

جامعة نيويورك أبوظبي

NYU ABU DHABI



AY 21-22 UNDERGRADUATE RESEARCH REPORT

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OFFICE OF STUDENT RESEARCH
NYU ABU DHABI

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Since its inception, NYU Abu Dhabi has been at the forefront of ensuring research and creative experiences are hallmarks of an NYUAD education. These opportunities are embedded within a student's academic life and ensure a transformative educational experience.

Undergraduate students have the opportunity to participate in research projects alongside world-class faculty and researchers throughout the academic year and summer. The faculty serve as mentors, collaborators, and role models - and encourage students to become active investigators, turning their ideas into solid learning objectives and outcomes. The value and excitement of undergraduate research has blossomed over the years, resulting in more than 200 NYUAD students actively taking part in research each year. A number of programs are in place to support and encourage student research. The breadth of these research opportunities, many of which span the four years of undergraduate studies, allow our students to determine their areas of interest and to explore post-graduation plans.

This report showcases and celebrates some of the excellent undergraduate research work that has taken place over the year. As we emerge from the peak of the COVID-19 pandemic which resulted in a switch to virtual settings and reframing of entire research projects, we rejoiced in seeing global mobility become a possibility again. Our students worked around the world on life-changing research projects, such as developing technologies to turn waste into energy, working on platforms to help post-stroke patients regain writing skills, launching a nanosatellite full of experimental equipment to the International Space Station, assisting with the development of the first database of family businesses in the MENASA region, and surveying medicine shops in Ghana to predict the risk of future drug-resistant pathogen outbreaks.

Our students have shown their thirst for knowledge and an eagerness to push academic boundaries. Their accomplishments have in-turn led to publications in world-leading journals, presentations at prestigious conferences around the world, awards from regional and international research competitions, admission to the country's best graduate schools, and jobs in some of the most competitive industries.

The commitment and dedication of the remarkable faculty and researchers at NYUAD and beyond has made the accomplishments showcased within this report possible. I would like to acknowledge the work of the Office of Student Research's Faculty Committee, who advise on the office's programs, guidelines and new initiatives, and reviewed in excess of 150 research funding requests and fellowship applications. The Committee comprises of Andrea Macciò, Olivier Bochet, Pradeep George and Sarah Paul.

A special note of appreciation is extended to Vice Provost Martin Klimke and Vice Provost of Undergraduate Education Sunil Kumar, for their roles in overseeing the Office of Student Research over the year. I would also like to extend my gratitude to Vice Provost and Associate Vice Chancellor of Global Education and Outreach Carol Brandt, who for more than a decade has overseen the development of NYUAD's summer programs of experiential learning, serving more than 300 students in internships and undergraduate research each year.

Sincerely,

Farhana Goha

Head of Visiting Students Program and Student Research

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1. Student Research Programs by the Numbers
2. Research in the UAE
3. Research around the World
4. Post-graduation Research Fellowship Program
5. Faculty Supervisors



STUDENT RESEARCH PROGRAMS BY THE NUMBERS

SUMMER RESEARCH GRANTS

Offers competitive grants to support students across the divisions, who have secured summer research positions. Students may work on independent research projects or join existing faculty research projects.

100
STUDENTS
PARTICIPATED

CONFERENCE PRESENTATIONS

Students may apply for conference grants to enable them to present their research and creative works at conferences and exhibitions.

7
GRANTS
AWARDED

SUMMER RESEARCH ASSISTANTSHIP PROGRAM

Provides students the opportunity to assist faculty to advance their research projects through paid research work during the summer.

84
APPOINTED

RESEARCH ASSISTANTSHIP POSITIONS DURING THE ACADEMIC YEAR

Provides students the opportunity assist faculty to advance their research projects through part-time paid research work during the academic year.

651
POSITIONS

VISITING SUMMER UNDERGRADUATE RESEARCH PROGRAM

Offers the opportunity for NYU New York, NYU Shanghai, and external undergraduate students studying in UAE-based universities to take part in research during the summer, supervised by NYUAD faculty members and funded by the Office of Student Research.

23
STUDENTS
PARTICIPATED

VISITING UNDERGRADUATE RESEARCH ASSISTANTSHIP AND ART APPRENTICESHIP AWARDS PROGRAM

Students from NYU New York and NYU Shanghai who wish to build their research experience during a semester abroad may apply for competitive undergraduate research assistantship positions.

25
STUDENTS
AWARDED

POST-GRADUATION PRACTICAL TRAINING PROGRAM

Allows faculty to appoint NYUAD seniors graduating in May to work full-time on faculty research projects in the summer following their graduation.

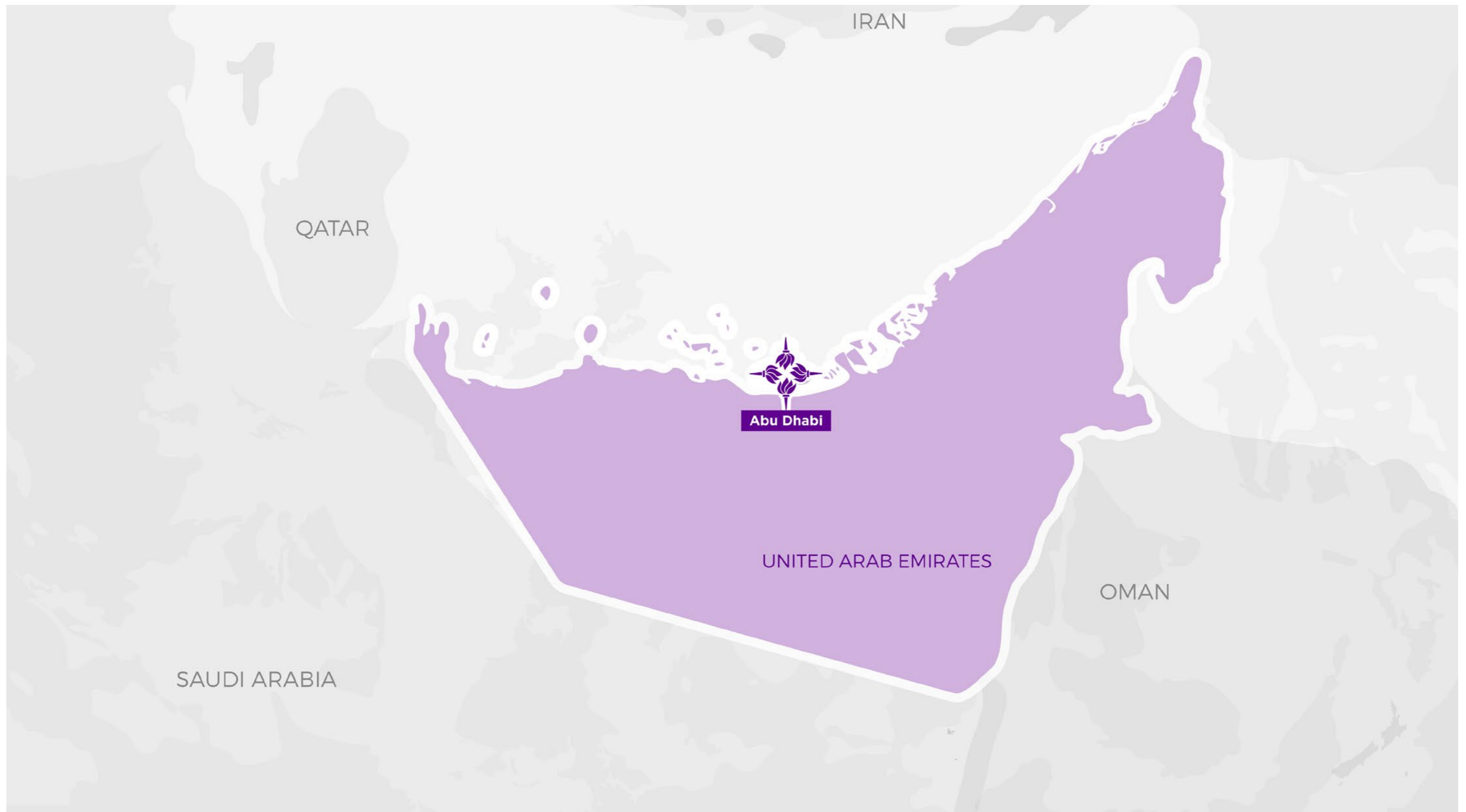
110
STUDENTS
PARTICIPATED

POST-GRADUATION RESEARCH FELLOWSHIP PROGRAM

Retains outstanding academic talent within the region by supporting a select cohort of exceptional NYUAD graduating seniors with a prestigious one-year research fellowship at NYUAD.

11
FELLOWS
SELECTED

RESEARCH IN THE UAE





**TSEDENIA
DENEKEW**

Major
Biology

Faculty Supervisor
Aashish Jha

EXAMINING DIVERSITY AND COMPOSITIONAL DIFFERENCES IN ORAL MICROBIOTA ACROSS SERUM CHOLESTEROL LEVELS IN THE EMIRATI POPULATION

Recent studies have demonstrated the oral microbiome's potential as a biomarker for Hypercholesterolemia, one of the most significant causes of cardiovascular disease in the Middle East.

In this study, baseline data was drawn from the UAE Healthy Future Study (UAEHFS) to examine the relationship between the oral microbiome (from mouthwash samples) and serum cholesterol in 2,716 Emiratis aged 18 years. Statistical analysis revealed a 26% prevalence of Hypercholesterolemia (31.2% and 18.5% in males and females respectively).

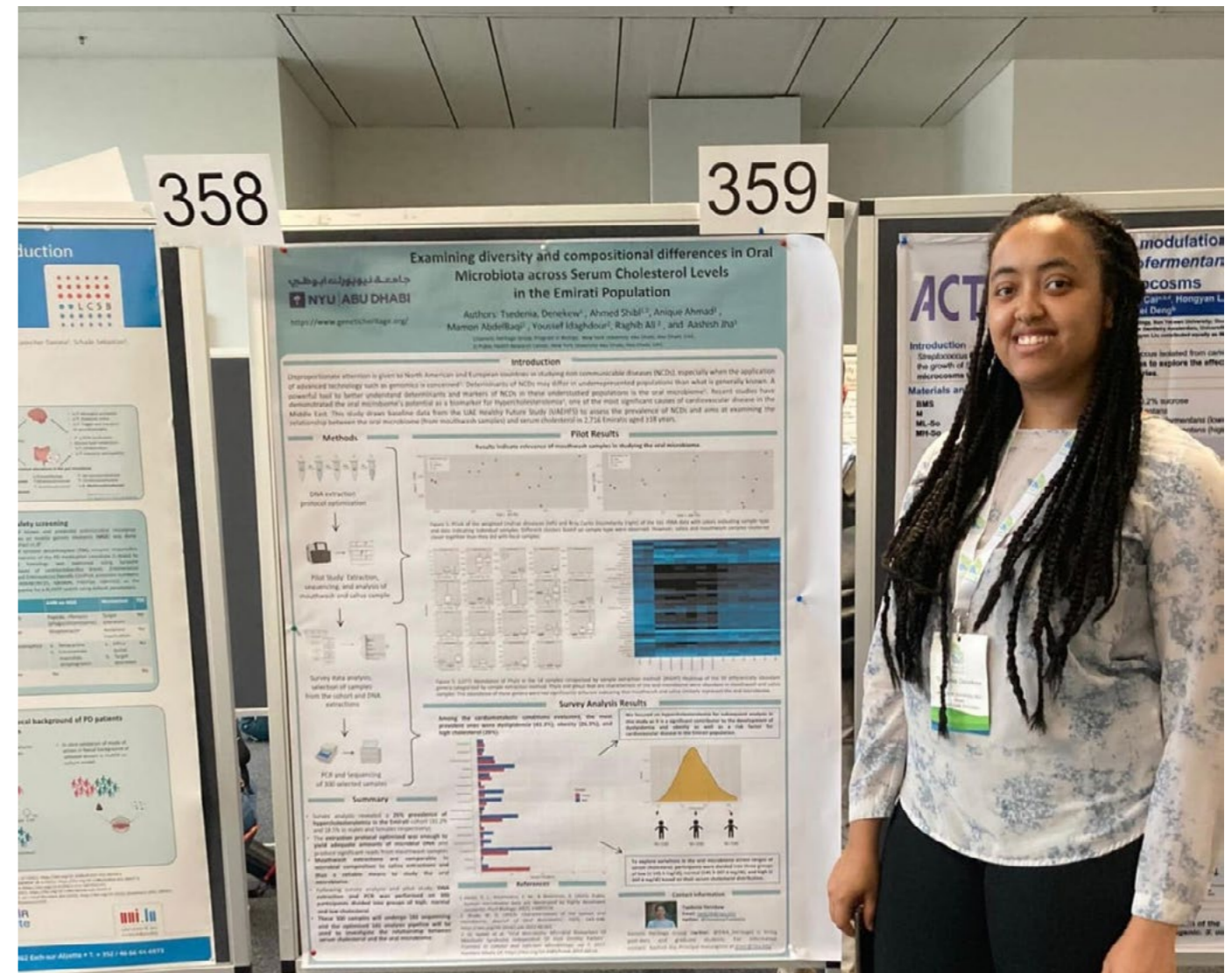
In a pilot study, where we collected mouthwash and saliva samples from five volunteers, we found that mouthwash samples differ in bacterial composition than both fecal and saliva samples, indicating their

relevance in elucidating the etiological role of the oral microbiome. To explore variations in the oral microbiome across ranges of serum cholesterol, participants were divided into three groups of low, normal, and high based on their serum cholesterol distribution. 300 (n=100 from each group) participants were selected after matching for confounding variables.

Genomic DNA from mouthwash samples was extracted from these participants and will be subjected to metagenomic and amplicon sequencing. Results from this study will contribute to our understanding of the relationship between the oral microbiome and metabolic disorders in the Emirati population.



Tsedenia performing DNA extractions from mouthwash samples to study the oral microbiome



Tsedenia presenting her Capstone thesis at the International Symposium for Microbial Ecology 2022 in Lausanne, Switzerland



Mark and Tsedenia, undergraduate students at NYUAD's Genetic Heritage Group, discussing computational methods to study allele-frequency data



**MARYAM
ALSHEHHI**

Major
Literature Creative Writing and
Political Science

Faculty Supervisor
Corinne Stokes



**KHALID
ELSHERBINY**

Major
Engineering

Faculty Supervisor
Rafael Yong-Ak Song

CURRICULUM DEVELOPMENT OF AN EMIRATI TEXTBOOK

My research involved exploring different methods to optimize teaching students the Emirati dialect. Through gaining an in-depth understanding of the several steps in curriculum development (the curriculum development model), I was able to develop the teaching curriculum for the Emirati dialect class. This development includes editing and adding learning materials, interactive activities and examples, and

independent methods to help participants reach an advanced level in Emirati dialect.

My research work involved performing searches and capturing links and screenshots from news and social media, distributing materials within appropriate folders and documents, recording audio/video, scripting dialogues, and creating games, worksheets, or special activities.



I've been passionately teaching students the Emirati dialect since my first year NYUAD through different forms. Working with various cultural groups, I recognized that students were interested in learning more about the Emirati culture though its dialect without being committed to a credit-bearing class. This inspired me to establish Ramsatna, a collaboration between the Arabic Studies Program and AlGhafah at NYUAD that offers a platform for Arabic learners to practice the Emirati dialect with native speakers, and to better understand the Emirati culture through language in the form of one-hour conversational sessions. I was truly intrigued by the world of teaching and curriculum development, which resulted in this summer assistantship under the mentoring of Professor Stokes.

A MICROFLUIDIC DIAGNOSTIC CHIP, ISSAC (INCREASING SENSITIVITY AND SPEED OF ASSAYS WITH CONCENTRATOR), FOR EARLY DISEASE DETECTION

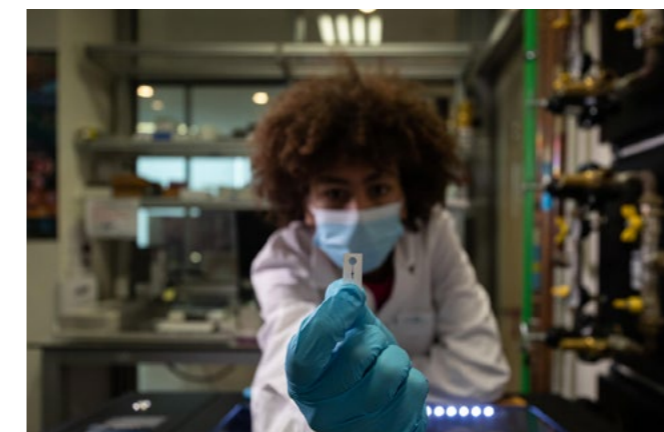
Cancer is dangerous, but what if we were able to detect cancer at an earlier stage than we ever thought possible while maintaining a low cost? What if we were also able to detect viruses like COVID-19 at an earlier stage than PCRs and other conventional methods are capable of?

The COVID-19 pandemic's long-lasting impacts, the potential for the revival of cases due to new variants, and the potential emergence of new pandemic-causing viruses call for an new point-of-care diagnostic chip that allows faster and sensitive detection at lower cost.

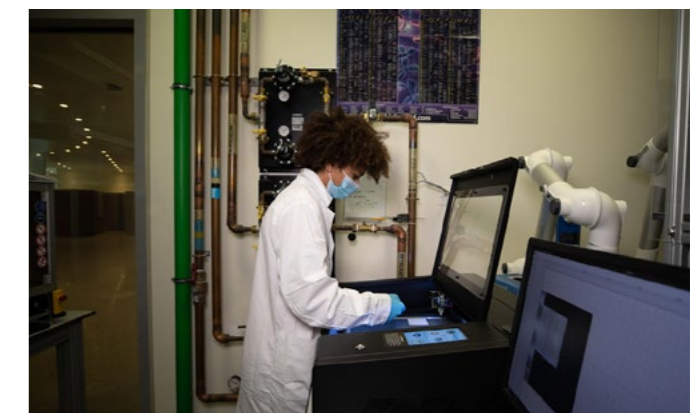
The goal of my summer project was to design and manufacture a microfluidic chip that is simple to fabricate and portable to be carried around, and allow easier sample collection with high disease detection sensitivity.

Using ion concentration polarization (ICP), the microfluidic chip preconcentrates target molecules electrokinetically from a liquid sample in a few picoliter volume next to the molecular capture probes. This concentration of molecules makes the detection more sensitive and rapid, thus enabling early detection of diseases. To ensure low cost of manufacture, the microfluidic chip was made a of two polyester substrates with an adhesive double-sided tape in between.

After laser cutting and printing of an ion-selective material, the three layers were simply stacked and bonded together. The new fabrication method with the laser-cut polyester film allowed a simple and rapid manufacture of a microfluidic electrokinetic concentrator chip that has the potential to become the next point-of-care diagnostic chip and combat future pandemics.



Inspecting the microfluidic chip



Preparing the laser cutter to start cutting the adhesive layer



AARUSHI PRASAD

Major
History

Faculty Supervisor
Rosemary Byrne



RAHUL SINGH



**NAUSHEEN
AIJAZ NAKHAWA**

Major
Electrical Engineering

School
BITS Pilani Dubai

Faculty Supervisor
Khalil Ramadi

RELIGIOUS FREEDOM AND THE COURT: A COMPARATIVE

I conducted a pedagogical compilation and analysis of freedom of religious judgements delivered by national courts and the sociological repercussions stemming from these pieces of law.

My focus was directed towards mapping the legal trajectory that these cases followed within national legal systems and how the verdicts ultimately shaped attitudes, beliefs and reactions of the general populace in the region. Ranging from the S.A.S v. France case in the European Court of Human Rights to the landmark hijab case in the Karnataka High Court, India, I studied the legal tools and arguments that were employed by both parties in the case and how social realities moulded these attributions.

Using this legal foundation as my baseline, I studied media narratives surrounding these cases and how the persuasiveness of these legal characterizations generated public sentiments. Specifically, I was interested in how complex legal arguments were broken into nugget-size sound bites, and how the

public then digested these verdicts and formed opinions.

Under Professor Byrne's guidance, I developed the habit of reading the judgement not in isolation but in conjunction with the framing of facts, and comparing it to judgements delivered by lower courts.



Seat of the European Court of Human Rights (ECtHR) in Rome, Italy

“As an aspiring attorney, this opportunity forced me to make headway in reading the fine letter of the law. Since I am a proficient French speaker, I could read the cases from francophone countries like Tunisia and Algeria not only in their translated English versions but the original French dicta as well. This intellectual exercise provided me unparalleled exposure to understand the law and judicial system, not from a universal lens but through a contextual pipeline.”

RFID ANTENNAS FOR INGESTIBLE BIOELECTRONICS

Invasive medical procedures like esophageal pH tests are inconvenient and uncomfortable for the patients. A common aspect of these procedures includes a probe that is inserted into the abdomen or intestines through the esophagus or rectum respectively. Ingestible wireless capsule technology is a painless and novel diagnostic approach that assists in inspecting the gastrointestinal tract for various diseases like tumors, cancer, or internal bleeding.

Radio Frequency Identification helps in the wireless transfer of information using radio waves. We conducted research on wireless forms of

communication that can be used on ingestible electronics, in essence, we simulated, characterized, and tested antennas for an RFID system. We used Ansys HFSS to model the antennas. Laser Induced Graphene (LIG) was used to fabricate the antennas various materials. This requires just a CO2 laser, and is cheap and easy to scale.

The developed antennas are flexible, and hence can be conformed based on the environment. The plan further is to procure an RFID chip and integrate it with the antennas to complete the system. RFID-based systems could be one way to communicate with implanted medical devices in the body.



Rahul measures the conductivity of the flexible LIG antenna

AARON MARCUS-WILLERS

Major
Music

ENID MOLLEL

Major
Music

GAURI KEDIA

Major
Interactive Media and Visual Arts

PRAJJWAL BHATTARAI

Major
Computer Science and Mathematics

Faculty Supervisor
Carlos Guedes



MATHILDE SIMONI

Major
Computer Science and
Mathematics

Faculty Supervisor
Dimitra Atri

MUSIC AND SOUND CULTURES PROJECT

NYUAD students Aaron, Enid, Gauri and Prajjwal were able to join forces as part of the PPTP program to work on different research projects for the Music and Sound Cultures (MaSC)'s research agenda.

Aaron Marcus-Willers worked on mixing, improving, and decoding ambisonic recordings for MaSC's ever-growing archive of taarab from Zanzibar and pearl diving music from Kuwait. Enid Mollel worked

on the Volume III of the Eisenberg collection and in generating metadata for the Basalama collection of recordings of compositions by Zanzibari composer Ally Salim Basalama. Gauri Kedia designed the interface for the Virtual-Reality browser of MaSC's digital compendium of music from the Western Indian Ocean. Prajjwal Bhattarai worked on the use of Transformers and deep learning in the generation of Carnatic-style rhythmic sequences.



Prajjwal, Gauri, Enid and Aaron in the MaSC Center

VISUALIZING AND CHARACTERIZING DISCRETE AURORAS ON MARS

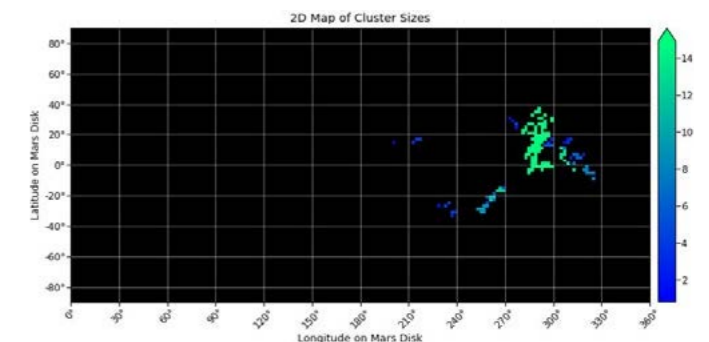
My summer research project aimed to visualize and analyze discrete auroras on Mars using the UAE's Hope mission dataset. The first phase of my work consisted in visualizing auroras from images captured by the EMUS (Emirates Mars Ultraviolet Spectrometer) instrument at the 130.4nm oxygen line, by applying logarithmic functions and choosing the appropriate range of intensity. These images were subsequently projected onto 2D maps with longitude and latitude grids.

The second phase of the research involved trying different data analysis approaches to automate the extraction and characterization of discrete auroral events, removing background noise from the observations.

Various combinations of image processing methods, statistics, and thresholds on altitude, intensity, and cluster size were used. This work will enable a

deeper analysis of auroras, including their geographic distribution on the Martian surface, their duration and occurrence frequency as well as their size, shape, and maximum intensity. It will help understand Mars' weather and upper atmosphere better.

Furthermore, it will enable to study potential correlations between auroras' locations on different orbits and the strong Martian crustal magnetic field.



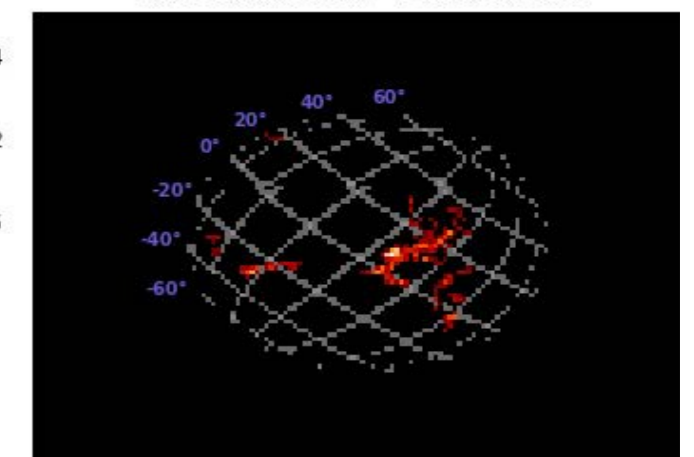
Orbit 83 18:43 band O I 130.4 triplet

Original Image - LOG Radiance



A sinuous aurora observed on Mars

Auroras and Grid - LOG Radiance





**ALIA
AL JANAHI**

Major
Mechanical Engineering

Faculty Supervisors
Martin Klimke and
Israa Mahjoub

FAMILY BUSINESS HISTORIES

This summer, I worked on researching, drafting and writing online publications, as well as managing academic references. I was able to assist in building the first database/archive of family businesses in the MENASA region.

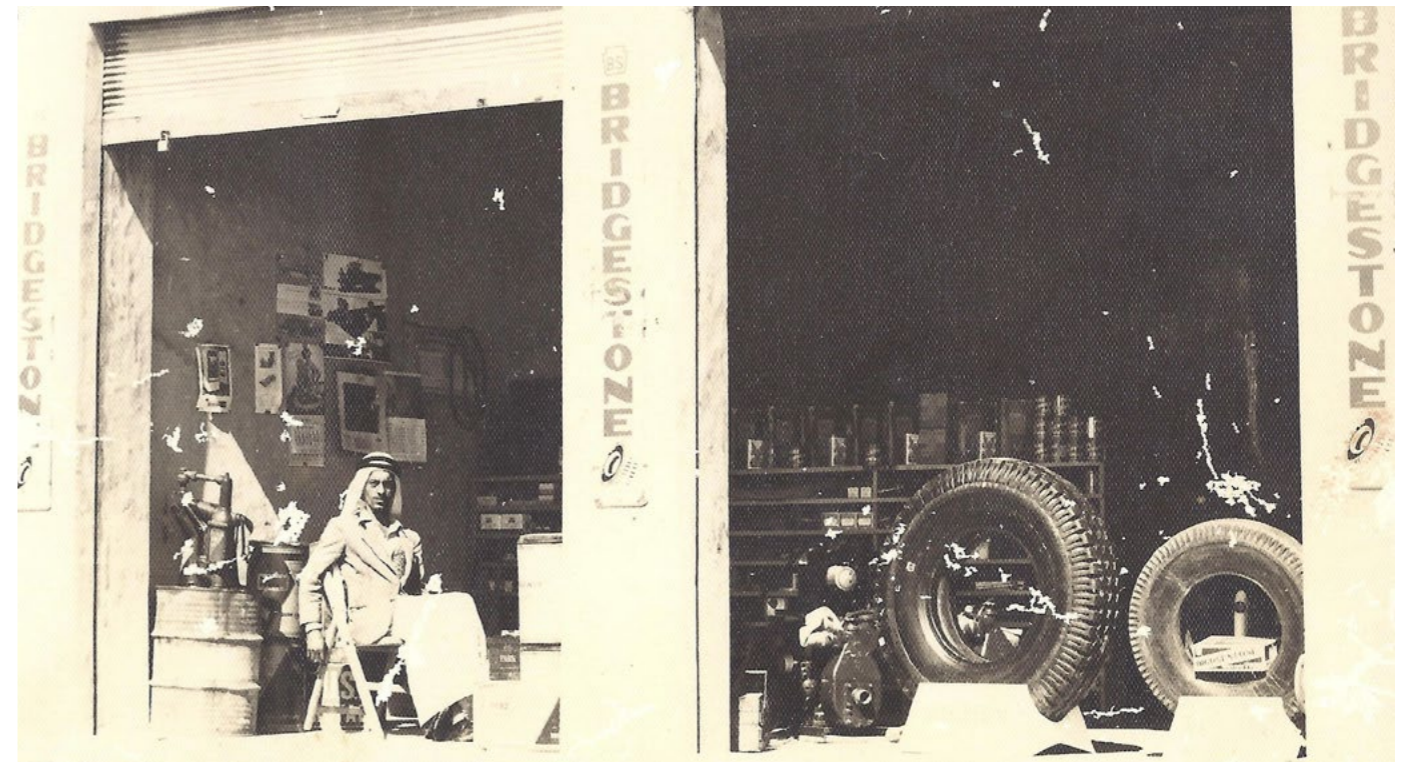
The project looks at the history of family businesses as an exceptional opportunity to gain insight into the economic and entrepreneurial history of the region. It feeds into my strong belief in the power of storytelling and how capturing the stories behind

leading regional family businesses can teach unique lessons. We examined reasons for the businesses' longevity, explored correlations between the founder stories and the business durability, and studied the different historical events that took part in the history of different businesses.

