جامعة نيويورك أبوظبي

NYU | ABU DHABI

AY 19-20
UNDERGRADUATE
RESEARCH REPORT

AY 19-20 UNDERGRADUATE RESEARCH REPORT

Research at NYU Abu Dhabi is embedded in a student's academic life, and undergraduate students are afforded the opportunity to participate in research projects alongside world-class faculty and researchers throughout the academic year and summer. NYUAD's Office of Undergraduate Research aims to promote and support undergraduate research, scholarship and creative activities across the disciplines, by administering various programs to facilitate this.

This report showcases some of the excellent undergraduate research that has taken place over the summer, as well as during the academic year, and celebrates the accomplishments of NYUAD's undergraduate researchers. Our students have shown their thirst for knowledge and an eagerness to push academic boundaries. Their research and creative works have in-turn led to publications in world-leading journals and presentations at prestigious conferences across the world. During the summer, undergraduate students are able to engage in full-time research, either by working independently on their own research projects, or by assisting faculty with existing projects. This gives students the opportunity to hone their research skills by becoming active investigators, who demonstrate creativity and learn the ability to tackle new and exciting challenges.

The COVID-19 pandemic has produced unprecedented challenges across the globe. Despite the effects of this pandemic and the significant changes it may have caused to our daily lives, NYUAD remained committed to supporting undergraduates to continue their research activities where possible. We would like to take this opportunity to thank the inspiring faculty and research staff at NYUAD and beyond, who have ensured undergraduate research continuity in these challenging times. In some instances, the switch to a virtual setting has involved considerably reframing entire research projects and plans, which previously relied on in-person work. Timelines and goals were adjusted, and individualized work plans were made. This would not have been possible without the support of faculty who have managed online collaborations and have proven their determination and commitment to continue to support students in their growth.

A special thank you and appreciation is extended to the Office of Undergraduate Research Faculty Committee, who advise on the office's programs, guidelines and new initiatives, and this year reviewed in excess of 150 research grant and fellowship applications. The Committee comprises of Andrea Valerio Macciò, Nelida Fuccaro, Olivier Bochet and Pradeep George. I would also like to extend my gratitude to Vice Provost and Associate Vice Chancellor of Global Education and Outreach Carol Brandt, who oversees the development of NYUAD's summer programs of experiential learning, serving more than 500 students in internships and undergraduate research. Finally, I would like to acknowledge and thank Assistant Director of the Office of Undergraduate Research Farhana Goha, for her work over the years in overseeing and developing the programs within the office.

NADA MESSAIKEH
Associate Vice Provost, Research Administration and Financial Planning

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OVERVIEW OF
UNDERGRADUATE
RESEARCH
PROGRAMS

SUMMER UNDERGRADUATE RESEARCH PROGRAM

The NYUAD Summer Undergraduate Research Program 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.

135 POSITIONS

POST-GRADUATION PRACTICAL TRAINING PROGRAM

The Post-graduation Practical Training Program (PPTP) allows faculty to appoint NYUAD seniors graduating in May to work full-time on faculty research projects in the summer following their graduation.

147 PPTP RESEARCH POSITIONS

CONFERENCE GRANTS

Students may apply for conference grants to enable them to present their research in prestigious conferences and at other venues where they can showcase their research and creative activities.

9 CONFERENCE GRANTS AWARDED

STUDENT ASSISTANTSHIP PROGRAM

The Office of Undergraduate Research oversees the Student Assistantship Program, which provides students the opportunity to earn money through part-time, hourly jobs with NYUAD staff or faculty.

352 STUDENT RESEARCH POSITIONS

VISITING UNDERGRADUATE RESEARCH PROGRAM

This competitive program offers the opportunity for NYU New York, NYU Shanghai, and external undergraduate students in local universities within the UAE to take part in research during the summer, supervised by NYUAD faculty members and funded by the Office of Undergraduate Research.

188 APPLICATIONS

* Program was suspended in summer 2020 due to COVID-19

INTERNSHIPS FOR EXTERNAL UNDERGRADUATE STUDENTS

Targeted at external undergraduate students already based in the UAE who wish to take part in a research internship at NYUAD during the academic year, and have a demonstrated interest in research and academia.

15 RESEARCH INTERNSHIPS TOOK PLACE

POST-GRADUATION RESEARCH FELLOWSHIP PROGRAM

Piloted in AY 18-19, the program is designed to support a select cohort of exceptional NYUAD graduating seniors with a demonstrated interest in academia, by providing a competitive opportunity for a prestigious one-year research fellowship at NYUAD.

9 RESEARCH FELLOWS SELECTED FOR AY 20-21

SUMMER UNDERGRADUATE RESEARCH HIGHLIGHTS

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PPTP and summer research are great education opportunities for our students to experience full-time research. The work requires a time commitment that would be challenging during the academic year. These programs serve as an important stepping stone to raise good researchers in the UAE.

SOHMYUNG HA
Assistant Professor of Electrical and Computer Engineering

"

David Joseph Wrisley
Associate Professor of Digital Humanities

It is an invaluable experience for a student who will be pursuing graduate studies to have an opportunity to pursue hands-on research, in close collaboration with a group of faculty and researchers. Students are able to bring what they learned in their classroom and Capstone research, and apply this to the day-to-day research and decision-making of historical research. We had biweekly team meetings, consultations for decision-making, and training sessions for the acquisition of new digital skills. This team work is an important opportunity for 360 degree learning to take place.

The OpenGulf Twitter account (@open_gulf).

Title page of Lorimer's Gazetteer of the Persian Gulf, Oman and Central Arabia (1915). Credit: Open license: archive.org.
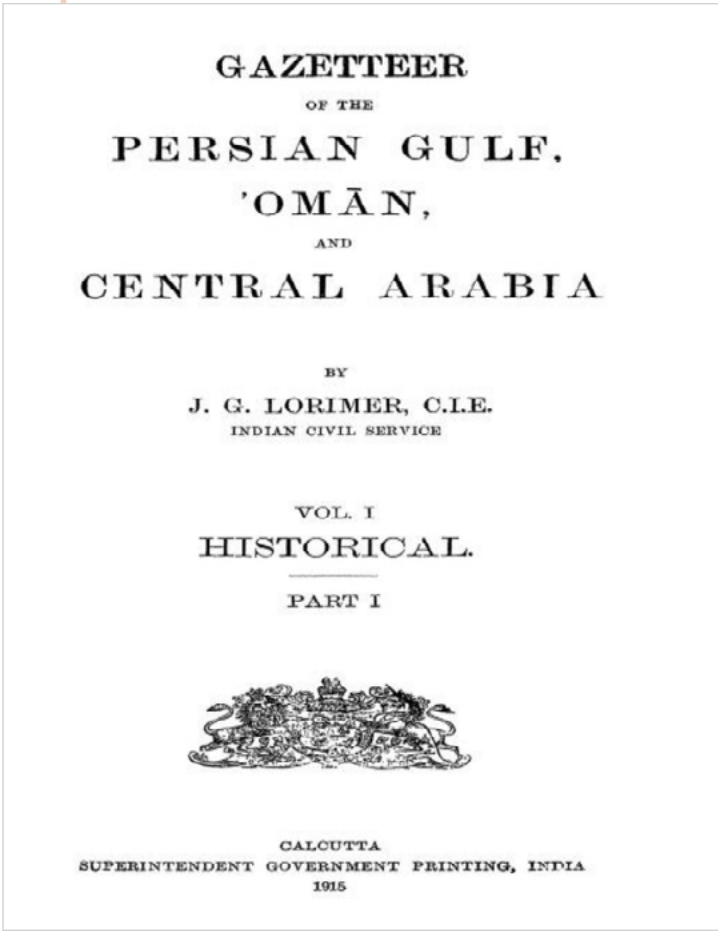
Faculty Supervisors **Nora Barakat** & David Joseph Wrisley

OPENGULF

OpenGulf is a set of interconnected digital projects focusing on historical documentation about the Arabian Gulf. The project specifically looks at the historical geography of the Gulf region as well as handwritten archival materials from the pre-oil period, creating data for both spatial analysis and AI-powered handwriting recognition and automated transcription. This project will turn data that is currently located in print archives, and make it accessible and available to global historians.

