get tested.

Room: A113
10:45a.m. – 11:00a.m.

Exploring the Role of Fertilization on the Foliar Nutrient Concentrations of a Tropical Rainforest
Presenters: Amayrani Sanchez and Mary Ashley Tenedor
Mentors: Silvia Alvarez-Clare, The Morton Arboretum and Ashley Wojciechowski, The Morton Arboretum and North Central College
Abstract:
Tropical rainforests are responsible for 30% of the total carbon dioxide exchange between the biosphere and atmosphere and store large amounts of carbon as biomass. Soil nutrient availability is an important regulator of forest carbon cycles by influencing tree growth and leaf nutrient concentrations. In this project, we studied how nitrogen (N) and phosphorus (P) added as fertilizer to the soils impact nutrient concentrations in the leaves of the most abundant tree (Pentaclethra macroloba) and tree palm (Socratea exorrhiza) seedlings as well as three other understory plants (palm Geonoma congesta, forb Calathea lasiostachya, and fern Polybotrya caudata) in a lowland tropical rainforest of Costa Rica. We collected 180 plants at EARTH University's EFFEX experiment, where forest plots have been continuously fertilized with N, P, NP, or kept as controls for 11 years and then used an elemental analyzer and ash digestion to measure the leaf nutrients. We found that the N treatment increased N foliar concentrations but NP treatment did not increase N showing luxury consumption of N. Foliar N:P ratios show NP colimitation. This research will advance our understanding of the role that nutrients play on the carbon cycle in tropical forests. Using this knowledge we will be better equipped to predict changes caused by global change.

Room: A115
10:45a.m. – 11:00a.m.

Study of Kidney Dilation in a Rat Bladder Augmentation Model
Presenters: Sonia Edassery & Milica Barac
Research Mentor: Dr. Arun Sharma, Northwestern University
Abstract:
Patients with Spina Bifida affected with myelomeningocele can typically display varying degrees of bladder dysfunction. In most cases, surgical reconstruction utilizing a piece of intestine is needed. However, this solution is unsustainable as many issues can occur and the possibility of using a scaffold is ideal. The goal is to use scaffolds with a biodegradable framework that can serve as a carrier for cells, in hopes that bone marrow stem/progenitor cells can be used as an alternative to what is used in surgical methods. The objective of our project was to look at the potential kidney damage in a rat model that has already been conflicted with kidney stones. We analyzed kidneys with regards to their kidney dilation, which can lead to renal scarring. We observed that the rats with poly 1,8-octanediol-co-citrate (POC) grafts were less likely to develop bladder stones, and they were also less likely to develop renal dilation or reflux in comparison to the small intestinal submucosa (SIS) model.

Room: A117
10:45a.m. – 11:00a.m.

Early Biomarkers of Alzheimer's Disease
Presenter: Vaishnavi Tetali
Mentor: Dr. Suraj Cherian
Abstract:
Alzheimer's disease (AD) is an irreversible, progressive brain disorder characterized by the deterioration of memory, visuospatial ability, and executive function. Because this neurodegeneration happens slowly, early diagnosis and intervention is needed. This study utilizes a preclinical transgenic mouse model of AD, 5XFAD, because it is characterized by an increase in amyloid-β oligomers (AβOs) in the hippocampus. Preliminary results show that the excitability of CA1, primary output neurons in the hippocampus, are only altered in younger mice but not in older animals. Additional evidence shows an increase in levels of two cytokines in the hippocampus in the younger age group. These results point to a potential link between excitability of these neurons and neuroinflammation. The innate or adaptive systems characterized by alterations in microglia, astrocytes of the brain, and peripheral immune cells such as T cells may underlie the mechanism for the shift in excitability of the neurons. Because functional changes in neurons are typically accompanied by changes in morphology, hippocampal tissues (post recording of electrical activity) were fixed and stained to be imaged. Current efforts include 3D reconstruction of traced neurons and Sholl analysis to determine if morphology is altered in 5XFAD and their control wild type littermates across different age groups.

Room: A119
10:45a.m. – 11:00a.m.

A 3D Hall Probe Calibration
Presenters: Micah McBride, Alexander Zhong
Mentor: Dr. Thomas Strauss, Fermi Lab
Abstract:
The Fermilab Mu2e experiment seeks to investigate the decay of muons into electrons. The experiment uses several superconducting magnets to create a complex magnetic field to transport the muons from their production point to the decay target, where several detectors will analyze the decay products. To correctly identify the particle tracks, a high precision map of the magnetic field is required to obtain the momentum distribution of decay particles and understand locations of potential magnetic traps that could contribute to the number of background events. The field map requirements demand a precision of the map of 10-4 Tesla. Thus, precision 3D Hall probes are used and need to be checked for their accuracy. As these probes are usually only precise to a 10-4 Tesla within a limited temperature range, they might need to be re-calibrated. In our project, we developed tools to create a multidimensional fit to interpolate the Hall probe readings between obtained calibration data points; variables include probe orientation, ambient temperature, and current magnetic field. We will describe the progress and final results of this work.

Room: A121
10:45a.m. – 11:00a.m.

Apoptotic Gene Response to Nitric Oxide Exposure in Human Carcinoma (A549) Cells
Presenter: Samira Cheruku
Mentors: James Radosevich, Oral Medicine and Diagnostic Sciences, UIC College of Dentistry
Abstract:
Studies have shown that high Nitric Oxide expression in human tumors predicts a poor outcome. In high Nitric Oxide (HNO) adapted cells, signal transduction in response to DNA damage is altered. The objective of this study is to determine what genes are associated with response to DNA damage to nitric oxide exposure. mRNA was isolated from A549 (parent) and A549-HNO cells. The mRNA was converted to cDNA and used to probe a microanalysis array. Genes related to DNA damage with p values of < 0.05, were excluded from analysis. The genes were analyzed for their relationship to each other and other molecular mechanisms, using the GoCode with the Gene Mania function, and Cytoscape. Six genes were identified (ABL1, BID, CASP9, CHEK2, GADD45A, GRB2) that were associated with Nitric oxide expression in relationship to DNA damage; all are activated in response to extra- or intra-cellular stimuli, and then proceed to induce apoptosis. ABL1 and GADD45A were found to be upregulated while the other 4 were found to be down regulated. By studying the genes related to DNA damage upon Nitric Oxide exposure, one can map the molecular phenotype of aggressive tumors, and contribute to developing better therapeutic strategies for cancer treatment.

Room: A123 -1)
10:45a.m. – 11:00a.m.

High School Climate and Adolescent Political Socialization
Presenter: Rohan Upadhyay
Mentor: Dr. Robert Bruno, University of Illinois in Chicago School of Labor
Abstract:
This study will observe the effects of the socioeconomic status of high schools on the political orientations of students. Specifically, it will investigate how the class cultural norms of the student body and faculty transmit political views to students. It will also explore the correlation between left-right political orientations for social and economic issues and the wealth of a school district. Wealth in this context is defined as the percentage reached of a state-assigned adequacy funding target, and the school districts will be divided into brackets based on this statistic, taken from the Illinois Report Card.

The study will use a cross-sectional survey – validated by an expert in the field – across Illinois public school districts. The survey will ask students about various political issues – divided into social and economic categories – and will use this input to provide each student with a value on an 8-point political compass. In addition, there will be separate political compasses calculated for the social and economic categories. These values will represent individual political orientations, and

their correlation with district socioeconomic status will be measured – this will be done for the general compass as well as the specific ones.

Room: A123 -2)
10:45a.m. – 11:00a.m.

Honokiol and Cisplatin Impact on Ototoxicity from Chemotherapy
Presenter: Zahra Vasi
Mentors: Claus-Peter Richter, MD, Phd. Vice Chair for Research, Department of Otolaryngology, Xiaodong Tan, Phd. Research Assistant Professor of Otolaryngology, Feinberg School of Medicine
Abstract:
In this experiment, ototoxicity from the chemotherapeutic drug cisplatin was studied to reduce or eliminate this common side effect from chemotherapy. Cisplatin causes damage to mitochondria and DNA in ear cells, resulting in severe hearing loss and deafness. Use of the drug Honokiol, a traditional Chinese medicine, is being tested in conjunction with chemotherapy to combat the ototoxicity from cisplatin and prevent hearing loss. In order to determine the effectiveness of this drug, two groups of mice are treated with cisplatin and with cisplatin and Honokiol and their hearing abilities are monitored. After specific intervals of time, the hearing ability of the mice was recorded by monitoring the reactivity in their brains after sounds were played at predetermined frequencies. Overtime, this determines how the hearing loss of the mice has progressed and provides a comparison between hearing loss from cisplatin and hearing loss from cisplatin with Honokiol. In order to confirm these results, x-ray fluorescence is used to study the ions in the cochlea of the individual mice. Our results initial results show a significant difference between treatment of mice with chemotherapy and treatment of mice with chemotherapy and Honokiol, indicated that the Honokiol does prevent ototoxicity.

Room: A147
10:45a.m. – 11:00a.m.

Using Monte Carlo to Estimate Systematic Uncertainties
Presenters: Akshaya Raghavan, Emily Springer, and Emily Gonda
Research Mentor: Dr. Peter Dong, IMSA
Abstract:
In order to interpret data from the CMS particle accelerator, we must compare generator-level variables with reconstructed variables in Monte Carlo samples. These comparisons allow us to estimate systematic uncertainties in the detector.

Generating Monte Carlo samples is a tedious process. Each step (generation, reconstruction, AOD, and miniAOD) entails creating new python files, submitting each file, checking the dashboard for completion, and resubmitting the step if needed. We created a program to automate this process. The program can handle multiple requests for different mass ranges, lambda values, interference types, and helicities. It uses a crontab to check the progress of each step, send emails when each stage is completed, and move to the next step.

Analyzing the error in the detector using Monte Carlo samples will allow us to compensate for the uncertainties when working with real data. We will present studies of invariant mass and transverse momentum resolution and the effect of acceptance and migration as a function of invariant mass. Both studies allow an estimate of key systematic uncertainties in the lepton energy scale that are used in the final analysis.

Room: A149
10:45a.m. – 11:00a.m.

Analysis of the Collins-Soper Angle in Contact Interaction and Large Extra Dimension Monte Carlo Data Samples
Presenters: Rebecca Osar, John Woods, Ayan Mallik
Mentor: Dr. Peter Dong, IMSA
Abstract:
The Collins-Soper angle θ* is the angle between the negatively-signed lepton and the Z axis in the center of mass reference frame, calculated using Lorentz-invariant kinematic variables. In CI analyses, cosθ* is used to control the lepton angular distributions (as 1 + cosθ), as well as determine forward-backward asymmetry of the dileptons in the sample. The cosθ distribution of a sample is a crater-shaped distribution ranging from -1 to +1, with an asymmetrical shift towards +1 caused by the transverse momentum asymmetries between interacting partons.
However, the Collins-Soper calculations can give rise to significant sources of error. One such error of particular importance is the Same-Sign Electron problem. Due to systematic error inherent to event reconstruction, the measured sign of about 5-10% of electrons and positrons is flipped, leading to positrons being labelled as electrons and vice versa. The Collins-Soper Angle calculation is dependent upon proper particle identification, and as such a method for labelling the particles in case of a sign flip is needed. This study aims to determine whether there are significant differences between random assignment, high Pt trusting, low Pt trusting, and other variable-dependent methods by comparing generator-level distributions with the various models of reconstructed distributions. If there are significant differences between methods, the study will determine which method yields the most accurate results.