The aim is to highlight the legacy and economic impact of selected family businesses, and understand family business decision-making to develop models for the future.



Late H.H. Sheikh Zayed bin Sultan Al Nahyan with Mohan Jashanmal, second-generation member of the Jashanmal Group. Abu Dhabi, 1968



Founder Nasser Alserkal in the second showroom of Nasser Abdullatif Alserkal Est. in Jamal Abdul Nasser Square, Dubai. Undated. Source: Alserkal family

The FBH project provides a wonderful platform and opportunity for undergraduate students to gain research experience. As a unique public history research project which falls in the intersection of academia and the private sector, students can contribute with their skills in research and writing, archival research, database management, graphic design, website development, and social media content. Students' contributions constitute a valuable asset to the project as they work closely with the project team and partners to achieve the final vision of the respective research outcomes.

Martin Klimke

Principal Investigator, Family Business Histories Project



JAE HYUNG LEE

Major
Psychology and History

Faculty Supervisor
Christopher Bryan



YUKI LI

Major
Computer Engineering

Faculty Supervisor
Michail Maniatakos



MUSKAAN CHOPRA

Major
Economics

Faculty Supervisor
Torsten Figueiredo Walter

TEACHING THROUGH THE STORM: UNDERSTANDING EXPATRIATE TEACHER STRESS AND RESILIENCE DELIVERING EDUCATION DURING COVID-19

I assisted on a project which focused on understanding expatriate teacher stress and resilience throughout the COVID-19 pandemic.

The study collected physiological data in the form of ECG data to observe heart rate variability (HRV). The aim of the study was to observe different

physiological responses depending on levels of occupational stress and support in the workplace.

After receiving training to the HRV analysis software, I participated in ECG data cleaning and interpretation, as well as demonstration of reliability, and maintaining consistent data cleaning standards.



With the skills I gained from this experience, I hope to continue working on the Teaching, Learning, and Development Lab's different projects to expand my interest in educational and developmental psychology. This was a field I had just started to gain interest in, and I am therefore excited to learn more and see where it leads for future research opportunities.



REMOVING THE EFFECT OF MACHINE LEARNING BACKDOORS BY TRAINING WITH NOISY DATASETS

I learned what “backdoor attacks in neural networks” are by reading related references and then investigated how to implement this backdoor attack to DRL-based traffic controller. To understand the state-of-the-art backdoor defenses, I learned how to train DNN networks with provided traffic data. For my experiments, I intended to find the noise that can achieve a high mean square error for the trigger samples, but without affecting the mean square error of the clean samples to a large extent. By using TensorFlow, I added two hidden layers and the output layer.

Since I intended to study the difference between true values and predicted values, I chose to use mean square error as the loss function. I added both gaussian noise and uniform noise to the sample data to train the model. Then, I used sample data without noise to test the model and record the mean square errors of samples.

By adding weights and bias of the genuine model, I finetuned the model by using the training data (containing both genuine samples and trigger samples), so I obtained the backdoored model. After I obtained the model, I used SUMO to load this neural network to simulate the traffic condition. I tested my neural network to check whether it can run normally, or if there is collision or congestion.

ASSESSING THE QUALITY OF SURVEY AND ADMINISTRATIVE DATA IN SUB-SAHARAN AFRICA

Survey and Administrative Data are vital sources of information for policy and research. However, case studies have raised concerns regarding the quality of these data sources. Our research assesses the quality of survey and administrative data by comparing information across different data sources.

In one project, this comparison was made between contemporaneous household surveys. We worked to gather household surveys and census data from all Sub-Saharan African countries, clean and analyze them, and visualize the data to derive population parameters to explore causes of discrepancy and implications on policy and research.

In the other project, the comparison was explored between administrative and household survey data. This literature was supported by data visualization methods in which we used admin and survey data to construct school enrollment statistics. Ultimately to highlight how financial reporting incentives affect the quality of administrative data.



**SHARON
LEE**

Major
Chemistry

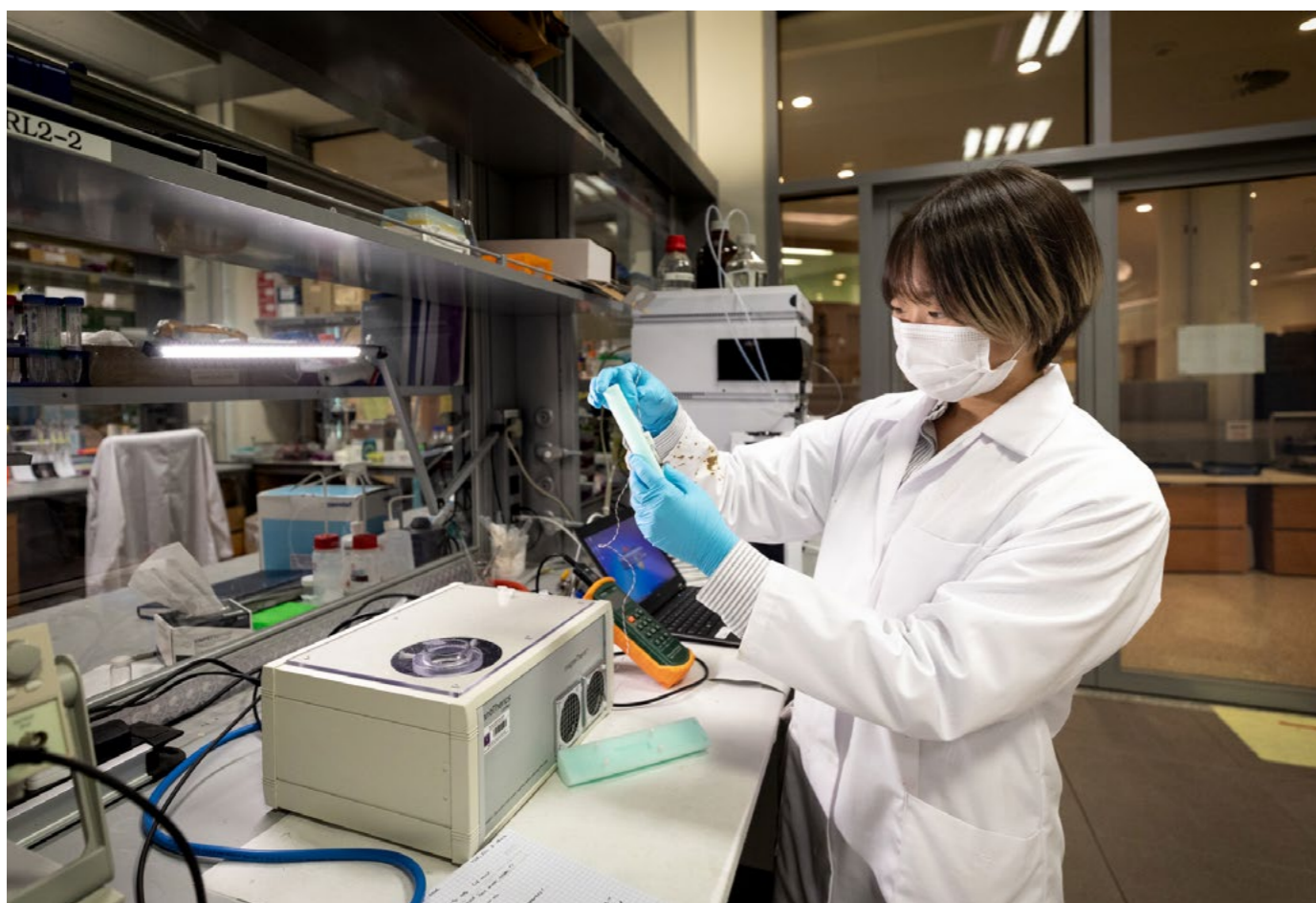
Faculty Supervisor
Ali Trabolsi

MAGNETIC COVALENT ORGANIC FRAMEWORKS FOR COMBINED THERAPIES (CHEMO AND THERMAL)

I was responsible for synthesizing magnetic porous materials that will serve as an anticancer drug delivery system. We designed a new synthetic approach that relies on the use of heat generated from exposing magnetic nanoparticles to an alternating magnetic field. If successful, this project will introduce a new

tool for the preparation of magnetic materials for biological applications.

I was responsible for fully characterizing the new material using PXRD, SEM, TEM, FTIR, UV-Vis spectroscopy.



Sharon preparing for a synthesis of magnetic COFs inside the AMF machine



Receiving a prize for the Poster Award by the President of ACS (American Chemical Society), Dr Angela Wilson



Sharon Lee, Class of 2022 Chemistry graduate, was awarded a Poster Award at The ACS Research Conference: Chemistry and Chemical Engineering in MENA for her Capstone project entitled, Ladanein-Coated Iron Oxide Nanoparticles (γ -Fe₂O₃ NPs) as a Potential Antiviral Against Coronaviruses.



Preparing for a synthesis of magnetic COFs inside the AMF machine (2)



FANISI MBOZI

Major
Political Science

Faculty Supervisor
Morgan Hardy



BATOOL ABEDRABBO

Major
Bioengineering

Faculty Supervisor
Wael Rabeh



DOROTHY ZHANG

Major
Computer Science

School
NYU New York

Faculty Supervisor
Aaron Kaufman

ABURI BUSINESS CENSUS

During PPTP, I worked on the Aburi Business Census. The Aburi business census was recently a recently conducted survey that aimed to spatially map the business ecosystem of Aburi town near Accra, Ghana.

As a research assistant, I received field data from the survey enumerators and was in charge of digitizing and mapping the spatial data that was collected during the day.

This work was done on software called Google Earth Engine (GEE), and one of the core takeaways of being a part of the survey has been learning to work in GEE and with spatial data in general.



Fanisi holding her Capstone award alongside Professor Harris



Congratulations to Fanisi, who was one of two students in Political Science to receive a Social Science Capstone award for her research 'When do voters see fraud? An analysis of voter preferences in polling station supervision'.

PURIFYING THE PROTEIN 3CLPRO

My summer research project involved purifying the protein 3CLpro, the main protease of coronaviruses. The lab maintained 35 mutants of this protein, and expressed them through E. coli, where the goal is to purify the expressed protein and characterize it. The mutations will be analyzed for their use in inhibiting coronavirus function compared to the Wild-type via stability, activity, and kinetics analyses. To quote, "The data will be used to identify amino acid residues that can inhibit the activity of the main protease of SARS-CoV-2 for the development of antiviral against COVID-19."

I assisted with preparing broth for E. coli expression, lysing and centrifuge, purification of the desired protein from the supernatant through affinity chromatography, and then size exclusion to prevent aggregates. I also helped to run Bradford assays to determine concentrations and SDS page analyses to determine the components and purity of our samples.

“It is a wonderful experience to see the inner workings of a research lab so aligned with my interests. I hope to continue this research during the academic year.”

MEASURING BIAS IN PUBLIC OPINION POLLS

During the Spring 2022 semester, I worked with Professor Kaufman to apply natural language processing (NLP) techniques to US public opinion survey questions in order to predict the political party affiliation based on the question text. Throughout this process, I worked primarily with Python and its many libraries. The pandas library was utilized to clean the raw dataset, and organize and format the data to our needs. Then, the Hugging Face libraries were used to initialize and train the sentiment analysis model. Thanks to NYUAD's high-performance computing (HPC) cluster and those who support its services, the total time required to train the model was cut down from several weeks to several hours, with the model reporting close to 90% accuracy by the end of the training period.

With the trained model, we were able to produce party affiliation predictions for over 10 million survey questions, and work towards producing a public-facing resource for others who may want to do the same.



Dorothy Zhang's research project was featured in NYU Global Program's Global Engagement Symposium Spotlight. She was nominated for her outstanding research while studying abroad and, as a result, will be automatically considered for one of NYU's two nominations for the prestigious Forum on Education Abroad's Award for Academic Achievement Abroad.



**LAYAN
ALKASAJI**

Major
Bioengineering and Arab
Crossroads



**RAMA
AL WIDIAN**

Major
Interactive Media

Faculty Supervisor
Justin Stearns



**OMAR
EL HERRAOUI**

Major
Computer Engineering

Faculty Supervisors
Mohammad Shafique and
Muhammad Abdullah Hanif



**MONIKA
MITOVA**

Major
Political Science

Faculty Supervisor
Ella Shohat

ARABIC AND ENGLISH DATABASE ON THE INTELLECTUAL HISTORY OF MOROCCO

Our summer research project included collecting and organizing data from previously-catalogued Moroccan manuscripts. The project aims to establish a searchable Arabic and English database for historians interested in studying the intellectual history of Morocco. Our tasks involved entering

all available information about each manuscript from printed catalogs into a single sheet and transliterating them to English. We also worked on researching scholars in the West African Arabic Manuscript Database (WAAMD) in order to identify the author of each work.



It has been such a pleasure working with NYUAD students on a project where you could get a group of students to work independently in Arabic and English towards creating a tool that will be used by scholars interested in Moroccan intellectual history globally. Because of the unique diversity of our community, I have a hard time imagining another place where we could be doing this.

Justin Stearns

Program Head of Arab Crossroads; Professor of Arab Crossroads; Global Network



QUANTIZATION OF DEEP NEURAL NETWORKS FOR INCREASED ENERGY AND MEMORY EFFICIENCY

Deep Neural Networks (DNNs) have emerged as a powerful set of algorithms and are used in a wide variety of applications that involve processing images, videos, texts, and natural language. However, DNNs come with a very high computational cost because of their algorithmic complexity, which hinders their ability to be used in resource-constrained embedded systems such as mobile devices, vehicle computers and other IoT devices. This therefore promotes the need for reducing the computational cost of DNNs using quantization techniques, which aim at reducing the memory and energy costs while maintaining suitable application-level accuracy.

My project involved researching and implementing several quantization techniques including hardware-aware quantization, Biscald DNN, and Compensated DNN, and testing the accuracy of the quantized DNNs. The results were very promising since the techniques were able to significantly reduce the memory required for the DNNs while keeping the accuracy almost the same as the unquantized model. My future goal is to use the techniques I have already implemented to construct a new quantization method which produces even better results.

IDENTITY, CULTURE, AND REPRESENTATION OF MIZRAHI JEWS

As a result of persisting Eurocentrism in historiography, Jewish historical experience is often reduced to that of European Jewry (Ashkenazim). Jews of Middle Eastern origin (Mizrahim) with roots in Arab-majority states are rarely considered and analyzed as distinct categories despite their rather different from that of Ashkenazi European history. In an effort to overcome this limitation of the currently available historical narrative, my summer research project addressed the Mizrahi experience relevant to Jewish and Middle Eastern histories.

The project focused on the representation of Jews from Arab and Muslim states in both Israel and North America and identified the critical junctures in Mizrahi history that have led to the formation of the Mizrahi identity.

The study also analyzed the implications of Eurocentric and Orientalist prejudices about Mizrahi Jews by assessing Mizrahi self-representation in art and cultural work both in and outside Israel.

To extensively study the Mizrahi identity, this research observed the emergence of the Mizrahi category not only from the lens of history but also from that of culture. The research focused on contemporary representations by assessing the place given to Mizrahi Jews in cultural institutions and museums.



FIDHA FARZANA ISMAIL

Major
Geosciences and GIS

School
UAE University

Faculty Supervisor
David Wrisley



MAYA FAYED

Major
Computer Engineering

Faculty Supervisor
Mohamad Eid



KOTRYNA KARPAUSKAITE

Major
Economics

Faculty Supervisors
Fiona Kidd and Marzia Balzani



SALEH AL HASHIMI

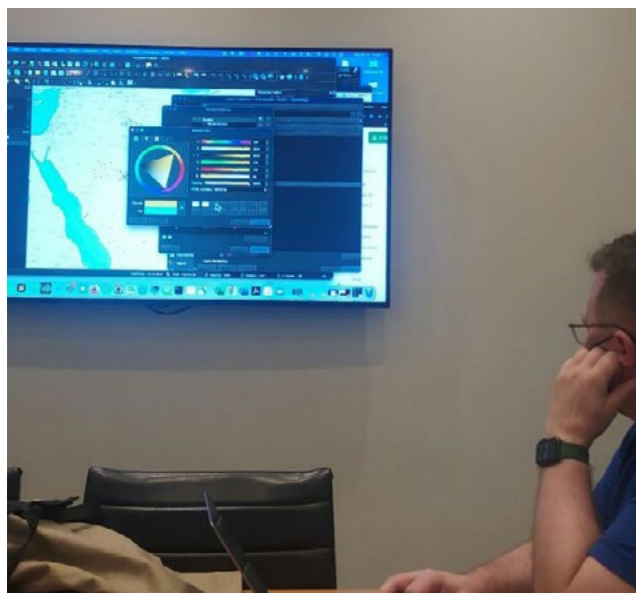
Major
Mechanical Engineering

Faculty Supervisors
Rotana Hay and Kemal Celik

HISTORICAL GEOGRAPHICAL AND ENVIRONMENTAL DATA ABOUT THE ARABIAN GULF

The data for this project included a searchable text version of Lorimer's Gazetteer of the Persian Gulf, Oman and Central Arabia and a large dataset of annotated places found in it.

I worked on refining the data from one portion of the Arabian Gulf region, visualized and wrote about that data and extracted entities and quantities from this historical corpus (animals, plants, temperature ranges, objects, water terminology, construction materials, rainfall amounts) to assist with building a geocoded dataset for a web-based environment atlas.



Mapping crops grown in regions of Lorimer's Gazetteer using ArcGIS software

DEVELOPING A VIRTUAL REALITY SIMULATION FOR THE RUBBER HAND ILLUSION USING VIBROTACTILE FEEDBACK

The Rubber Hand Illusion (RHI) is a perceptual illusion in which the subject is meant to assume ownership of a model rubber hand that is under the effect of an external stimulus. In its classical form, it is administered by way of applying tactile stimulation of a person's real hand, which is hidden from view, while synchronously providing the same stimulus to an observed rubber hand model that is placed in full view of the subject.

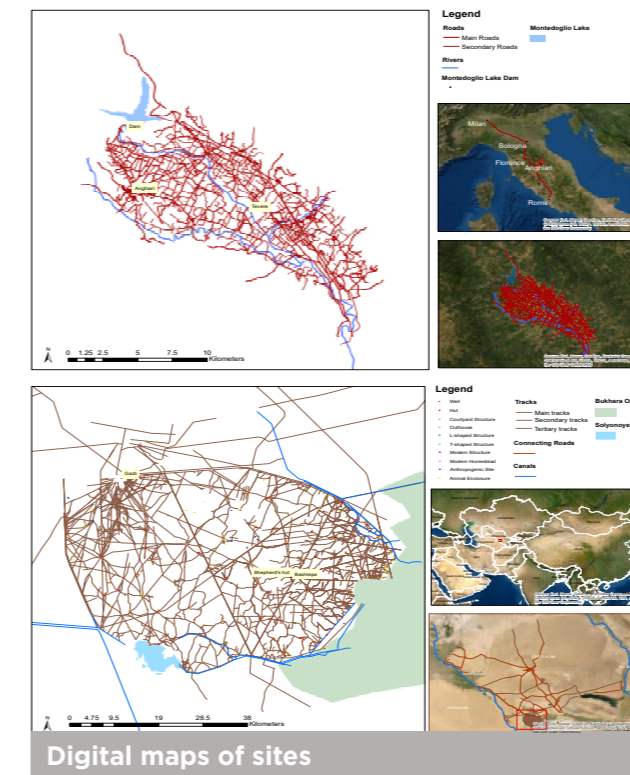
My research involved investigating the degree of body ownership experienced by users when the RHI is applied in a virtual reality environment. We also further incorporated vibrotactile feedback to augment the perceptual illusion and assessed the effect of different combinations of simulation parameters on the degree of body ownership experienced. This involved investigating the effect self-touch vs touch from others as well as continuous vs discrete vibrotactile feedback. The experimental setup for this study also involved designing and programming a custom-made vibrotactile sleeve in order to deliver the desired vibrotactile sensation.

Ultimately, in designing a virtual system that effectively administers the RHI effect, we hoped to use this study as a precursor for the development of an RHI-based solution to the neurorehabilitation of post-stroke patients.

AL MAKĀN: PLACE AND PLACE MAKING IN THE ANTHROPOCENE

The aim of this project is to map the increasing connectivity of regions over time in order to understand the impact of human communities on diverse landscapes.

We are focusing on two distinct regions: the Qyzylqum in Uzbekistan and Anghiari in Italy. To trace the anthropogenic activities in these areas, I created digital maps of sites such as roads and buildings in the present day, and georeferenced historical imagery which is being used to create maps.



Digital maps of sites

LIMESTONE CALCINED CLAY CEMENT (LC3) WITH LOCAL CLAYS

Ordinary Portland Cement (OPC) is the most common cement used due to its physical and chemical properties that reduce cracking and shrinkage whilst remaining inexpensive.

My summer research revolved around finding more environmentally and economically friendly alternatives to the conventional OPC using local clays. Using a mixture of limestone and local calcined clays, we were able to identify a high reactivity clay with a promising potential for the implementation of Limestone Calcined Clay Cement (LC3), an emerging sustainable alternative to OPC.

The results we obtained from the thermal gravimetric, calorimetry analyses, and compressive strength tests confirm the potential that our identified clay has in being a sustainable alternative. The step following the identification is implementation or proof of concept in non-critical structural elements such as ground slabs.

Additionally our research involved our exploration of calcium hydroxide (Ca(OH)₂) waste in plaster and mortar. We tested the physical and chemical properties of different samples of mortars with varying proportions of lime and limestone powder. This research is done in an attempt to replicate real-life application of mortars and encapsulation of waste. The samples were tested under various conditions such as curing in a Ca(OH)₂ solution and carbonation.



**JULIE
MATULA**

Major
Chemistry



**MAHMOUD
ELBEH**

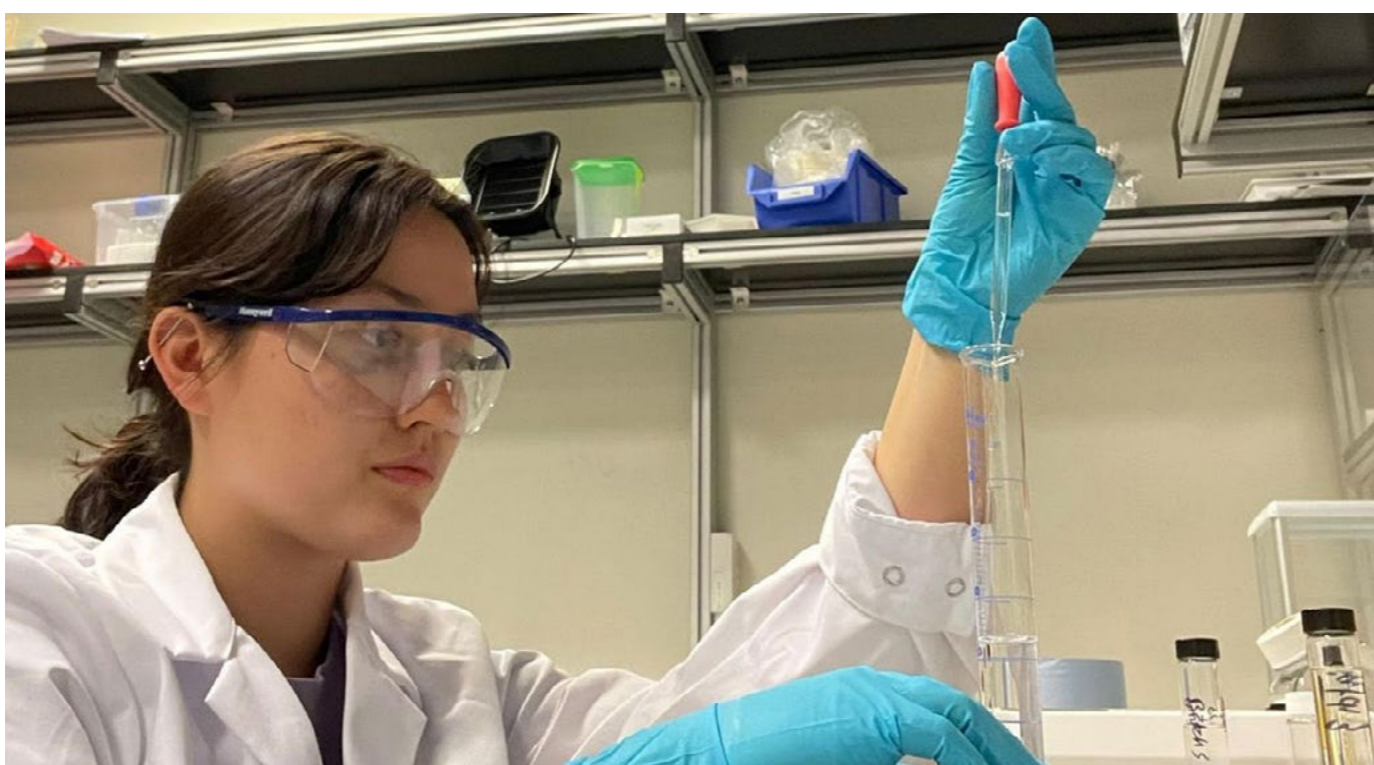
Major
Chemistry

Faculty Supervisor
Khalil Ramadi

SYNTHESISING FLUORESCENT CARBON NANO-PARTICLES FROM PLASTIC WASTE

One of the many consequences of the global pandemic that continues to affect us today is the significant increase in plastic waste. From mandatory mask wearing, to increasing numbers of food as well as other packaged delivery, the production of plastic has shown no signs of slowing down. As a result, undergraduate students at the Laboratory of Neuroengineering and Translational Medicine (LANTRN) used this as motivation to focus their research on recycling both masks and plastic bags - repurposing them into carbon

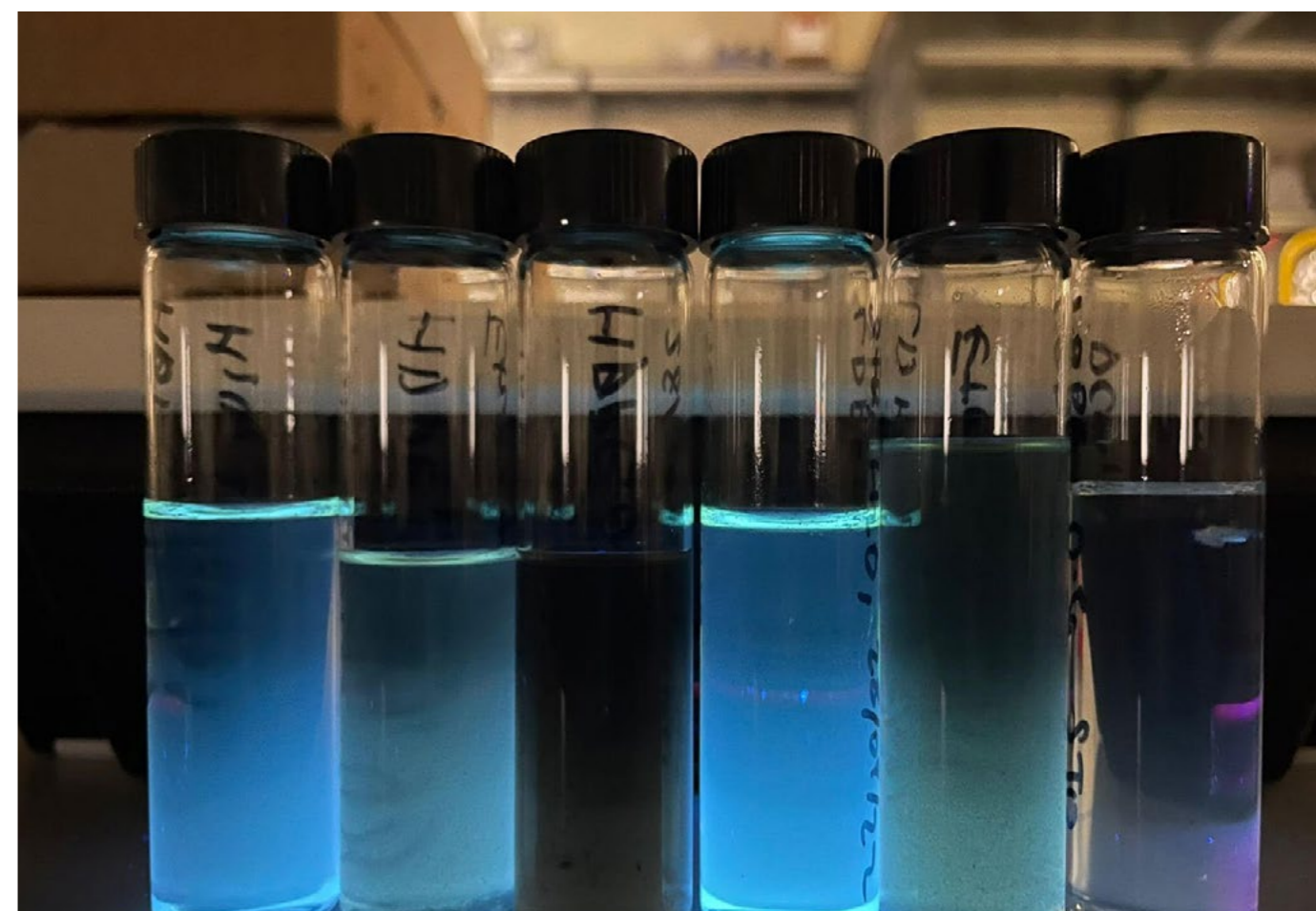
quantum dots. Carbon dots are nano-particles that have a quasi-circular shape with many desirable properties; the most well-known being their ability to show fluorescence in a non-toxic way. Because of this, carbon quantum dots have a wide range of applications including bio-imaging, bio-sensing and drug delivery. With this in mind, the students were able to convert waste that would have ended up in a landfill into materials that can be used across many different applications.