This project began with John G. Lorimer's Gazetteer of the Persian Gulf, Oman and Central Arabia, extracting 23,000 unique place names in the Gulf region with a total of 51,000 annotations from the Gazetteer's Geographical Dictionary, and geolocating them. The project also involved organizing and mapping the Dictionary's statistical information (e.g. number of livestock or date palms) by geographical location in order to generate novel research questions. We provided visualization for some of this data and explored the creation of a more formal gazetteer. OpenGulf's web page: opengulf.github.io

GURGEN TADEVOSYAN

PPTP | Class of 2020

Major
Political Science

NADA AMMAGUI
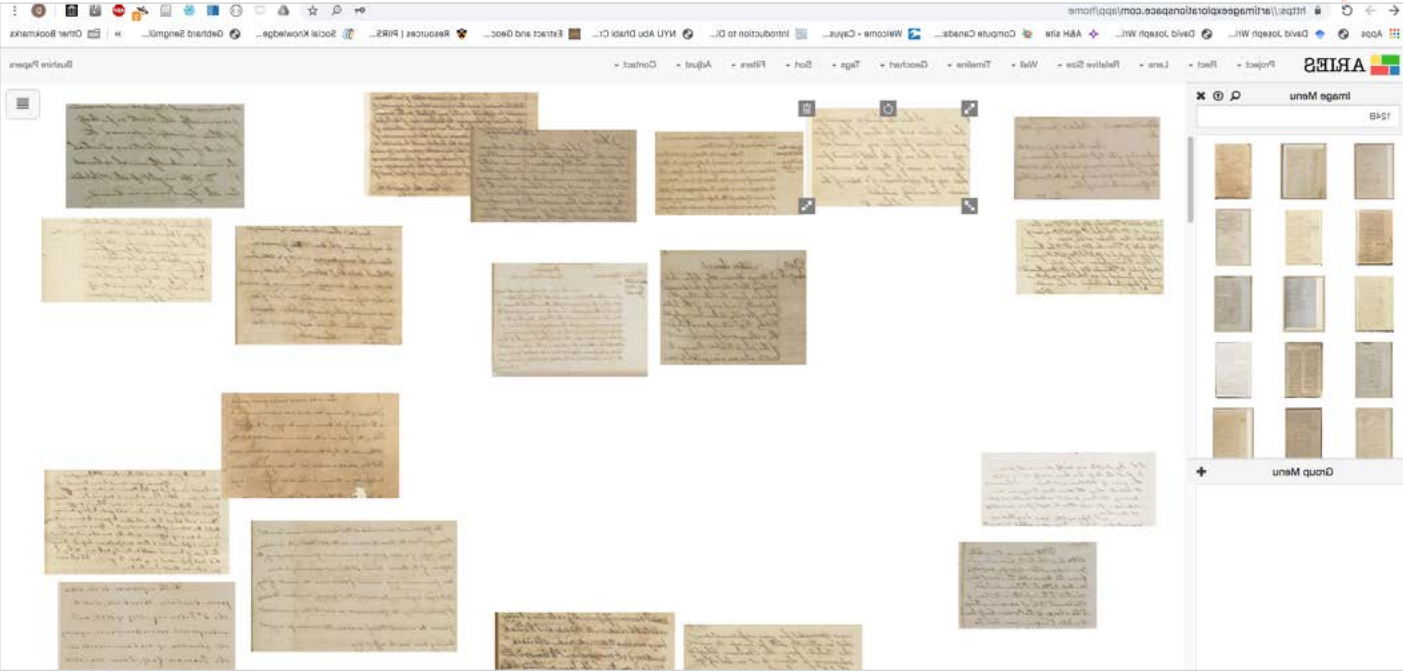
PPTP | Class of 2020

Major
Arab Crossroads Studies

LIYAN IBRAHIM
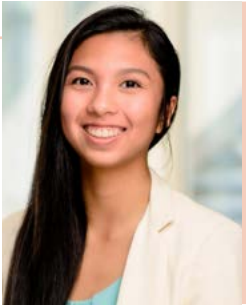
UGR | Class of 2022

Major
Computer Science

The variety of handwritings included in the Bushire Residency Papers. Credit CC license ; British Library Indian Office Records / QDL.

PPTP | Class of 2020

MARIA PAULA CALDERON

Major
Interactive Media

Faculty Supervisors
Aaron Sherwood & Jack B. Du

REDESIGNING AND DEVELOPING THE NEW INTERACTIVE MEDIA PROGRAM'S WEBSITE

A key element of the Interactive Media program's ethos is its dedication and interest in new technologies. Not only does the program seek to elaborate innovative and creative applications of such technologies, but it also strives to demystify them. Overall, it is imperative for the Interactive Media program to have an up-to-date and user-friendly website. As such, this research project consisted of editing, designing, and developing a new website for the Interactive Media program that not only establishes a professional and attractive public image, but also facilitates the process of updating and maintaining the website in the long term. This research project served as an extension of my student assistantship as a user experience designer with the Lab, where I began the website's brainstorming, producing initial sitemaps and wireframe designs for each page.

"

Aaron Sherwood
Program Head, Interactive Media; Assistant Arts Professor of Interactive Media

PPTP has afforded Maria the opportunity to work on a professional project with support and guidance. Maria worked diligently to create a new website for the Interactive Media program and is honing key industry skills. Having experienced PPTP now firsthand, I really appreciate what a benefit it can be in launching a student into their career post-graduation.

Mockup of the tablet and mobile versions of the Interactive Media Program's new website design.

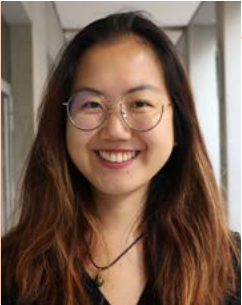PPTP | Class of 2020

MARK PAPAI

Major
Philosophy, Arabic Minor

Faculty Supervisor
Omima El Araby

LEARNING ARABIC WITH VIDEOS

In learning a language, listening is an essential skill for the improvement of language learning as it directly impacts learners' conversational skills. However, textbooks, in general, focus on reading, writing and grammar drills while they pay little attention to listening material. Hence, language teachers are obliged to fill in the gap by putting a lot of effort and time in finding and creating listening material suitable for teaching in terms of language, content and proficiency level.

This research project was the initial phase of creating an audio and video online library, that aims at collecting recording speech of native speakers and authentic Arabic video clips to be used by Arabic language teachers and students to enhance Arabic language teaching and learning at NYUAD. The collected listening material will also be accompanied by a transcript or subtitle in each item for integration of reading and listening.

The Arabic Audio-Video Library, once created, will be launched on the NYUAD YouTube Channel for easy access for learners of Arabic in the community.

PPTP | Class of 2020

EMMA CHIU

Major
Philosophy, Arabic Minor

Faculty Supervisor
Muhamed Al-Khalil

SUBJECT-BASED CORPUS OF ARABIC AND BIOGRAPHY OF TAWFIQ SAYIGH

My research constituted a two-part investigation:

1. Analysis of the 30 poems collection by Tawfiq Sayigh
2. Analysis of newspaper articles and reports about the coronavirus in the Arab World. Part one delves into voweling and analyzing poetic devices used by Tawfiq Sayigh in his most recent poetry collection. Part II is composed of a corpus of newspaper articles, where a potential paper would be aimed at discussing and analyzing linguistic variation in press communication of newspaper articles and reports about the novel coronavirus in regions of the Arab World. To examine a relatively narrow scope, the chosen reports and articles were at least 70% composed of material strictly about the coronavirus, in the following regions: the UAE, Bahrain, Oman, Saudi Arabia, Kuwait, Qatar, Lebanon, Syria, Jordan, Palestine, Morocco, Tunisia, Algeria, Sudan, Egypt, Mauritania, Libya, Iraq, and Yemen. The goal of this project was to examine whether or not despite the common usage of Modern Standard Arabic, communication about the novel coronavirus would yield different results in language use due to regional differences.
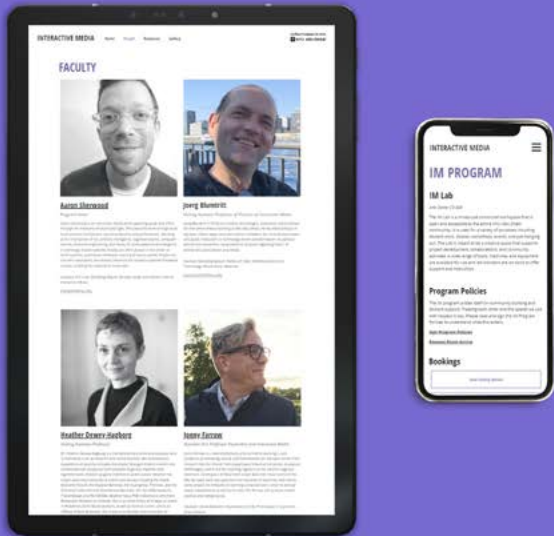
UGR | Class of 2021