Room: A151
10:45a.m. – 11:00a.m.

Optimization of p65 and GFP Antibodies in Immunofluorescence to Study NFkB Signaling
Presenter: Maryam Mufti
Mentors: Jonna Frasor, Emily Smart, Svetlana Semina, University of Illinois at Chicago
Abstract:
Breast cancer is the second leading cause of cancer-related deaths in the United States for women (Chang, 2012). There has been a decline in deaths due to preventative measures and better treatment, however, African American women experience worse prognosis, shorter survival times, and higher mortality rates due to various reasons including genetic risk factors, obesity, and others which are still unknown. The focus of the project is on Estrogen Receptor +

breast cancer as it is the most common. Treatments for ER+ BC include selective estrogen receptor modulator, aromatase inhibitors, and selective estrogen receptor degrader. However, 50% of ER+ breast cancer develops endocrine resistance and these tumors are more aggressive and metastatic. A body of evidence shows that NFkB plays a crucial role in resistance and can drive tumorigenesis of breast cancer. This research aims to study ER and NFkB in breast cancer which has been shown to be important to understanding the underlying reasons for racial disparities in breast cancer. Thus, this research looks to optimize immunofluorescence staining of NFKB in ER+ breast cancer cells, in order to study ER/NFkB crosstalk and its effect on development of tamoxifen resistance and survival of tamoxifen-tolerant cells.

Room: A155
10:45a.m. – 11:00a.m.

Striatal Projection of dSPNs to GPe Pathway in Relation to Parkinson's disease
Presenter: Saivasudha Chalasani
Mentors: Dr. Qiaoling Cui and Dr. Savio Chan, Northwestern University
Abstract
The external globus pallidus, located in the basal ganglia, is associated with a variety of functions including the control of voluntary motor movements. To fully understand the input control of the GPe, we focused upon the projection from the dSPN neuron class to the Npas1 neuron class within the GPe of Parkinson's Disease models and control models of mice. Using cell-specific transgenic mice, measures of the current amplitudes of dSPN-Npas1 projection were recorded and investigated. To unveil the underlying mechanism, the difference in the number of dSPN-GPe synaptic contacts between a mouse model of PD and control mice will be explored. To explore if synaptic contacts are increased accordingly, synaptic contacts of dSPN-GPe pathway were visualized using immunohistochemistry and counted using FIJI software. Synaptic contact will be visualized and identified through two ways: 1) the immediate spatial relationship between GFP+ terminals from dSPNs and postsynaptic marker gephyrin; 2) the overlap between GFP+ terminals from dSPNs and presynaptic marker Vesicular GABA transporter (VGAT). Overall, the investigation of the dSPN-Npas1 pathway within the basal ganglia helps to lead to a better understanding of the wiring principle of the basal ganglia in the Parkinson's disease, allowing for further research and cures for this movement disorder.

Room: B108 -1)
10:45a.m. – 11:00a.m.

Identifying effects of stress on RNA editing in a rat brain model of PTSD
Presenter: Krishnachandra Nair
Mentor: Monsheel Sodhi, Loyola University Chicago
Abstract:
This project analyzes the effects of environmental stress on levels of RNA editing in an adult rat brain PTSD model to search for implications in mental health. We have previously detected changes in the levels of RNA editing due to prenatal stress, but we have not tested a model of adult stress. We plan to investigate changes in the levels of RNA editing through NGS (next-generation sequencing) of cDNA with the aid of specifically designed primers at RNA editing sites. This project focuses on alterations in levels of RNA editing specifically in the hippocampus of the rat brain model as literature in the field has shown the hippocampus to be heavily involved in the animal stress response. Through the usage of specific RNA sequences that are conserved between rats and humans, this project aims to extrapolate its findings to increase current understanding in the field of the molecular basis of PTSD in humans.

Room: B108 -2)
10:45a.m. – 11:00a.m.

Effects of ERG Gene Knockdown in Lung Cancer Cells on Endothelium Permeability
Presenter: Janna Jann
Mentor: Dr. Dolly Mehta, the University of Illinois at Chicago College of Pharmacy
Abstract:
Compelling evidence suggests endothelium permeability comprises vascular architecture affecting a body's angiogenesis and tumorigenesis. One of the key factors of endothelium permeability is the ERG gene which is located in the nuclei of endothelial cells. The ERG gene is classified as a proto-oncogene which means that through excessive mutation it can code for factors causing cancer. Through QPCR and RNA extraction from lung samples, we studied ERG gene knockdown and how the endothelium permeability affected basic functions of the cell along with vascular permeability. By seeing the suppression of certain protein functions, we can analyze the role of ERG in lung tissue. This study furthers the understanding of ERG gene knockdown and its correlation with tumorigenesis and by learning more about ERG's function along with the inhibition of lung cancer cells.

Room: B115
10:45a.m. – 11:00a.m.

Engineering a celG Mutation in Vibrio fischeri Bacteria and its Effects on Cellobiose Metabolism and Cellobiose-Induced Gene Expression
Presenter: Nicole Wolff
Research Mentor: Dr. Karen Visick, Loyola University Medical Center
Abstract:
Vibrio fischeri bacteria colonize the Euprymna scolopes bobtail squid, and are most commonly known for their unique ability to provide bioluminescence to the squid. However, motility and biofilm formation are two other traits known to be important for squid colonization. To conduct research on this type of bacterial behavior, it is useful to develop strains in which the natural regulatory control is replaced with an inducible system, such that biofilms or motility can be switched on or off with an inducer. One such inducible system uses the cellobiose-inducible promoter Pcel. Through this promoter, we can use flrA and fliQ to induce motility, and sypA to induce biofilms. Inducibility is lost, however, when the CelG protein is able to degrade cellobiose. Using PCR splicing with antibiotic-resistance cassettes, we generated an ES114 Vibrio fischeri mutant lacking celG, thus lacking the ability to degrade cellobiose. We then tested growth of Vibrio fischeri under various conditions: different nutrients, temperatures, gene deletions, and trimethoprim-resistant cassette insertion for complementation of a gene, using both biofilm and motility assays. Results can show how mutations and nutrient conditions affect Vibrio fischeri, which serves as a model for other symbiotic systems.

Room: B116
10:45a.m. – 11:00a.m.

Drug Discovery
Presenters: Megan Lee and Sarah Yow
Mentor: Dr. John Thurmond, IMSA
Abstract:
Anastrozole is a commercial drug used to treat breast cancer in postmenopausal females. It targets the protein Cytochrome P450 19A1 which cleaves androgen to produce estrogen which can cause breast cancer. The focus of our project was to alter the chemical structure of the drug and improve its properties to inhibit the protein Cytochrome P450 19A1 from producing estrogen more effectively. We began by studying how the drug binds to protein Cytochrome P450 19A1 and prevents it from functioning. A molecular representation of this bindage was not online, so we studied to protein ligand properties of Cytochrome P450 19A1 and drew it ourselves using the computer programs ACD ChemSketch and Molinspiration. We compared this structure to that of the drug Androstenedione with the same target protein as it had a molecular representation of its binding on the PDB website. Using SeeSAR, we used Androstenedione's PDB and substituted it with the Anastrozole molecule so that we had a 3D model of Anastrozole molecule binded to the common target protein, Cytochrome P450 19A1. We then altered the molecule of Anastrozole by altering the structure in various different ways. As of right now, the most effective alteration is one

that has nitrogen atoms exchanged for phosphorus atoms in the molecule to improve the binding affinity to Cytochrome P450 19A1. Specifically, we exchanged nitrogen atoms to phosphorus atoms to get our binding affinity boundary to 0.04 nM to 3.78 nM from the original 4488.02 nM to 445911.64 nM. After concentrating on the estimated affinity, we directed our focus towards torsion quality, intermolecular clash, and intramolecular clash. By significantly improving the molecule's binding affinity to Cytochrome P450 19A1, we have altered the Anastrozole drug to improve its effects on patients.

Room: B133
10:45a.m. – 11:00a.m.

Antibacterial Properties of the Extract of Abelmoschus esculentus
Presenter: Bhavya Jasthi
Mentor: Dr. John Thurmond, IMSA
Abstract:
Abelmoschus esculentus (Okra) is a highly nutritious vegetable. It belongs to the malvaceae family and is widely cultivated in India, Africa, America, and Brazil for its fibrous fruits containing round, white seeds. Usage of traditional plants and natural products for the treatment of infections rather than synthetically derived drugs are on a steep rise. Therefore, the aim of this study was to determine the antibacterial potency of aqueous and ethanoic extracts of Abelmoschus esculentus seeds. Antibacterial activity of aqueous acetone and ethanol extracts of dried peel and seeds of okra were evaluated against selected various bacteria. Fresh Okra was cut up and separated into the green peel, white peel, and seeds. These were collected and air-dried under a heat lamp and extracted separately using acetone and ethanol as solvents of extraction. Phytochemical analysis was conducted and the extracts were tested for antimicrobial activity against some selected bacterial isolates of E. coli/DH5a, Bacillus subtillis, Enterococcus raffinosus, Acinetobacter baylyi, and Pseudomonas putida using the Kirby-Bauer test. It was observed that the ethanol green peel extract showed maximum inhibitory effect on all tested bacteria compared to the acetone and ethanol extracts with seeds and white peel.

Room: A113 -1)
11:05a.m. – 11:20a.m.

Creating a Particle Physics Simulation using AI
Presenter: Aryan Vaidya
Menters: Dr. Rick Cavanaugh, Fermilab
Abstract:
For many years, the Monte Carlo simulation has been the prevalent method of measuring probabilities when it comes to the field of particle physics. While it has traditionally been built on the usage of regular probabilities and the fundamental practices of the standard model, there has been a push for an updated version of this simulation, and so this experiment aims to do so by building the Monte Carlo using AI to expedite the process. While this is the end goal, the first year was spent primarily in development of the neural network environment, and learning how to build such a network in Python. As such, the development of the neural network will continue into the next year, at which point results will be available for analysis.

Room: A113 -2)
11:05a.m. – 11:20a.m.

Combined Spectroscopic-Photometric Follow-up Observations of DES Stellar Streams
Presenter: Ethan Tse
Research Mentor: Dr. Ting Li, Fermilab National Laboratories
Abstract:
A stellar stream is a group of stars that has been torn away from globular clusters and dwarf galaxies that have been stretched apart by gravitational tidal force. Previous observations have been made of stellar streams by the Dark Energy Survey. The objective of this research project is to confirm the findings discovered in the previous study and to further provide kinematic information about the streams. Stellar streams are sensitive to gravitational influences and we hope to use this data to help map the Milky Way's Dark Energy Halo. Currently, we have taken new measurements of the stellar streams in the southern hemisphere and are working to ensure that the information has been properly observed. By the end of the research project, we hope to measure the 3D position, 3D velocity, and metallicity of all the stellar streams in the southern hemisphere. Furthermore, we hope to develop the instrumentation and techniques needed to carry out this type of research.

Room: A115
11:05a.m. – 11:20a.m.