Julie preparing a new batch of carbon quantum dots



Mahmoud with the final product under UV-light



Fluorescent quantum dots under UV-light



YIFAN LIN

Major
Film and New Media
and Arabic

Faculty Supervisor
Amos Ezra Katz



PAVLO ODNNOZDRIEV

Major
Film and New Media and
French



ISABEL RIOS

Major
Film and New Media

Faculty Supervisor
Amos Ezra Katz

ETIHAD PROJECT

Traditionally, airline pilots have relied on thousands of pages of manuals and readings to learn aviation safety and Crew Resource Management (CRM). Etihad Airways Training Center is interested in researching micro education and the use of videos for teaching pilot safety. Our proposed joint study

between NYU Abu Dhabi and Etihad Airways aimed to examine the efficacy of video micro education in comparison to textbooks in the training of flight safety instructors and study the degree of agreement (concordance) between the two education methods.



Yifan Lin conducting scientific research on the current application of new media in educating airline pilots



Flight simulators at Etihad Aviation Training



Professor Amos at Etihad Aviation Training

NOUS NON PLUS

Working with live concert and behind-the-scenes footage of the New York City-based rock band, Nous Non Plus, Pavlo and Isabel edited a rock mockumentary of their Parisian tour. As an academic exercise, the two films were taken in

two very different directions with each editor - one creating a true mockumentary (fictionalized documentary) and the other editor creating a reflection on the making of a mockumentary (documentary of a mockumentary).



Isabel and Pavlo editing the rock mockumentary



Members of the Nous Non Plus band

**AIRA
KHALIQ**

Major
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**AYA
EL MIR**

Major
Computer Engineering

**BAOYUAN
ZHANG**

Major
Electrical Engineering

**IBRAHIM
NAYFEH**

Major
Mechanical Engineering

**JOSH
KO**

Major
Bioengineering

**JASIR
ZAKARIA**

School
American Community
School of Abu Dhabi

**JULIO
ZUAZOLA**

Major
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**KIRUBEL
TESFAYE**

Major
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**LUKELO
LUOGA**

Major
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**MINH NHAM
QUAN**

Major
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**NASHEED
UR REHMAN**

Major
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**OBED
MORRISON**

Major
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**RAMI RICHANI
HAMDAN**

Major
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**SHERIFA
YAKUBU**

Major
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Faculty Supervisor
Matthew Karau

NYUAD ROBOSUB

NYUAD RoboSub is a student-led research organization developed in early 2022 as part of the Engineering Design Studio of NYUAD. Our mission is to breach the barriers of theoretical education through creating physical machines and simulations of underwater robotics systems. We worked on research and development into Autonomous Underwater Vehicles (AUVs) that are able to address current challenges in today's maritime industry.

Dugong is the very first AUV model designed and built by NYUAD RoboSub based on a BlueROV2 platform. After half a year's dedication from all of our diligent team members, we proudly presented Dugong to the RoboSub competition 2022, a competition promoted by RoboNation in the USA.

Developed from the already decent and reliable BlueROV2 platform, our Dugong integrates many powerful features to cater to the needs of the various

tasks required by the competition. With a water-tight battery hull, the most dangerous component of the whole robot is insulated completely from water.

A hydrophone array placed at different points around Dugong gives the robot sufficient ability to perform ultrasonic localisation under water. Various control and computation components are integrated into the main hull, allowing Dugong to control its own navigation. A customised camera casing allows Dugong to visualise what is in front of it underwater, and a gripper attached to the bottom of the robot empowers it to pick up and drop intended objects.

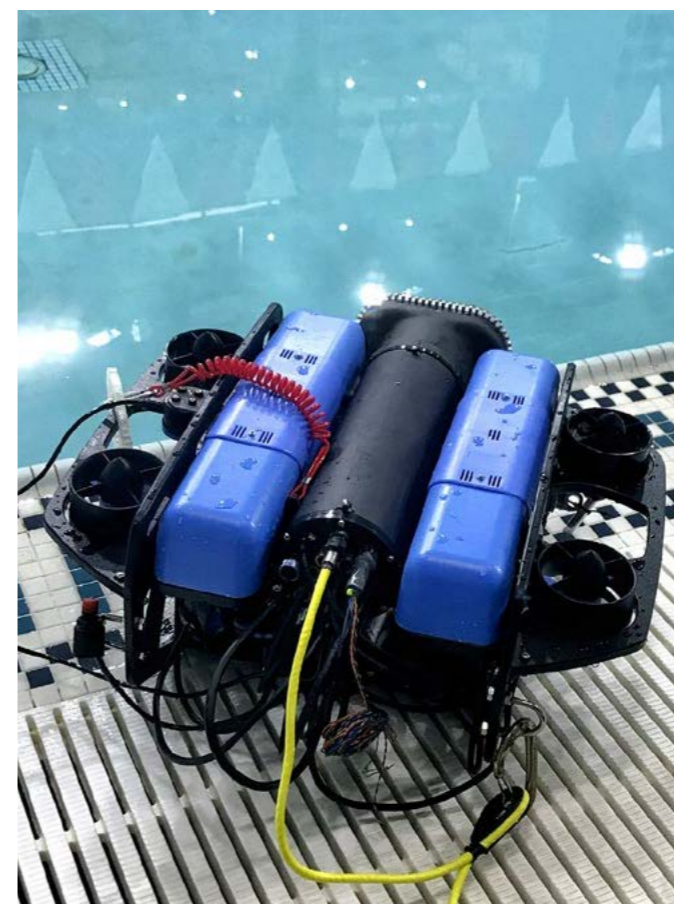
The AUV contains a custom-made housing that protrudes from the main capsule to hold the main computer and the front-facing camera; this provides more room for other components such as the power distribution board.

“ RoboSub was the culmination of a challenge that spanned multiple engineering domains, requiring collective expertise to ensure the success of our AUV. In achieving this goal, our team learnt new skills and gained practical expertise applicable to real-world systems ”

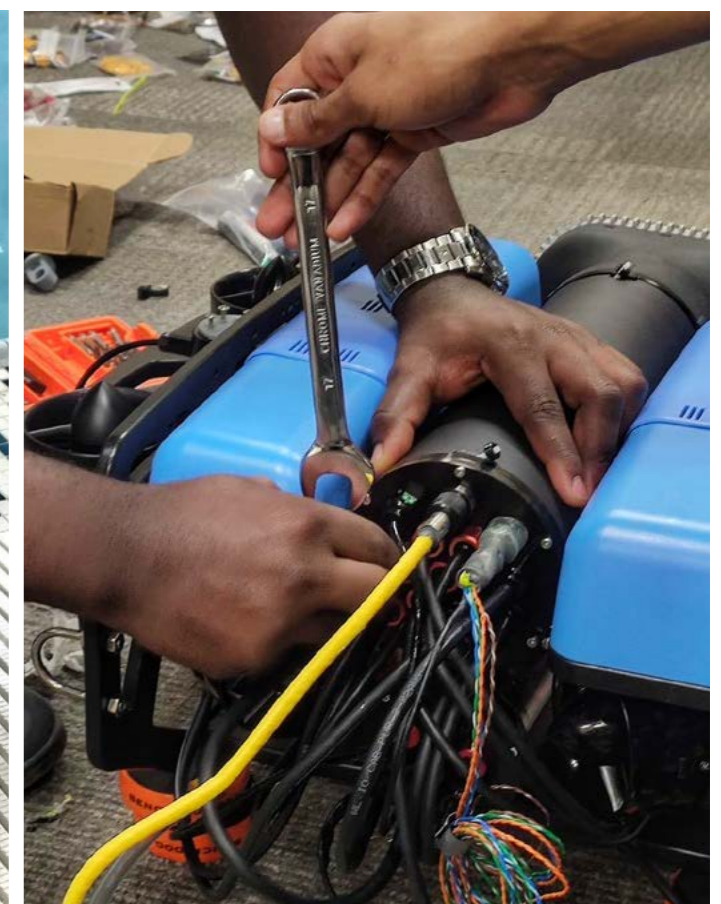
Nasheed Ur Rehman



Members of the RoboSub team



The AUV Dugong at the poolside



The team assembling the main watertight enclosure



**RASHIK
CHAND**

Major
Bioengineering

Faculty Supervisor
Sanjairaj
Vijayavenkataraman

INTERACTION PROBLEMS

Wall shear stress is the most critical factor in determining the viability of cells during the bioprinting process, and controlling wall shear stress remains a challenge in extrusion bioprinting. We investigated the effect of various bioprinting parameters using computational simulations on maximum wall shear stress (MWSS) in the nozzle to optimize the bioprinting process.

Steady-state simulations were done for three nozzle geometries (conical, tapered conical, and cylindrical) with varying nozzle diameters (0.1 mm–0.5 mm) at different inlet pressure (0.025 MPa–0.25 MPa) as inlet conditions. Non-Newtonian power law was used to model the bioink rheology and four different bioinks with power-law constants ranging from 0.0863 to 0.5050 were examined.

To capture the dynamic behavior of the bioink and the thread profile of the extruded bioink, transient simulations were carried out.

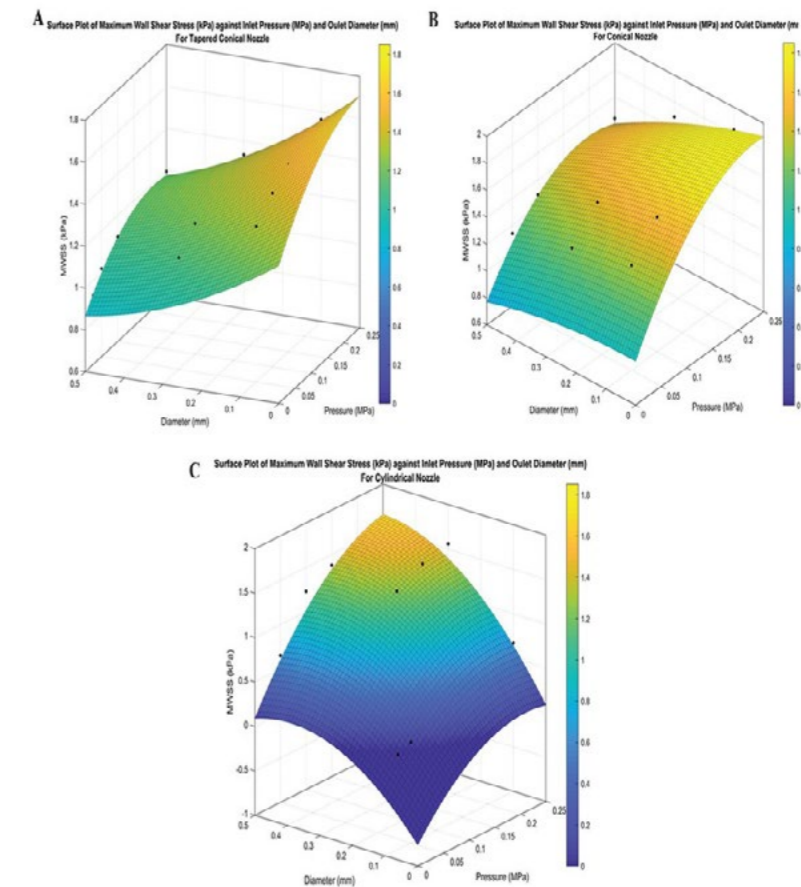
Our results indicate that although the MWSS is lowest in the cylindrical nozzle, this stress condition lasts for a longer portion of the nozzle and for the same inlet pressure and nozzle diameter, the mass flow rate is lower compared to the tapered conical and conical nozzle, contributing to lower cell viability.

Computational Fluid Dynamics Assessment of the Effect of Bioprinting Parameters in Extrusion Bioprinting

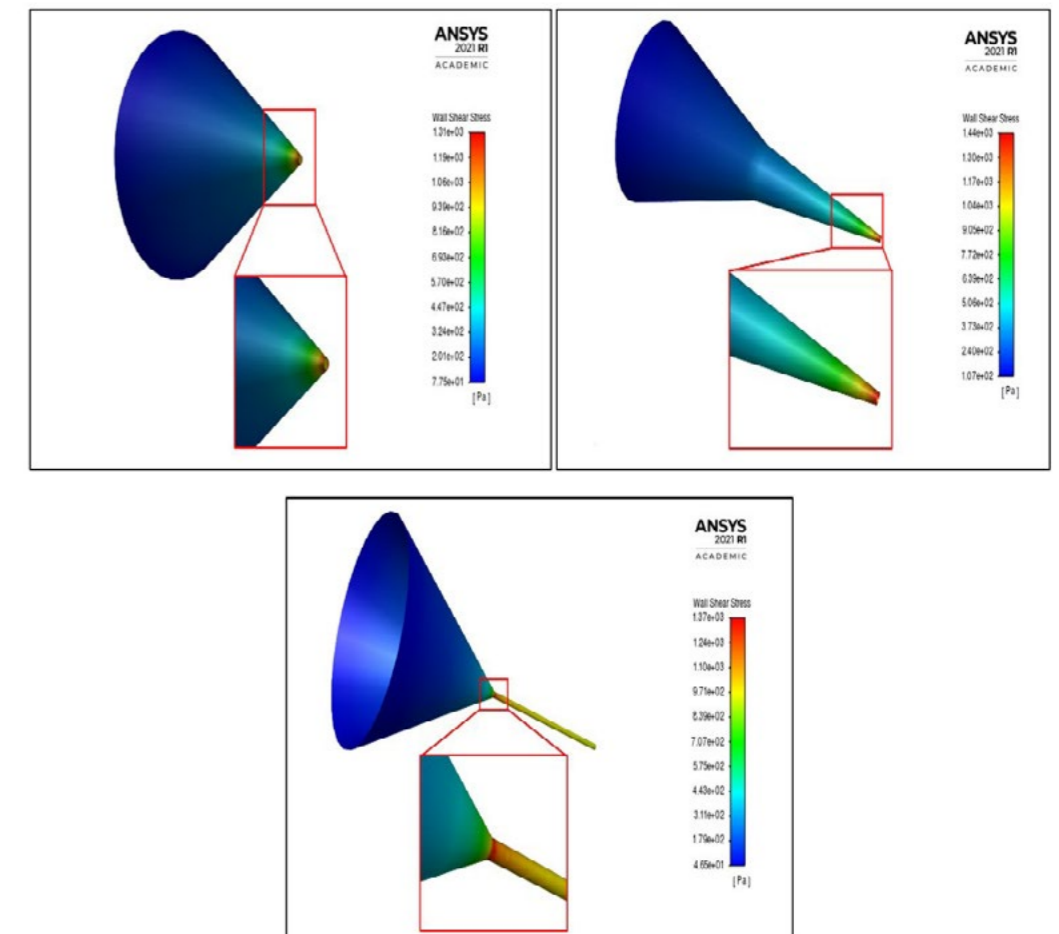


Rashik Chand, Beni Shimwa Muhire, and Sanjairaj
Vijayavenkataraman

International Journal of Bioprinting 8, no. 2 (2022): 45 - 60



Surface plot for maximum wall shear stress (in kPa) for tapered conical, conical, and cylindrical nozzles



Contour of wall shear stress for tapered conical, conical, and cylindrical nozzle with outlet diameter 0.3 mm and pressure 0.20 MPa

**ELVIRA
SELIVANOVA**

Major
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**FEDERICO
JANNELLI**

Major
Economics

**NASTASSJA
GERLICH**

Major
Political Science

**STEFFANIE
DIAS**

Major
Mechanical
Engineering

**YEHOWAHI
SEKAN**

Major
Mechanical
Engineering

Faculty Supervisors
Daniel Johnson and
Philip Panicker

TEAM SAADIYATECH: INJAZ UAE X SHELL YOUTH FOR SUSTAINABILITY MBR-MIPG PROJECT

NYUAD's team SaadiyaTech focused our efforts towards developing a project of a combined and innovative solution to producing Purple Hydrogen for electricity generation, turning Saadiyat Island's waste into energy.

Integrated Microwave-Induced Plasma Gasification (MIPG) and anaerobic Membrane Bioreactor (MBR) technologies, our team entered the Injaz UAE x Shell Youth for Sustainability Competition, working for four months under the supervision of Joe Harrison, Asset Manager at Shell, winning the Best Environmental Impact prize in the university category in March 2022.

Our vision was to further develop last year's SMECEYI project, specifically by testing our established Engineering prototype (a small scale Microwave Induced Plasma Gasification plant). Through this, we strove to advance our understanding of the potential for implementation of the specific technology in the UAE, demonstrating financial viability as well as the undeniable positive environmental impact.

With this being said, SaadiyaTech's project both aligns and encourages future development of technologies that resonate with the UAE's vision of reducing food waste by 2030, as well as their target to move to net zero by 2050.

“ The multidisciplinary team that we created and the guidance of academic and industry experts that we received are what made this experience so rewarding from an academic point of view. This competition reminds us of how crucial it is to combat climate change with solutions that are not merely environmentally sustainable, but also financially viable. ”

Federico Jannelli | Nastassja Gerlich



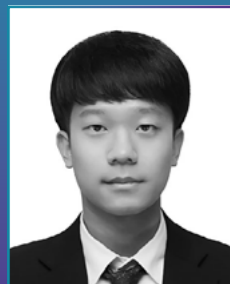
Team SaadiyaTech won the Best Environmental Impact award at the Injaz x Shell Competition



The closing awards ceremony at the Netherlands Pavilion, Dubai Expo 2020



Awards presented for Best Environmental Impact and Most Innovative Solution



**DANIEL
AHN**

Major
Chemistry

Faculty Supervisor
Ali Trabolsi

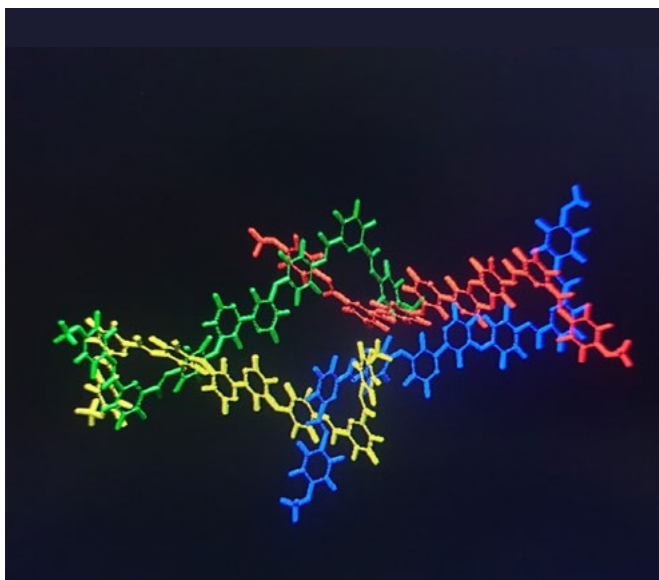
SYNTHESIS OF MOLECULAR WEAVE AND ITS APPLICATION IN WATER TREATMENT

Mechanically interlocked molecules have been in the interest of chemists because of their aesthetic uniqueness and large applicability. Molecular weaves are a topologically unique mechanically interlocked molecular species that consist of several one-dimensional polymers that are interwoven to create a fabric. Trabolsi Research Group has been studying molecular knots and braids created by imine bond formation between diamino bipyridine (DAB) and diformyl pyridine (DFP).

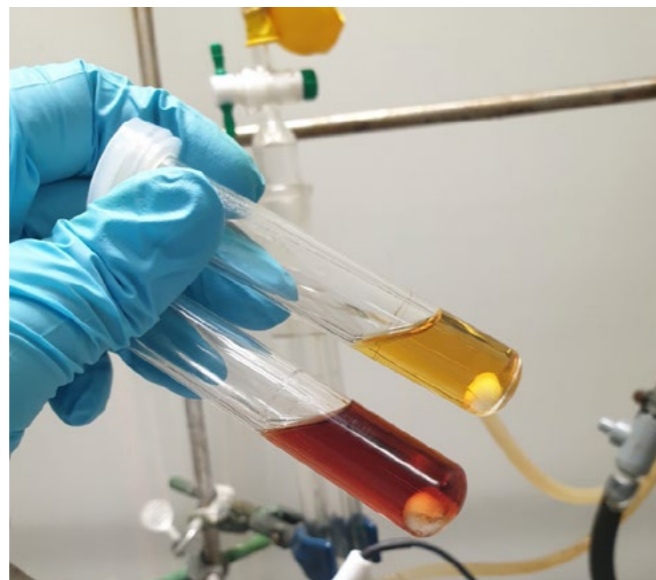
The objective of the research was to expand the usage of DAB and DFP moieties into creating molecular weaves out of them and to analyze the product's properties. To do so, I synthesized various candidate linkers (DAB, DFP, DFB, DHP) that could

form molecular weaves. I was able to synthesize a stock of DAB, DFP, DFB, and DHP. I was also able to react several combinations of each linker in the hopes of creating the molecular weave. I also estimated the geometrical stability of DAB-DFP weave using computer simulations.

Using MAPS program, I was able to determine that zinc is the most stable metallic center for the weave out of four other candidate transition metals. Moving forward, I expect to increase the number of candidate linkers and increase trials for weave synthesis. Once the weave is synthesized, it will be analyzed with NMR, pXRD, and MS. The synthesized weave will also be analyzed for its applications in water purification.



Simulation of 2x2 molecular weave of DAB and DFP



Product of first attempt of molecular weave synthesis



**YONAS BERHANE
TESFAI**

Major
Civil and Environmental
Engineering

Faculty Supervisor
Monica Menendez and
Hossam Abdelghaffar

School
UAE University

VEHICLES' COOPERATION AT MERGING ZONES IN A MIXED TRAFFIC ENVIRONMENT

Autonomous driving in a mixed-traffic environment can reduce road congestion and delays while increasing capacity, but it also poses a number of challenges. During my summer research position, I conducted a literature review on freeway merging in an automated vehicle environment.

This research broadens my knowledge of traffic engineering systems and traffic simulator software,

particularly Vissim, a microscopic multi-modal traffic flow simulation software.

I was able to model both a freeway merging section and a major downtown. In the model, I also incorporated traffic volumes and traffic signal controllers. Furthermore, I investigated network performance parameters such as travel time, delay, speed, and emissions.



Photo from the software PTV Vissim



LYDIA
YAN

Major
Interactive Media Arts
and Humanities

School
NYU Shanghai

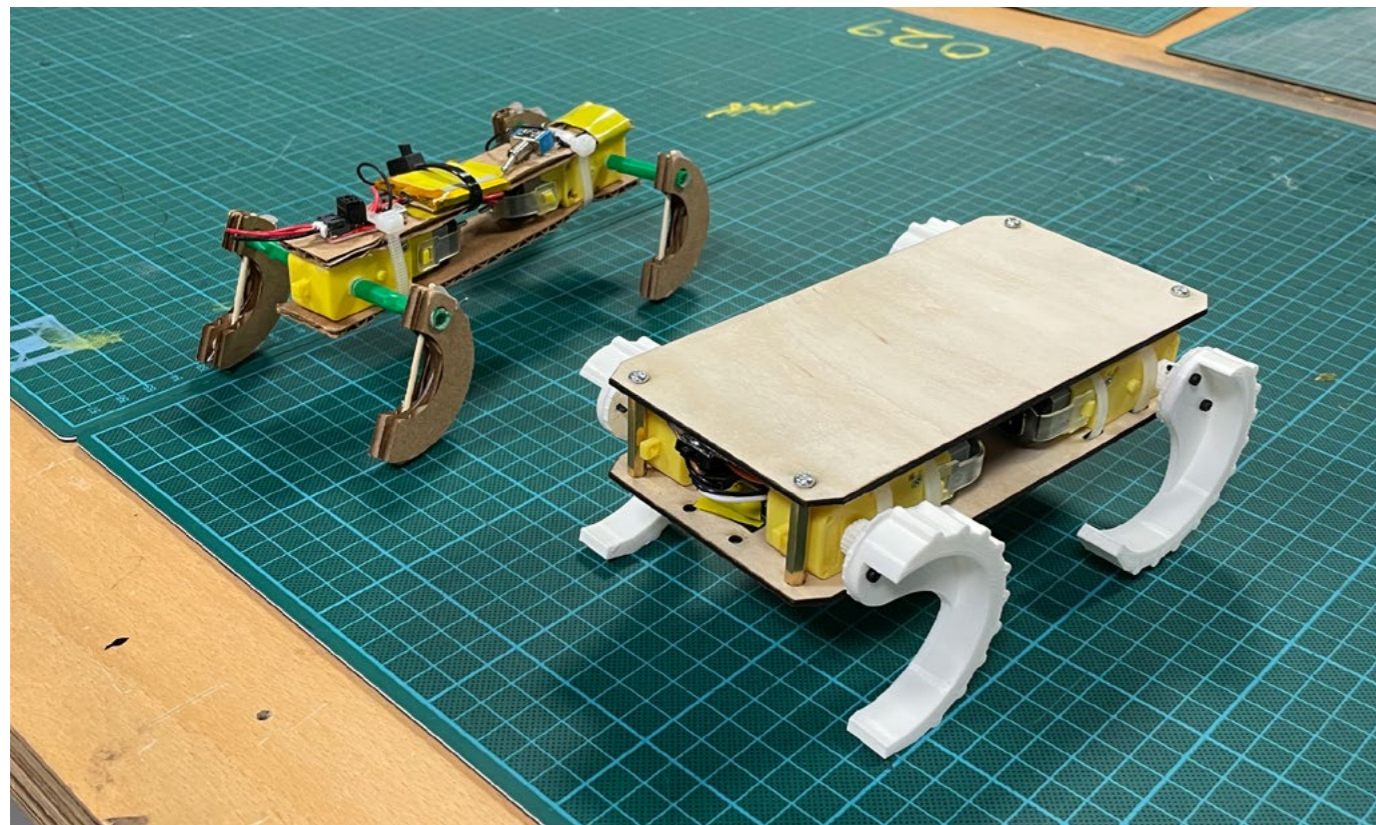
Faculty Supervisor
Michael Ang

DESERT MEDIA ART

I secured a research assistantship award to join Professor Michael Ang's research team. Along with students Michael Leo and Jannie Zhou, we researched media art outside of the gallery and off the grid. Our project included building desert robots for the upcoming "Desert Media Art" class for NYUAD's Interactive Media program.

Our team made two prototype wheg (wheel = leg) robots that we affectionately named "Wheggo". We used an existing design by Brainergiser and also created a new robot specifically designed for the desert.