TOM
ABI SAMRA

Major
Literature and Creative Writing

Faculty Supervisor
Maurice Pomerantz

ADAB IN THE SEVENTEENTH CENTURY: A STUDY OF YŪSUF AL-SHIRBĪNĪ'S BRAINS CONFOUNDED

The post-classical period in the Arabic tradition, approximately from the 13th to the 18th centuries CE, has been long-thought to be a "literary desert," as one scholar put it. Thus my research this summer, which feeds into my Capstone Project, was an investigation of a text from that period, specifically from seventeenth-century Ottoman Egypt: Yūsuf al-Shirbīnī's Hazz al-quḥūf bi-sharḥ qaṣīd Abī Shadūf (bilingual edition published by the Library of Arabic Literature in 2016). Specifically, my project sought to dismantle the dominant paradigm about the period by arguing for literary continuity throughout the Arabic literary tradition.

This research project inaugurated my scholarly commitment to working on post-classical Arabic literature.

"

Goffredo Puccetti
Assistant Professor of Practice of Visual Arts

The UAE is a country with a strong bond with its roots and heritage and a place open to influxes from travelers and exogenous cultures. This research project questions what tradition truly is, as well as how mobile and mutable tradition can be.

PPTP | Class of 2020

EKIN
BASARAN

Major
Economics

Faculty Supervisors
Goffredo Puccetti & Erin Collins

DESIGNING CULTURAL EXPRESSION FOR A CHANGING WORLD

I spent the summer assisting with Tahwheel, a research project promoting attitudes towards sustainable transportation and biking. To assist with the development of this project, I worked on ethnographic surveys for cycling, sustainability, and the perception of the kandura and abaya, the national dress for male and female Emiratis respectively. I also delved deeper into the history of the UAE national dress and how it was contextualized in a bid to promote cohesiveness in the Gulf region.

The abaya and the kandura reinforce a sense of unity, while also representing values that connect the Emirati society to the Bedouin traditions: religion, modesty, and nationalism. Tahwheel hopes to motivate towards a conversation that explores how might we reconsider culture, particularly, heritage and national dress of the UAE as we become more and more conscious of our environmental impact and aspire to create a sustainable future.

"

I graduated as an economics major with minors in computer engineering and design. I want to pursue design research or experience design in my career. I am an advocate for interdisciplinary learning and thus, working on this project and working with Goffredo was very exciting.

Image of user testing research in progress.

PPTP | Class of 2020

ARTEM MISIURENKO

Major
Economics

Faculty Supervisor
Fiona Kidd

CENTRAL ASIAN ARCHAEOLOGY: PERSPECTIVES ON NOMADS, MOBILITY, AND AGRO-PASTORALISM.

This research focused on the use of words and concepts associated with nomadism, mobility, and agro-pastoralism in Russian language literature produced by archaeologists, ethnographers, and travelers to Central Asia between the 17th and the 20th centuries. Mobile populations play a crucial role in connectivity, moving across and between landscapes, bringing with them the raw and finished products from their areas, as well as information, knowledge, technologies, and ideas. In Central Asia, mobility takes a large number of forms, it occurs and transforms for various reasons. Yet the scholarly need to categorize the peoples involved in these movements and lifestyles has fundamentally impacted how one thinks about connectivity. This issue is important because the historiography of terms such as 'nomad' and 'sedentary' has established a false binary that continues to structure research and disciplinary frameworks today. My objectives were to explore how the fluidity of populations in agro-pastoral and pastoral economies in Central Asia has been documented and understood in Russian and Soviet scholarly and travel literature. My part of the project is a contribution to a paper by Professor Fiona Kidd, who addresses the question from different perspectives.

Uzbekistan - one of the main crossroads of the ancient world.

Faculty Supervisor Andras Gyorgy

PATH OF LIGHT VIA AGITATED LIQUID

Growing cell cultures continues to be a prominent problem in biological experiments as they require a static environment. Devices such as turbidostats have been created to monitor and adjust the conditions in the environment to overcome this issue. However, these are not frequently used due to high costs and fluid volume limitations. Building upon previous work, our research team spent the summer continuing the design of a low-cost 3D printed IoT device to monitor cell growth in Erlenmeyer flasks. Specifically, this research focused on the simulation and analysis of the flow and movement of different liquids inside the container as it is subjected to centrifugal forces. A computational environment that simulates the movement of the liquid given the geometry of the flask, properties of the liquid, and trajectory was created and analyzed.

KEVIN KURIAKOSE JOSEPH

UGR | Class of 2022

Major
Mechanical Engineering

JACOB CHOULJIAN

UGR | Class of 2022

Major
Mechanical Engineering

YEHOWAHI SEKAN

UGR | Class of 2022

Major
Mechanical Engineering

"We are proud to have done the research working from three different continents to achieve our established goals. We used the resources provided by the university like Zoom, Google Meets, Notion and Slack to keep in touch and update the team on the work done.

PPTP | Class of 2020

PRAJNA SONI

Major
Mechanical Engineering

Faculty Supervisor
Ali Diabat

A PERISHABLE PRODUCTS SUPPLY CHAIN PROBLEM DURING COVID-19 LOCKDOWN RESTRICTIONS

The pandemic has affected the supply chain industry drastically, reducing the available workforce, eliminating distribution channels, and adding regulations which restrict supply chains further. Through this project, I examined the impact of COVID-19 on the perishable product supply chain, modelling the problem mathematically to optimise delivery given regional restrictions in response to COVID-19. The supply chain network investigated entailed a management platform, warehouses, and customers subject to additional constraints like limited working hours and different delivery modes due to the implementation of regulations to minimise the spread of COVID-19. I designed a robust optimization model, resilient to COVID-19 regulations, allowing companies to meet increased delivery demands while minimising costs. I tested the model using sample curated data-sets that resemble realistic scenarios in Abu Dhabi to obtain managerial insights on the role of (i) a customer satisfaction requirement and (ii) a working-hour time restriction on the objective cost.

PPTP | Class of 2020

FEBIN THAPA MAGAR

Major
Mechanical Engineering

Faculty Supervisor
Philip Panicker

QUAD-TURBINE HOVERBOARD

The Quad-Turbine Hoverboard Project aimed to design a single-user flying vehicle using turbines in place of electric rotors conventionally implemented in quad-engine drone type flying objects. The board should be user accessible and simple to use, mimicking the user experience and aesthetic of a skateboard to replicate the "Hoverboard" commonly seen in science fiction films. To this end, true conventional flight is not the desired outcome, rather a form of motion primarily within a stable lateral plane to create the "hovering" experience. Several existing prototypes with similar goals have been developed but all either rely heavily on impractical infrastructure to allow magnetic levitation or forsake the sleek, simple experience of a "hoverboard" in place of a complicated flight procedure.

Faculty Supervisor **Anthony Tzes**

PRINCE STEVEN ANNOR

PPTP | Class of 2020

Major
Computer Engineering

YUSUF JIMOH

UGR | Class of 2022

Major
Electrical Engineering

A CALM COMPUTING APPROACH TO IMPROVING THE QUALITY OF HUMAN INTERACTIONS

With the rapidly growing technology industry, access to varying complexities of technological devices has been unprecedentedly high and only promises to increase with time. While the benefits of technology are tremendous, their pervasiveness in our lives secretly poses serious threats to the underlying fabrics of individual and societal behavior and interaction. Research demonstrates that technological devices are generally addictive, "noisy", and their use can tremendously reduce the quality of human interactions.