Implementation of the Bernstein–Vazirani Quantum Algorithm on the IBM Q Computers
Presenters: Sydney Wang, Athena Zheng
Mentors: Dr. Jens Koch, Daniel Weiss, Xinyuan You, Northwestern University
Abstract:
The complexity of certain classical computer algorithms can be reduced by a quantum algorithm completing the same task. We examine the implementation of the Bernstein–Vazirani algorithm. It finds the hidden n-bit string s from the function fs(x)=sx that takes an n-bit input string x and outputs one bit, the dot product. This algorithm reduces the complexity from n queries for the best classical algorithm to just one. Though the quantum algorithm theoretically always gives the correct string, in practice, factors such as decoherence of the physical qubits due to external noise reduce the algorithm's accuracy.
By implementing the algorithm on the IBM 5-qubit and 14-qubit quantum computers, we are able to analyze correlations between the accuracy of the results and the properties of the physical qubits used. Not all qubits are pairwise connected, nor do they have the same coherence times. Using Python to build the quantum circuits, we create several implementations of the circuit with different qubits. We establish that 1/T1, 1/T2, and gate errors are positively correlated with calculation errors. Consequently, we observe that the 14-qubit quantum computer, on average, is more prone to errors than the 5-qubit quantum computer.

Room: A117
11:05a.m. – 11:20a.m.

Using a Guided User Interface and Automated Robot to Image Caenorhabditis Elegans
Presenter: Chris Teng
Mentor: Anthony Fouad, University of Pennsylvania
Abstract:
From aging research to paramount biological discoveries such as apoptosis, C. Elegans has been the crux of many research problems in the past decade. However, they possess certain qualities, such as their microscopic size, that make repetitive lab work extremely tedious for human labor and thus a strong candidate for automation. To automate the process of preparing worms for certain experiments, we designed and coded software that was able to accurately detect worms in a grayscale image. To do this, we analyzed the contour curves of a regular roundworm and also designed an efficient guided user interface to improve usability. Through our efforts, we were able to produce a robot capable of moving in three lateral directions with a camera mounted gantry system. It is capable of fine tuning images and live feed, as well as recognizing worms with great accuracy. Furthermore, the robot is also mounted with a metallic wire pick that is used to pick up worms and transfer them to new plates. The pick is retractable and can also autonomously sterilize itself. Since the pick would need to have extreme precision to pick up a worm, it would need to be extremely sensitive. In solving this issue, we developed two ways: image analysis and capacitive touch sensing. The image analysis simply detected small changes in image gradience while the capacitive touch sense small changes in electric current. Overall, the project demonstrated the

opportunities of automation and how it can efficiently minimize tedious lab procedures. Not only is the robot intuitive, but also highly distributable and reproducible for other laboratories.

Room: A119 -1)
11:05a.m. – 11:20a.m.

Mapping the Role of the Notch4 Receptor in Angiogenesis
Presenter: Krishna Thakkar
Mentor: Dr. Naiche Adler, University of Illinois - College of Medicine
Abstract:
Angiogenesis is the process by which new blood vessels form, as cells in hypoxia secret Vascular Endothelial Growth Factor which creates the tip cell phenotype in whichever endothelial cell it binds to. The new tip cell promotes the stalk cell phenotype in neighboring cells through the Notch pathway. The tip and stalk cell phenotypes are critical to angiogenesis, but not much is understood about the pathway responsible for their creation. With this experiment, we aim to understand how the pathway functions by examining the impact of knocking out components of it, namely Notch4 and its downstream targets, Rnd1 and Unc5b. In order to quantify the effects of knocking out these proteins using CRISPR/Cas9, postnatal mice retina were compared on measures of radial outgrowth, tip cells, and branching of the retinal vasculature. Based on initial results, it is expected that the Notch4 knockout mice will exhibit less radial outgrowth and reduced branching of retinal blood vessels. The mapping of angiogenic pathways offers many avenues for studying human health. For example, new cancer research aims to reduce blood flow to tumors by decreasing angiogenesis. Therefore, a deeper understanding of the role of Notch4 could aid the development of new medicinal therapies.

Room: A119 -2)
11:05a.m. – 11:20a.m.

Discovery of potent PDE4 inhibitors
Presenter: Ishani Tarafdar
Mentor: Dr. Timothy Hagen, Northern Illinois University
Abstract:
The phosphodiesterase 4 (PDE4) enzyme, which is responsible for hydrolyzing cAMP in immune cells and the central nervous system, is involved in conditions such as Alzheimer's disease, schizophrenia, and depression, making it a promising target for pharmaceutical development. Drugs such as Apremilast and Crisaborole are already in use. Ligands which act as inhibitors of PDE4 and have high binding affinity to the active sites, thereby increasing levels of cAMP in immune cells, are being investigated to treat patients with these conditions. Through computerized molecular docking experiments, a common method used in drug design and discovery, we bound different small molecules from the protein data bank (PDB) to binding sites of the PDE4 enzyme. Using the results of the experiments conducted with AutoDockTools, we were able to determine preferred orientations or poses of the ligands as well as their binding affinity to PDE4. Further study needs to be done on PDE4 inhibitors in order to understand PDE4 regulation and treat conditions impacted by it.

Room: A123 -1)
11:05a.m. – 11:20a.m.

The Effects of T cell PD-1/PD-L1 Cis-Binding on T cell-APC Interactions
Presenter: Yatri Sutaria
Mentors: Chufan Cai, Dr. Jun Huang, University of Chicago
Abstract:
PD-1/PD-L1 trans-binding between T cells and APCs is known to inactivate the TCR, preventing a TCR/pMHC complex. The PD-1/PD-L1 trans-interaction is especially of interest in cancer research, as the PD-L1 on the cancer cells will complex with the PD-1 on the T cell, preventing the T cell from binding to the cancer cell and releasing cytokines or perforins, allowing the cancer cells to proliferate. Multiple studies build off of this knowledge and focus on how blocking PD-1/PD-L1 signaling allows T cells to continue attacking tumor cells. Recently, there has also been research done on how PD-1/PD-L1 cis-binding on APCS impacts T cell/ APC binding. However, there has not been much research on PD-1/PD-L1 cis-binding on T-cells, which is what our experiment focuses on. The goal of our study is to identify the effect T cell PD-1/PD-L1 cis-binding has on TCR/pMHC interactions by blocking the PD-1/PD-L1 signal with anti-PD-L1 antibodies. In the future, the results of this study can possibly be applied to cancer immunotherapy as well.

Room: A123 -2)
11:05a.m. – 11:20a.m.

Engineering pH dependent camelid antibodies with aspartic acid and glutamic acid
Presenter: Dana Stanecki
Mentor: James R. Horn, Hyeyoung Eom, Northern Illinois University
Abstract:
Protein engineering is growing as an important subject as new discoveries in this area open new doors for application of different proteins. Camelid antibodies specifically are an area of interest because they lack the light chain and only possess the heavy chain that allow for unique applications. This heavy-chain only design increases stability and specificity in bonding interactions. Previously, camelid antibody proteins were engineered by the Horn Lab that had high bonding affinities at high pHs. Using isothermal titration calorimetry, we studied the bonding affinities at pH 4.0 in several mutations that allowed for high binding at low pH. By mutating certain amino acids in the homodimer bonding interface to aspartic acid or glutamic acid, we were able to engineer proteins with different structures to examine the efficacy and the affinity of the bonding at low pH. Further research is needed to determine the most effective mutation and to study the effect these mutations have on the structure.

Room: A147
11:05a.m. – 11:20a.m.

Analysis of Negative-Weight Events in Monte Carlo Generation with Next-To-Leading-Order Parton Distribution Functions
Presenters: Abigail VanderPloeg, Madison Hahamy, Rylie Meek, Daniel Lee
Mentor: Dr. Peter Dong, IMSA
Abstract:
In a particle physics analysis, Monte Carlo simulation is one of the most important steps, as it allows for an estimate of the cumulative effects of a particle's interaction with detector material, allowing an accurate estimate of event selection efficiency and background expectation. The CMS collaboration uses the parallel processing system CRAB to generate Monte Carlo events. Events go through four steps: GENSIM, DIGIRECO, AOD, and MINIAOD, each step compressing the events to a more workable amount of memory.
The parton density function, or PDF, describes the distribution of particles within the colliding protons that is essential to generating Monte Carlo events. However, PDF's are determined by a complicated mix of theory and experiment, and different PDFs yield different results. Recent next-to-leading-order PDF's have led to the production of events with a negative event weight, representing events that should be subtracted from the analysis. This raises the disconcerting possibility that the total expected number of events in a channel could be negative, especially in the high-mass region of interest. We examine Monte Carlo contact interaction events for negative-weight events and determine their effect, if any, on the analysis.

Room: A149
11:05a.m. – 11:20a.m.

Feldman-Cousins Analysis at CMS
Presenters: Grant Dexter and Michael Vayninger
Mentor: Dr. Peter Dong, IMSA
Abstract:
Feldman and Cousins introduced a statistical technique to perform a frequentist analysis which unifies upper and lower limits with two-sided confidence intervals. This solves the problem that the choice of upper limit or two-sided interval leads to intervals that do not give frequentist coverage if the choice is dependent on the data. The Feldman-Cousins approach involves sorting pseudoexperiments by their likelihood ratio, or R value. This involves sorting a number of points in N-dimensional space by their R values. After removing the points with the lowest likelihood, the remaining points define a region in space: a simple task in the single-channel case, but a more difficult one in the general N-channel case. An algorithm must be employed to determine whether a given pseudoexperiment is contained in the defined region. The current "box" approximation on a sample dataset yielded a lower limit of 15.47 TeV, compared to the Bayesian limit of 21.14 TeV. Work is underway on a multi-dimensional hull algorithm, a more aggressive approximation which will raise this limit even further.

Room: A151
11:05a.m. – 11:20a.m.

Machine learning for ASL translation
Presenters: Jacob Levine, Arthur Lu
Mentors: Karen Livescu, Bowen Shi,
Abstract:
Machine learning is the scientific study of algorithms and statistical models that computer systems use to effectively perform a specific task without using explicit instructions, relying on patterns and inference instead. Machines learn by taking in large amounts of data and slowly adapting an artificial network to process the data. Machine learning has been used in a wide variety of applications including speech and language recognition and translation. Over the past few years, increased computational power has allowed machine translation using machine learning methods to become accurate for various languages. However, for languages that are not widely used, machine translation models may not be as accurate. One such language is American Sign Language (ASL), used by about 300,000 people. ASL translation has many problems that translation from other languages have, such as the lack of a large annotated dataset. Additionally, it also has problems that machine translation from other languages do not have: ASL does not have a spoken or written form, ASL's grammatical structure is different from most spoken languages, and ASL borrows words from English by fingerspelling. Although translation of individual signs has been accurate for a long time, accurate fingerspelling readings have only begun to become accurate recently. These algorithms to do this are fairly data-hungry and thus, have been limited by the lack of a large dataset. However, there are many deaf news sites that have numerous hours of video in ASL. Therefore, to help collect a larger dataset, we are developing a machine learning algorithm to identify fingerspelling in videos. Our current approach is to process each frame through a convolutional neural network called VGG-16 for feature extraction, then feed the results through one 3D convolutional layer, then use a set of standard linear layers for prediction. However, currently, this model severely underfits the data, meaning that the model can't pick up on the variance of the data and instead is not accurate enough to be used.

Room: A155
11:05a.m. – 11:20a.m.