The robots can move through surprisingly difficult terrain, especially considering they are mostly made of cardboard and glue. We got the chance to test the robots in different terrestrial situations, including the desert, grassland, and indoor tile ground. Rather than "conquering" the dunes, the robots are designed to engage gently with the terrain and provide a platform for exploring the interaction of technology and nature.



Wheggo V.1



Manglab at IM Lab (from left: Michael Leo, Lydia Yan, Michael Ang, Jannie Zhou)



Wheggo V.2



**RAWAN
HABASHY**

Major
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Faculty Supervisors
Rotana Hay and
Kemal Celik



**SADE
CHAFFATT**

Major
Biology

Faculty Supervisor
Kirsten Sadler Edepli

WASTE ENCAPSULATION

Over the years, radioactive materials, like the radioactive fuels in aluminum, have been increasing in our surrounding environments, causing contamination. In addition, aluminum is highly unstable in a high pH environment. Due to the negative effects that are caused as a result of the reactions caused by these radioactive materials, it is essential that we find ways to encapsulate these materials and prevent them from polluting the environment.

My project involved encapsulating aluminum waste in Portland cement (PC) and reactive magnesium oxide cement (RMC). We mixed aluminum bits and

plates in mixes produced with PC and RMC. Some of the samples were cured in a CO2 chamber to gain strength while others were left outside (the moist samples).

The compressive strengths were monitored with a compression machine, and the electrochemical properties of the embedded aluminum plates were measured with a potentiostat to indicate the dissolution and hence the encapsulation effectiveness of these matrices. Moreover, RMC was observed to better retain its mechanical performance.



Samples cast in molds for compression testing



Sample fragments in isopropanol to stop hydration

HOW DOES THE H3K27me3 EPIGENETIC MARK IMPACT LIVER REGENERATION?

Uhrf1 is an epigenetic regulator vital for DNA methylation and is required for the suppression of transposable elements (TEs). Using a mouse model, previous research concluded that epigenetic compensation occurred in hepatocytes with Uhrf1 knockout, to protect the genome against H3K27me3 epigenetic mark is responsible for this, redistributing from the promoters of genes

the activation of TEs. It is suspected that the required for liver regeneration, to hypo-methylated TEs- repressing them. As such, this research aims to investigate liver regeneration by determining whether H3K27me3 is important for the suppression of non-regenerating, pro-regenerative genes in mouse hepatocytes. To explore this research project, I worked with a new mouse strain containing a mutation in the poly-comb repressive complex 2, more specifically a mutation in the EED subunit. This EED mutation will result in a knockout of H3K27me3 which allows us to investigate whether genes needed for liver regeneration will be suppressed in the absence of this epigenetic mark.

I plan to continue working on this research project for my Capstone. Being in the lab this summer provided me with the opportunity to learn the necessary skills and techniques which I will apply, once the necessary mouse lines have been developed. Each day in the lab was filled with fun and continuous learning. It was a great opportunity to learn from and be mentored by such great scholars in the lab.



Adding reagents for a PCR reaction to genotype mouse samples



NIRAJ PUDASAINI



SIMON DAROTA

School
UAE University



YAPHET WELDEGEBRIEL

School
Khalifa University

Major
Electrical Engineering

Faculty Supervisor
Muhammad Shafique



FILMON TSEGAY FSEHAYE

Major
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School
Higher Colleges of
Technology

Faculty Supervisor
Panče Naumov

IMPLEMENTING MACHINE LEARNING ALGORITHMS IN AUTONOMOUS ROBOTS

Simultaneous Localization and Mapping (SLAM) is a mapping technique that allows a robot to create a map of an unknown environment while simultaneously keeping track of its location.

Situations where a mobile agent has to rely solely on on-board sensors for navigation, for instance in an absence of GPS, SLAM proves to be very useful. SLAM is mostly used in robotics and autonomous driving, and accuracy and robustness in SLAM systems is crucial for the real world applications.

The main purpose of the research was to see how the deep learning based SLAM algorithms perform

in terms of speed and resource utilization and find tools to optimize them so that they can run on the embedded mobile platforms.

Since the embedded platforms in mobile robots lack computation resources to process the real time images and create a 3D map reconstruction of the environment for navigation and localization, our tasks were to implement pruning and quantization in the DROID-SLAM neural network model and reduce the computational resources used during the real time implementation.

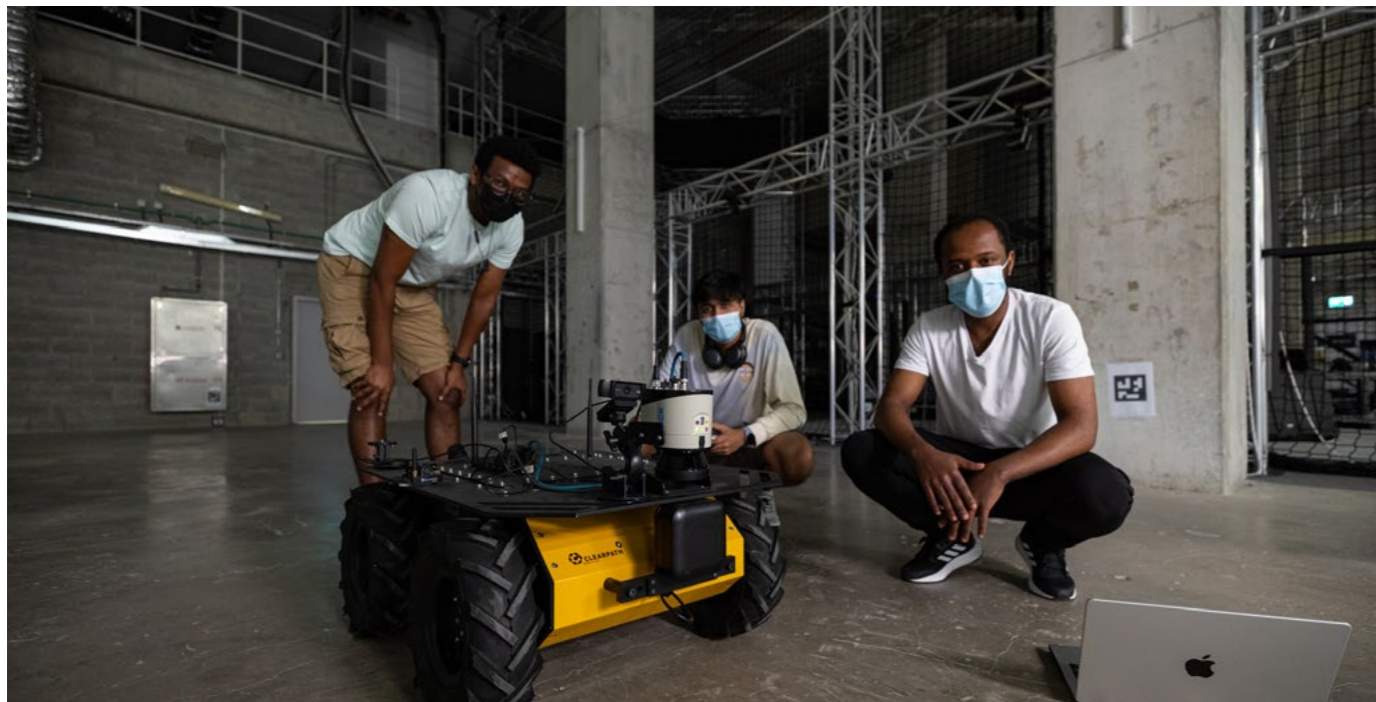
ORGANIC IONIC PLASTIC CRYSTALS FOR LITHIUM-ION BATTERIES

With advancing battery storage for different electronic devices, including electric cars, solid-state electrolytes currently hold a great potential to substitute liquid electrolytes. Lithium-ion batteries (LIBs) have been widely used for power-driven and energy storage systems.

Though being used in a wide range of applications, the development, and applications of LIBs have been restricted by safety issues associated with the high flammability, volatility, and leakage risk of conventional carbonate solvents. Thus, my undergraduate research project focused on solid-

state electrolytes for improving the safety of LIBs. Specifically, this research concentrated on OIPCs (organic ionic plastic crystals) for Lithium-ion batteries.

OIPCs are new class of candidate materials for solid-state electrolytes as they have the desired properties, such as high proton conductivity with non-flammable and non-volatile properties. In this project we synthesized new types of conceivable OIPCs and tested their thermal properties using different analytical techniques such as DSC and TGA, with some very promising results.



Yaphet, Niraj and Simon with a mobile robot



Preparation of OIPCs



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Faculty Supervisor
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SUZAN HAILE GHIRMAY

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ABDULLAH AWADH AL ATEQI

Major
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Dimitra Atri



DUŠAN POPOV

Major
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Faculty Supervisor
Joan Barceló

BIOMIMETIC BONE SCAFFOLD DESIGN

My project focused on biomimetic scaffold design for bone tissue engineering. I worked on extracting microstructure information from the CT scan which included conversion of DICOM files to STL format and extraction of microstructure data such as porosity at different regions of the bone structure, and worked on trying to design scaffolds with the same anisotropic porosity.



Yaniet working on a biomimetic bone scaffold design

3D PRINTING OF COMPOSITE BONE SCAFFOLDS

My project involved exploring 3D printing of composite scaffolds for bone tissue engineering. I worked on training with the 3D printer, designed a simple square mesh scaffold, prepared a few composite solutions of iron nanoparticles and polycaprolactone and 3D printing trials for fabricating the scaffolds for mechanical testing.

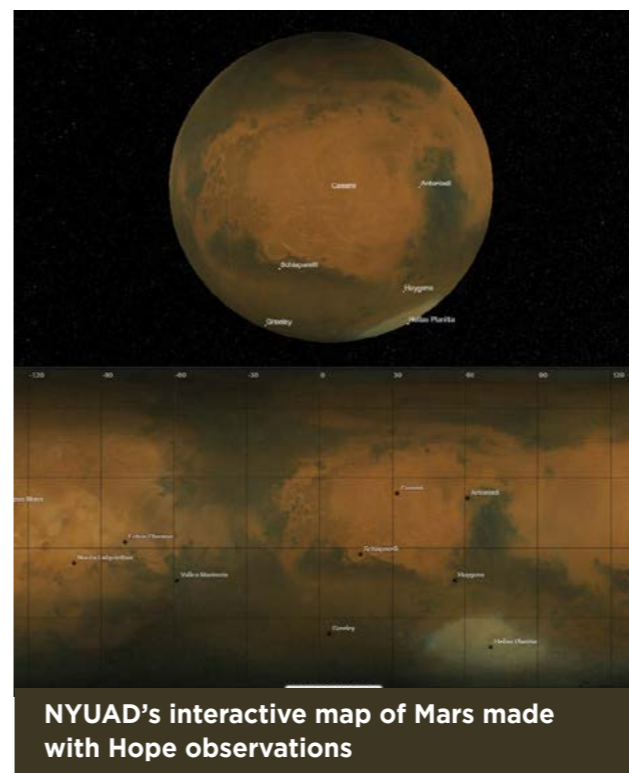


Suzan working on 3D printing of composite bone scaffolds

MARS RESEARCH GROUP

My research project involved analyzing data from the EXI instrument (Emirates eXploration Imager) on board the UAE's Hope probe and creating a user-friendly web interface to visualize it.

I created a web interface which looks similar to Google Maps, where a user can see the entire map of Mars along with information of different features such as volcanoes, impact craters etc. I also created a Google earth-like interface where users can directly interact with the entire globe of Mars, which will soon be made available to the public. This work will make Hope Probe's findings accessible to everyone in the UAE and around the world.



NYUAD's interactive map of Mars made with Hope observations

META ANALYSIS OF MICRO LEVEL EFFECTS OF EXPOSURE TO WARTIME VIOLENCE

Even though a wide range of literature has been produced on micro level effects of violent conflict, there is still no consensus on what the effects of wartime violence are on political attitudes and behavior.

Throughout the summer, I worked with Joan Barceló, with the goal of evaluating the evidence reported so far in empirical studies, and also discovering new ones to be added into our meta analysis. Building on the previous work done, we launched a comprehensive literature review, discovering 80 additional studies of the micro level effects of exposure to wartime violence on outcomes such as peace attitudes, support for democracy, ethnic and national identities, voting patterns, political engagement, civic engagement, and trust.

Additionally, we began recording the newly added studies into a data set covering 70 features of the study. We also worked on obtaining the original data set, codebook, and replication files for each study, and organizing them in preparation for conducting the actual meta analysis.



ISIDORA LAZIC

Major
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Faculty Supervisor
Madeleine Wolf

School
Paris Sorbonne University
Abu Dhabi



LIZA RUNKOVA

Major
Economics

Faculty Supervisor
Jordan Norris



AYA MOHAMMAD ABDELHAQ

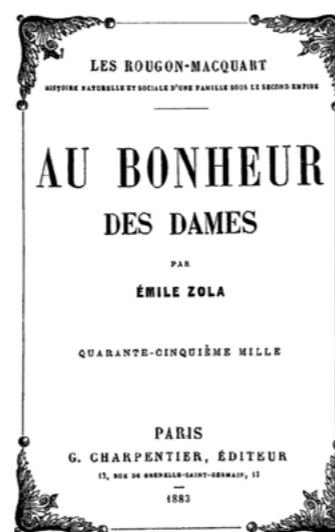
Major
Physics

School
Khalifa University

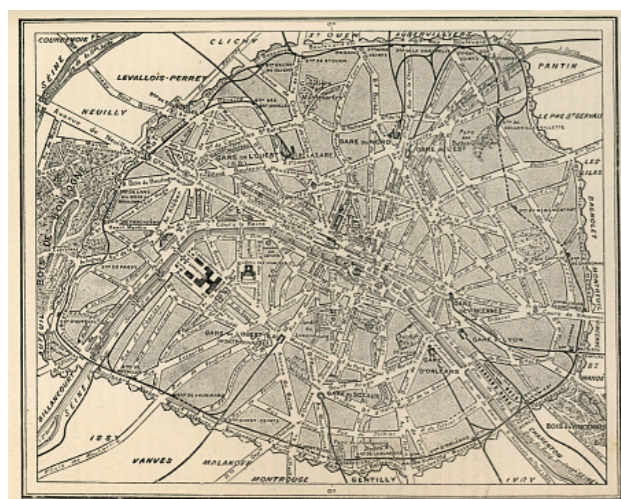
Faculty Supervisor
Serdal Kirmizialtin

SOUND-MAPPING NINETEENTH-CENTURY PARIS, FRENCH STUDIES

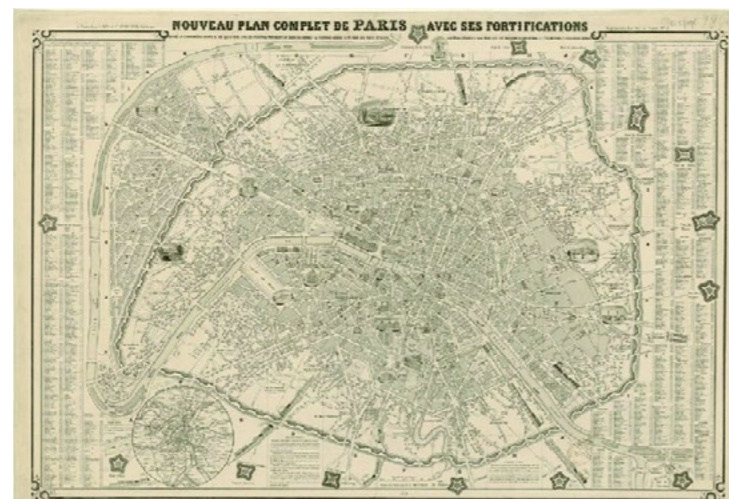
This project aimed to transform nineteenth-century French sources into a digital archive and then eventually into an interactive “sound map.” I was involved in the initial phase, and I started by identifying descriptions of sound in nineteenth-century novels by Honoré de Balzac and Emile Zola based around specific places in Paris. I created a database to keep track of the different noises of the French capital and their associated locations, as well as other relevant information about the cultural values attached to these sounds. I paid particular attention to Emile Zola’s novel, *Au bonheur des dames* (1883), which recounts the birth of the department store in modernizing Paris. Through close readings and analyses of important passages, we traced how the sounds of Zola’s novel relate to gender, class, and the changing physical and socio-economic landscapes of Paris.



After surveying multiple novels, Isidora chose Emile Zola’s famous novel about the birth of the department store in Paris as a case study to show how sound allegorizes the new booming industry



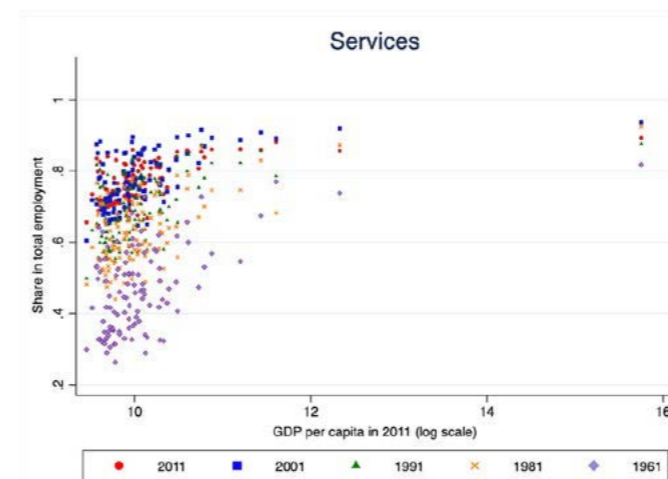
Using the database that Isidora started, the project aims to eventually create an online sound map of nineteenth-century Paris



STRUCTURAL CHANGE IN THE UK

UK city growth has long been a subject of research; interestingly enough, a number of UK cities have shown different urban growth patterns across time. Yet, little research has been conducted to examine the determinants of cities’ growth and decline back in the 1950s.

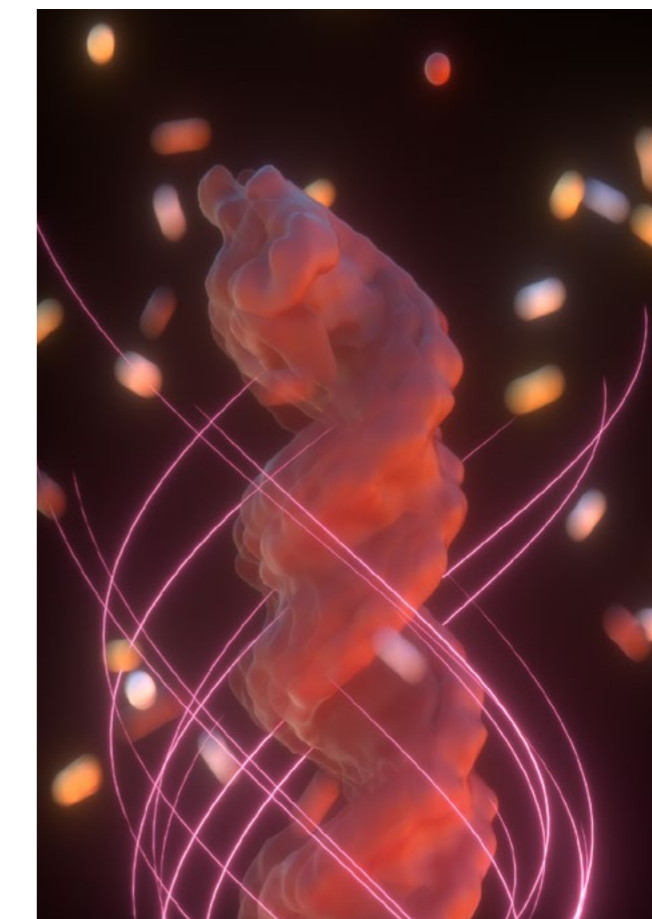
My summer research work focused on the short-term and long-term determinants of the UK cities’ industrial specialization from the 1960s up until now, with an aim to develop a growth model to rationalize our findings and further advance recent research on structural transformation in the UK.



Share of Service Sector in Total Employment 1961-2011

COMPUTATIONAL MODELING OF RNA

RNA is one of the essential molecules of life. The structure and interactions of RNA molecules have implications in medicine and understanding of biological processes. The project aimed to model structure and dynamics of RNA molecules using molecular dynamics simulations.



Computer simulations show that the positively charged ions constantly move around the RNA, forming an ion atmosphere



**MUYAN
JIANG**

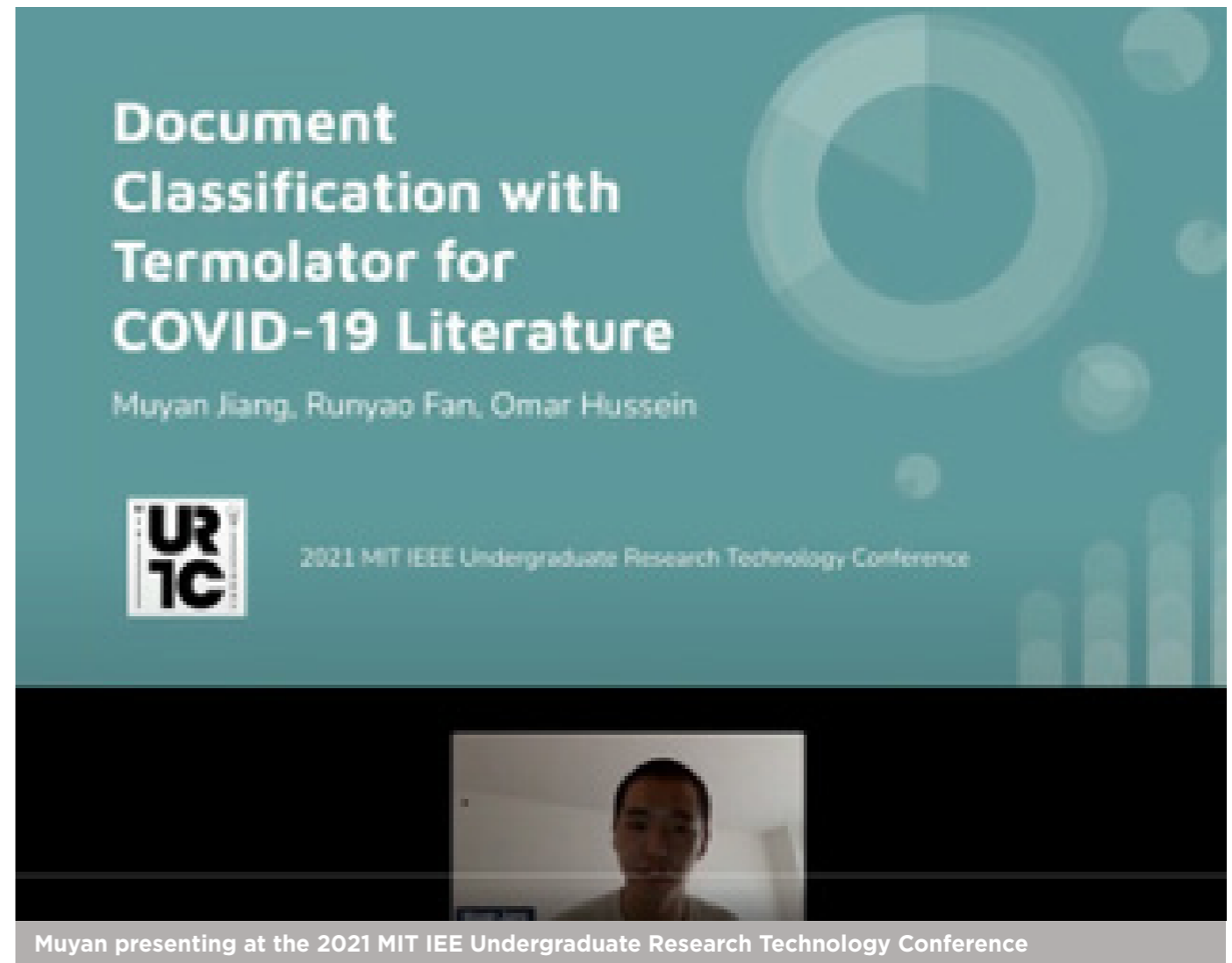
Major
Mathematics and
Computer Science

Faculty Supervisor
Ilya Spitkovsky

KIPPENHAHN CURVES

The numerical range of an operator is the range of the associated quadratic form on the unit sphere of the Hilbert space. We established some properties of the numerical range generating curves (also called Kippenhahn curves) of reciprocal matrices, in particular concerning the location of their elliptical components. We computed explicitly the criteria for which the curves contain entirely ellipses and provide a complete description of higher rank numerical ranges when these criteria

are met. Furthermore, during my PPTP summer research, I extended the study of this family of matrices to any dimension and investigated their properties there. We derived a general description of the Kippenhahn polynomial of the reciprocal matrix at any dimension and standardized a derivation process of the ellipticity criteria for its associated numerical range



Muyan presenting at the 2021 MIT IEEE Undergraduate Research Technology Conference



On some reciprocal matrices with elliptical components of their kippenhahn curves

Special Matrices, vol. 10, no. 1, pp. 117-130, 2022

Muyan Jiang and Ilya Spitkovsky



Document classification with termolator for covid-19 literature

In 2021 IEEE MIT Undergraduate Research Technology Conference (URTC), pp. 1-5, 2021

Muyan Jiang, Runyao Fan, and Omar Hussein



New threshold reveals the uncertainty about the effect of school opening on diffusion of covid-19

Scientific Reports, vol. 12, p. 3012, Feb 2022

Alberto Gandolfi, Andrea Aspri, Elena Beretta, Khola Jamshad and Muyan Jiang



It was a pleasure working with Muyan in the capacity of his Capstone mentor. We wrote two papers together; one was published before he graduated and the other is currently under review. He is now a graduate student at the University of California Berkeley but our collaboration continues. Mentoring Capstone projects of Math majors has been the most rewarding part of my teaching experience at NYUAD.

Ilya Spitkovsky
Professor of Mathematics





**MOHAMMED
KHALED ALZAABI**

Major
Physics

School
Khalifa University

Faculty Supervisor
Mohammad Qasaimeh



**RODAINA
KHALED**

Major
Biomedical Engineering

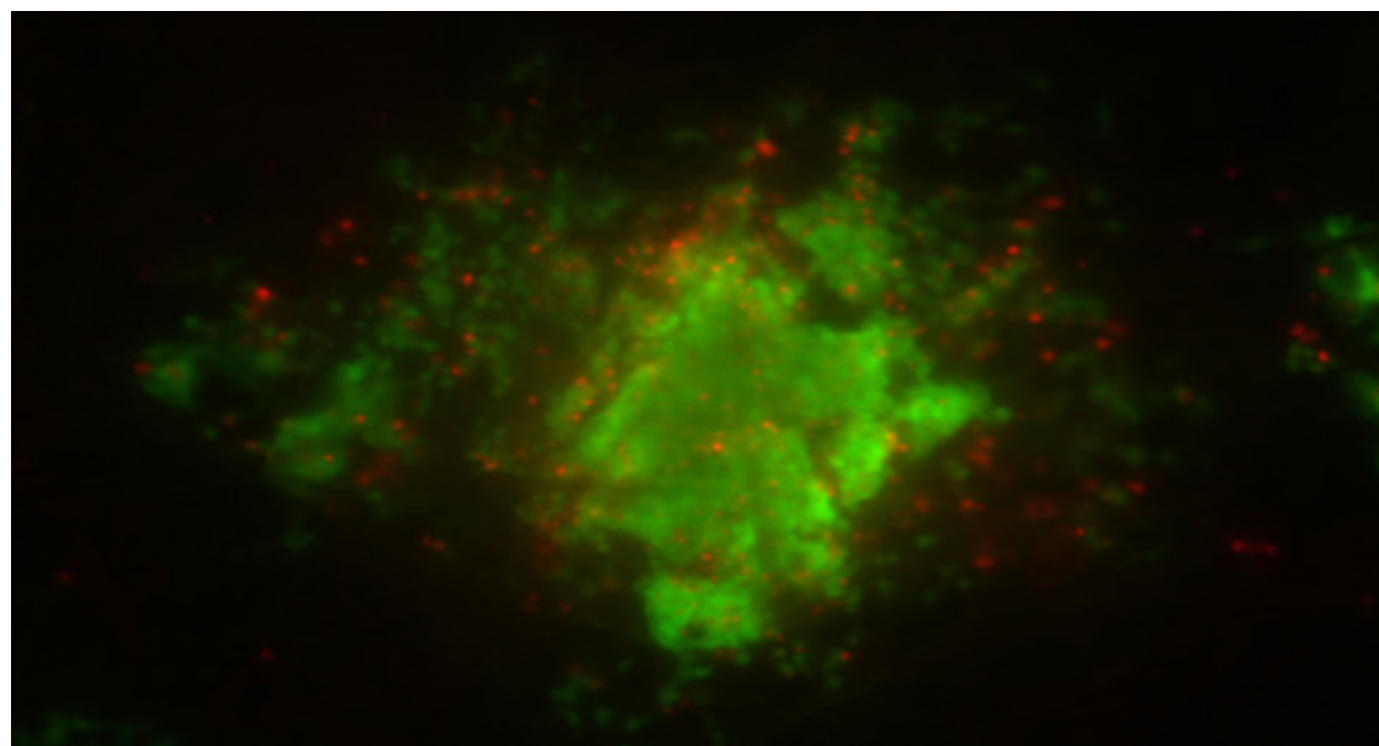
School
Khalifa University

Faculty Supervisor
Rafael Yong-Ak Song

MICROFLUIDICS FOR BIOLOGY AND LIFE SCIENCES, THE ADVANCED MICROFLUIDICS AND MICRODEVICES LABORATORY

My research was focused on turning 2D cell culture into 3D cell culture. During drug discovery, cells are being tested on 2D flasks and the successful ones from there are moved into animal testing and then finally, clinical trials. However, a very tiny number of drugs end up being used in the industry due to the huge difference in the environment between the 2D monolayer of cells and the 3D physiology of the animal and human body.