This project employed a calm computing approach to analyze and develop technological tools to preclude the potential downsides of our current devices. Tools we developed include smartphone applications, smartwatch applications, and web servers. Other tools we employed include environmental sensors, mobile robots, and cloud infrastructures. The assembly of software and hardware we developed works to increase its awareness of its user's state as well as its environment through data acquisition and processing and based on this awareness, drastically minimizes a user's technological interaction by handling delegable tasks in the periphery, allowing users to focus on things that matter.


Calm Computing setup.

UGR | Class of 2022

ULJAD BERDICA

Major
Electrical Engineering

Faculty Supervisor
Chen Feng

VISCOELASTIC SIMULATIONS FOR MOBILE 3D PRINTING THROUGH ROBOTICS SIMULATION PLATFORMS

Mobile 3D printing is an increasingly popular manufacturing paradigm since it extends the versatility of gantry-based 3D printing by removing the inherent limitations in size, time and complexity. With the increased magnitude of such projects, simulations become essential as a way to validate the design, control potential errors and test the most optimal algorithms and printing regimes. Current simulations are either based on the task sharing aspect between printer robots or structural analysis of the print design. Through a review of the most innovative material simulating techniques like Material Point Method, Smooth Particle Hydrodynamics, Finite Element Methods and other numerical hybrids, our team developed a reliable plugin that can be used in Gazebo to enable the simulation of realistic visual of viscous materials output and allow mobile 3D printing robots to operate with respect to spatial and physical restrictions. This approach to simulation aims to help the design and testing of new mobile printing algorithms that account for the change in material behavior and do not rely on traditional mesh-based analysis.

Poster used to participate in the NYU Tandon poster session.
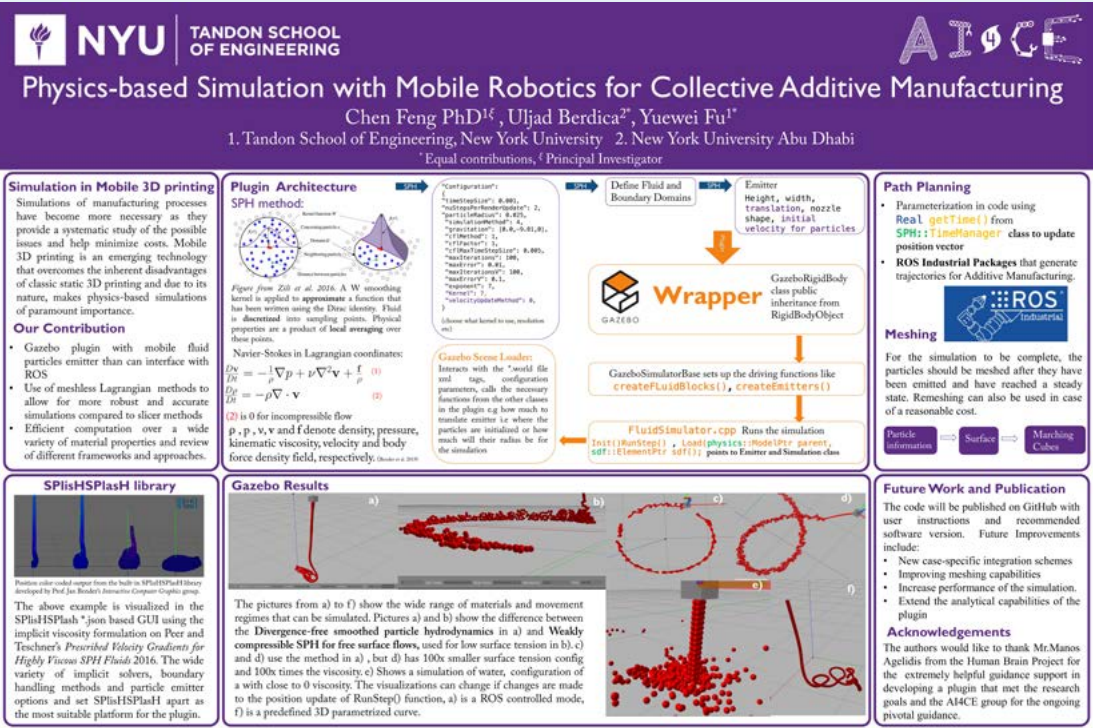
UGR | Class of 2022

SOFIA CHAVELE-DASTAMANI

Major
General Engineering

Faculty Supervisor
Victoria Bill

3D PRINTED BIOMEDICAL DEVICES

This project closely researches the use of 3D printing for crisis response and healthcare, exploring best practices in large-scale rapid prototyping for humanitarian relief and community assistance. From hurricanes and earthquakes to COVID-19, 3D printing provides an affordable, sustainable solution to decentralizing manufacturing, providing a more community-based, large-scale approach to disaster response. It can simplify supply chains and logistics for urgently needed equipment in isolated areas, allowing professionals to fix and prototype specialized medical devices in hours. We explored methods, tools, materials, and approaches to 3D printing in crisis relief, working towards the development of a comprehensive guide of best practices.

Using a hands-on approach to the exploration of 3D printing, and in cooperation with Occupational Therapists at NYU Langone Hospital, we researched and designed biomedical devices that directly address needs of patients, such as a zipper pulls for patients with movement issues. In response to COVID-19, a general use assistive clipping device that can aid patients with telecommunications while hospitalized and isolated during the pandemic was designed, prototyped using 3D printing, and provided for use at NYU Langone.

Poster used to participate in the NYU Tandon poster session.
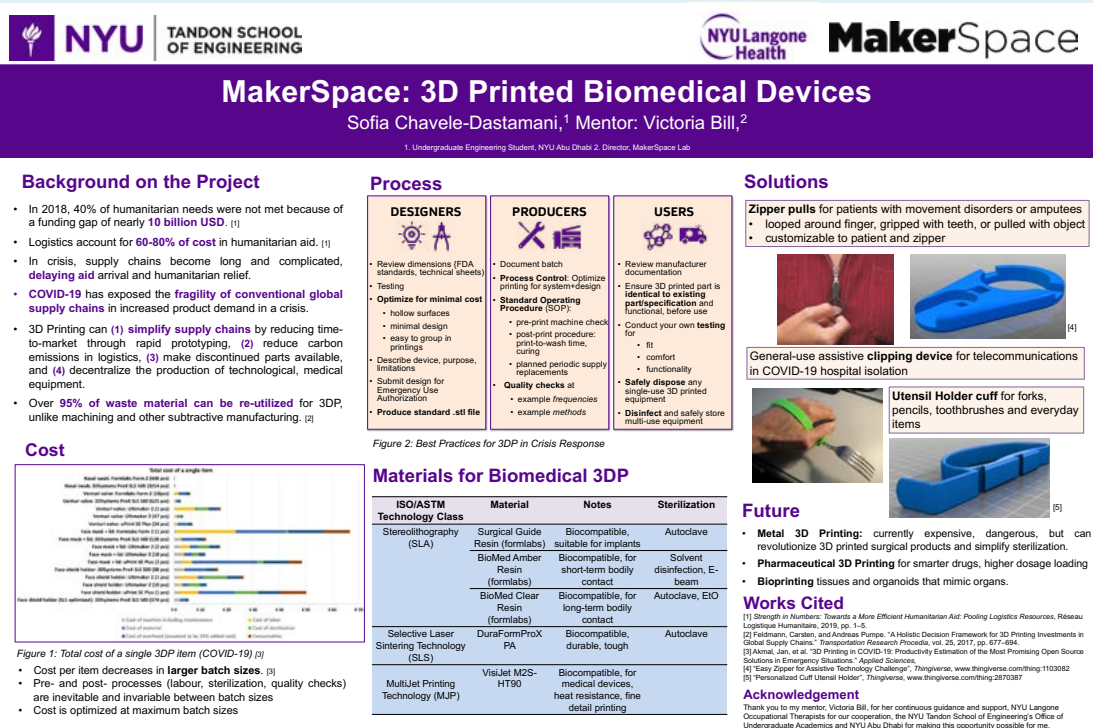
UGR | Class of 2021

MAJID ALABBASI

Major
Mechanical Engineering

Faculty Supervisor
Kemal Celik

EFFECT OF MICROGRAVITY ON FRESH PROPERTIES, MICROSTRUCTURE, AND MECHANICAL PROPERTIES OF POTENTIAL MATERIALS FOR PLANETARY CONSTRUCTION VIA 3D PRINTING

My summer research focused on gathering the literature and past experiments involving concrete and, specifically, cement in microgravity conditions. The research involved three main pillars. The first being the additive manufacturing nature of cement and how it can be implemented. The second aspect was a general look at Martian conditions and accounting for limitations and advantages. Finally, I focused on fresh properties, microstructure, and mechanical properties of cement. This work aims to further the research currently being done on the topic of Martian potential materials for construction.