Honokiol and Cisplatin Impact on Ototoxicity from Chemotherapy
Presenter: Zahra Vasi
Mentors: Claus-Peter Richter, MD, Phd. Vice Chair for Research, Department of Otolaryngology, Xiaodong Tan, Phd. Research Assistant Professor of Otolaryngology, Feinberg School of Medicine
Abstract:
In this experiment, ototoxicity from the chemotherapeutic drug cisplatin was studied to reduce or eliminate this common side effect from chemotherapy. Cisplatin causes damage to mitochondria and DNA in ear cells, resulting in severe hearing loss and deafness. Use of the drug Honokiol, a traditional Chinese medicine, is being tested in conjunction with chemotherapy to combat the ototoxicity from cisplatin and prevent hearing loss. In order to determine the effectiveness of this drug, two groups of mice are treated with cisplatin and with cisplatin and Honokiol and their hearing abilities are monitored. After specific intervals of time, the hearing ability of the mice was recorded by monitoring the reactivity in their brains after sounds were played at predetermined frequencies. Overtime, this determines how the hearing loss of the mice has progressed and provides a comparison between hearing loss from cisplatin and hearing loss from cisplatin with Honokiol. In order to confirm these results, x-ray fluorescence is used to study the ions in the cochlea of the individual mice. Our results initial results show a significant difference between treatment of mice with chemotherapy and treatment of mice with chemotherapy and Honokiol, indicated that the Honokiol does prevent ototoxicity.

Room: B108 -1)
11:05a.m. – 11:20a.m.

Using Molecular Dynamics Simulations to Investigate HIV-1 Protease
Presenter: Elizabeth Murphy
Mentor: Dr. Ao Ma, Associate Professor, Department of Bioengineering,
Abstract:
HIV-1 Protease is a principal object in drug discovery given its key role in the survival of AIDS. Without HIV-1 Protease, the disease would not be able to replicate or mature in the way proper for its survival (Caflisch et al. 2004). Given the complicated nature of its folding, including two flaps that shift between closed and partially open depending on the presence of a ligand, the folding mechanisms are important in the drug discovery process (Hornak 2006). Running molecular dynamics (MD) simulations is one method for investigating more closely the folding mechanisms of HIV-1 Protease. This study utilized GROMACS through a Cygwin64 terminal to run simulations on HIV-1 Protease to further study these folding mechanisms.

Room: B108 -2)
11:05a.m. – 11:20a.m.

Simulating Behaviors of POMDPs
Presenter: Jay Dong
Mentor: Piotr Gmytrasiewicz, UIC Artificial Intelligence Laboratory
Abstract:
Intuition is an important human capability that allows us to gauge and predict the properties of an unknown environment. This study presents an approach to how a computer agent can replicate this innate intuition by using an algorithm that will learn from an unknown underlying state using Partially Observable Markov Decision Processes (POMDPs). This task is difficult because the computer will never have 100% certainty in its decisions, thus every action will be based on a belief state. To determine the transition probabilities in our unknown environment, we are currently recursively applying a learning algorithm, looking for patterns in the computer's belief state. We are implementing these ideas and algorithms using Java in an effort to create an intelligent machine. We test the competence of our algorithms by running them in a simulation with known transition probabilities and finding percent error between calculated probabilities and true probabilities. Although a robust, error-free algorithm has not been developed, we hope to find a logical and consistent algorithm that will determine transition and observational probabilities accurately and consistently.

Room: B116
11:05a.m. – 11:20a.m.

Research into Antimicrobial Soil
Researchers: Alexandra Gonzalez, David Revilla, Jolin Zhang
Mentors: Dr. John Thurmond, Dr. Angela Ahrendt
Abstract:
As the rate of antimicrobial resistance rises, the need to find new antibiotics has never been more important. One possible way to create new antibiotic compounds is to search for antimicrobial bacteria in dirt. In our studies, we took three soil samples from a concentrated area to test the antimicrobials within, against different pathogenic strains. Colonies from the soil samples were then run through a spread patch test to check for antimicrobials. All colonies that tested positively for antimicrobial were then run through PCR to identify the size of the microbe. Our study has concluded and agrees with past studies that there are in fact organisms with antimicrobial properties that can be found in soil. This is just the beginning of the antimicrobial study, as there is still much more analyzing to be done on the soil throughout the rest of IMSA campus. In order to further analyzing the colonies we have already isolated to discover ways they can be used as antimicrobials, this research project must continue over the coming years with new students to lead it.

Room: B133
11:05a.m. – 11:20a.m.

Cloning, Expression, & Purification of the Plasmodium Falciparum hypoxanthine guanine xanthine phosphoribosyltransferase to use in Drug Binding Studies
Presenters: Faith George, Trisha Sudhakar, Aryan Walia
Mentor: Angela Ahrendt, PhD., Illinois Mathematics and Science Academy
Abstract:
In this project, the aim is to find a drug to treat malaria. The target that was chosen is an enzyme of Plasmodium falciparum, hypoxanthine guanine xanthine phosphoribosyltransferase (HGXPRT). HGXPRT is an enzyme required for P. falciparum to synthesize purine nucleoside monophosphates essential for DNA/RNA production. When HGXPRT is inhibited there is a potential for P. falciparum to be eliminated. A plasmid containing the gene for HGXPRT was acquired and transformed into BL21 DE3 for expression. The HGXPRT enzyme was expressed and purified using immobilized nickel ion chromatography, and successful expression was confirmed by SDS-PAGE. In addition, the gene was amplified from the plasmid by PCR to insert into a different expression vector to compare the expression between the two systems.

Room: A113
11:25a.m. – 11:40a.m.

Exploring Nucleolar Impact on Keratinocyte Differentiation
Presenters: Aaron Rodrigues and Kurt Leano
Mentor: Dr. Sui Huang
Abstract:
As the largest components within the nucleus, nucleoli consist of ribosomal DNA regions and are essential for ribosome synthesis. Yet, for such distinct regions within the central component of cells, there has been little research concerning its influence on cellular metabolism outside of ribosome synthesis. Thus, nucleoli may play key roles in crucial cell processes, including involvement with cellular differentiation. In this study, we observed the change in nucleolar count as keratinocytes differentiate, measuring other factors across epidermal layers including the quantity of cells without nucleoli, centromere count, centromere association with the nucleolus, and centromere association with the nuclear membrane. By defining layers based on general distance from the basal cell layer, we detected correlations between cells of different levels of differentiation for the aforementioned factors. These significant changes across layers suggest that the nucleolus plays an active role in differentiation, promoting further investigation into the nucleolus' holistic function.

Room: A115
11:25a.m. – 11:40a.m.

The Role of DONs in Regulating Bone Tumor Formation from Mesenchymal Stem Cells
Presenters: Alison Deng and Scott Du
Mentor: Dr. Tong-Chuan He, University of Chicago
Abstract:
Osteosarcoma is a differentiation disease that results from an osteoblast differentiation and proliferation imbalance. This study investigated how certain 19-base short regulatory RNAs may disrupt BMP9-induced osteoblast differentiation in mesenchymal stem cells (MSCs). We are interested in determining these effects because they may further explain the development of osteosarcoma.
We introduced a completely randomized 19-base short RNA Library into MSCs and discovered several short RNA transcripts, which are named as Disruptors of BMP9 (DONs). We showed that these DONs can produce osteogenic resistant MSCs at various time points during library screening. We found that MSCs affected with DONs produce a bone tumor-like phenotype. This study determined that iMAd 199 mesenchymal stem cells stably expressing either DONs 1, 2, and 3 effectively disrupted BMP9-induced osteogenic differentiation. Based on these results, we hope to sequence the DONs's RNA to determine any up or down regulation of mRNA or lncRNA involved in the pathogenesis of osteosarcoma.

Room: A117
11:25a.m. – 11:40a.m.

Influence of Gender, Time and Intensity on Rating of Pleasantness of Food Odors
Presenter: Saisupritha Talasu
Mentors: Thorsten Kahnt, Jana Tegelbeckers, Northwestern University Feinberg School of Medicine
Abstract:
The olfactory system is a central system that plays an essential part in the smell. Smell is an important sense because it is linked to parts of the brain that processes emotion and memory, so it can alert us to danger like fire or spoiled food when we are in trouble. Food is often used as a rewarding stimulus because it induces appetitive behavior, so it has the potential to make us approach and consume. People can love or hate certain foods or objects only by their odor. The participants in this study were given four savories and four sweet odors to smell when they were in a hungry state and rate them depending on the pleasantness of the odor. Then they chose one savory and one sweet odor and did a test rating the pleasantness and intensity of odor. There were two elements we looked at when analyzing the data. One, if the time of day and gender had any effect on the pleasantness of rating and two, the comparison between pleasantness and intensity in the two odors chosen after the first test.

Room: A119
11:25a.m. – 11:40a.m.

Applications of machine learning in glioblastoma diagnosis, classification, treatment, and prognosis
Presenters: Andrew Du, Matthew Lee
Mentors: Dr. Jane Wu, Warren McGee, Wu Laboratory, Northwestern University Feinberg School of Medicine
Abstract:
Glioblastomas are highly invasive, malignant, grade IV astrocytomas, formed primarily from cancerous astrocytes and sustained by intense angiogenesis, often causing non-specific symptoms and creating difficulty for definitive diagnoses. This study aims to utilize artificial intelligence, machine learning, and deep learning techniques in order to provide an accurate molecular classification and survival prognosis for glioblastoma patients using magnetic resonance imaging, clinical, and genomic data. Images from TCIA-TCGA and IvyGAP datasets will be processed and used to train and test computer algorithms. At the study's current stage, raw data has been processed for use and an algorithm is in development for the aforementioned purposes. Criteria are also being determined for selecting data of utility to the current study. A multilayer perceptron and a convoluted network will be combined in a single end-to-end Keras model designed to accept mixed data inputs from processed clinical, genomic, and MR imaging data. These results can help identify predictive features that could assist in providing more accurate and comprehensive diagnoses and that are significant for survivability.

Room: A121 -1)
11:25a.m. – 11:40a.m.

Comparing Network Sampling Methods
Presenter: Alec Chen
Mentor: Dr. Lulu Kang, Illinois Institute of Technology
Abstract:
Networks can be used to analyze systems in the real world, however they are often too large for our computers to analyze within a reasonable amount of time. A solution to this is network sampling methods. These are just ways of sampling a smaller "representative" network that we can analyze. Being representative means that the sample retains certain characteristics of the original network. Because there are many characteristics, it means many different things for a sample network to be representative. I looked at three common sampling methods, being random degree node, random edge induced, and snowball sampling, and compared them based on how similar they were to an arbitrary original network for fundamental characteristics, degree and clustering coefficient.

Room: A121 -2)
11:25a.m. – 11:40a.m.

Creating an Algorithm to Transform Data Hierarchies Based on New Information
Presenter: Vibhav Adivi
Mentor: Piotr Gmystrasiewicz, University of Illinois at Chicago
Abstract:
In artificial intelligence, an important type of machine learning algorithm involves taking old data and using new information to transform it. With this in mind, the famous Cheryl's Birthday problem was taken in order to take the information that each agent knows and put it into a data hierarchy, and then using an algorithm to transform this data hierarchy based on the new announcements made throughout the problem. For this, pseudocode in the form a series of conditional statements to find out what dates could be eliminated to find Cheryl's actual birthday in the problem. With this, a computer can be programmed to solve any problem in the form of Cheryl's Birthday with any information. This algorithm opens the possibilities of machine learning algorithms that are able to change data sets based on given information.

Room: A123 -1)
11:25a.m. – 11:40a.m.