Paper is especially useful to solve this not only because it is cheap, easily accessible, and easy to be mass produced, but it also allows for a 3D environment for the cells to grow in due to its fibers. Therefore, during my research, I was able to store and preserve different cells in engineered isolated wells in paper and observe their growth over time, showing that they prefer living in this new environment.



Cancer cells after 14 days of 3D culture in the bioengineered paper

A BIOMIMETIC DESIGN OF MARINE IGUANA'S SALT GLAND

Marine iguanas living on Galapagos Islands are known for their very efficient salt glands, where they 'sneeze' out salt. Because they feed underwater, they take in a large amount of saltwater. In order to prevent dehydration, they must expel salt without expelling water, so they have specialized glands that remove salt from their blood. Bioinspired by this ability, the project aimed to build an artificial salt gland in a microfluidic chip that can expel salt ions from sea water and demonstrate the capability of marine iguana's salt sneezing on chip.

“ This experience has given me an incredible opportunity to try hands-on research, for which I am extremely grateful. I had the opportunity to use eight different devices when working on my experiments, and was continually provided with insightful feedback and guidance. ”



Pipetting hydrogel into the channels for micropatterning



KUNAL SATPUTE

Major
Economics

Faculty Supervisor
Wifag Adnan



CHARLENE CHEN

Major
Cellular and Molecular Biology

Faculty Supervisor
Kirsten Sadler Edepli



ZAINAB ALI ADAN

Major
Mathematics

Faculty Supervisors
Raghib Ali and Amar Ahmad



KHALIFA KHALED GHALED ALMHEIRI

Major
Chemical Engineering

School
Abu Dhabi University

Faculty Supervisor
Panče Naumov

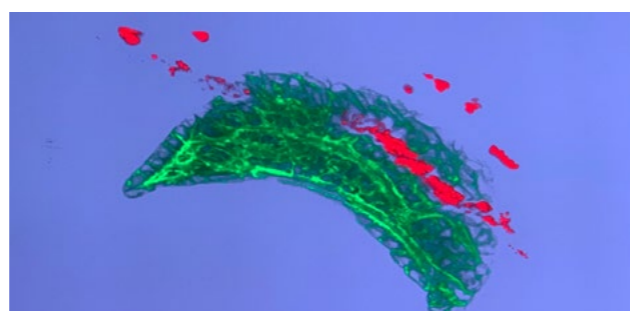
THE DISTRIBUTIONAL WELFARE CONSEQUENCES OF WORK PERMIT MARKETS: EVIDENCE FROM THE WEST BANK

The desire to capture the economic benefits of international labour mobility has led to proposals for the trade of work permits. This system has been expected by some to reduce undocumented workers and increase market efficiency. I assisted the study of the circumstances of the Palestinian migrant workers as the work permit market expanded in Israel in a bid to reduce undocumented workers.

I was able to take on tasks that required learning new skills such as using certain softwares and data cleaning methods. This will prove invaluable in preparing me for my Capstone project.

UTILIZING LIVE CELL IMAGING TO UNDERSTAND IMMUNE CELL BEHAVIOR IN THE LIVER

My summer research project explored how senescence, induced by overexpression of the UHRF1 oncogene in the zebrafish liver, interacts with a type of immune cell known as neutrophils. Through introducing transgenes that produce green fluorescence in the liver and red fluorescence in neutrophils, we utilized live cell imaging to produce 3D time lapse movies to study how neutrophils behave around the liver. This is all made possible by adorable zebrafish, which remain optically translucent as tiny larvae.



Neutrophils (fluorescently tagged red) surround the zebrafish liver (green) in vivo

I feel incredibly fortunate to be in such a hardworking and supportive lab, with people who are not just knowledgeable but also kind!

THE UAE HEALTHY FUTURE STUDY – A COLLABORATIVE PROSPECTIVE OBSERVATIONAL COHORT STUDY AMONG UAE NATIONALS

Happiness is an essential part of life. It can be defined as the level at which individuals positively evaluate their lives. Many individual and social factors, such as income and physical health, influence happiness, and their significance varies from one person to another.

Due to the increasing rate of obesity in the UAE, this research focused on understanding the relationship between BMI and happiness levels among individuals in the UAE, considering their age and gender. We used a subset of the collected data in the UAE Healthy Future Pilot Study and performed our analysis using the R programming language.

Also, to better understand this relationship, I conducted a literature review on several studies with similar interests from various countries. Results from the data analysis as well as the literature review were then summarized in a formal statistical analysis report. The results of this research will be beneficial in understanding the impact of BMI on the happiness level of the UAE population as well as raising awareness about the negative consequences that obesity has on our mental and physical health

SMART MATERIALS FOR ELECTRONICS AND ROBOTICS APPLICATIONS

Smart dynamic materials constitute an emerging class of materials that are capable of controllable response to external stimuli such as mechanical pressure, light or heat. By tactful modification of the assembling components and molecular manipulation techniques, we are able to achieve the soft actuators with multiple responses so as to realize multidirectional control over the motility. Such soft actuators are useful for controlling energy conversion from light or heat to mechanical work that could be further conveniently transferred to electricity or motion. In this project, I worked closely with the members of Naumov's Smart Materials Lab to prepare, analyze and assess the performance of new smart molecular materials.



Khalifa Almheiri's quality assessment of (soft actuators/ smart materials) using an optical microscope



**SEON
YEONG CHO**

Major
Chemistry

Faculty Supervisors
Panče Naumov
and Ejaz Ahmed

ORGANIC IONIC PLASTIC CRYSTALS WITH HIGH IONIC CONDUCTIVITY FOR LITHIUM ION BATTERIES

Lithium-ion batteries are attracting a lot of attention from the energy sector since they power the necessities of life from cell phones and laptops to hybrids and electric cars. Several unique features including high energy density, light weight, rechargeability and extra safety are the main reasons behind the growing popularity of this technology. Organic ionic plastic crystals (OIPCs) are a new type of materials which can work as solid-state electrolytes in presently used batteries. OIPCs are composed of a selected combination of organic cations and anions. As OIPCs are non-flammable and non-volatile, they are safer alternative to replace the flammable

liquid electrolytes. A research team consists of an undergrad student Seonyeong Cho and research scientist Ejaz Ahmed, led by Panče Naumov, at NYUAD described a new type of OIPC. Evaluations of the thermal properties, ionic conductivities, and rotational dynamics revealed that this new OIPC has high thermal stability, high ionic conductivity and rotational mobility of the constituent ions which promotes high ionic conductivity with increasing temperature. These characteristic features make this material a promising candidate as a solid-state electrolyte for lithium ion batteries.



Class of 2022 Chemistry graduate, Seon Yeong Cho, won third prize at Abu Dhabi University's 9th Undergraduate Research Competition for her Capstone project titled, Organic Ionic Plastic Crystals with High Ionic Conductivity for Lithium Ion Batteries.

Organic Ionic Plastic Crystals with High Ionic Conductivity for Lithium Ion Batteries

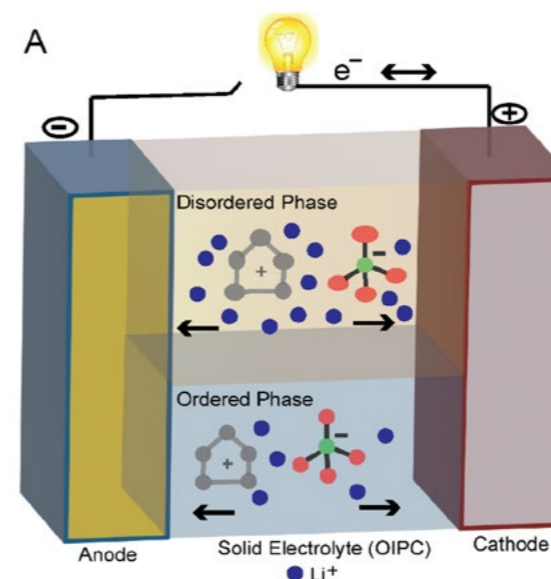
Seon Yeong Cho
Smart Materials Lab (Naumov Group)
New York University / New York University Abu Dhabi

TOPIC
"Organic Ionic Plastic Crystals with High Ionic Conductivity for Lithium Ion Batteries"
University: New York University Abu Dhabi

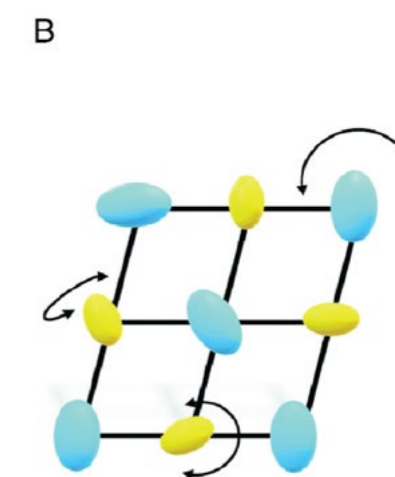
Members
- Seon Yeong Cho

Mentor
- Dr. Panče Naumov
- Dr. Ejaz Ahmed

3rd Winner



Schematic of a typical solid-state Li⁺ ion battery incorporating an OIPC as solid-state electrolyte



A typical OIPC showing an orientational disorder



LUCAS GOMEZ-DOYLE

Major Social Research and Public Policy

Faculty Supervisor Kinga Makovi

DOUBLY ROBUST ANALYSIS OF POLITICAL PARTISANSHIP AND IDEOLOGY ON VACCINATION INTENTION IN THE UNITED STATES

This summer I had the chance to prepare my thesis for publication. My thesis explores how the pandemic became polarized, deepening existing ideological divides and subsequently fostering greater ambivalence towards vaccines. To understand better how politicized vaccine hesitancy had become, I drew upon a representative panel survey in the US from the spring and fall of 2020, to derive estimates for the impact of partisanship and political ideology on vaccination

intentions for individuals and their children using matching and doubly robust regression analysis. My summer was spent learning the ins and outs of journal submissions, bettering my coding skills in R, synthesizing and searching for new research, as well as learning how to be a successful co-author. While I am still years away from being the scholar I want to be, this summer's research, with the guidance of my academic mentor, proved to be a foundational step in my future in academia.

This PPTP experience provided Lucas with the chance to learn the necessary skills and procedures to create a journal article from a Capstone project.

Kinga Makovi
Assistant Professor of Social Research and Public Policy



ANWAAR ABDULBASET ALHADHRAMI

Major Cellular and Molecular Biology

Faculty Supervisor Saqer Almarri

School UAE University

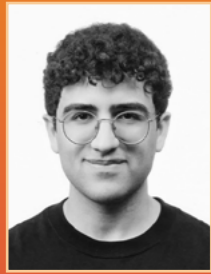
PRE-MODERN ARABIC WRITERS

This project consisted of developing biographies of a variety of writers in the pre-modern Arabic/Islamic intellectual tradition. I developed these biographies by referring to biographical dictionaries from digitized books written in Arabic, and collecting and verifying information about their birth and death dates, their scholarship, and

relevant biographical anecdotes. I then entered my collected biographical data about the writers into a spreadsheet that will be used to develop a timeline of the writers' activities and their networks of relationships.



Two pages from a biographical dictionary: Ṭabaqāt al-shāfi'īyya written by: Jamāl al-Dīn al-Asnawī, showing biographies of some writers



OMAR RAYYAN

Major Electrical Engineering and Computer Science



DHIYAA AL-JORF

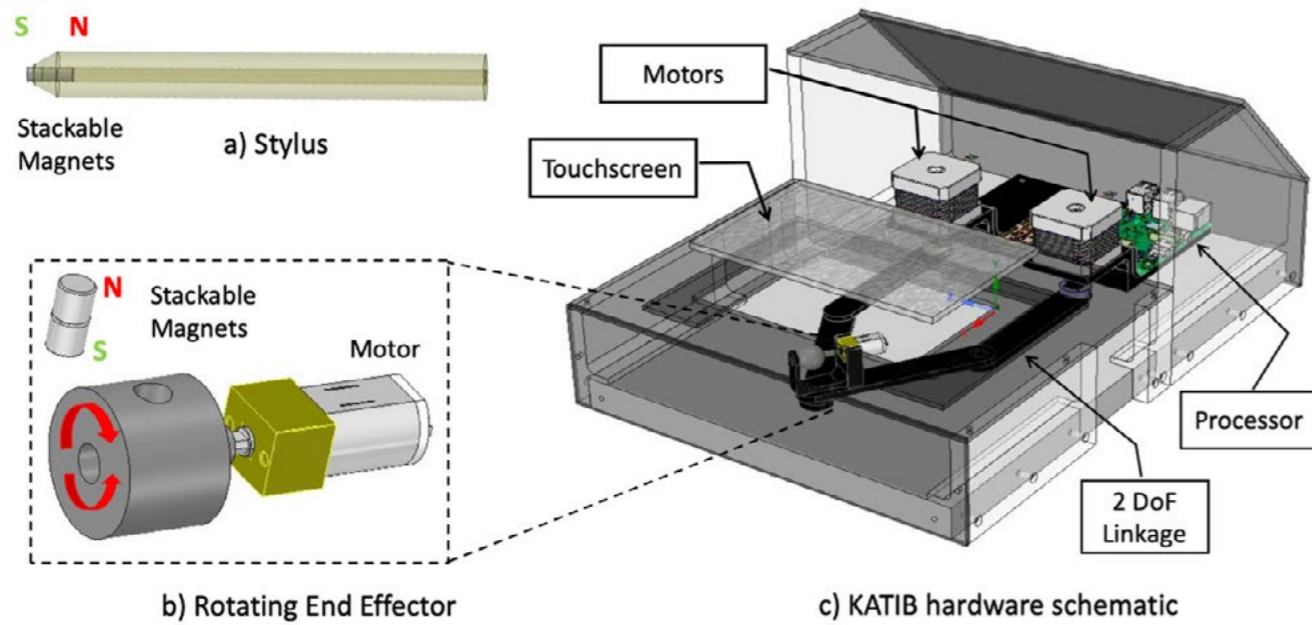
Major Computer Engineering

Faculty Supervisor
Mohamad Eid

DEVELOPING SERIOUS TASKS FOR KATIB FOR THE REHABILITATION OF FINE MOTOR SKILLS

We took part in a summer research project based in the Applied Interactive Multimedia (AIM) Lab of NYUAD. Our role over the summer was to develop handwriting tasks based on adaptive serious games to improve the fine motor skills associated with handwriting. The tasks are to be run on KATIB which is a handwriting assisting platform that provides contact-less kinesthetic feedback by utilizing magnetic forces. KATIB aims to help post-stroke patients regain writing skills through its easy-to-use software. It enables patients to perform physical tasks while receiving real-time feedback from their therapists.

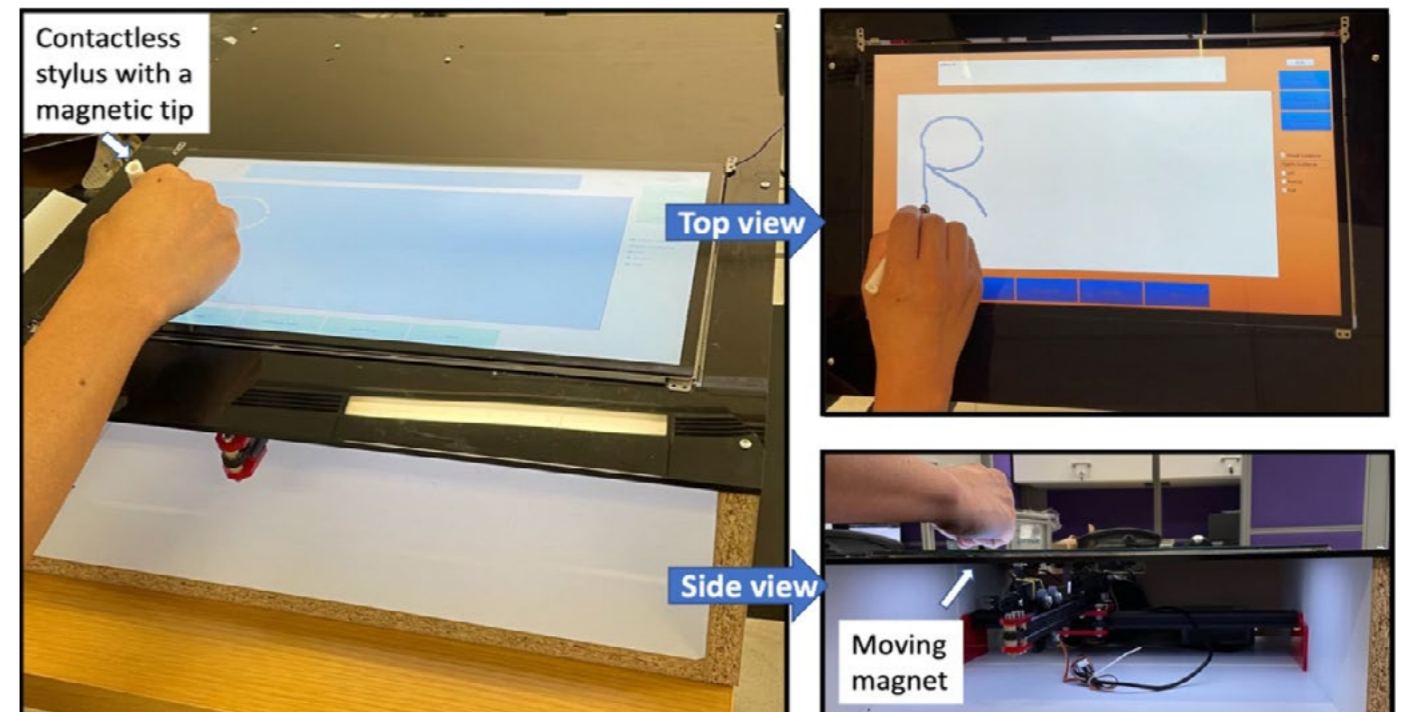
The purpose was to make the rehabilitation of handwriting skills fun and engaging. We developed a range of serious games, targeting varying skills and adjustable levels of difficulty. The games utilize freehand handwriting through the KATIB platform to address varied handwriting abilities of patients. This application is meant for both the academic and health sectors where schools and hospitals can implement it for students and post-stroke patients respectively.



KATIB Platform providing contactless force feedback

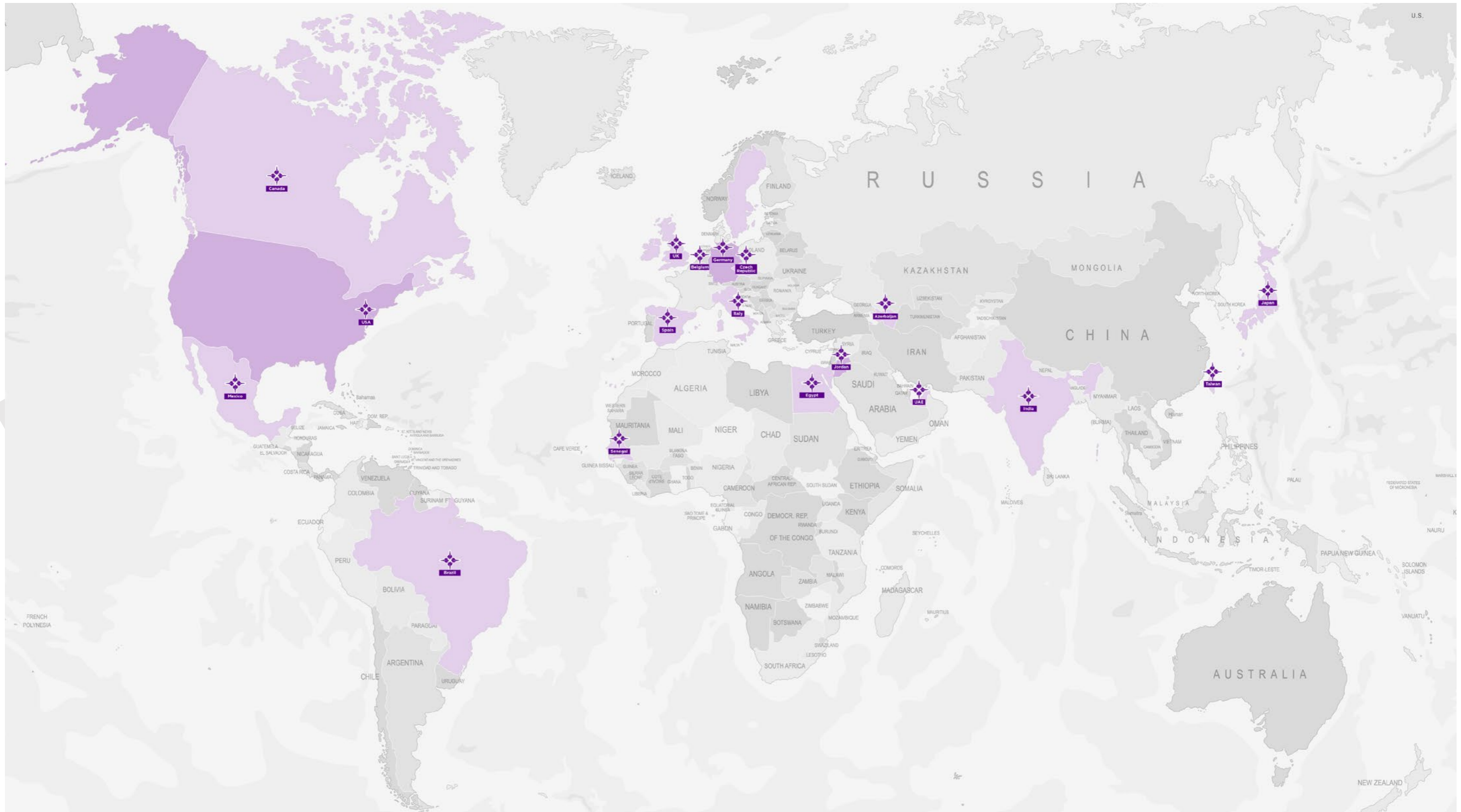


Testing the software developed



KATIB prototype

RESEARCH AROUND THE WORLD





**NOORA
JABIR**

Major
Social Research and
Public Policy

Faculty Supervisor
Robert Parthesius

Research Location
India and the UAE

THE DHOWS OF MALABAR: HERITAGE NARRATIVES OF INDIAN OCEAN SHIPBUILDING TRADITIONS

I spent the summer visiting boatyards in various parts of Kerala in order to learn about the intergenerational transmission of boatbuilding knowledge, and the decline of traditional Keralite forms of building boats.

As one of the last few people in the Indian Ocean world that continue to ‘sew’ planks together to build boats, traditional Keralite boatbuilders today form the last generation to possess the knowledge and skills required to make these kinds of boats that were once characteristic of the Indian Ocean littoral. Due to the lack of demand for these skills—both due to the introduction of new, cheaper forms of boatbuilding and a specific pedagogy that relies entirely on oral traditions to pass down this knowledge—the

intangible heritage of Keralite boat building is rapidly disappearing. By visiting shipyards across Kerala, I attempted to understand how boatbuilders view this decline, as well as understand how issues of caste, gender and climate change have significantly shaped this industry.

I also worked to trace the transformation of these skills in the field of experimental archaeology by conducting interviews with shipwrights working on the Bronze Age Boat project on campus. The archaeological reconstruction project is also simultaneously one of heritage production, and I explored how different forms and frameworks of knowledge interact in the laboratory environment of the Ancient Boat Lab.



Sewn-boat built in Beypore that will be displayed in Qatar during the FIFA World Cup



A wooden dhow at an abandoned shipyard in Kerala



Noora at a boatyard in Beypore, Kerala



The Bronze Age Boat project, where Noora conducted interviews and learnt about experimental archaeology



Boatbuilders at Beypore work together to build a baghlah



**JAMES
JIANG**

Major
Civil Engineering

Faculty Supervisors
Alex Fröhlich and Stephan Ott

Research Location
Technical University of Munich



**SUSHIL
BOHARA**

Major
Electrical Engineering

Faculty Supervisor
Ramesh Karri

Research Location
NYU Tandon School of
Engineering

WOOD PANEL PAINTING (HOLZTAFELBILD)

This project was related to material monitoring. It was about humidifying a historic painting on wood, which has shrunk due to a very dry indoor climate. The paint was cracking and fell from the wood frame. To stop shrinkage and to allow the wood to swell again, we tried to generate a more humid air around the painting and monitor the extension as well as temperature, moisture content, etc.

The project included development and model

application of an *in situ* humidification method with a monitoring concept using the example of an anthropogenically damaged large-format wooden panel painting.

The project investigated the possibilities of the remoisturing and monitoring of - by low, anthropogenically caused air humidity - strongly damaged cultural heritage in a practice-oriented way.



James in the wood panel workshop

GPT 3-BASED MACHINE LEARNING MODEL FOR 'VERILOG' GENERATION AND DETECTION

My summer research project involved working on a machine learning model to generate the Verilog codes for electric circuit simulations. I coded the simulations for electronic systems using different possible levels of abstraction in Verilog, namely behavioral, dataflow, gate, and switch levels, so as to produce enough data to train the GPT-3 model.

We trained the model so that it would learn to generate the Verilog codes for any electric system based on the prompts provided to it. Similarly, I used the regular expressions in C++ to develop the

model to extract the Verilog code snippets from any textbooks provided to it by the user. The model was able to extract the code snippets from a wide variety of textbooks and use them as the training data for machine learning.

This made the model capable of self-learning from textbooks without having to fetch the training data manually. The correctness of the extracted codes was verified by synthesizing them in Xilinx ISE and simulating them using the FPGAs.

```
storeIn Val(fanout);

in0 = in0Val[evalElement];
in1 = in1Val[evalElement];

mask= getMask(in[:]) & getMask(in[:]) &
getMask(in[:]) & getMask(in[:]);
//Switch Level Modeling
out = fillBits((in0 I in) & (mask, mask));
if(out != outVal[evalElement])
schedule( out);
if (DebugFlags[0])
end
$display("in= %b\nin= %b\nmask= %b %b\nout = %b_%b",
in[:],in[:], in[:],in[:],
mask,mask, out[:],out[:]);
end task
//Given either a-strength or-strength half of a strength value
//return a masking pattern for use in a wire evaluation.
function [:] getMask;
input [:] halVal; //half a full strength value
casez (halVal)'b??????: getMask ='b';'b?????: getMask ='bl';'b????: getMask ='bl';
endcase
endfunction
// Schedule the evaluation element to change to a new value.
// If the element is already scheduled then just insert the new value.
task schedule;
input [:] newVal; II new value to change to
begin
if (DebugFlags[0])
$display(
"Element%d, type %s, scheduled to change to %s(%b_%b)",
evalElement, typeString eleType[evalElement]),
```



Training the large language cybersecurity model for hardware design



HANNAH GREENE

Major
Social Research and
Public Policy

Faculty Supervisors
Jemima Frimpong and
Kinga Makovi

Research Location
Ghana



Links to the survey questionnaire, a set of ArcGIS maps to visualize responses at the neighborhood level, and the Capstone Project



Accra-based student Rafiatu Abdul-Mumin worked as a research assistant for the project

WE WANT TO PREVENT RESISTANCE: SHOPKEEPER STEWARDSHIP AND ANTIMICROBIAL RESISTANT PATHOGENS IN ACCRA, GHANA

Antibiotics and antimalarials are critically important life-saving medications. Yet the overuse and misuse of these medications are driving the emergence of untreatable drug-resistant pathogens. To understand the underlying drivers of antimicrobial misuse, this study investigated how often antimicrobials were sold in pharmacies and chemical shops throughout Accra. The survey examined whether shopkeepers sold partial treatment courses, and how shopkeepers navigated financial needs when customers couldn't afford requested medications. I wanted to unite my SRPP major with all that I'd learned in Foundations of Science, pre-medical track courses, and an immunology internship in Accra. Antimicrobial resistance lies at the intersection of everything

I care about: justice in global health care, holistic well-being, climate change, and historical awareness. Colonialism and resource exploitation create a fragmented system of healthcare, and to this day much of the Accra population rely on informal networks to obtain medicines to treat illnesses. Under the guidance of my supervisors, I worked with 43 shopkeepers and collaborated with a research assistant to survey an additional 40 shops. We found that shopkeepers' distribution practices were more nuanced than conventionally assumed in prior studies. Specifically, they have awareness of the dangers of drug resistance, and in turn perform a vital stewardship role in trying to support community health.