Majid gathering data on cement in microgravity conditions.

PPTP | Class of 2020

FARAH SHAHBAZ

Major
Civil Engineering

Faculty Supervisor
Kemal Celik

COMPARATIVE LIFE CYCLE ASSESSMENT OF REACTIVE MGO (RMC) PRODUCED FROM REJECT BRINE AND PORTLAND CEMENT (PC) PRODUCTION

Portland cement, as a single material industry, contributes to significant CO_2 emissions on a global scale. Reactive MgO cement is considered as a sustainable cement alternative to Portland cement. One of the main sources of Reactive MgO production is synthesizing it from reject brine.

My research project evaluated the environmental impacts of reactive magnesium oxide cement produced from reject brine and compares it to Portland cement production using Life Cycle Assessment framework. My PPTP research findings will further contribute to my work for the Post-graduate Research Fellowship at NYUAD.

Zameek, Abdullah and Aven Le Zhou. "ConfessorBot: Can Machine Learning Algorithms Identify, Understand and even Confess with Human Emotion?" *Proceedings of the 5th Arts and Science International Exhibition and Symposium*, Tsinghua University, Beijing, China (2020).

UGR | Class of 2021

AIZAZ ARIF ANSARI

Major
Computer Science

Faculty Supervisor
Michail Maniatakos

UNDERSTANDING BINARY EXECUTABLES OF UNKNOWN FORMAT

Reverse Engineering binary executables is extremely useful since it allows computer scientists to explore existing software designs and discover any security vulnerabilities. However, not all binary executables can be reverse engineered using the currently available tools due to lack of format information. In my research, I attempted to better understand these binary executables of unknown format. I applied transfer learning techniques where I converted these binaries to images and trained a deep learning model on them to perform semantic segmentation. Using this deep learning model, I was able to identify code and data sections of binary files with 92% accuracy. This deep learning tool can be used in parallel with existing reverse engineering tools to improve segment (code/data) identification.

Control flow analysis on a decompiled control binary.
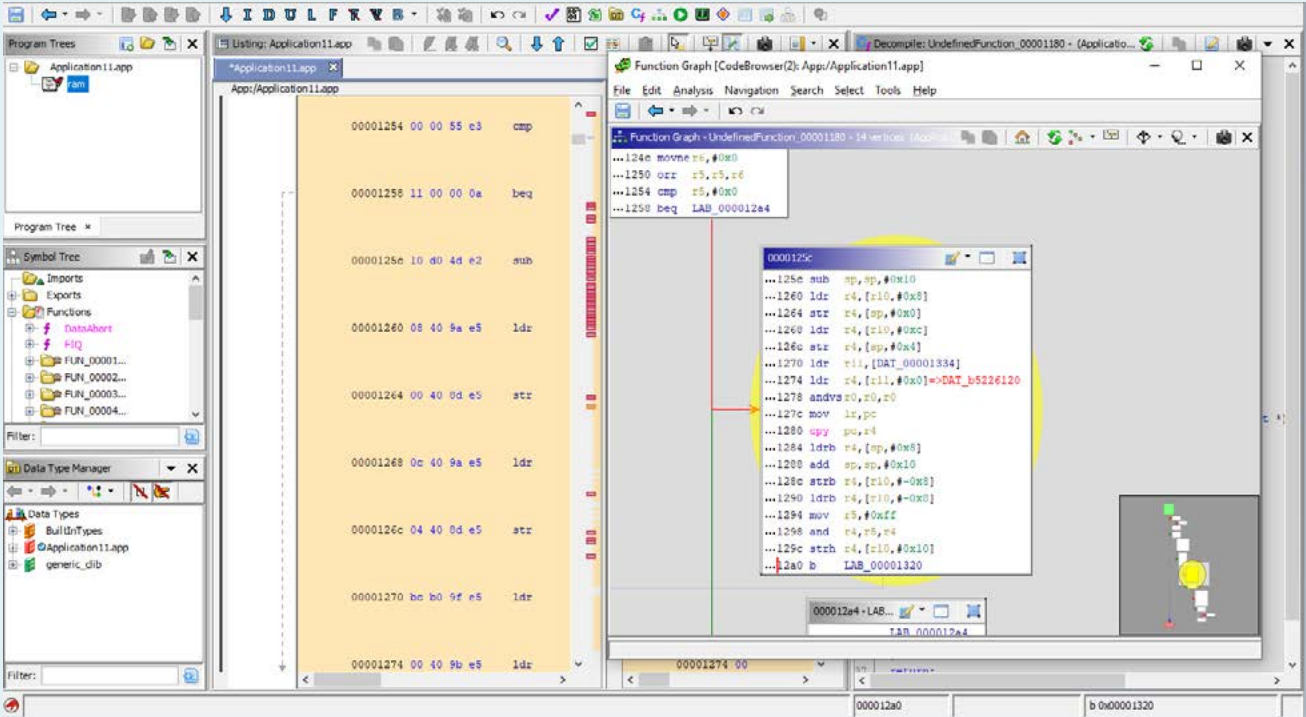

UGR | Class of 2023

GOPIKA KRISHNAN

Major
Computer Science

Faculty Supervisor
Michail Maniatakos

TARGETED BACKDOOR ATTACKS ON FACIAL RECOGNITION SYSTEMS WITH CHANGE OF EXPRESSIONS

Facial recognition systems have improved immensely in its classification accuracy with deep learning techniques. However, due to the security-critical aspect of the field, it is equally important to evaluate the reliability of the system in addition to its accuracy. This can be achieved by taking advantage of the black-box nature of deep neural networks. I worked on targeted backdoor attacks on deep neural networks trained for facial recognition by the technique of data poisoning. For the attack, smiling instances of the attacker were mapped to the target label and so, in effect, the trained model switched names to the target when the attacker smiled. Moreover, the trained model maintained state-of-the-art performance, making the attack undetectable. The work reflects security concerns of deep neural networks as factors like change in expressions could cause model misbehavior.

Abstract rendering of a human face.

Faculty Supervisor **Mohamad Eid**

ALLAN MICHELIN

UGR | Class of 2022

Major
Computer Engineering

SARA BA'ARA

UGR | Class of 2022

Major
Computer Engineering

HADI ASSADI

UGR | Class of 2021

Major
Electrical Engineering

FACEGUARD: A WEARABLE SYSTEM TO AVOID FACE TOUCHING

This summer we participated in the development of a smartwatch application that warns users when they are performing a hand movement that is likely to touch their face. This is an important functionality essential to a range of medical patients, and in the context of the recent global pandemic, valuable to the general public as well. The smart watch used during development utilizes an inertial measurement unit, measuring rotation and linear and angular acceleration along three dimensions. Data on user motion across varying positions was collected and then applied to a convolutional neural network model, producing a final prediction accuracy of 95%+.

My colleagues and I carried out the entire development process, first programming the watch as needed using arduino, and then developing a user interface to aid the collection and subsequent recording of data. Following this, we conducted appropriate data analysis before constructing and testing the architecture of a one dimensional convolutional neural network.

Mantha, Bharadwaj, **Yeojin Jung** and Borja García de Soto. "Implementation of the Common Vulnerability Scoring System to Assess the Cyber Vulnerability in Construction Projects." Proceedings of the 8th Creative Construction Conference, 28 June to 1 July, Digital Platform (2020). DOI: https://doi.org/10.3311/CCC2020-030.