Measuring the Response of Nevomelanocytes to MBEH, 4-TBP, and 8-DPAT
Presenter: Nikhilesh Gupta
Mentors: Dr. I. Caroline Le Poole and Emilia Dellacecca, Feinberg School of Medicine, Northwestern University
Abstract:
Congenital nevi are pigmented moles present at birth that have a 2 to 20-fold increase in the chance of developing melanoma. In the past, melanoma has been treated using bleaching agents to give patients a more even skin tone which they may prefer. Bleaching seems to have a cytotoxicity towards melanocytes and not keratinocytes meaning it provides an effective solution. More specifically, the phenols in experimentation are MBEH, 4-TBP, and 8-DPAT. Since it is similar to the amino acid tyrosine, monobenzyl ether of hydroquinone (MBEH) is able to be converted into a highly reactive quinone which can act in a melanosomal cell to restrict melanocyte expression. Additionally, 4-tertiary butyl phenol (4-TBP) has been proven to induce apoptosis in the targeted regions and 8-DPAT has been used to reduce the cytotoxicity of the specific region to reduce chances of nevus cells becoming tumorigenic, ensuring that stem cell like cells do not differentiate. Thus, bleaching allows for a non-intrusive form of removing the congenital nevi and preventing future melanoma that can help in situations of extensive lesions where options such as skin grafts are not a viable choice. The experimentation aims to test and characterize the effect of these phenols on nevomelanocytes.

Room: A123 -2)
11:25a.m. – 11:40a.m.

Developing a Multivariable Artificial Pancreas for Various Exercise Types and Intensities
Presenter: Bala Ramaraju
Mentor: Dr. Lauretta Quinn, Univerity of Illinois-Chicago (UIC)
Abstract:
Diabetes mellitus (DM) has been a major public health problem in the U.S., affecting more than 29 million (9.3%) of the population. Type 1 diabetes (T1) is a form of DM in which very little or no insulin is produced by the pancreas, resulting in high blood sugar levels in the body. Many people with T1DM use daily physical activity to help with their blood glucose level regulation. Current insulin preparations and insulin delivery are not able to adjust to the changes in blood glucose associated with the unplanned changes in physical activities. Therefore, an AP or “closed loop” system that can be adjusted with time flexibility is desirable. The focused objective of this research study is to detect and mitigate the effects of exercise on blood glucose concentrations through the development of a Multivariable Adaptive Artificial Pancreas System (MAAP) in Type 1 Diabetes. Currently, experiments are being extended to evaluate a semi-closed-loop algorithm (i.e., a closed loop algorithm that has periodic manual inputs) during physical activity and exercise; and to compare them to open loop control under identical conditions. This, in turn, will help visualize a healthier and better future for those with Type 1 diabetes.

Room: A147
11:25a.m. – 11:40a.m.

Calculating Multichannel Bayesian Limits Using a Markov Chain Monte Carlo Calculator
Presenters: Lily Pan, Srivinay Tummarakota, Thailer Lietz
Mentors: Dr. Peter Dong IMSA, Dr. Leonard Spiegel, Fermi National Accelerator Lab
Abstract:
Our group's goal is to find evidence of quark-lepton compositeness by analyzing contact interactions that would indicate the presence of preons, theoretical constituents of quarks and leptons. We focus specifically on the Bayesian statistical analysis that determines the lower limit for the energy scale at which such contact interactions would occur. We calculate limits using a Bayesian Markov chain Monte Carlo calculator which utilizes RooStats, a statistical analysis program, to find the 95% confidence interval for a given parameter of interest. We show that we can find simple single-bin limits, then include background processes and systematic uncertainties into the limit calculation before generating multi-channel limits. We are creating a program that computes the Bayesian limit of multiple channels with correlated systematic uncertainties. We will show our promising results and outline the issues that remain to be solved.

Room: A149
11:25a.m. – 11:40a.m.

Search for Hypervelocity Stars Using DES
Presenter: Tyrone Whitmore-Wilson
Mentors: Dr. William Wester, Fermi National Accelerator Lab
Abstract:
Hypervelocity stars are important for better understanding the nature of dark matter in the galaxy. By studying hypervelocity stars in the galaxy, we can gain a better understanding of the distribution of dark matter in the galaxy. However, finding hypervelocity stars in the Milky Way is difficult. My project utilized the Dark Energy Survey (DES) to develop a method for identifying hypervelocity stars in the DES database. To identify a hypervelocity star, I the clumping of the observation locations in the sky and compare the trend of the location over time. This method can be implemented in the future to search the DES database for new hypervelocity stars instead of just confirming the findings of other projects in this field.

Room: A151
11:25a.m. – 11:40a.m.

The Effect of Myoelectric Computer Interface Training on Arm Kinematics and Function after Stroke
Presenters: Torin Kovach & Ishaar Ganesan
Mentor: Dr. Marc Slutzky, MD, PhD, Northwestern University
Abstract:
Abnormal co-activation patterns of arm muscles is a substantial cause of impaired arm function after stroke. In our previous study, a myoelectric computer interface (MCI) training paradigm was designed to help stroke survivors reduce this abnormal coactivation. The effects of MCI training on function and arm kinematics in 32 chronic stroke survivors was evaluated, and results suggested that MCI training holds promise to improve arm function after stroke. The MCI training system in the previous study produced biofeedback for a single muscle pair. Now, we have designed a new paradigm, with a biofeedback system returning feedback for three muscles at once, and a sham paradigm to act as a control group. We are comparing patients using the original MCI paradigm and both of our new MCI systems, all over a six week period. We hypothesize that the original paradigm is still effective in reducing coactivation, the sham paradigm is not effective in reducing coactivation, and the three-muscle paradigm is more effective in reducing coactivation than the original paradigm.

Room: A155 -1)
11:25a.m. – 11:40a.m.

Improving Cardiovascular Disease Care among Liver Transplant Recipients
Presenter: Aneesh Maganti
Mentors: Dr. VanWagner, Dr. Amna Daud, Mr. Finn, Feinberg Lab, Northwestern University
Abstract:
The overall goal of this study is to improve quality of cardiovascular disease (CVD) care, a leading cause of complications and death, among liver transplant recipients. Currently, there is a lack of liver transplant-specific CVD clinical practice guidance. The study aims to quantify opinions, knowledge and usual care patterns about CVD care after liver transplant from practitioners who provide care to liver transplant recipients across a variety of medical specialties and from liver transplant patients/caregivers in order to create new CVD care guidance for practitioners to follow so they can improve outcomes for liver transplant patients. For my role in this study, I analyzed the collected survey data from practitioners and liver transplant patients/caregivers, which will form the basis for a future CVD guidance document and implementation of this guidance into clinical practice. I used Research Electronic Data Capture (REDcap) software and then built three surveys about CVD care after liver transplant using the platform.

Room: A155 -2)
11:25a.m. – 11:40a.m.

Testing Chloride Content and Penetration Capability within Concrete
Presenter: Hasan Almousawi
Mentors: Dr. Mohsen A. Issa, Structural and Concrete Research Lab Director, University of Illinois at Chicago
Abstract:
Purpose to measure the penetration capability of chloride within unknown specimens of concrete. In doing so measuring the structural integrity of concrete when chloride provided materials are introduced, which introduces the possibility of corrosion in steel reinforcements. Solution of concrete will be poured, preparing four specimens. These serve as a control in which one contains no chloride and the other three specimens contain known amounts of chloride. Utilizing the drill, a sample will be cut out vertically from the surface towards the bottom, approximately 3 inches in length. Around five samples will be collected from differing depths, until the bottom is reached, for measuring chloride content. These slabs will be crushed and the powder produced will be run through both acid-soluble and water-soluble chloride detecting tests regulated by the ASTM (American Society for Testing and Materials) standard testing methods. The results of chloride content will be graphed against depth to establish a profile of the penetration capability of both acid-soluble and water soluble chloride within the concrete sample laid.

Room: B133
11:25a.m. – 11:40a.m.

Inhibiting the HGXPRT Enzyme in Plasmodium falciparum to Prevent Malaria
Presenters: Christopher Bridges and Vincent Pergrossi
Mentor: Dr. John Thurmond, Illinois Mathematics and Science Academy
Abstract:
Plasmodium falciparum, the parasite responsible for the majority of deaths caused by malaria, requires purine to survive. These organisms are able to continually supply themselves with purine by processing hypoxanthine salvage from its host. Without the ability to create its own purine, the Plasmodium falciparum would die, which makes purine starvation a viable method of preventing deaths from malaria. The enzyme in the parasite that allows it to salvage purine is called the hypoxanthine-guanine-xanthine phosphoribosyltransferase enzyme (HGXPRT). By inhibiting this enzyme with S-SerMe-ImmH phosphonate, the parasites will starve. Therefore, better binding affinity between the ligands and their respective binding sites on the enzyme increase the effectiveness of this antimalarial treatment. By using various computer-aided drug design software, primarily SeeSAR, the phosphonate ligands were adjusted to increase their binding affinity. Out of many attempted revisions, a small subset are substantially better than the original ligands. After using online bioactivity calculators, these improved ligands showed no signs of breaking any of Lipinski's drug rules, nor did they become drastically more difficult to create in a lab. By making these changes to the phosphonate ligands, the S-SerMe-ImmH becomes an even more potent drug for inhibiting the HGXPRT enzyme in Plasmodium Falciparum, allowing more lives to be saved from malaria.

Session III 1:40p.m. – 2:35p.m.

Room: Academic Pit
1:40p.m. - 2:05p.m.

Anatomical Tradeoffs in xylem characteristics impact oak water use strategies
Presenter: Jessica Oros
Research Mentor: Dr. Christy Rollinson, The Morton Arboretum
Abstract:
The wood in a tree consists of specialized cells, known as vessels, which take water from the roots and transport it to the leaves. The size and density of these vessels can indicate the ability of the tree to transport water, and oak vessels are larger in the early part of the wood, called the earlywood, than vessels grown towards the end of the growing season. We know vessels aid in growth through water transport, and each tree species has its own unique wood characteristics, therefore, there may be a link between vessel density and growing strategies of a species. The area of earlywood vessels in the white and red oak trees cores from the Morton Arboretum were measured, and vessel density was calculated as a ratio of the vessel area over the total earlywood area in that particular ring. The average earlywood vessel density in white oak was found to be almost 1.2 times that of red oak, and white oak vessel area was 45% larger than vessel area in red oak, which may indicate differing strategies of water transport. These differences between vessel growth will help us understand how they can adapt to different conditions with varying water availability.

Room: Café
1:40p.m. - 2:05p.m.

Loss of EphA2 inhibits GATA-3 transcriptional function leading to a terminal differentiation defect
Presentors: Michelle Sia, Amit Somalwar
Mentor: Bethany Perez-White, Research Assistant Professor of Dermatology at Northwestern University Feinberg School of Medicine
Abstract:
Epidermal differentiation involves complex signal transduction networks. Often, these signal relays depend on the transmission of cues from the plasma membrane to the nucleus to control gene expression. Receptor tyrosine kinases (RTKs) are integral in orchestrating intracellular communication cascades to induce differentiation. Loss of EphA2 RTK causes differentiation defects in 3D reconstituted human skin (3D RHS) resulting in tight junction catastrophe. In EphA2-deficient (shEphA2) 3D RHS we show significant loss (>75%, $P<0.05$) of loricrin, filaggrin, and involucrin at protein and mRNA levels, indicating EphA2 signaling impacts keratinocyte differentiation at the transcriptional level. GATA-3 is expressed in the nuclei of suprabasal keratinocytes in mature 3D RHS, mimicking the expression pattern of human skin (~35%+, $R2=0.99$, $P=0.05$). In 2D cultures, GATA-3 accumulates in the nucleus in control cells (48.6%+) 24h after calcium-induced differentiation, but to a lesser extent in shEphA2 cells (12.5%+, $P<0.01$). This loss of expression in shEphA2 cells results in loss of GATA-3-driven transcription indicated by 65% ($P<0.001$) decrease in GATA binding activity in a promoter luciferase reporter assay. These results indicate that EphA2 promotes GATA-3 nuclear accumulation and positively regulates the transcription of terminal epidermal differentiation genes.