Mapping variables from the 72-question survey allowed for identifying risk factors at the neighborhood level

I conducted my Capstone fieldwork during my study away semester in Ghana, surveying medicine shops to predict the risk of future drug-resistant pathogen outbreaks. Monitoring the use of antibiotics and antimalarial medications is essential to preempt the emergence of antimicrobial resistance. This fieldwork showed the value of gathering insight directly from medicine shopkeepers.

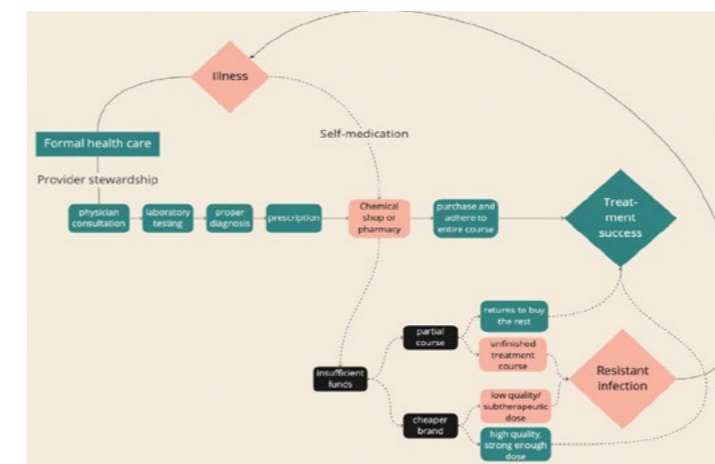


Diagram of common pathways to access antimicrobial medications



Various herbal medications are displayed in a chemical shop, including some used to treat malaria



**WILDER
WORRALL**

Major
Biology

Faculty Supervisors
Xueqing Chen and Zhe Li

Research Location
Harvard University

SATIATION OR CESSATION: INVESTIGATING IGF1R IN FALLOPIAN TUBE EPITHELIAL ORGANOID GROWTH

Epithelial ovarian cancer (EOC) often originates in the fallopian tubes (FT), the duct connecting the uterus and ovaries. Fallopian tube epithelial (FTE) tissues contain a rich supply of secretory and ciliated cells, in which an FT stromal cell subpopulation may serve as a hormone-responsive niche for stem/progenitor cells, by regulating their differentiation and proliferation.

However, these cells can undergo oncogenesis when malignant mutations in critical genes, such as *Bra1*, *p53*, *Pdgr*, and *Lgr5/6*, arise. *Igfr1* is the gene that encodes the receptor for the insulin-like growth factor 1 (IGF-1) hormone. *Igfr1* is robustly expressed in EOC tumor cells, but current inhibitors provide limited benefit in blocking tumor growth, which makes it of interest for investigation. Organoid

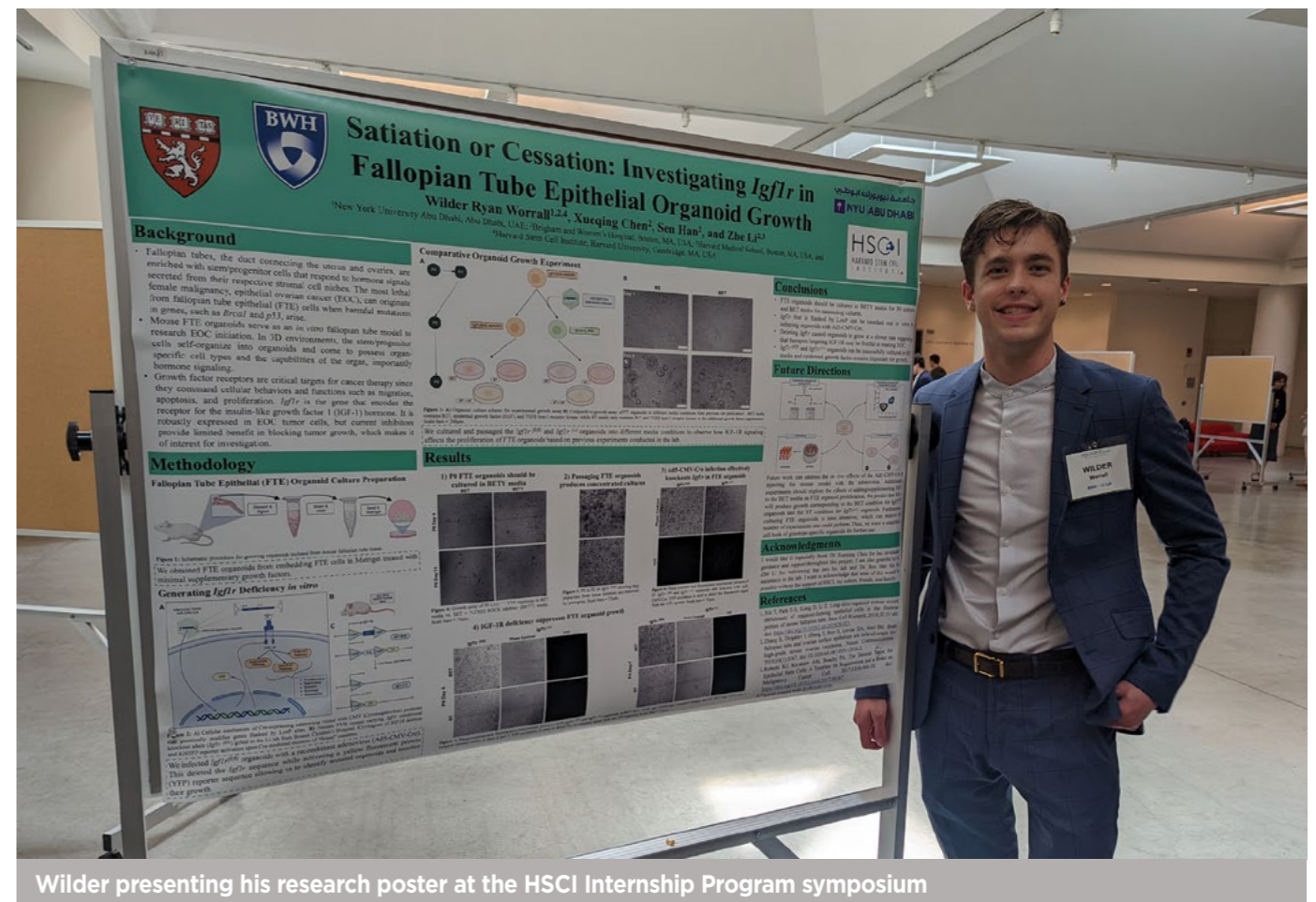
culture technology provides the *in vitro* capability to study and characterize FTE stem cells and the molecular mechanisms that underlie their potency and malignancy.

Furthermore, recent studies in personalized medicine have shown that manipulated epithelial organoids can easily integrate into patient tissue and correct targeted malignancies. In my project, organoid-forming FTE progenitor and stromal cell co-cultures were employed with a recombinant Ad-CMV-Cre adenovirus to verify the use of adenoviruses to generate genetic deficient and study the potential role of *Igfr1* in EOC formation.

“The Harvard Stem Cell Institute (HSCI) Internship Program (HIP) was an amazing experience. I was able to meet and hear from some of the leading scientists in stem cell research. The opportunity to create and present a scientific poster better equipped me for a future in academia.”



Wilder and fellow cohort members in front of the Widener Library on Harvard's campus



Wilder presenting his research poster at the HSCI Internship Program symposium



ARYA GAUTAM

Major
Biology

Faculty Supervisor
Joy Bergelson

Research Location
NYU New York



LUKEO LUOGA

Major
Computer Engineering

Faculty Supervisor
Kaan Ozbay

Research Location
NYU Tandon School of
Engineering

ISOLATION OF PSEUDOMONAS SYRINGAE FROM ARABIDOPSIS THALIANA

I was responsible for isolating various strains of *Pseudomonas syringae* from the plant species *Arabidopsis thaliana* in order to understand the structure of pathogen community assemblages in plants found in non-agricultural settings. I used a selective medium and selective PCR primers to isolate desired strains of bacteria.

Alongside wet lab research, I was also involved in a computational analysis project through a collaboration with the Jha lab at NYUAD. In this project, we were interested in learning about the evolutionary relationship in resistance (R) genes between three closely growing invasive plant species. Specifically I was responsible for running various algorithms such

as NLR tracker, NLR annotator and hmmer search to extract potential R genes from the genome database of these plant species.

Furthermore, I was also responsible for running InterProScan on the protein accessions of these plant species to extract information about potential Integrated Domains (ID)—domains other than the canonical R protein domains that have been suggested to be integrated with R proteins as an evolutionary mechanism to recognize effector molecules secreted by pathogens and initiate a cascade of immune pathways to expel the pathogens.

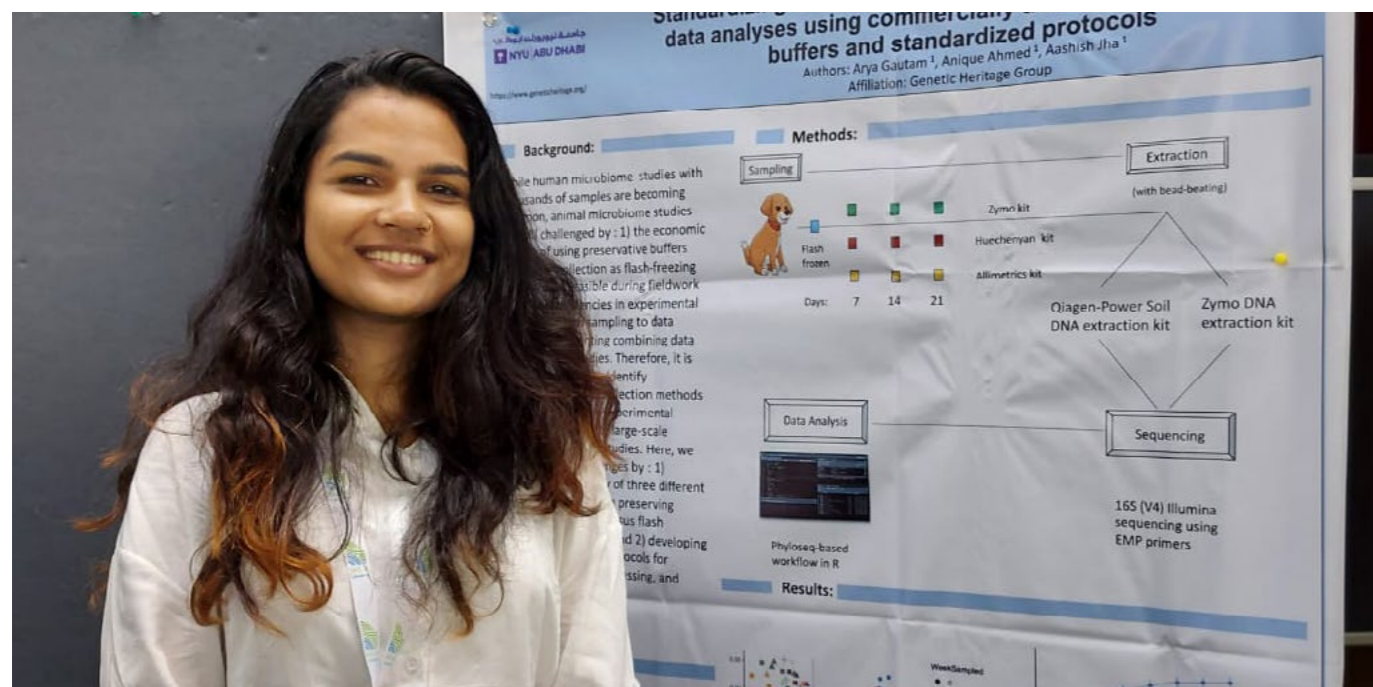
INTENTION PREDICTION ALGORITHMS FOR COOPERATIVE DRIVING AND CONNECTED/AUTONOMOUS VEHICLE APPLICATIONS

Cooperative Driving has become one of the new research frontiers in the field of connected and autonomous vehicle (CAV) research. Pedestrian safety remains to be one of the critical issues in Cooperative Driving and CAV applications. This is because it has been a challenging task for connected and autonomous vehicles to estimate when pedestrians will cross streets since pedestrians can move in different directions, suddenly change motion, be occluded by a variety of obstacles, and be distracted while talking to other pedestrians or typing on a mobile phone.

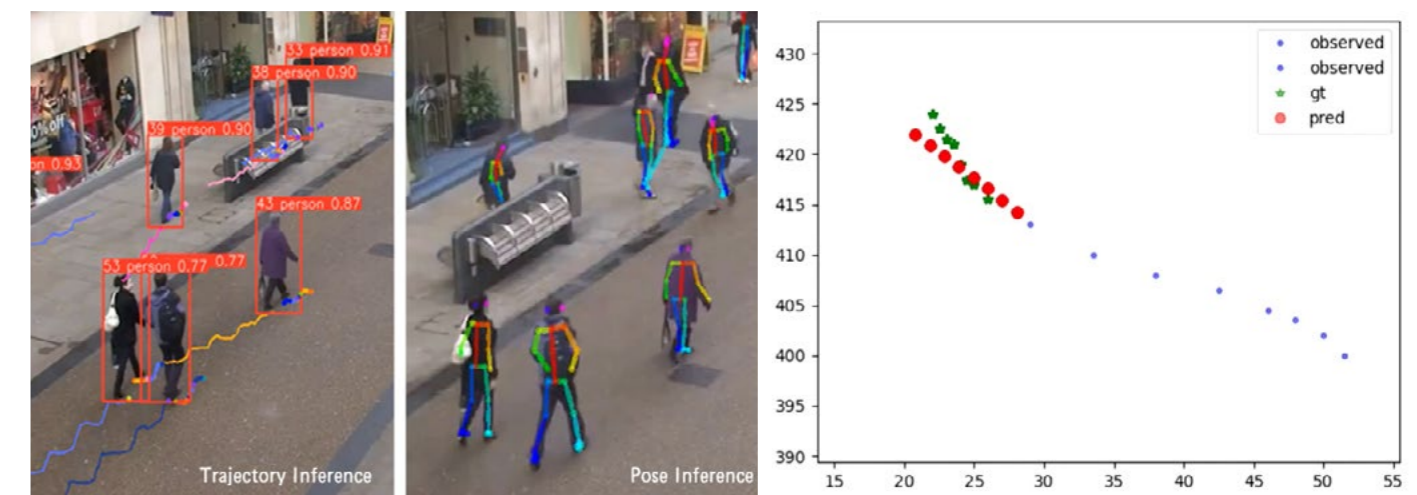
Moreover, their decisions can also be affected by several factors. Intention prediction algorithms can provide essential information for warning systems

or autonomous driving systems to avoid pedestrian-vehicle incidents. Existing methods for pedestrians' intention prediction include trajectory inference and pose inference.

The goal of this project is to explore existing methods of intention predictions and implement State of Art methods to develop a deep learning-based intention prediction algorithm to improve vehicle and vulnerable road user safety in urban areas. Real-world videos recorded by CCTV cameras on different streets of New York City will be used to extract vehicle and pedestrian behaviors to be used in the development of intention prediction algorithms.



Arya presenting at the ISME18 conference in Switzerland



Visualization of Observed and Predicted Pedestrian Trajectory



ABIGAIL AMA KOOMSON

Major
Biology

Faculty Supervisors
Sumeet Pal Singh and
Kirsten Sadler Edepli

Research Location
Singh Lab, Belgium

INVESTIGATING THE LONG-TERM IMPACT OF SHORT-TERM EXPOSURE TO ARSENIC AND ETHANOL ON THE EPIGENETIC LANDSCAPE IN THE LIVER OF ZEBRAFISH

One of the goals of my summer project was to understand the relationship between gene expression and chromatin accessibility in both control and arsenic (iAs) treated fishes at both five and 15 days post fertilization (dpf). I learned to analyze both RNA-seq and ATAC-seq datasets towards answering specific questions for this goal. Also, using a cell lineage tracing approach developed by the Singh lab, we worked towards finding out whether the hepatocytes that are present in the liver following exposure to ethanol (EtOH) at five dpf are the same ones that are present later at 15 dpf after regeneration or recovery. This project will give us a better understanding of the sustained effect of arsenic on the epigenetic landscape in the zebrafish liver.

“My time in the Singh lab has been very engaging. I have learned new wet lab skills and data analysis tools which I hope to bring back to the Sadler lab to work on my Capstone project. I am thankful to the Office of Student Research for funding this unique opportunity!”



Abigail is screening for the presence of 2 transgenes by collecting zebrafish larvae with red and green eye lenses



RAMEEN MAHMOOD

Major
Electrical Engineering



YULIA GRAJEWSKA

Major
Computer Science and Mathematics

Faculty Supervisor
Ivan Selesnick

Research Location
NYU Tandon School of Engineering

INTERPRETABILITY AND GENERALIZATION OF CNNs IN SIGNAL DENOISING

Convolutional Neural Networks (CNNs) have recently gained increased recognition with signal denoising tasks, however there is little insight towards understanding their inner workings.

The aim of our project was to understand what a Convolutional Neural Network learns during the training process of denoising a sparse signal, and hence improve its generalization and interpretability. We performed numerous experiments and were

able to identify patterns in the filters, for example: time reversal, negation and scaling. This allowed us to derive and impose constraints on CNNs.

The resulting networks require less training and have increased performance as well as improved generalization. This result validates our understanding of what the CNNs learn and enhances the efficiency of sparse signal denoising.

Interpretability and Generalization of CNNs in Sparse Signal Denoising
Rameen Mahmood, Yulia Grajewska
New York University Abu Dhabi

Abstract
Convolutional Neural Networks (CNNs) have recently gained increased recognition with signal denoising tasks, however there is little insight towards understanding their inner workings. The aim of our project is to understand what a CNN learns during training, and hence improve its **interpretability** and **generalization**. We perform numerous experiments and are able to identify patterns in the filters, for example: time reversal, negation and scaling. This allows us to derive and impose constraints on CNNs. The resulting networks require less training, maintain the denoising performance, have better generalization, all with fewer parameters. Our project is a step towards understanding CNNs using the lens of signal processing.

Methodology
We perform **extensive experiments** for signal denoising using Pytorch. We analyze the performance of our CNNs and the learned filters using Matlab.
We start noticing patterns in the **unconstrained CNN**:
The figures are a mathematical verification of our constraints:
The denoiser achieves the invariance properties. The imposed constraints result in better denoising performance.

Background
CNN is a Deep Learning (DL) architecture with applications in classification, denoising, and many more. Our research focuses on employing CNNs for sparse signal denoising.
What is a CNN?
$$D(x) = W_3 \cdot \text{ReLU}(W_2 \cdot \text{ReLU}(W_1(x)))$$

Layers of CNN
ReLU (rectified linear activation function)
Output = Input if Input > 0
Output = 0 if Input < 0

Results
SNR vs noise level (α)
SNR vs sparsity level (ρ)
The denoiser achieves the invariance properties. The imposed constraints result in better denoising performance.

Conclusions & Future Direction
This project analyzes the interpretability and generalization of CNNs trained for sparse signal denoising. Future work could include analyzing a larger or deeper CNN and denoising a more complex signal.

Citations & Acknowledgements
- Al-Shabli, A., & Selesnick, I. (2022). Positive Sparse Signal Denoising: What Does a CNN Learn?. IEEE Signal Processing Letters, 29, 912-916. <https://doi.org/10.1109/psp.2022.3160372>
- Hou, J., Wang, J., Zhang, F., and Huang, J., 2020. One-bit compressed sensing via ℓ_p (0 < p < 1)-minimization method. Inverse Problems, 36(5), p.055005
We give our heartfelt thanks to our wonderful research advisors: Prof. Selesnick and Abdullah Al-Shabli.

NYU TANDON SCHOOL OF ENGINEERING

Research poster presented at the IEEE Undergraduate Research Technology Conference at MIT



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BEING KAZAKH AND BEING KAZAKHSTANI: ETHNIC AND NATIONAL IDENTITIES OF YOUNG RETURN MIGRANTS IN KAZAKHSTAN

Ethnic return migration has been gaining global prominence. It describes the relocation of diasporic populations' descendants back to the countries of ancestral origin. Kazakhstan presents a unique case of ethnic return migration with ethnic Kazakhs relocating from countries like China, Mongolia, Russia, and Uzbekistan.

This Capstone Project investigates the opinions and perceptions of young Kazakh returnees studying at Kazakhstani universities. What does returnee youth think about their relocation to Kazakhstan? What ethnic, social, and political identities do they find to

be significant? How do they experience this "return" and interact with those around them? Drawing on 21 in-depth interviews conducted with students in Astana and Almaty, the project attempts to illuminate these questions and present the diversity of meanings young returnees forge for themselves.

Young people's narratives showcase the complex interactions between affective and instrumental attitudes, as well as between feelings of belonging to Kazakh nation and Kazakhstan as a state.

“ This research opportunity allowed me to apply the knowledge I have gathered throughout my academic career. From recruiting participants for interviews to conducting qualitative analysis, this experience was indispensable to my growth as a young researcher and a student interested in migration. ”

PHOTODEGRADATION OF PESTICIDES

Pesticides are substances that are used in order to destroy, prevent, or control pests. Although proven toxic and potentially hazardous to human health, pesticides are deliberately released into the environment and have the potential to contaminate water, sediment, and vegetation. It is, therefore, important to better quantify the environmental fate of pesticides to achieve sustainable food production. Sunlight-driven processes can degrade pesticides; an understanding of photodegradation mechanisms and quantifying reaction rate constants will improve the predictive capabilities of environmental fate models.

In this study, direct photodegradation was investigated to understand the environmental fate of a set of pesticides, including pyridine herbicides, strobilurin fungicides, and triazole fungicides. Direct photodegradation occurs when the pesticide absorbs a photon, resulting in a reaction. Molar absorptivity measurements, using a UV-vis

spectrophotometer, were performed to determine if pesticides would absorb sunlight. The compounds were then placed in a photoreactor using bulbs that emitted photons in varying wavelength ranges (UVC, UVB, and UVA), and the fraction of degradation over different time periods were quantified using liquid chromatography (LC - UV).

Preliminary results indicate that pesticides absorb light strongly within the UVC wavelength range. We also determined that compounds with similar structures have different molar absorptivities. Using this information, the quantum yields of these pesticides were found to be different when using different light sources in the photoreactor. Although some of the pesticides have similar structures, small variances in structure resulted in different molar absorptivities as well as differing susceptibility to photodegradation as demonstrated by differing quantum yields.



Experimental set up for direct photodegradation and molar absorptivity measurements



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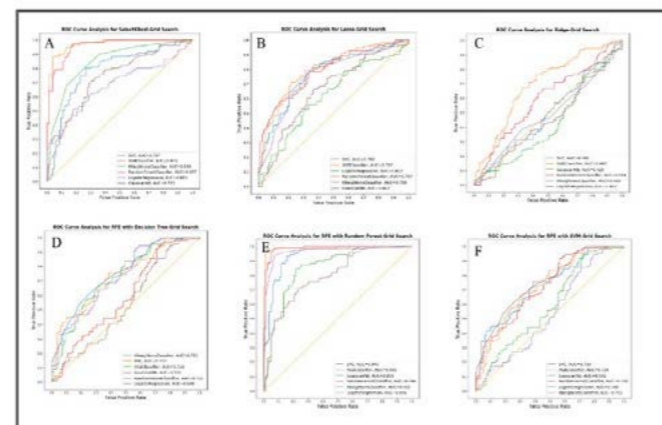
MACHINE LEARNING ASSISTED ANALYSIS OF LUNG-CANCER GENE-EXPRESSION PROFILES IN DETERMINING NOVEL POTENTIAL PROGNOSTIC BIOMARKERS

Lung cancer is one of the most commonly diagnosed cancers, with 2.21 million cases every year and reporting the highest mortality among cancers with 1.80 million deaths every year as per WHO (WHO, 2022). There is an unmet need to determine novel and reliable biomarkers, which can specifically represent the correct stage and progression of cancer, which can enable correct and timely treatment plans for lung cancer patients. In the project, publicly available microarray gene expression data for lung cancer was leveraged and exploited using different Machine Learning Approaches such as XGBoost, Random Forest, kNN, Decision Tree, and SVM.

Microarray gene expression raw data representing different stages of lung cancer was previously pre-processed such that the batch effect was removed and the data was normalized. Firstly, I standardized given data and split it into training and testing sets which is a standard step for building machine learning models. Next, to overcome the undesired dataset dimensionality, since each sample is having more than 20,000 gene expression values, I applied different feature selection algorithms to obtain the most relevant genes, which allowed me to segregate the conditions under consideration with optimal accuracy. Finally, I applied different machine

learning algorithms (SVM, XGBoost, Random Forest, kNN, Naive Bayes, Logistic Regression) and optimized each of the models by tuning its hyperparameters using grid search and nested loop. Finally, I analyzed obtained models based on the accuracy score and ROC and PR curves.

Receiver Operating Characteristic (ROC)



ROC Curve for selected machine learning models: A) SelectKBest B) Lasso C) Ridge D) RFE with Decision Tree E) RFE with Random Forest and F) RFE with SVM with hyperparameters selected using Grid Search.

DIVINE JUSTICE

Divine Justice is a 24-hour durational courtroom drama performance by the poet, playwright and astrologer, Ariana Reines, in which a small choir constitutes judge and jury, and she reimagines the courtroom as a space in which the feminine body is the presumed authority. Disillusioned by failures of the American justice system, the artist asks what would happen if the planet Venus actually presided over the American Judiciary, as it does over Justice

in the Zodiac. Reines collapses trial and sentence, judge and jury, into light and sound- a single summer day of Venus tested, and time served.

My work involved discussing the project, laying out a structured budget for the project, and developing a methodology to procure the necessary items for the set, sourcing materials and making the props, and ensuring the set is ready for the performance.



Behind the scenes at the Divine Justice performance

“ I hope to pursue my Capstone in the field of legal reform, so participating in a project that has a creative outlook on the process of the Judiciary, and how various social and economic groups interact with the Justice System will give me clarity on my research for my Capstone Project. ”



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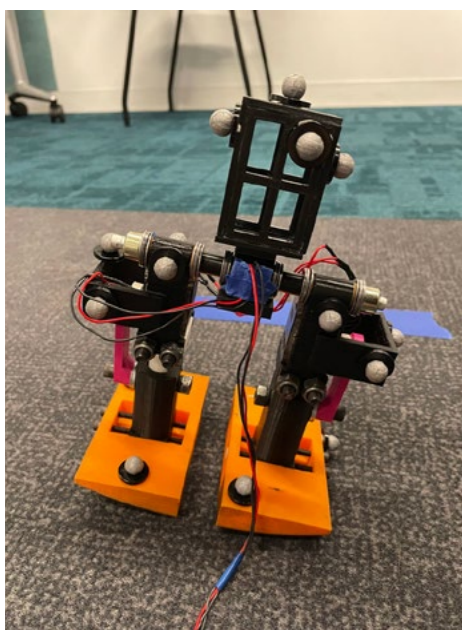
DEVELOPMENT OF SPEED AND STABILITY TESTING PLATFORM FOR PENGUIN ROBOT

Penguins are known to have high efficiency in walking and achieve a stable gait on slippery terrain that makes them a good model to improve passive dynamic bipedal robots, which has high potential in application to rehabilitation devices for mobility-impaired people.