Faculty Supervisor **Mohamad Eid**

RUTH GEBREMEDHIN

PPTP | Class of 2020
Major
Computer Engineering,
Electrical Engineering

KEN IIYOSHI

PPTP | Class of 2020
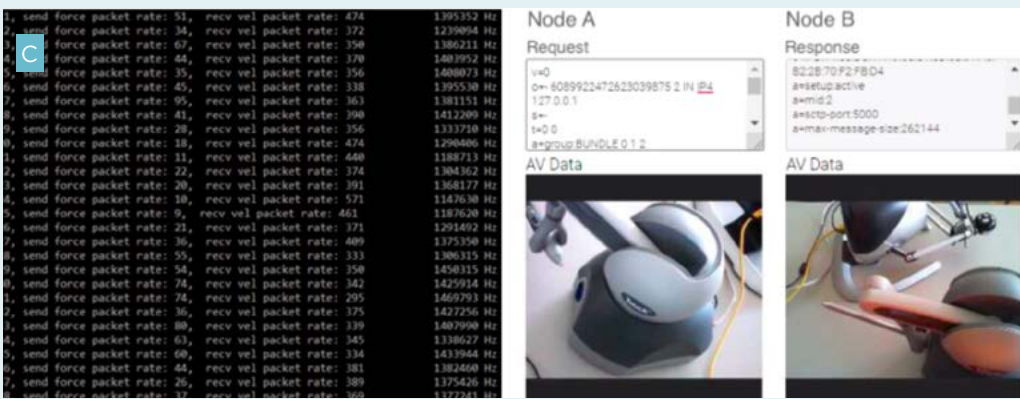Major
Computer Engineering,
Electrical Engineering

WEB-BASED HAPTIC-AUDIO-VISUAL TELEOPERATION

We continued our engineering Capstone Project in NYUAD's Applied Interactive Media Lab this summer, by implementing a standardized system for haptic-audio-visual communication on 5G internet. Haptic communication can be likened to a Skype call, but with additional devices added for communicating body movements such as a handshake. The system can now operate haptic devices of different models between different computers. To use the system, one only has to start a webpage on each side of the teleoperation. The system's communication speed is fast enough for real life applications. Such a system has never been implemented in an open-source, academic setting. We thus participated in IEEE's monthly 5G haptic communication standards meetings to update our progress, with a plan to incorporate our system as part of their standard by the end of this year. We created an extensive documentation and manual so that interested researchers can use this system. We submitted a paper, which is being reviewed for an academic conference. The standardized system has extensive applications in tele-surgery, rehabilitation, rescue, construction, and entertainment. Our lab is also now in talks with labs from other universities to use this system for interdisciplinary research.

Demo of the system through a tele-operated drawing application. A) haptic devices for tele-operation. B) different haptic devices can be used. C) the activity can be monitored through a webpage.
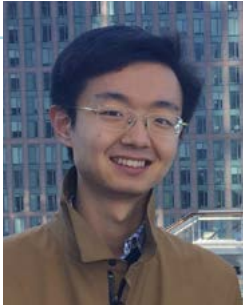
Faculty Supervisor **Khaled Shahin**

SHAHAD BADRI

UGR | Class of 2021

Major
Mechanical Engineering

YUANBEI FAN

UGR | Class of 2021

Major
Mechanical Engineering

USE OF WIND TURBINE RENEWABLE ENERGY FOR DESALINATION

The scope of our summer research involved designing wind turbines to power a water desalination plant through the use of reverse osmosis, producing energy without the need to generate electricity in the process. This project targets the mountainous emirate of Fujairah. The wind would also be able to provide the power needed to treat wastewater. Therefore, coupling renewable energy with desalination is an environmentally sustainable solution that both conserves fossil fuels and provides solutions to water scarcity. Our main focus comprised of designing and modeling wind turbines blades. This required choosing an appropriate existing airfoil to model on ANSYS- an engineering finite element analysis software used to simulate and test computer models of structures and calculate their mechanical properties. We configured the geometry of our blade and incorporated it in computational fluid dynamics to numerically calculate the solutions needed for the research. We obtained various results such as the blade's pressure contour, velocity vector and magnitude profiles, coefficient of lift and drag- all of which reveal essential information surrounding how efficient our chosen blade is in producing maximum power compared to other blades.

Wind turbine blade in the process of stress analysis in ANSYS.

PPTP | Class of 2020

OSCAR GOMEZ

Major
Mathematics,
Computer Science

Faculty Supervisor
Alberto Gandolfi

PHASE DIAGRAM OF CONSTRAINED POTTS MODEL WITH A VARIABLE NUMBER OF COLORS AND OF STIRLING NUMBERS OF THE SECOND KIND

Prompted by an image segmentation problem we developed the abstract theory of some finite volume Gibbs distributions with Potts nearest neighbor interactions, a large number of possible states, and a constraint on the number of states (or colors). It turns out that the distribution is highly concentrated on a single number of colors, except for critical points when it is concentrated on k or k+1 colors. In this way, we obtained a flexible construction of every Potts model with no predetermined number of colors. Proofs are based on the theory of combinatorial stochastic processes and on a suitably adapted version of the Swendsen-Wang algorithm. We also exploited the connection with combinatorial stochastic processes to efficiently simulate the distribution at finite temperatures.

PPTP | Class of 2020

ZHENGYANG JIANG

Major
Computer Science

Faculty Supervisors
Nizar Habash & Muhamed
Al Khalil

AN ONLINE READABILITY LEVELED ARABIC THESAURUS

For a given user to input a word, this interface provides the word's possible lemmas, roots, English glosses, related Arabic words and phrases, and readability on a five-level readability scale. This interface builds on and connects multiple existing Arabic resources and processing tools. This one-of-a-kind system enables Arabic speakers and learners to benefit from advances in Arabic computational linguistics technologies. Feedback from users of the system will help the developers to identify lexical coverage gaps and errors.
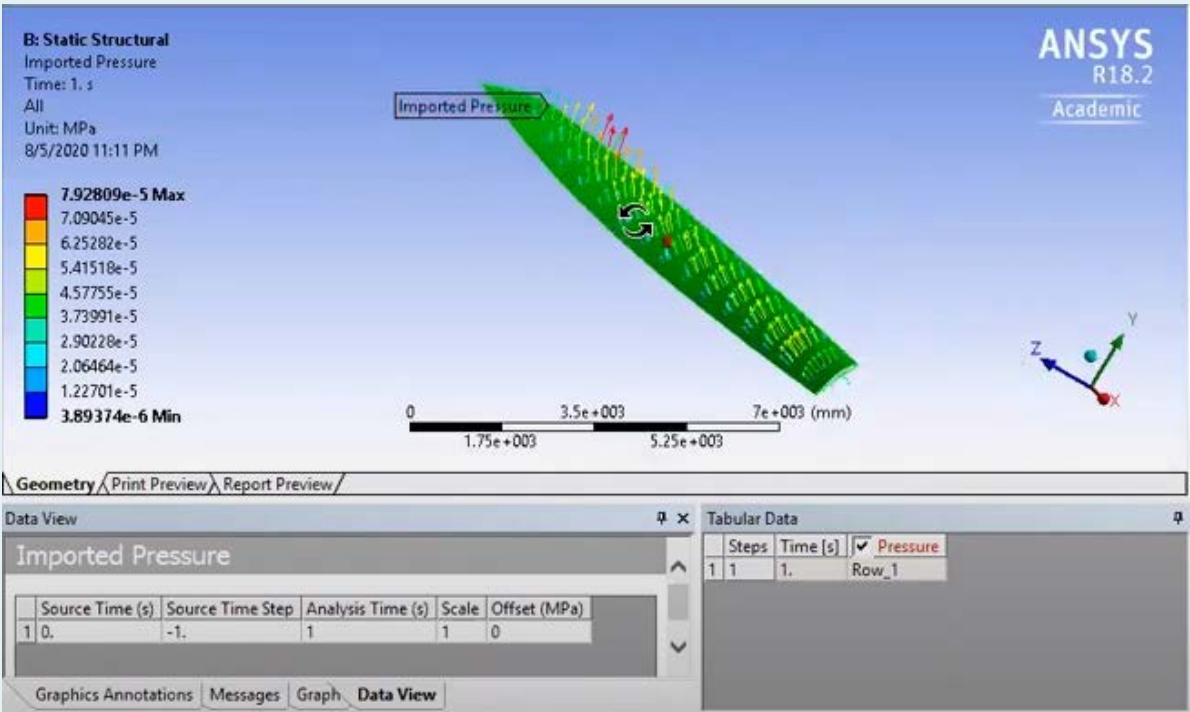
Search Result of بطاقة in Word Mode.
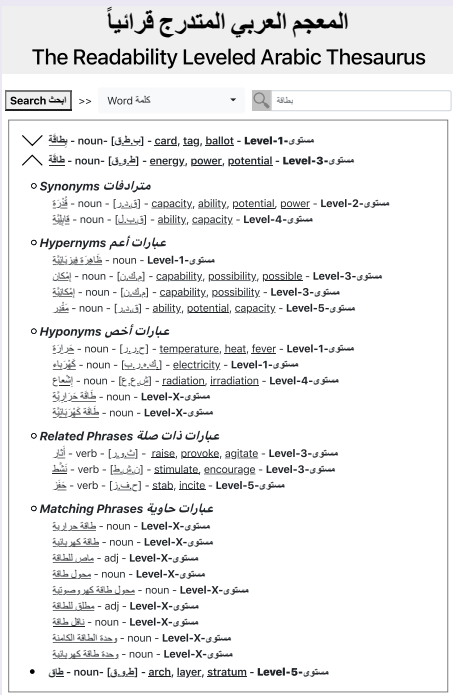
UGR | Class of 2022