Room: IN2
1:40p.m. – 2:05p.m.

A Novel Classification Method of Hybrid Proton PBS Plans using DVH based Metrics
Presentor(s): Louise Lima, Alice Liu
Mentor(s): Draik Hecksel, Steven Laub, Mark Pankuch, Aditya Panchal (Northwestern Medicine)
Abstract:
Proton Pencil-Beam Scanning treatment plans are optimized using Single-Field Uniform Dose (SFUD), Multi-Field Optimization (MFO), or a combination of the two techniques into a Hybrid plan. In this study, we develop a method to evaluate plans using metrics applied to field-specific differential dose volume histograms (DVHs) from various treatment areas.

An application was developed to create normalized differential DVHs of the primary target volume for each field in a proton PBS treatment plan, and used five metrics to create a final ranking system for 235 patients plans. The results were then compared to their initially selected optimization technique, compared across treatment locations, and ran through statistical and machine-learning algorithms to test the validity of the ranking criteria.

Out of the 235 patient plans, our system reclassified 33 plans as MFO, 57 Hybrid, and 145 SFUD. Statistical analyses using ANOVA and T-test assuming unequal variances showed all values to be significantly different, and various clustering and re-classification methods proved our ranking system to be a more accurate representation of the treatment plans than the initial automatic optimization.

A classification method for proton PBS plans was developed, which can aid in future robustness evaluation, image guidance tolerance, plan documentation, and data analysis.

Room: Lecture Hall
1:40p.m. – 2:05p.m.

DNA Methylation in Autophagy-associated Genes and Risk of Prostate Cancer
Presenter: Jimmy Ren
Mentor: Dr. Yinan Zheng, Northwestern University
Abstract:
The study of autophagy is a growing field that is emerging as one of the most important studies in cancer due to the nature of autophagy's significant biological functions. The complex relationship between autophagy and prostate cancer is still under debate, with studies demonstrating inconsistent results in terms of tumor growth. DNA methylation is one of the key dynamic epigenetic mechanisms in gene regulation. This prospective study aims to understand the role of DNA methylation in autophagy-related genes and prostate cancer development. Among over 740 human autophagy-related genes we examined, 10 methylation biomarkers in the promoter regions of 12 genes, including 6 novel genes and 6 well-known genes, were found to be predictive to inform risk of prostate cancer at least 4 years before cancer diagnosis. Pathways analysis revealed that these genes involved in necroptosis and calcium signaling, which play key roles in autophagy and prostate cancer development. Within 4 years pre-diagnosis, the relationships between methylation of these genes and cancer development became obscure and insignificant, which indicate an accumulation of epigenetic "noise" in advancing malignant disease that confounds the methylation biomarkers and thus may explain prior inconsistent studies. Our study suggests that methylation in autophagy-related genes may serve as novel therapeutic biomarkers for further study.

Room: Library
1:40p.m. – 2:05p.m.

Discovery of EGFR using Erlotinib prototype for the Treatment of Lung and Other Cancers
Presentor: Jodie Meng
Mentor: John Thurmond, IMSA
Abstract:
Epidermal Growth Factor Receptor (EGFR) is a transmembrane protein involved in the regulation of signaling pathways and is known to be frequently overexpressed in epithelial tumors. Erlotinib is a small molecule inhibitor of EGFR commonly used for the treatment of lung and pancreatic cancers. In the present study, 707 selective inhibitors of EGFR were designed based on the erlotinib prototype. Results were filtered by parameters outlined in Lipinski's rule. Molecular simulation programs such as SeeSar, AdmetSar, SwissADME enabled the prediction of the compounds' toxicity, binding affinity, physicochemical properties, and pharmacokinetics. The equilibrium dissociation constant was decreased from 101.469534 to 0.000054, therefore increasing the binding affinity by over 1,879,065 fold. The data suggested that modifying the 1,2-Dimethoxyethane structures, particularly by replacing oxygens with nitrogens and adding cyclic compounds to the ends, resulted in the greatest increase in binding affinity to EGFR. Rigidifying linkers and adding O-H groups allowed for the decreased inhibition of hERG, a protein involved inducing cardiotoxic effects. These findings may lead to further optimization of anticancer drugs and provide a computational strategy for drug design.

Room: Math Study Area
1:40p.m. – 2:05p.m.

Classifying Variable Stars with Gaia Color-Magnitude Diagrams
Presenter: Xander Hall, Illinois Math and Science Academy
Mentor: Adam Miller and Aaron Geller, Northwestern University, Nicholas Easton, Case Western Reserve University
Abstract:
The Large Synoptic Survey Telescope (LSST) is an 8.4 m telescope in Chile. It will observe ~37 billion objects in the night sky and, of these objects, more than 20 million will exhibit significant brightness variations, known as variable stars. Efficient algorithms are needed to classify the different categories of variable stars to better understand different aspects of Astrophysics. To improve the automated classification of variable stars, we have started a citizen science Zooniverse project, Stellar Sleuths. The data given is in the form of light curves (stellar brightness versus time) from the Asteroid Terrestrial-impact Last Alert System (ATLAS), and they can be used to determine if a star shows periodic variations in brightness. However, there is additional information (such as the temperature of a star) that can be used to aid the classification process. In this project, we have experimented with the addition of supplemental information to add to the light curves for classification. With data from Gaia, a space-based telescope with an unprecedented ability to measure precise distances to stars, we place hundreds of millions of additional (normal) stars on the color-magnitude diagram (CMD) as a reference to compare with a given variable star. Prior to April 2018, for many of these stars, this information was poorly unknown. Gaia distance measurements allow us to determine the intrinsic brightness of the stars that it observes. We find that CMDs significantly improve our ability to classify different variable stars.

Room: Academic Pit
2:10p.m. - 2:35p.m.

CRISPR knockout of the DUB OTUD6B in lung cancer cells
Presenters: Nayonika Roy, Miriam Franks, Suhitha Irukulla
Research Mentor: Dr. Maurizio Bocchetta, Loyola Medical Center
Abstract:
Deubiquitinases (DUBs) are crucial determinants of protein stability, localization, complex formation and activity within cells (1). The OTUD6B DUB has been previously linked to cell growth and proliferation (2). More specifically, the isoform OTUD6B-2 may promote protein synthesis and DNA synthesis through deubiquitination of c-Myc (2). We established OTUD6B-knockout A549 and H1299 non-small cell lung cancer (NSCLC) cell lines to determine how OTUD6B contributes to the malignant potential of cancer. To delete OTUD6B expression, we utilized clustered regularly interspaced short palindromic repeats (CRISPR) technology, using short RNA guides to direct an endonuclease (Cas9) to specific sites on genomic DNA (3). Our approach involved double nicking/homologous recombination insertion (4) of an antibiotic resistance cassette into the OTUD6B exon IV.

Room: Café
2:10p.m. - 2:35p.m.

Diagnostic Imaging and Therapy of Amyloid Beta Oligomers
Presenters: Nafay Abdul and Sophie Pribus
Research Mentors: Mrs. Kirsten Viola, Northwestern University
Abstract:
One of the largest improvements in the diagnosis of Alzheimer's disease (AD) has been the use of in vivo imaging methods on various species to detect the presence of amyloid fibrils. However later studies have shown that these fibrils are not closely linked to the development of the disease. Current research suggests that early stage biomarkers which instigate memory loss consist of Aβ oligomers (AβOs). AβOs accumulate early in AD and experimentally cause memory dysfunction and major cellular pathologies (e.g., tau abnormalities, synapse loss, neurological damage, etc.). Thus, AβOs are widely regarded as the isoform of Aβ responsible for AD pathology.

A valuable and important resource currently unavailable to clinicians and researchers is a means to image buildup of AβOs in vivo. Currently, MRI is used to quantify brain volume or measure brain metabolism. Available probes identify amyloid plaques and are not useful for imaging AβOs. With an AβO probe it would be possible to correlate AβO buildup with resulting cognitive pathology, providing a new means to investigate the AβO hypothesis and to assess the effectiveness of new drugs.

AβOs are now regarded as one of the first toxins to appear in disease progression, and they provide an excellent target for early diagnostic imaging. Our findings suggest that the AβO-targeted probes are not only useful for the early diagnosis of AD, but also for tracking the effectiveness of new drugs. Recent finding also suggest these probes are themselves therapeutic. Our long-term goal is to develop a diagnostic for early prodromal detection of AD and for evaluating the effectiveness of new drugs related to AD onset.

Room: IN2
2:10p.m. – 2:35p.m.

Cell Specific Pallidal Control of Cortical Striatal Input
Presentor: Shubha Verma
Mentors: Harry Xenias, Ph.D., Savio Chan, Ph.D., Northwestern University
Abstract:
The basal ganglia are a collection of brain nuclei involved in sequenced movements as well as learning goal-directed behaviors, but it is poorly understood. I researched the inhibitory pathway between the external globus pallidus (GPe) and the dorsal striatum (dStr). Over 95% of the cells composing the striatum are of two classes: direct pathway SPNs (dSPNS) or indirect pathway SPNs (iSPNS), which respectively facilitate or inhibit movement. Direct pathway SPNs and indirect pathway SPNs contain different receptors, D1 and D2 receptors, respectively. We used naïve and 6-OHDA lesioned Npas1-Cre transgenic mice in our studies to compare a healthy brain to the Parkinson's model. By using the whole-cell patch clamp technique to inject the SPNs from the dStr with fluorescent dye while electrophysiologically recording the inputs of the GPe to the SPNs, we studied the synaptic contacts of the inputs using a confocal microscope. After collecting images from the confocal microscope, I analyzed them using FIJI Image-J software. My findings showed that in the naïve model, the iSPN input to the dStr was greater than the dSPN input. However, in the lesioned model, the input of both the iSPNs and the dSPNs was relatively similar. This work will help us further comprehend the pathogenesis of Parkinson's Disease.

Room: Lecture Hall
2:10p.m. – 2:35p.m.

The Pathological Interaction Between Alzheimer's Disease and Osteoporosis in 5xFAD Model
Presenter: Shruti Shakthivel
Research Mentor: Dr. Ryan Ross, Rush University
Abstract:
Alzheimer's Disease (AD) and Osteoporosis are common degenerative diseases of aging. AD has been considered a risk for osteoporosis and previous studies have shown that patients with AD have an increased risk for hip fractures which are the result of osteoporosis, suggesting a link between reduced bone mass and AD. This experiment studied the 5xFAD mouse model which recapitulates many AD-related phenotypes. The objective was to compare the bone mass of 5xFAD mice with AD-like phenotypes to mice without AD. The results demonstrate that 5xFAD mice have a progressive loss of bone mass as they age. Although previous papers have denoted similar results in another AD mouse model, Tg2576, this is the first time these results were shown in the 5xFAD mouse model. As each mouse model of AD recapitulates a different aspect of the disease, these findings can help narrow down what connects osteoporosis and AD. The findings confirm that AD mice have significantly reduced bone mass, consistent with the development of osteoporosis. The substantial change in bone mass over time between the 5xFAD mice and Wild-Type mice suggests that the disease's effects are age-dependent.