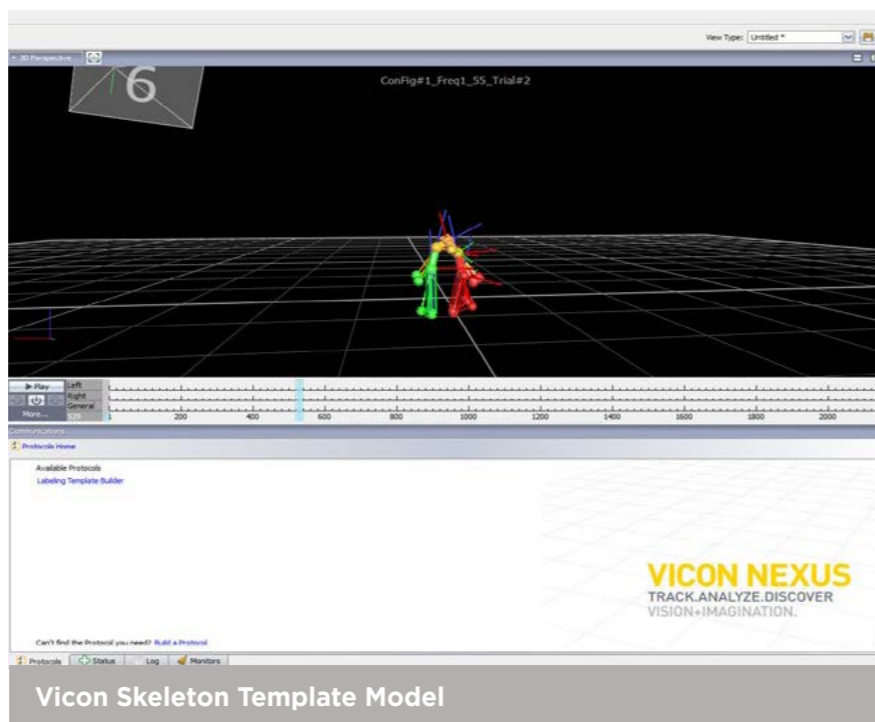
In this project we designed a pelvis and link for an under-actuated bipedal robot which allowed it to have variable mass distribution. We aimed to perform gait analysis on the robot using Vicon Nexus software. We created a skeleton model of the robot and calculate the center of mass position based on the marker trajectory collected using motion capture cameras. In addition, the gait parameter

data including walking speed were recorded. A test bed to record how the robot reacts to perturbations in the form of tugging was built where the walking robot is subjected to a specific amount of force for a brief instance.

By analyzing the forces felt by the robot, and using the Vicon Nexus system to identify the robot's behavior, a quantitative analysis was concluded on the limits of stability for the robot. By better understanding the behavior of the system, future passive dynamic bipedal robots can be optimized to better fit objectives, such as increased stability, walking speed, or controllability.



Penguin Robot with Retro-Reflective Markers Attached



Vicon Skeleton Template Model

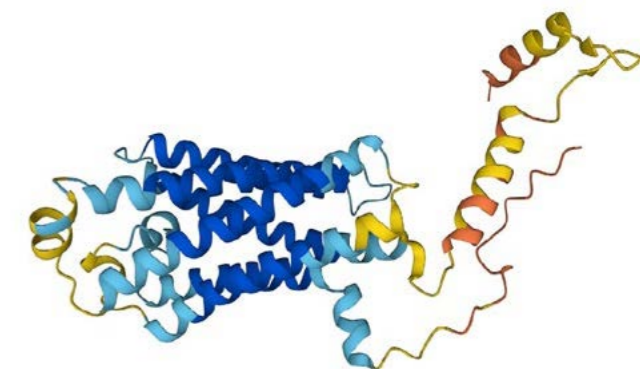
IDENTIFYING GLIDOSOME-PROTEIN SPECIFIC INTERACTION FOR MALARIAL DRUG DISCOVERY

My project involved working on the parasite invasion of the red blood cells using a gliding mechanism. Multiple parasitic membranous proteins have been identified as being part of the protein complex aptly termed the glideosome. These include glideosome associated proteins (GAPs), Myosin complexes and substrate dependent motility proteins. The team's objectives were to identify and characterize the proteins involved in invasion and use modeling and experimental techniques to identify potential inhibitors to prevent cell invasion.

The process started by searching the existing databases for membrane associated proteins that can be expressed using a bacterial vector using various synthetic biology techniques. In due process, using various sequence analysis tools, we identified hypothetical proteins with transmembrane domain Ankyrin and RAP domain.

The gene sequence that codes for the identified protein was taken and amplified using plasmidial genomic DNA, cloned in pET28a+ vector, with C terminal His tag and expressed in BL21 DE3 expression system. Recombinantly expressed

protein was extracted and purified using metal affinity chromatography, polished using size exclusion chromatography, and analyzed for its purity using SDS-PAGE gel electrophoresis. Once extracted, this protein can be characterized and the search for specific inhibitors to prevent cell invasion can begin.



GAPM1 Membrane protein that is associated with parasitic invasion of Red Blood Cells

Novel vision restoration techniques: 3D bioprinting, gene and stem cell therapy, optogenetics, and the bionic eye



Abhay Menon and Sanjairaj Vijayavenkataraman
Artificial Organs 46, no. 8 (2022): 1463-1474



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UNDERSTANDING THE MECHANISMS OF ACTION OF TWO VIRAL ONCOPROTEINS-E6 AND E7

Human papillomaviruses (HPV) are the causative agents of cervical cancer and they are one of the main causes of cancer death in women worldwide. Studies have shown that the HPV oncogenes, E6 and E7, are key to the cell transformation that underlies HPV-mediated cancer and work together to induce carcinogenesis. It was found that E7 is especially active in stages of tumor formation, causing benign tumors and targeting Rb, and E6 is believed to play an important role during the later stages of cancer progression.

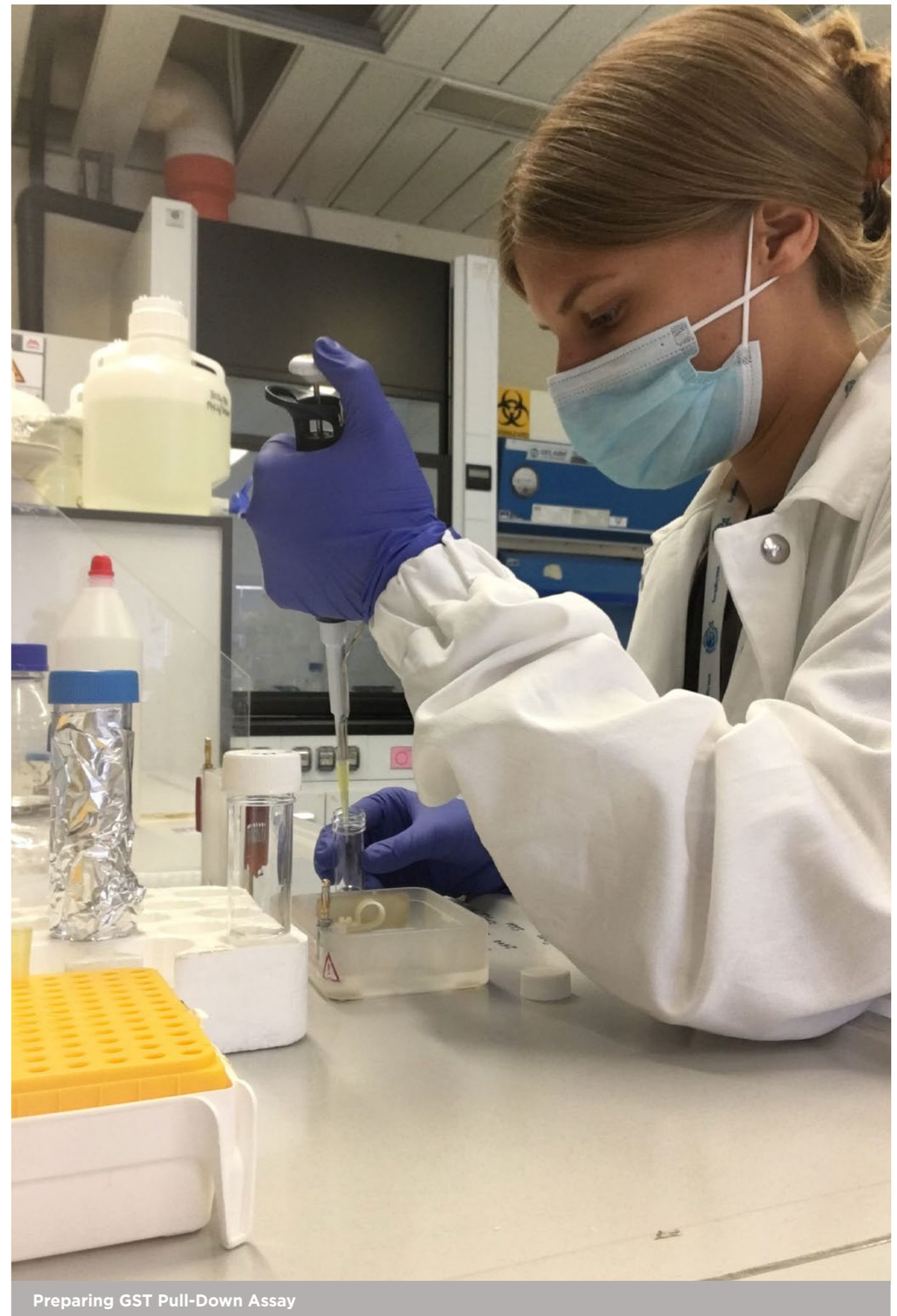
The goal of the research was to study one or two of candidate proteins from the AP1 and AP2

families of adaptor proteins for interaction with E7. This involves the expression and purification of E7 in bacteria and using this to perform protein-protein interaction assays with the components of the AP1/AP2 complexes and co-transfections with these proteins and E7 in HEK293 cells.

My project hypothesis was that there is a competition between Scribb (protein that binds to AP2 and plays a major role in cell and piconasa polarity) and 16E7 in the LXCXE motif to bind AP2M1. During my research, I performed experiments that initially confirmed the hypothesis, one of them being GST Pull-down assays.



I learned so much by taking part in this experience, met incredible researchers, and gained a lot of hands-on lab experience. As a student I believe that this was an incredible opportunity to be part of such a prestigious research institution. Being able to work with PhD students and senior researchers as undergraduate students was a great way to see what a research career looks like, and has helped me to review my future career prospects.



Preparing GST Pull-Down Assay



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INTENTION PREDICTION ALGORITHMS FOR COOPERATIVE DRIVING AND CONNECTED/AUTONOMOUS VEHICLE APPLICATIONS

The manufacturing industry has welcomed the automation of factories ever since industrialization. An assembly stage recognition system is crucial for an automated production line. As the manufacturing product changes, the recognition system will have to be built again for the individual product. Therefore, it is hard for the construction industry to achieve automation since its products are always varying and it would not be cost-effective to develop the recognition system each time. We aimed to build

an AI recognition system that can quickly adapt to the new stages of assembly as the project changes.

To achieve the goal of an AI-based recognition system, we built a twin model of the modular construction factory in a realistic Virtual reality environment. With the VR environment, we trained AI, confirm the Sim2Real AI in a modular construction factory works, and developed an assembly stage recognition system with AI.



Virtual Reality for Building and Urban Scale Virtual Environments research

Chin-Ling Hou¹

¹ Undergraduate Student, New York University Abu Dhabi
Advisors: PhD Student Keundeok Park, Prof. Semiha Ergan

Abstract

In the research project, we are aiming to build an AI recognition system that can quickly adapt to the new stages of assembly in a automation line as the product changes. To achieve the goal of an AI-based recognition system, we are first building a twin model of the modular construction factory in a realistic virtual reality environment. With the VR environment, we will train AI, confirm the Sim2Real AI in a modular construction factory works, and eventually develop an assembly stage recognition system with AI.

Background

The manufacturing industry has welcomed the automation of factories ever since industrialization. An assembly stage recognition system is crucial for an automated production line. As the manufacturing product changes, the recognition system will have to be built again for the individual product.

- hard for the construction industry to achieve automation
 - products are always varying
 - would not be cost-effective to develop the recognition system each time
- Aiming to build an AI recognition system
 - building a virtual reality environment to train AI to quickly recognize new stages of assembly line

VR Environment

In the VR environment, we are building a twin model of the modular construction factory. In Figure 1, the factory model is done without any extra textures and colors. Using blender, we are adding textures to each objects to prepare the data for the training of AI.

Figure 1: The full factory model without textures



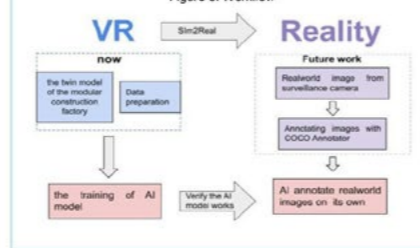
In Figure 2, the stop sign is an example of the individual objects with textures and colors added. Currently, we are in the process of data preparation in order to train the AI object detection in simulation environment. Merging all objects into one blender environment, we will have the VR environment ready.

Figure 2: Individual object file with textures



Future Work

Figure 3: Workflow



Acknowledgement

The author thanks NYU Tandon School of Engineering's Office of Undergraduate Academics for the opportunity to be a part of the UGSRP. Thanks to NYU Abu Dhabi office of undergraduate research for the generous funding for the research project. Thanks to PhD Student Keundeok Park for continuous support and guidance. Thanks to Professor Semiha Ergan for the giving me the chance to work with BILAB. Finally thanks to everyone in BILAB.

Research poster

FAIR DIVISION IN FINANCIAL SYSTEMS/ AN ALGORITHM FOR FAIRER CHESS

My research assistant tenure in the summer involved exploring what constitutes fair division between agents under different constraints and in a variety of contexts. I was able to review and learn more about concepts from Brams' own books 'Fair Division' and 'Theory of Moves'.

Additionally, I conducted literature reviews on dozens of papers to help Brams on some of his working papers on Fair Division and Fair Split algorithms on indivisible objects.

“ It was a pleasure having this incredible opportunity to work with one of the pioneers of fair division, Professor Brams. I hope for more interaction between us to come, as I thoroughly enjoyed the experience and was intrigued by his work and the domain of the Fair Division. ”

DIY ASSISTIVE TECHNOLOGY: DESIGNING AN ALTERNATE APPROACH TO DESIGN AND MANUFACTURE AT DEVICES

In the Assistive Technology (AT) industry products are usually designed for general customer groups of people with disabilities, without taking into consideration that most types of disabilities are different and therefore require unique solutions to perform day-to-day tasks. In addition, previous work suggests that one of the biggest barriers in AT is the high costs of products and insufficient funding.

For this project I proposed alternate approaches to design and develop AT devices for people with physical disabilities that are unique to each individual, while keeping prices of production to a minimum so the products can reach larger audiences.

As a case study for this research project, I partnered with the NYU Moses Center for Student Accessibility to design and develop an affordable AT device for NYU students who cannot physically raise their hands in class to be able to notify their professor when they want to join class discussions.



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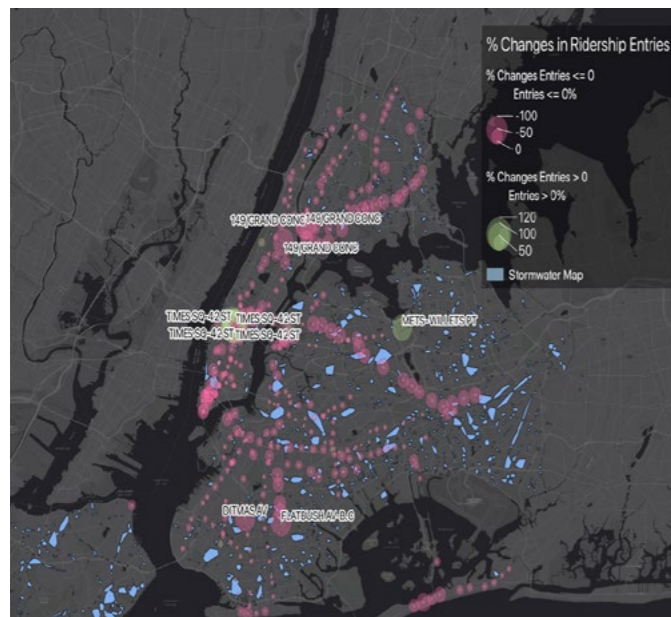
DIGITAL MODEL FOR FLOODING IN NEW YORK CITY

Due to the effects of climate change, extreme rainfall events are becoming more frequent and devastating for New York City infrastructure. To quantify the damages done by extreme weather events, disaster risk analysis is conducted to identify infrastructural vulnerabilities. The objective of this study was to identify and quantify the extent of flood damages at an infrastructural, economical, and social level.

To achieve this, Hurricane Ida was used as a case study to create a digital model. The first step involved cleaning open source data, such as MTA ridership records and 311 service requests. After organizing the data, interactive maps were created using GIS

software to visualize the information. Conducting a quantitative study on the impact of flooding is a crucial first step in completing cost-benefit analysis at a city level, informing the public on flood vulnerability and promoting further research.

This study contributes to a broader project that aims to create a digital model for disaster risk analysis containing data for all of New York City. This digital model will not only address various forms of flooding, but also other forms of extreme weather in the near future to better prepare for the impacts of climate change.



Percent change in MTA ridership entries due to Hurricane Ida



Group photo of the Disaster Risk Analysis Lab

LET'S READ AND TALK

My focus was on exploring the home learning environment and literacy experiences of Syrian refugee children in Jordan. With a local organization 'We Love Reading', I conducted daily visits to Syrian families and interacted with children and their mothers through Mindware technology and psychological measures, including the Strop Task, and book reading

activities. With the inclusion of physiological data within an intervention study, this research is among the first to identify inter-individual variation in family stress processes and how these processes influence the effectiveness of interventions.



Pilot training using book activity and the MindWare data collection software ahead of fieldwork with Syrian refugee families in Amman, Jordan

I am incredibly grateful to have participated in this project and hope that it will help in the understanding of early childhood development of Syrian youth while maintaining feasibility and cultural sensitivity.



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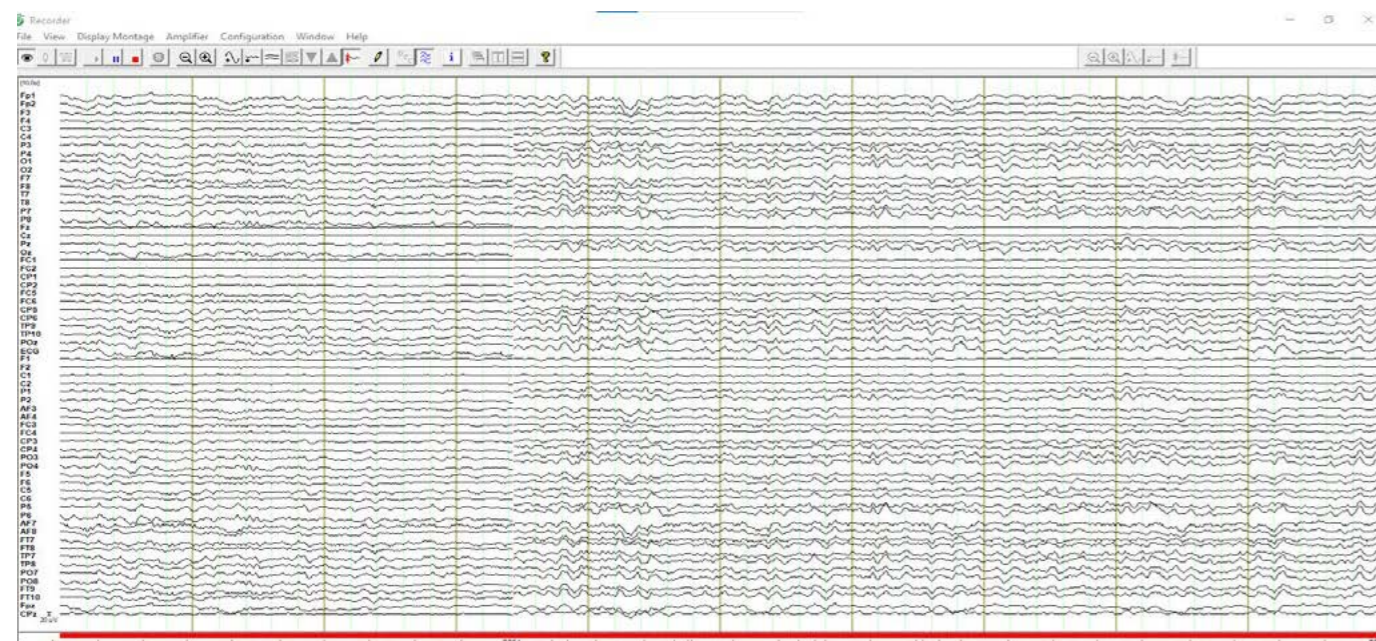
INTERDISCIPLINARY RESEARCH IN ANAESTHESIA: BRIDGING THE GAP BETWEEN THE MICRO-AND MACROSCALE

Delirium after surgery with general anesthesia (GA) occurs in roughly 20% of all elderly patients. High dosages of GA have been shown to increase the risk of postoperative delirium (POD). Dysfunction in a recently discovered brain cleaning system - 'the glymphatic system' - has been suggested to be related to POD, but how this system functions across different depths of GA and its relationship with neural activity requires further investigation.

My research project aimed to uncover the changes in different aspects of neural activity across different dosage levels of sevoflurane GA in human data, and relate these changes to alterations in cerebrospinal

fluid flow as a key component of the glymphatic system. I analysed the power spectral information of neural activity recordings using novel software to first clean the data for various artifacts. I was able to contribute my skills by adding a GUI to one of the software packages.

I then analysed the functional magnetic resonance imaging (fMRI) data, preprocessing the data and then extracting the CSF flow signal across dosage levels. I could then relate the neural activity parameters with those of the CSF flow to uncover a changing relationship across increasing dosage levels.



64 EEG channels recorded under resting state eyes closed conditions

URBAN GREEN SPACES AND ENVIRONMENTAL ACTIVISM IN BERLIN

I started my research with curiosity and an open mindset and eventually narrowed my focus on community gardens and urban agricultural activism. I was able to work with anthropologists at the University of the Arts and also created an ethnographic film about one very special community garden in Berlin that is located in an old cemetery. This was particularly interesting as some visitors came to tend to a loved one's

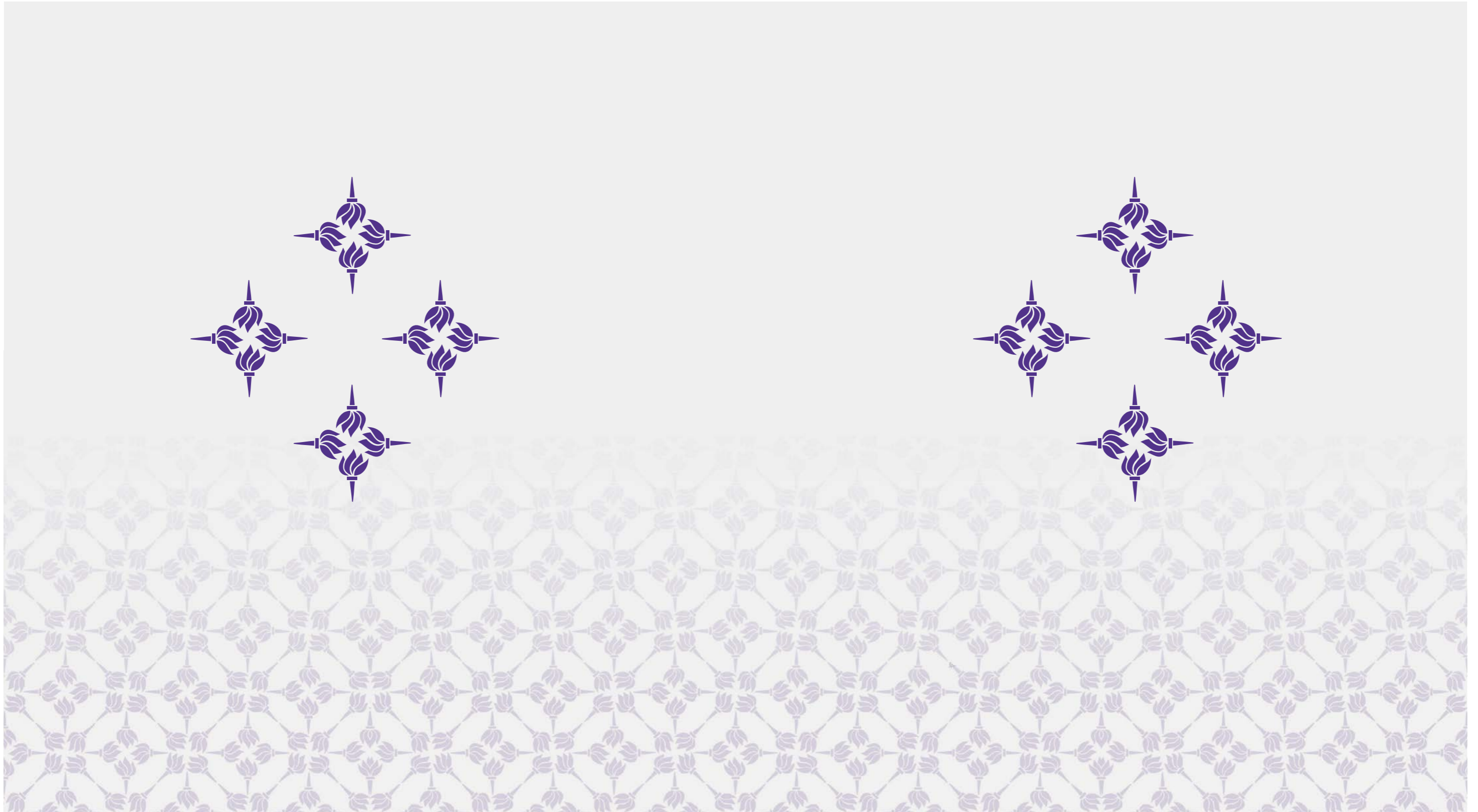
grave, while others came for the peacefulness within a bustling city, and others came to remove weeds or lunch at the local kitchen that used only ingredients grown in the garden.

I was surprised to learn that these community gardens are part of international networks and often host visitors such as high school classes from as far as South America.



Vegetables, flowers, and raised garden beds in Prinzessinnengarten in Berlin

RESEARCH FELLOWSHIP PROGRAM





NAWAL ALJAEEDI

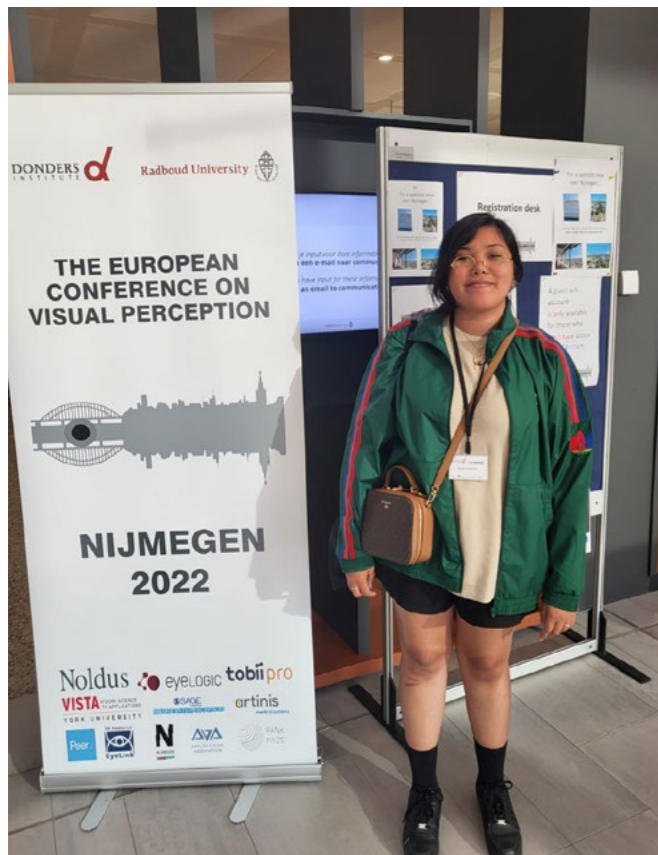
Faculty Supervisor
Olivia Cheung

THE CONFIGURATION EFFECT OF READING MUSICAL NOTATION

My project sought to explore the importance of configuration processing on reading musical notation, in comparison to a baseline expertise of faces in order to better understand how the brain adapts its perceptual processes with acquired expertise.

We did this by misconfiguring musical notes as well as faces, and examining activation in certain

brain areas prodded by the stimuli mentioned. We were inspired by previous research that showed that different domains of expertise can activate different performance areas in the brain not related to such, such as a car expert observing cars while activating face areas in the brain. I was accepted to pursue a MSc in Neuroscience at King's College London.



Nawal representing NYUAD at the European Conference on Visual Perception 2022



The opening lecture of the European Conference on Visual Perception 2022



KESHANA RATNASINGHAM

Faculty Supervisor
Joan Barcelo

THE LEGACIES OF EXPOSURE TO IN-GROUP VIOLENCE ON ETHNIC RECONCILIATION: EVIDENCE FROM SRI LANKA

When understanding the impact of exposure to violence in conflict research, studies thus far have looked at the impact of violence when perpetrated from the outgroup. Yet, conflicts are complex and although a conflict may mainly occur between two or more distinct groups, ingroup violence is also prevalent during intergroup wars. My research analyzed the impact of exposure to ingroup violence during Sri Lanka's civil war, on long-term political attitudes and behaviors.