MORGANE MOTLIK

Major
Psychology

Faculty Supervisor
Antje von Suchodoletz

CAN THE KIQ PROGRAM CHANGE THE QUALITY OF EDUCATIONAL DIALOGUE DURING STEM LESSONS?

I worked on creating an ambulatory assessment to measure the occupational well-being of kindergarten teachers and directors, with a particular focus on Germany, where the project was based. Due to COVID-19, an additional aspect incorporated into the assessment was the effect that the lockdown has had on teachers and supervisors, as well as parents. This investigation included how the pandemic affected the feelings of job security, development, and safety in the workplace. My work, which included literature searches, keeping documentation of literature and measures, as well as transcribing interviews resulted in a ready survey to be implemented in the pilot study. This is an important first step for the larger research project I was part of since the assessment will be used to investigate the effectiveness of a new professional development intervention in Germany.

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KHOLA JAMSHAD

Major
Mathematics

Faculty Supervisor
Elena Beretta

THE EFFECT OF SCHOOL OPENING ON COVID-19 DIFFUSION

The aim of the project was to consider the impact that different school opening policies would have on the spread of COVID-19. We studied the disease prevalence for different age groups in the case of Finland and Sweden in order to develop a model to optimize the policies with respect to the infected population and in person classes. This included setting up an extensive system of Ordinary Differential Equations evolved from the SIR epidemic model and estimating all the parameters involved. I worked particularly on establishing the mathematical proofs for the existence and uniqueness of a solution for our system.

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KATHIA FAZ NOWAK

Major
Psychology

Faculty Supervisor
John Burt

HOW BIODIVERSITY CHANGES IN RESPONSE TO THE ENVIRONMENTAL GRADIENTS THAT EXISTS BETWEEN THE GULF OF OMAN AND THE SOUTHERN ARABIAN GULF

My summer research work consisted mostly of two tasks: the first, measuring fish and the second, collecting ecological information on fish. To measure fish, I calibrated the scale (mm/pixel) and then measured fishes in the images my supervisor sent. To collect the information, I searched through online databases (FishBase and IUCN Redlist) as well as different scientific papers. By measuring the fish, I was collecting data that could give an insight into the health of the Gulfs' communities. I am continuing my involvement in the Marine Lab's research into the fall semester in hopes that I can see this project to its completion.

Biodiversity of reef fauna shifts as you leave the Gulf of Oman and move into the southern Arabian Gulf towards Abu Dhabi. This is an image of a diverse and abundant reef community at Al Harf, near the entrance of the Arabian Gulf.

UGR | Class of 2021

OSCAR SAPKOTA

Major
Biology

Faculty Supervisor
Piergiorgio Percipalle

A STUDY OF THE TRANSCRIPTIONAL PROFILE OF MAMMALIAN CELL LINES EXPRESSING MUTATED NUCLEAR MYOSIN 1 (NM1) IN AN NM1 KNOCK-OUT BACKGROUND

Recent studies can be found to suggest potential involvement of Nuclear Myosin 1 (NM1) in the DNA Damage Response (DDR) pathway. The question this research plans to tackle is how cells respond to DNA damage under the absence of NM1. The project hopes to test this by first creating mammalian cells that constitutively express mutated NM1 in an endogenous NM1 Knock-out background. In order to do so, the preparation of functional vector that express mutated NM1 in-frame within an inducible promoter is crucial. That is exactly what this summer research project aimed to achieve. With the help of DNAStar, vectors carrying NM1 with mutated N terminus chains were successfully cloned in-silico. The plasmids designed during this project can be used to transfect and express the targeted protein into mammalian cells with an NM1 knock-out background. This can be achieved via viral transduction. Further, the knock-in cells created can be used to study the differences between the NM1 mutants in comparison to wild type condition, focusing on processes which are directly connected to DNA damage including growth and proliferation, apoptosis.

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DANIEL HUTERER PRATS

Major
Physics

Faculty Supervisor
Andrea Macciò

CREATING A GALAXY WITHOUT DARK MATTER IN A DARK MATTER-DOMINATED UNIVERSE

While galaxies are usually thought of as a large concentration of stars and gas, they actually mostly contain dark matter. It is the dark matter that creates a potential well in which the baryonic matter lies. In recent studies led by Pieter Van Dokkum, some ultra diffuse dwarf galaxy (UDG) have been observed to have almost no dark matter. This observation, which pressures the belief of requiring dark matter to form stable galaxies, is investigated using numerical simulations of galaxies in this project. I worked with my professor to select the optimal candidates from the NIHAO (Numerical Investigation of Hundred Astronomical Objects) sample to test the theory of gravitational tidal stripping.

After choosing three candidates, I ran simulations to "shoot" the UDG around a larger galaxy. This aimed to recreate the effect of the UDG orbiting a central galaxy, which exerts a gravitational pull on the dark matter of the smaller galaxy as it revolves around it. Using the right orbit around the central galaxy, the portion of dark matter of the UDG was reduced to similar levels as measured by Pieter Van Dokkum and his team. This project demonstrated not only the mechanism required to reproduce galaxies lacking dark matter, but also hints at how populated the universe should be of these rare objects due to the limited complex circumstances that enable their existence.