Room: Library
2:10p.m. – 2:35p.m.

Using Initial State Radiation (ISR) Jets for SUSY Search
Presenters: Emily Sallenback and Bert Cao
Mentors: Dr. Richard Cavanaugh and Dr. Zhenbin Wu, Fermi National Accelerator Lab
Abstract:
To search for the hypothesized SUSY particles, physicists have to create algorithms or cuts to separate signals from the unwanted background events. Cuts are easy to apply to a dataset, but are not always very efficient at selecting the signal being analyzed. In this study, we analyzed the plausibility and effectiveness of using ISR jet pseudorapidity and ISR jet Pt cuts on the T2tt signal sample from the CMS detector to separate the signal from the background. After graphing the Pt and pseudorapidity per event graphs, we concluded that an ISR jet Pt cut would be an effective cut, but and ISR pseudorapidity cut would not be effective. We determined that an ISR jet Pt cut around 350 GeV would be effective at increasing the ratio of signal events to background events because below 350 GeV, there are significantly more background events than signal events. ISR jets appear in a large amount of particle interactions, so although our findings only are for the T2tt signal, it is highly likely that these findings could be applied to other signals that are being analyzed for the search for supersymmetry.

Room: Math Study Area
2:10p.m. – 2:35p.m.

Classifying Generalized Symmetric Spaces for Unipotent and Semisimple Elements in SO(3,p)
Presenters: Hanson Hao, Jake Sutter
Mentor: Dr. Ellen Ziliak, Benedictine University
Abstract:
In this project, we look at the Special Orthogonal group of 3x3 matrices over a finite field, denoted SO(3,p). In particular, we focus on classifying the generalized symmetric spaces, which are defined by an involution f:SO3,pSO3,p such that ffM=M
for these matrices. We begin by explaining what types of involutions exist for our group, and once those involutions are established, we classify two important spaces: the Extended Symmetric Space R and the General Symmetric Space Q. We describe these spaces for the two isomorphy classes of involutions (building off of Benim et al.) through counting arguments, in which we split R and Q into unipotent and semisimple cases. Some counting arguments are established for the size of Ru, Qu, and Rss (unipotent matrices in R, unipotent matrices in Q, and semisimple matrices in R, respectively). Further progress can be made on verifying our other conjectures and generalizing our results to field extensions. Applications of our research can be seen in physics, where the SO(3,p) matrices are particularly effective at describing the effects of rotation and spin.

Student Presentation Reference List

Last Name	First Name	Presentation Number Session – Start – Room	SIR Poster Reference
Abdul	Nafay	III- 2:10pm- Café	c11
Adams	Mara	I- 10:05am- A113	b01
Adhikari	Shikha	I- 9:45am- B133	b03
Adivi	Vibhav	II- 11:25am- A121 -2)	
Agarwal	Ayush	I- 10:05am- A149	b30
Alexandria-Strong	Maxine	I- 10:05am- A113	b01
Almousawi	Mohamad Hasan	II- 11:25am- A155 -2)	
Apavaloaiei	Eliza	I- 9:45am- B116	b02
Asllani	Klaybis	I- 9:45am- A147	
Baffoe	Peter	I- 9:45am- B125	b35
Banerjee	Pouravi	I- 9:45am- B133	b03
Barac	Milica	II- 10:45am- A115	b52
Berthold	Zoe	I- 9:45am- IN2	
Bhalla	Pratibha	I- 10:25am- A117	b41
Bhaskar	Shivang	I- 9:45am- A155	b13
Blad	Evan	I- 10:05am- A147	b49
Bridges	Chris	II- 11:25am- B133	b25
Calhoun	Aaron	I- 9:45am- A115	
Cao	Bert	III- 2:10pm- Library	c08
Casey-Fusco	Micah	II- 10:45am- IN2	
Chalasani	Saivasudha	II- 10:45am- A155	b04
Charlotte	Graves	I- 9:45am- A113	
Chen	Alec	II- 11:25am- A121 -1)	
Chen	Allen	I- 10:25am- A115	b51
Cheruku	Samira	II- 10:45am- A121	b05
Coates	Trinity	I- 10:05am- IN2	
Crews	Isaiah	II- 10:45am- IN2	
Daggett	Hannah	I- 9:45am- A119	
Dalvi	Saachi	I- 10:25am- B133	b06
Daniels	Alyssa	I- 10:05am- B133	b07
Deng	Alison	II- 11:25am- A115	b47
Depaz	Alana	I- 10:25am- A113	b08
Dexter	Grant	II- 11:05am- A149	b09
Domowicz	Alex	I- 9:45am- A147	
Dong	Jay	II- 11:05am- B108 -2)	

Last Name	First Name	Presentation Number Session – Start – Room	SIR Poster Reference
Du	Andrew	II- 11:25am- A119	
Du	Scott	II- 11:25am- A115	b47
Edassery	Sonia	II- 10:45am- A115	b52
Elkin	Nikita	I- 10:25am- A147	b21
Ellington	Rebecca	I- 10:05am- B133	b07
Errampalli	Eric	I- 10:05am- A115	b10
Federici	Grace	II- 10:45am- B125	
Fowler	Ian	II- 10:45am- IN2	
Franks	Miriam	III- 2:10pm- AC Pit	c12
Gandhi	Akash	I- 10:25am- A155	b11
Ganesan	Ishaar	II- 11:25am- A151	b17
George	Faith	II- 11:05am- B133	b12
Gonda	Emily	II- 10:45am- A147	b34
Gonzalez	Alexandra	II- 11:05am- B116	b26
Gonzalez	Diana	I- 9:45am- A155	b13
Gorevoy	Eden	I- 10:05am- A155	b14
Gumpula	Kaushal	I- 10:25am- A147	b21
Gupta	Nikhilesh	II- 11:25am- A123 -1)	
Hahamy	Madison	II- 11:05am- A147	b32
Hall	Xander	III- 1:40pm- Math Study	c01
Halliman	Matthew	I- 10:25am- IN2	
Hamayat	Maahum	I- 10:25am- B133	b06
Hao	Hanson	III- 2:10pm- Math Study	c02
Helmold	Ben	I- 9:45am- A123	
Hendrix	Meghan	I- 9:45am- B108	
Hokinson	Matt	I- 10:05am- A147	b49
Homecgoy	Ashley	II- 10:45am- IN2	
Hong	Jerry	I- 9:45am- A155	b13
Hudelson	Ethan	I- 9:45am- A119	
Ichhaporia	Rustom	I- 10:05am- A147	b49
Irukulla	Suhitha	III- 2:10pm- AC Pit	c12
Jagusah	Ishanpepe	I- 9:45am- A113	
Jann	Janna	II- 10:45am- B108 -2)	
Jasthi	Bhavya	II- 10:45am- B133	b15
Jayaraman	Ajay	I- 10:25am- B108 -2)	
Karan	Meghana	I- 10:05am- B115	b16
Kaur	Mehr	I- 10:05am- B110 -1)	
Knutson	Max	I- 10:25am- B110	
Kovach	Torin	II- 11:25am- A151	b17

Last Name	First Name	Presentation Number Session – Start – Room	SIR Poster Reference
Kuzmina	Elizaveta	I- 9:45am- B133	b03
Lamptey	Ann	I- 9:45am- IN2	
Leano	Kurt	II- 11:25am- A113	
Lee	Daniel	II- 11:05am- A147	b32
Lee	Matthew	II- 11:25am- A119	
Lee	Megan	II- 10:45am- B116	b18
Lee	Nathan	I- 10:25am- IN2	
Lennox	Andrew	II- 10:45am- IN2	
Levine	Jacob	II- 11:05am- A151	b19
Li	Mingyang (Lily)	I- 10:05am- B108 -2)	
Li	Patrick	I- 10:05am- A117	b54
Lietz	Thalier	II- 11:25am- A147	b40
Light	Abigail	I- 10:05am- IN2	
Lima	Louise	III- 1:40pm- IN2	c03
Lin	Allia	I- 9:45am- A119	
Liu	Alice	III- 1:40pm- IN2	c03
Liu	Winny	I- 10:05am- B108 -1)	
Lu	Arthur	II- 11:05am- A151	b19
Lundwig	Marcus	I- 9:45am- A147	
Maddali	Neha	I- 10:25am- B133	b06
Maganti	Aneesh	II- 11:25am- A155 -1)	
Mallik	Ayan	II- 10:45am- A149	b50
Mason	Rachel	I- 9:45am- B116	b02
Maxwell	Carter	II- 10:45am- IN2	
McBride	Micah	II- 10:45am- A119	b55
McKelvie	Michael	I- 10:25am- A149	b48
McKibben	Vincent	I- 9:45am- A117	
Meek	Rylie	II- 11:05am- A147	b32
Meng	Jodie	III- 1:40pm- Library	c04
Meng	Sabrina	I- 10:25am- B115	b20
Milavec	Lucas	II- 10:45am- IN2	
Mitchell	Zoe	I- 9:45am- A151	b53
Moreno	Rachel	I- 9:45am- B108	
Mou	Timothy	I- 10:25am- A147	b21
Mufti	Maryam	II- 10:45am- A151	b22
Murphy	Elizabeth	II- 11:05am- B108 -1)	
Nagarathnam	Manikandan	I- 9:45am- A115	
Nair	Krishnachandra	II- 10:45am- B108 -1)	
Nikam	Ishan	I- 10:25am- B108 -1)	

Last Name	First Name	Presentation Number Session – Start – Room	SIR Poster Reference
O'Brien	Kaleigh	I- 10:25am- A119	b23
Oros	Jessica	III- 1:40pm- AC Pit	c05
Osar	Rebecca	II- 10:45am- A149	b50
Pan	Lily	II- 11:25am- A147	b40
Panda	Sidhartha	I- 10:25am- A151	b24
Park	WonJun	I- 9:45am- B110	
Patel	Nilan	I- 9:45am- A155	b13
Pergrossi	Vincent	II- 11:25am- B133	b25
Phillips	Ethan	I- 9:45am- B108	
Pickett	Lauren	I- 10:05am- B125	b43
Pribus	Sophia	III- 2:10pm- Café	c11
Ptak	Tyler	I- 9:45am- A115	
Raghavan	Akshaya	II- 10:45am- A147	b34
Ramaraju	Bala	II- 11:25am- A123 -2)	
Reddy	Chetan	I- 10:05am- A149	b30
Reiter	Jay	I- 10:25am- A149	b48
Ren	Jimmy	III- 1:40pm- Lecture Hall	c06
Revilla	David	II- 11:05am- B116	b26
Rodrigues	Aaron	II- 11:25am- A113	
Romanov	Katerina	I- 10:05am- B125	b43
Roy	Nayonika	III- 2:10pm- AC Pit	c12
Ryou	Jaimie	I- 9:45am- A123	
Sallenback	Emily	III- 2:10pm- Library	c08
Sanchez	Amayrani	II- 10:45am- A113	b37
Sanchez	Natalie	I- 9:45am- IN2	
Shah	Moksh	I- 10:25am- A123	b27
Shaikh	Faris	I- 10:25am- A115	b51
Shakthivel	Shruti	III- 2:10pm- Lecture Hall	c07
Shapiro	Brennan	I- 10:25am- IN2	
Sharma	Anisha	I- 10:25am- A149	b48
Shwatal	Austin	I- 10:05am- A151	b28
Si	Katherine	II- 11:05am- B125	b29
Sia	Michelle	III- 1:40pm- Café	c09
Singh	Vidhi	II- 10:45am- IN2	
Sleyko	Grace	I- 9:45am- B108	
Smith	Harry	I- 10:05am- A147	b49
Sobczynski	Alexandra	I- 9:45am- A117	
Somalwar	Amit	III- 1:40pm- Café	c09
Son	Ian	I- 9:45am- A115	