We developed a survey using behavioral games and insights and conducted a field survey in the Northern province of Sri Lanka - one of the battlefield provinces during Sri Lanka's civil war. We also conducted an online experiment to understand the causal implications of exposure to ingroup violence for Tamils in post-war Sri Lanka.

The study was selected to be presented at the MPSA conference where I presented its preliminary findings in Chicago in April 2022.

This fellowship gave me the skills and experience to conduct a large-scale field research project; from developing the survey instrument, to hiring and training a survey team, to writing up the study and presenting its findings at a renowned Political Science conference.



Surveyors in the field



**KACPER
LECKI**

Faculty Supervisor
Andrea Valerio Macciò

IMPACT OF GRAVITATIONAL RECOIL ON GALAXY FORMATION IN NIHAO

I studied the influence of gravitational recoil of central black holes on galaxy evolution. During my fellowship, I simulated and analyzed 66 NIHAO galaxies on NYUAD's supercomputer. I tested the dependence of properties of supermassive black holes and their host galaxies on recoil velocity, inclination angle, and accretion mode.

My research suggests that recoiling black holes accreting according to the Bondi-Hoyle-Lyttleton model tend to oscillate around the center and flare up only when passing through the dense central region. On the other hand, when the viscous disk model was employed, black holes were found to settle quickly in the center and consistently outshine their stationary counterparts.

Regardless of the accretion mode, when the central black hole underwent recoil, the density profiles of the galaxies and their star formation rates were altered. Because these properties can be measured, my research helps to find galaxies that could host recoiling supermassive black holes by providing expected observables.

I gave a talk discussing my findings at the N-Body Shop Conference in New York to the experts in the field of cosmological simulations.

From September 2022, I will be pursuing a master's degree in Aerospace Engineering at TU Delft while developing my own sustainable aviation project in collaboration with Solar Ship, Inc. and the University of Toronto.



N-Body Shop Conference at the Flatiron Institute in New York



NYUAD's Center for Astro, Particle, and Planetary Physics (CAP3)



1.80 Gyr
Visualization of gas particles in a young galaxy



11.80 Gyr
Visualization of dark matter particles in one of the NIHAO galaxies



VINCE NGUYEN

Faculty Supervisors
Heather Dewey-Hagborg and
Joerg Blumtritt

Funded by CITIES

INTERFACING LOW-COST AIR QUALITY SENSORS WITH APPLE WATCH: A SELF-QUANTIFIED APPROACH TO RAISING AWARENESS OF AIR POLLUTION

This design study explored the Apple Watch as an interface for visualizing air quality data and examined how it affects awareness and behavior change among users. I built portable air quality monitors, developed a full-stack iOS-watchOS app, and user-tested the system through semi-structured interviews and surveys.

Findings suggest that the Watch's notifications help users notice air quality change events where they would not check otherwise and that the Watch's complications (widgets) provide glanceable data and reminding users of the surrounding air even

when they don't intentionally think about it. I presented these findings at the UbiComp 2022 conference (Cambridge, UK).

During my fellowship with Center for Interacting Urban Networks (CITIES), I maintained the existing air quality monitors network on campus, developed a new dashboard to provide campus sustainability data, and gave a workshop on air quality fundamentals to the community. I will be joining Politecnico di Milano to pursue a MSc in Digital and Interaction Design to continue designing interactive user interfaces for change.



Vince at his self-organized Air Quality Fundamentals workshop at the NYU Abu Dhabi campus in December 2022



The portable air quality monitor prototypes constructed by Vince as parts of his research fellowship



Participants in the Air Quality Fundamentals workshop responding to interactive questions on their personal experience with air pollution



Vince presenting optimal ways to achieve healthy indoor air quality with the workshop's participant



The Apple Watch app interfaces developed by Vince to visualize air quality data fetched from the portable air quality monitor



A real-world photo of how a participant attached the portable device to their everyday item during the usability study phase of Vince's research fellowship



YAO XU

Faculty Supervisor
Kinga Makovi

EXPERIMENTAL EVIDENCE ON TREATMENT OF RETURN MIGRANTS TO MAINLAND CHINA DURING THE COVID-19 PANDEMIC

My fellowship year project investigates contested national membership using experimental evidence on public attitudes towards return migration in mainland China during the pandemic. We ask the questions: do Chinese citizens discriminate against returning Chinese amid the pandemic? If so, what drives this and what might we do to mitigate the negative consequences?

Discrimination toward returnees might reflect the uncertainty of a novel disease and everyday people's perception—however inaccurate—of returnees as vectors of contagion. Moreover, unequal treatment might also signal class antagonism and reflect contestations over who is seen as a full member of the nation.

To investigate Chinese citizens' treatment of returnees, we fielded a large-scale, online, behavioral experiment in China in November 2021 (n=2,697), which involved two key experimental manipulations

as well as the collection of several characteristics of participants, their network, and the contextual they live in. We situate the differential treatment of returnees in the literatures on citizenship, belonging, and migration before delving into the case of China and policies toward returning citizens.

Our focus on everyday people's treatment of returnees during COVID-19 reveals how border crossers may not be seen as full members of the nation even when they hold citizenship by law. Methodologically, the give-or-take dictator game used in this project drew inspiration from my Capstone and PPTP project (Abascal et al, forthcoming).

I also presented a working paper on the fellowship project at the International Migration roundtables during the American Sociological Association Annual Conference held in Los Angeles in August 2022.



KATHARINA KLAUNIG

Faculty Supervisor
Nancy Gleason

Hilary Ballon Center for Teaching and Learning

INTERNATIONAL STUDENTS' ADAPTATION TO UNIVERSITY RESEARCH FELLOWSHIP WITH THE HILARY BALLON CENTER FOR TEACHING AND LEARNING

As a research fellow with the Hilary Ballon Center for Teaching and Learning (HBCTL), I spent the year working on a research project in which I examined how aspects of prior educational backgrounds of students facilitate their adaptations to certain aspects of the university such as interactions with faculty, participation in the classroom, navigating course selection, involvement in the institution, and making friends, amongst other things. This is particularly pertinent to institutions such as NYUAD with highly diverse student bodies. This project contributes to knowledge of student adaptation, first generation students, and international students. Through interviews with students, the role of prior education institutions in students socialization to a US curriculum was highlighted. Additionally, I collaborated on various projects with the HBCTL, supporting the center in our mission to support faculty and instructors in their teaching. I also contributed to the development of materials to support faculty in teaching at NYUAD.



THAIS THOMAS

Faculty Supervisors
Fatiah D. Touray and Nancy Gleason

Office of Inclusion and Equity

CLASSROOM COMFORT? AN EXAMINATION OF STUDENT PERCEPTIONS OF FACULTY RACIAL AND ETHNIC DIVERSITY AND ITS IMPACT ON CLASSROOM CLIMATE

As the inaugural fellow in the Office of Inclusion and Equity, I spent the past year collaborating on projects to advance the strategy for inclusion, diversity, belonging and equity across the institution while undertaking a research project focused on faculty racial/ethnic diversity and classroom climate. Through this project I was able to explore the unique experiences of students in the classroom as well as their nuanced perception of faculty diversity at this global liberal arts university. Ultimately, my project concludes that although the racial/ethnic diversification of faculty is of paramount importance, universities, particularly those serving international student bodies, must also invest in faculty training programmes that encourage discussions of positionality, develop intercultural understanding, and center classroom climate management.



**NICCOLÒ ACRAM
CAPPELLETTO**

Faculty Supervisors
Robert Parthesius and Alia Yunis

WHAT GOES INTO A UNESCO NOMINATION? ALTERNATIVE HERITAGE PRACTICES IN ERITREA AND UAE

I conducted research in the field of heritage studies in several locations in the UAE and Italy. I adopted the lens of heritage to describe processes of identity construction in the context of colonial and postcolonial Italy in comparison with Eritrea, also through the lens of contemporary art. Thanks to the collaboration with the Dhakira Center for Heritage Studies, I was involved in a research project in the UAE about Delma Island in the Western region in relation with other heritage sites in the Emirates, mainly Al Ain. Working with Dhakira expanded my field of action and allowed me to gain insights into academic and practical work related to heritage.

Some outputs include participating in the Graduate Research Showcase at NYUAD,

participating in an academic conference in Urbino (Italy), being invited to the Young Professional Forum organized by the CCR-Venaria Reale, and putting together the first edition of the Dhakira Heritage Film Festival. All these different projects gave me a solid idea of the academic field and laid foundations for much more work to come.

‘Imperatives, Aesthetics and Paradigms of Care: how Positionality informs Research and viceversa’, Sharjah Art Foundation, forthcoming

‘Asmara as World Heritage Site,’ conference paper, VI ASAI Biennial Conference: Third millennium Africas in the global world, Urbino, June-July 2022

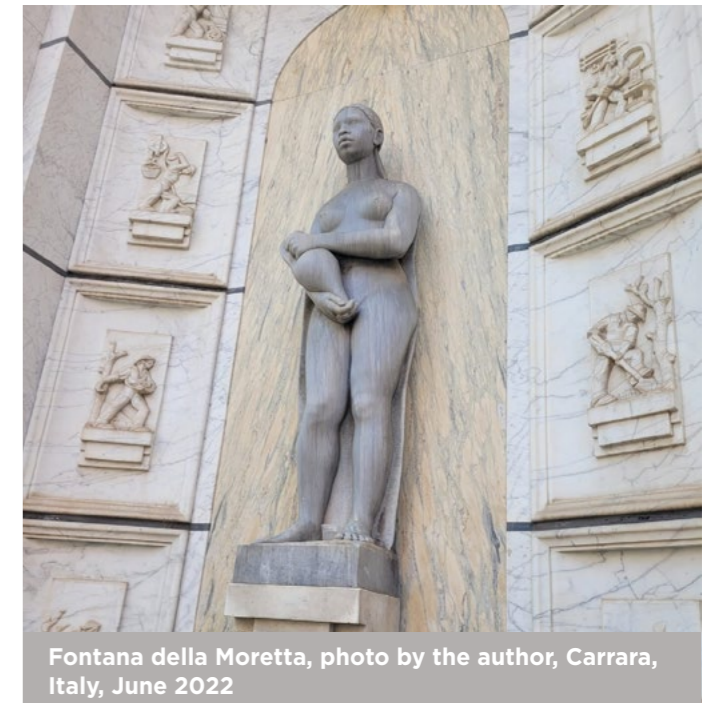
Niccolò Acram Cappelletto



“ I asked myself: How can I explore the legacies of colonialism today? How am I able to gain a voice and create noise in a context of institutional silence? Does it matter that I am doing this kind of research away from my home? ”



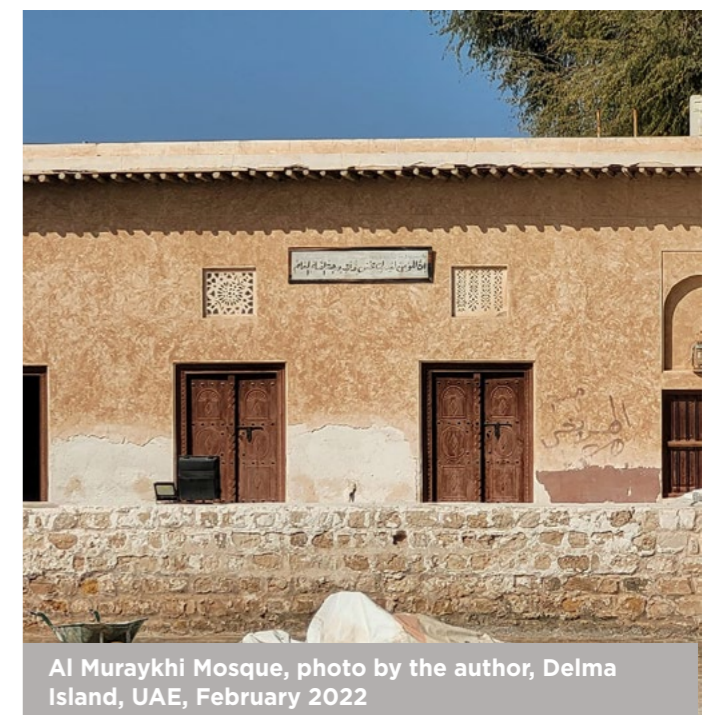
Unruly Connections, Alessandra Ferrini, exhibition, ar/ge kunst, Bolzano, Italy, June 2022



Fontana della Moretta, photo by the author, Carrara, Italy, June 2022



Dhakira Heritage Film Festival, screening of Asmarina, May 2022



Al Muraykhi Mosque, photo by the author, Delma Island, UAE, February 2022



**LUBNAH
ANSARI**

Faculty Supervisors
May Al-Dabbagh and Surabhi Sharma

LOVE IN THE TIME OF LOVE JIHAD: HINDU-MUSLIM INTIMACIES IN INDIA

This research project investigated the complex lived realities of Hindu-Muslim partners and their wider ecosystems, who live in societies where the primary systems of stratification are rooted in caste, gender and religion. Utilizing arts-based research methodologies and feminist ethnographic frameworks, I delved into conversations with children, parents, and other family members to explore the intergenerational impact of socially stigmatized unions.

The longitudinal interview-based study resulted in several outcomes: self-reflexive research paper exploring identity negotiations amongst children and parents of Hindu-Muslim partners; an article

investigating the nuanced understandings of interfaith union during the politically charged decade of Love Jihad conspiracy; an autoethnographic documentary film on my Hindu-Muslim family to understand the nature of intergenerational trauma; a personal essay exploring Hindu-Muslim intimacies between South Asia and the Gulf; a participatory photography and film project on how interfaith children create safety in nation-building projects perpetuating identities of fixity; a research-creation archive (zines, collages, blog posts, etc.) that documented the texture of the fellowship year.



'The Landless Review', exploring the ways in which Hindu-Muslim dynamics interplay between South Asia and the Gulf. Publication forthcoming in Planning a Retreat essay to be published at Warehouse421

'Love in the time of Love Jihad', publication forthcoming in 'Indian Empire Anthology'



Presented research and brief documentary film screening at Tasavvur Collective's "Writing Muslim Women in South Asia"



Presentation at Tasavvur Collective's 'Writing Muslim Women in South Asia', on Oral Traditions and Ethnography



Process of filming 'Sambhal Ke'

Photo credit: Karim Hajee



OSCAR SARKOTA

Faculty Supervisor
Piergiorgio Percipalle

BETA-ACTIN REGULATES OSTEOBLAST DIFFERENTIATION GENES IN SIMULATED MICROGRAVITY

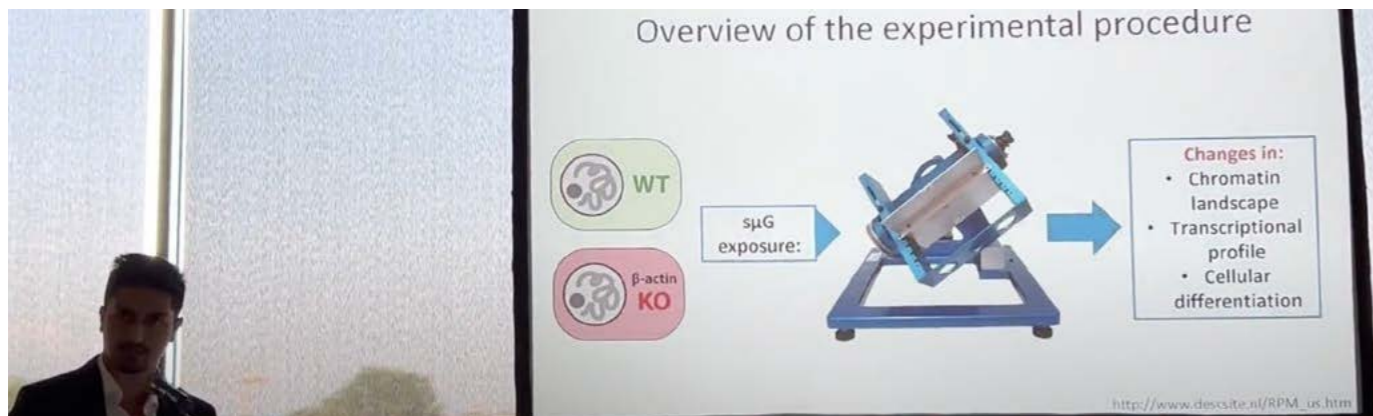
My project for the fellowship investigated the role of beta-actin in regulating cellular pathways that govern osteoblast differentiation in simulated microgravity. We discovered that the absence of beta actin in mouse embryonic fibroblasts hinders their ability to transduce mechanosensory stimuli into gene expression programs that govern cellular differentiation into osteoblasts.

Findings from this project are not only relevant to space research, but also to understand pathologies such as osteoporosis and cancer that involve an impaired ability of cells to communicate with changing extracellular stimuli.

I presented my findings at the New England Science Symposium 2022 organized by Harvard Medical School and the Tissue Engineering and Regenerative Medicine International Society (TERMIS)'s European Chapter Conference 2022. I am currently preparing the project's manuscript for publication.

Starting January 2023, I will be pursuing my PhD at the Institute of Molecular Oncology in Milan to study the role of telomeric DNA damage in inducing cellular senescence.

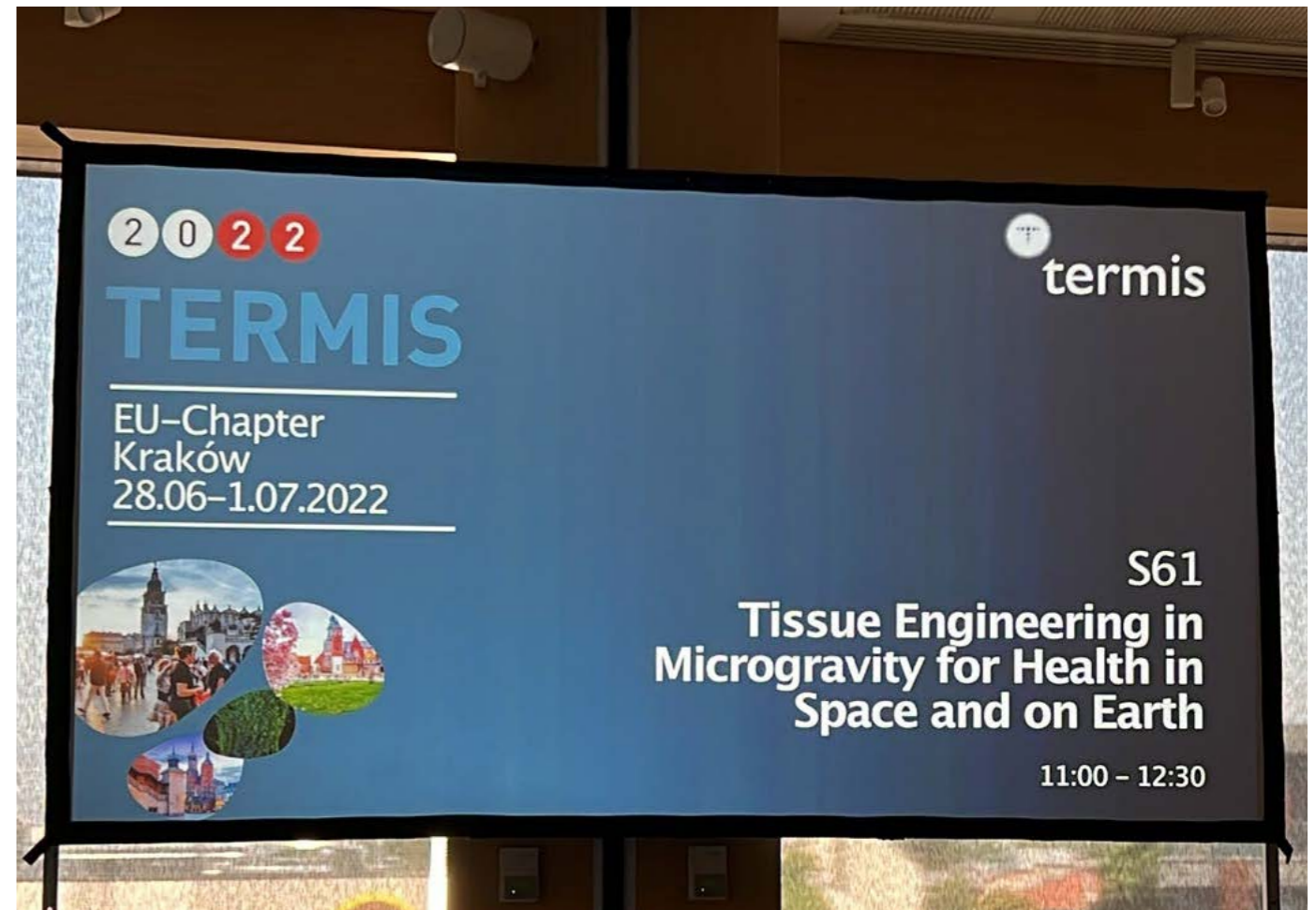
“The fellowship allowed me to experience the full joy and rigor of pursuing an independent research project. As a result, I have developed lots more skills and experience, and feel more confident heading into my graduate studies.”



Delivering a podium presentation about my research at TERMIS EU Krakow Chapter 2022



Incubating mouse embryonic fibroblasts before simulated microgravity exposure



TERMIS session for tissue engineering in microgravity, during which I presented my research



SUNGMIN SOHN

Faculty Supervisor
Ali Diabat

OPTIMIZATION FOR DRONE-TRUCK COMBINED OPERATIONS ROUTING SYNCHRONIZATION PROBLEM

Through comprehensive studying of Waleed Najy's previous work "Collaborative Truck-and-Drone Delivery for Inventory-Routing Problems", the fellowship work was focused on a new operation model that relaxes the constraint of the drone being able to visit only one customer. In other words, through further exploration, the drone was allowed to visit multiple customers to deliver goods. The model was established upon the same concept of inventory routing problem while the constraints were heavily amended for the drone to serve multiple customers.

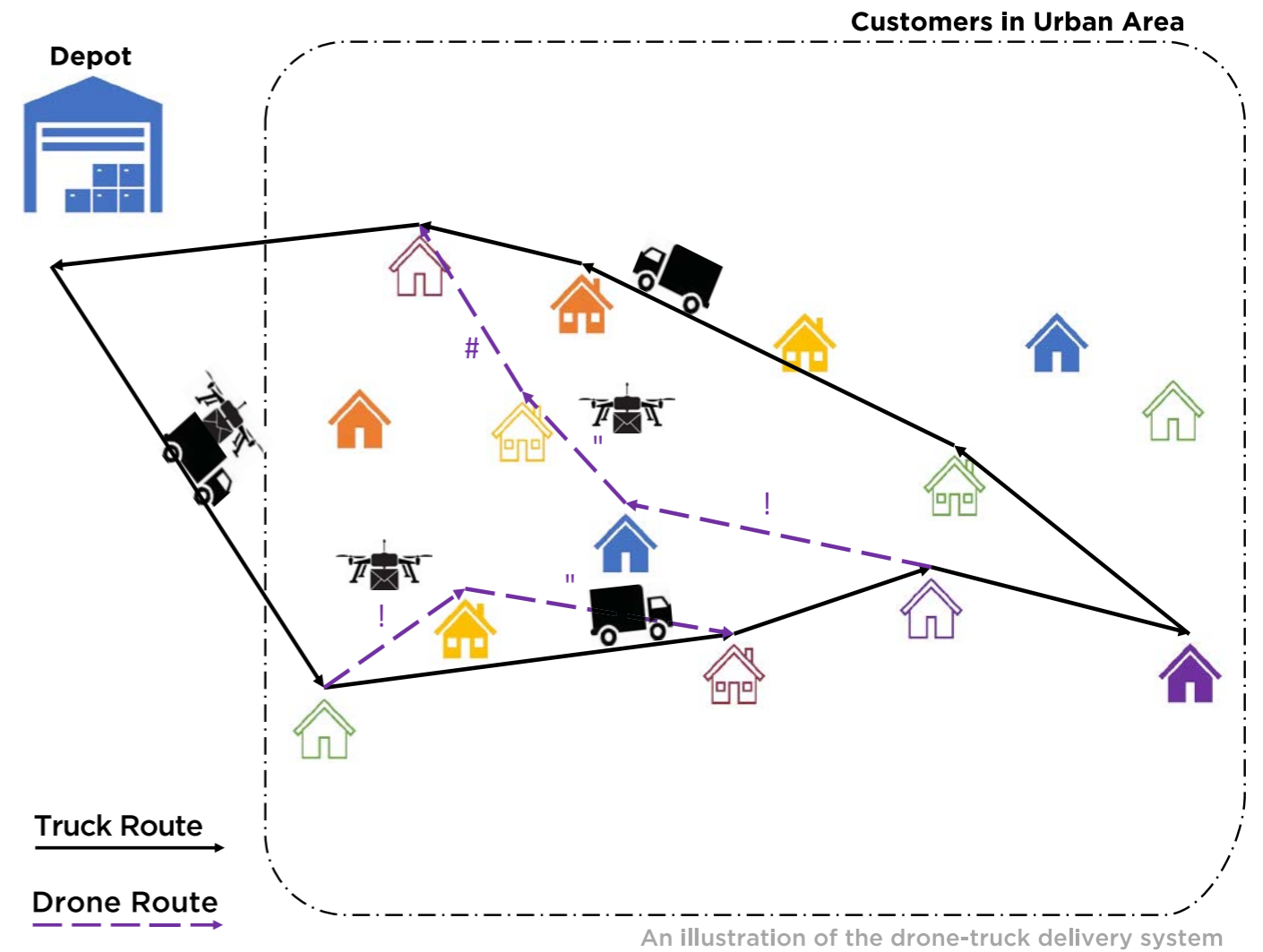
The model then was tested to investigate if allowing the multiple visitations for the drone yields less

transportation cost than the single visiting drone operations. The result exhibited that allowing the multiple visitations costs less. After checking 17 instances of different customer numbers in the system (from four customers to 20 customers), it could be confirmed that the multiple visitations of the drone to the customers is beneficial.

For easier understanding of the instances, several example paths were designed to explain how multiple visitations operation is more beneficial than that of the single visitation. This has been used in the research presentation organized by CITIES research center (see research related photo).



Presenting research outcomes to the NYUAD and CITIES research community



The drone and truck delivery system in urban area; an example in which the drone serves one customer in a trip (dotted line 1-2) and two consecutive customers in a row (dotted line 1, 2, and 3)



CONGRATULATIONS

To the following NYUAD students who were awarded
a Post-Graduation Research Fellowship

From September 1, 2022 - August 31, 2023

| Student Name | Faculty Supervisors | Project Title |
|------------------------------|--|--|
| Aaron Marcus-Willers | Matteo Marciano and David Wisley | Acoustic Mapping of the Impacts of Anthropogenic Noise Pollution on Abu Dhabi's Ecological and Social Systems. Funded by CITIES |
| Fanisi Mbozi | Jonathan Andrew Harris | When do Voters see Fraud? An Analysis of Voter Preferences in Polling Station Supervision. |
| Hazem Lashen | Muhammad Shafique | Label Efficient Clinical Machine Learning |
| Ivana Drabova | Jordan Norris | Sustainable Consumption and Structural Change |
| Jaime Andres Fernandez Uribe | Sarah Paul and Matthew Silverstein | Knowing What's Good: Exploring the Intersection of Ethics and Epistemology |
| Karno Dasgupta | Katia Arfara | Being in Time: Aestheses of the Anthropocene |
| Marko Brnovic | Rafael Maria Gutierrez and Serdal Kirmizialtin | Induced Ion Correlations Lead to DNA Attraction in Divalent ions |
| Noora Shuaib | Nancy Gleason | Faculty and Student Perspectives of Critical Pedagogies of Care in the Core Curriculum at NYUAD |
| Riko Morisawa | Fatjah D Touray and Hannah Brueckner | Transformative Moments at NYU Abu Dhabi |
| Tsedenia Denekeew | Aashish Jha | Oral microbiome analysis of the UAE Healthy Future Study Cohort to identify markers associated with health and disease in the Emirati population |
| Yaman Garg | Kemal Celik and Masoud Ghandehari | Ground Truth Validation of the Microclimate Model of NYUAD Campus: An Arid Cities Research Project |

WITH THANKS TO ALL FACULTY AND ACADEMIC STAFF WHO SUPERVISED NYU ABU DHABI UNDERGRADUATE RESEARCHERS IN ACADEMIC YEAR 2021-2022.

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