Last Name	First Name	Presentation Number Session – Start – Room	SIR Poster Reference
Soto	Daniel	I- 10:05am- B110 -2)	
Springer	Emily	II- 10:45am- A147	b34
Sreenivas	Bharath	I- 10:25am- A123	b27
Stanecki	Dana	II- 11:05am- A123 -2)	
Sudhakar	Trisha	II- 11:05am- B133	b12
Sunkara	Suraj	I- 9:45am- A149	
Sutaria	Yatri	II- 11:05am- A123 -1)	
Sutter	Jake	III- 2:10pm- Math Study	c02
Taiwo	Bopoade	I- 9:45am- B125	b35
Talasu	Saisupritha	II- 11:25am- A117	b36
Talusan	Ryan	I- 9:45am- A149	
Tarafdar	Ishani	II- 11:05am- A119 -2)	
Tatum	Andrew	I- 9:45am- A119	
Tenedor	Mary Ashley	II- 10:45am- A113	b37
Teng	Chris	II- 11:05am- A117	
Tetali	Vaishnavi	II- 10:45am- A117	b39
Thakkar	Krishna	II- 11:05am- A119 -1)	
Thatte	Shvetali	I- 10:05am- A123	
Thekiniath	Roshan	I- 9:45am- B110	
Tin	Ashley	I- 10:05am- A155	b14
Tse	Ethan	II- 11:05am- A113 -2)	
Tummarakota	Vinay	II- 11:25am- A147	b40
Un	Anthony	I- 9:45am- A123	
Upadhyay	Rohan	II- 10:45am- A123 -1)	
Vaidya	Aryan	II- 11:05am- A113 -1)	
Vasi	Zahra	II- 11:05am- A155	b38
Vayninger	Michael	II- 11:05am- A149	b09
Vegesna	Tanmayee	I- 10:25am- A117	b41
Velagapudi	Tejo	I- 9:45am- B110	
Verma	Shubha	III- 2:10pm- IN2	c02
Vyas	Aabha	II- 10:45am- B125	
Walia	Aryan	II- 11:05am- B133	b12
Wang	Michelle	I- 10:05am- A119	b42
Wang	Sydney	II- 11:05am- A115	b46
Warcup	Kara	I- 10:25am- B110	
Warikoo	Gowri	I- 10:05am- B125	b43
Whitmore-Wilson	Tyrone	II- 11:25am- A149	b56
Wolff	Nicole	II- 10:45am- B115	b44
Woods	John	II- 10:45am- A149	b50

Last Name	First Name	Presentation Number Session – Start – Room	SIR Poster Reference
Wulffraat	Grace	I- 10:05am- IN2	
Xiao	Doreen	II- 10:45am- IN2	
Yang	Breanna	II- 11:25am- B125	b31
Yoon	Eunice	I- 9:45am- B115	b45
Yow	Sarah	II- 10:45am- B116	b18
Yue	Grace	I- 10:05am- A149	b30
Zheng	Athena	II- 11:05am- A115	b46
Zheng	Jolin	II- 11:05am- B116	b26
Zhong	Alex	II- 10:45am- A119	b55

Mentor List | Business Internship

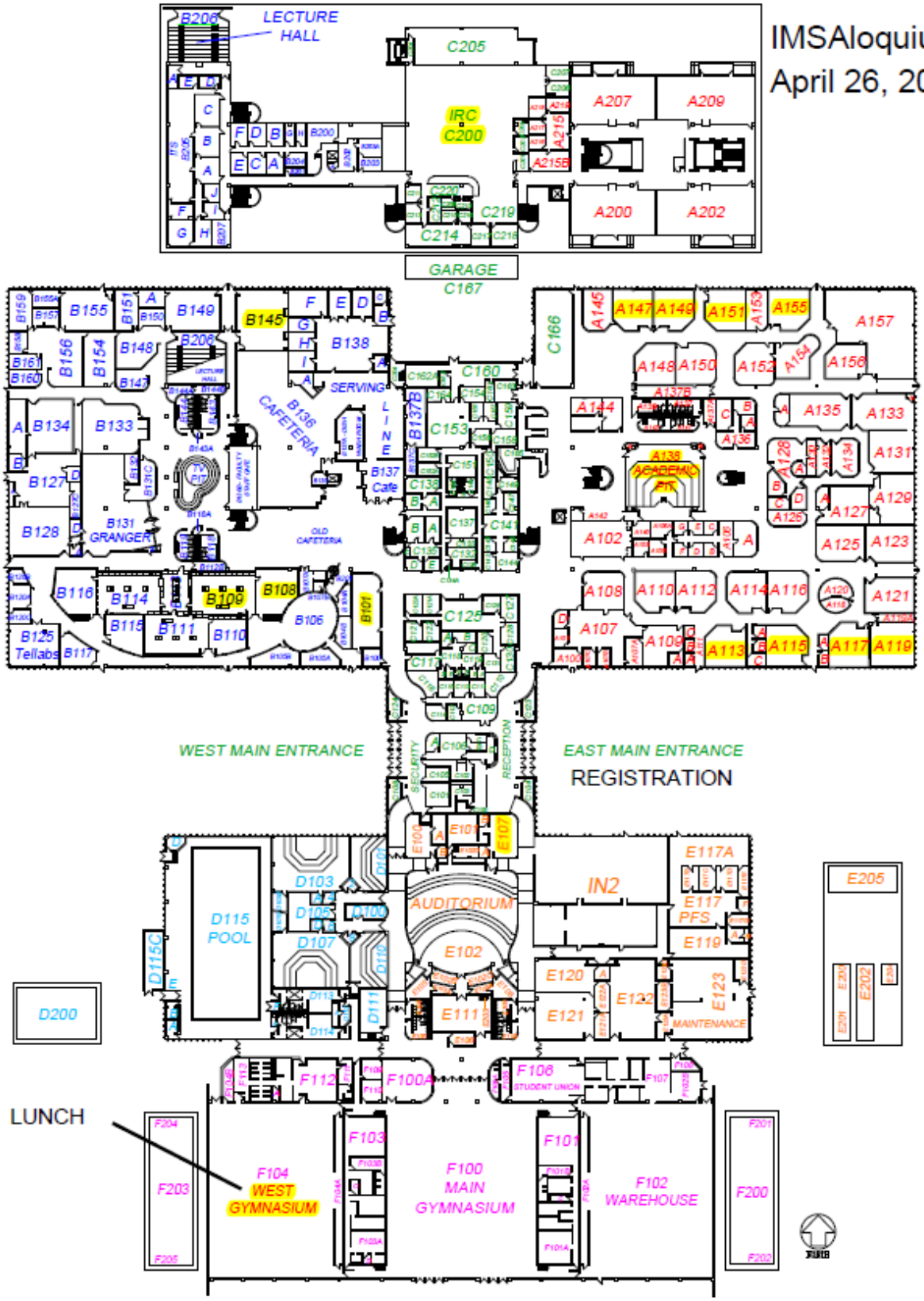
Dealer Fox LLC.	Dan Trinidad
CleanCio Corps	Rocio Lane
Interperter TAP	Victor Abundi Jon Morse and Victor Arellano
AutoPair	Ken Koger
Cab Dash	Jeff Talamantez Joe Talamantez
CancerIQ	Christopher Bun Ethan Kent Andrew Tang
Aurora Collective/City Segment LLC	Brandon Lyon
IMSA Innovation Center	Dr. Kelly Page
LEAP Innovation LEAP Innovation LEAP Innovation	Susan Liu Jake Williams Chris Liang-Vergara
VisMed3D/Symptomatic	Dima Elissa
Course Stars LLC	Jill Ko
Enovation/Cleantech	Linda Zabors

Mentor List | Student Inquiry and Research

Ball Horticultural	Jayaraj Alappat
Benedictine University	Tiara Perez-Morales
Benedictine University	Ellen Ziliak
Chicago Cubs	Christopher Jones
Chicago Proton Center	Steven Laub
Fermi Lab	Jim Annis
Fermi Lab	Ting Li
Fermi Lab	Brian Nord
Fermi Lab	Sam Posen
Fermi Lab	Lenny Speigel
Fermi Lab	Thomas Strauss
Fermi Lab	William Wester
IL Institute of Tech.	Lulu Kang
IMSA	Angela Ahrendt
IMSA	Sowmya Anjur
IMSA	Adrienne Coleman
IMSA	Peter Dong
IMSA	Anthony Fouad
IMSA	Eric Hawker
IMSA	Patrick Kearney
IMSA	Laura Kopff
IMSA	David Lundgren
IMSA	Tom Meyer
IMSA	Sarah O'Leary-Driscoll
IMSA	Crystal Randall
IMSA	Claiborne Skinner
IMSA	Eric Smith
IMSA	John Thurmond
IMSA	Tracy Townsend
Loyola Medical	Maurizio Bocchetta
Loyola Medical	Monsheel Sodhi
Loyola Medical	Karen Visick
Morton Arboretum	Silvia Alvarez-Clare
Morton Arboretum	Chuck Cannon
Morton Arboretum	Christy Rollinson
North Central College	Frank Harwath
North Central College	James Kaduk
NIU	Timothy Hagen
NIU	James Horn
NIU	Narayan Hosmane
NIU	Holly Jones
NIU	Mel Lenczewski
Northwestern Univ.	Sui Huang
Northwestern Univ.	Thorsten Kahnt
Northwestern Univ.	Caroline Le Poole
Northwestern Univ.	Richard Miller
Northwestern Univ.	Bethany Perez White
Northwestern Univ.	Claus-Peter Richter
Northwestern Univ.	Arun Sharma
Northwestern Univ.	Marc Slutzky
Northwestern Univ.	Lisa VanWagner
Northwestern Univ.	Dileep Varma
Northwestern Univ.	Jane Wu
Northwestern Univ.	Harry Xenias
Northwestern Univ.	Yinan Zheng
Northwestern Univ.	Savio Chan
Northwestern Univ.	Randall Berry
Northwestern Univ.	Aaron Geller
Northwestern Univ.	Jens Koch
Northwestern Univ.	Kirsten Viola
Rush Medical	Costica Aloman
Rush Medical	Meghan Moran
Rush Medical	Ryan Ross
Toyota Tech. Institute	Matthew Walter

UIC	Naiche Adler
UIC	Robert Bruno
UIC	Richard Cavanaugh
UIC	Jonna Frasor
UIC	Piotr Gmytrasiewicz
UIC	Mohsen Issa
UIC	Irena Levitan
UIC	Ao Ma
UIC	Dolly Mehta
UIC	Laurie Quinn
UIC	James Radosevich
UIC	Deepak Shukla
University of Chicago	Zeray Alemseged
University of Chicago	Chufan Cai
University of Chicago	Chihway Chang
University of Chicago	Tong-Chuan He
University of Chicago	Jean Greenberg
University of Chicago	Marynia Kolak
University of Chicago	Karen Livescu

IMSAloquium
April 26, 2019



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