A comparison of a simulated galaxy (left) with a real one (right, galaxy NGC4051).
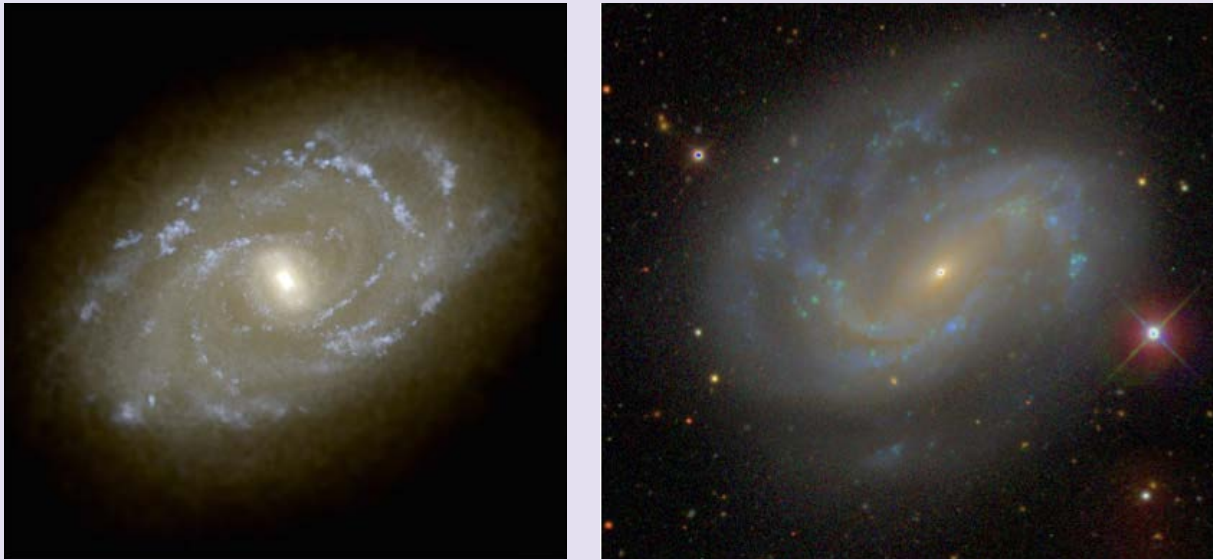
Time evolution of velocity dispersion of the stars in a dwarf galaxy. Under specific circumstances, simulated galaxies (colored lines) are able to reproduce the observed points (grey/black points with error bars).
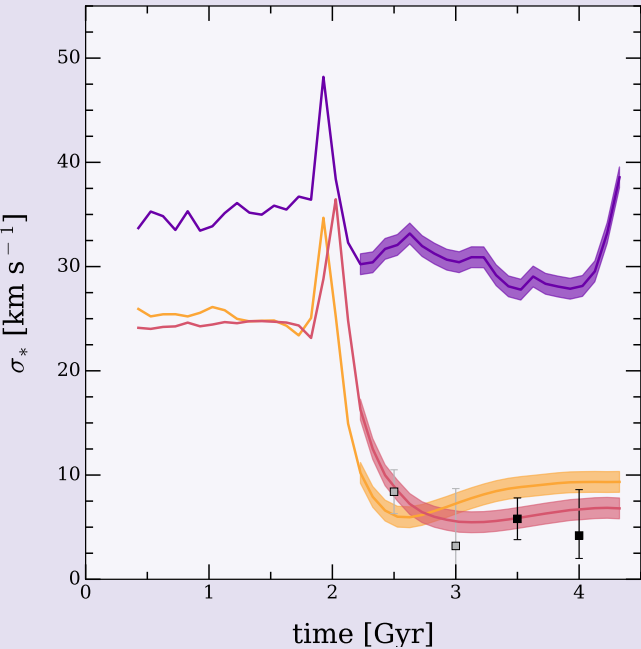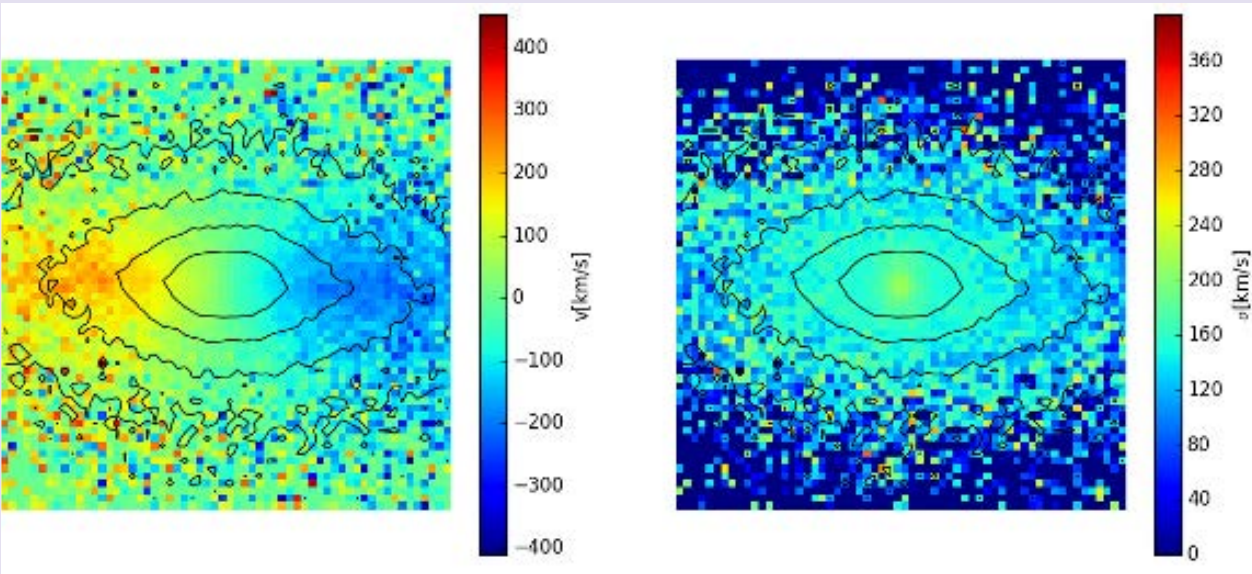
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SANA ELGAMAL

Major
Physics

Faculty Supervisor
Andrea Macciò

STELLAR KINEMATIC ANALYSIS OF NIHAO ELLIPTICAL GALAXIES

Numerical simulations of galaxy formation have greatly contributed to our understanding of the physical processes of galaxy formation and evolution over the last years. Using the NIHAO (Numerical Investigation of a Hundred Astrophysical Objects) simulations, my project investigated the stellar kinematics of the simulated NIHAO elliptical galaxies and compare them to observations. Observations have established that galaxies come in two flavors which have different formation pathways – fast rotators, which display clear large-scale stellar rotation, and slow rotators, which do not. I constructed stellar line-ofsight velocity and dispersion maps for all the elliptical NIHAO galaxies as well as isophotes, which are curves of constant luminosity. I also used the maps to compute quantities such as the spin parameter, which is a measure of the stellar angular momentum of a given galaxy, for many projections. The spin parameter was then used to classify a given NIHAO galaxy either as a fast or a slow rotator, based on an empirical criterion. The second phase of my project was to investigate the effect of AGN feedback (i.e. black holes) on stellar kinematics, which was achieved by comparing the stellar kinematics of NIHAO galaxies with AGN switched on or off. I concluded that AGN feedback results in a decrease in the stellar angular momentum of galaxies and rounder isophotes.

Two-dimensional stellar line-of-sight velocity (left) and stellar velocity dispersion plots for a simulated NIHAO elliptical galaxy (fast-rotator) in edge-on view. The black curves are isophotes.


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OSCAR GOMEZ

Major
Mathematics, Computer Science

Faculty Supervisor
Enrico Bertini

VICE: VISUAL COUNTERFACTUAL EXPLANATIONS FOR MACHINE LEARNING MODELS

The continued improvements in the predictive accuracy of machine learning models have allowed for their widespread practical application. Yet, many decisions made with seemingly accurate models still require verification by domain experts. In addition, end-users of a model also want to understand the reasons behind specific decisions. Thus, the need for interpretability is increasingly paramount. We developed ViCE, an interactive visual analytics tool that generates counterfactual explanations to contextualize and evaluate model decisions. Each sample is assessed to identify the minimal set of changes needed to flip the model's output. These explanations aim to provide end-users with personalized actionable insights with which to understand, and possibly contest or improve, automated decisions. The results are effectively displayed in a visual interface where counterfactual explanations are highlighted and interactive methods are provided for users to explore the data and model. The functionality of the tool is demonstrated by its application to a home equity line of credit dataset.

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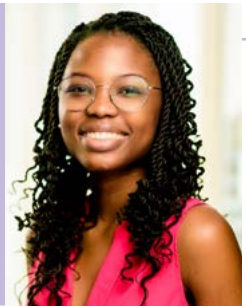
VONGAI CHRISTINE MLAMBO

Major
Biology

Faculty Supervisor
Dipesh Chaudhury

EFFECTS OF SOCIAL STRESS ON TEMPERATURE RHYTHMS

Deciphering and understanding how patterns of neural activity drive various behaviours is a fundamental approach in Neuroscience research. The data sets are usually large and most current software requires significant manual input which extends the time it takes to complete analysis. As such, this research project sought to examine existing code frameworks to assist in the development of an in-house program that can differentiate high frequency burst activity in a train of electrical signals obtained from neurons. After conducting a literature and database review of open-source code, two promising frameworks in Python, SpikeInterface and Neurodsp were shortlisted. Both of these programs can accomplish three key criteria that will be invaluable in analysis: 1) They can extract neural recordings saved in a wide array of file formats. 2) They can scan long recordings and isolate epochs that demonstrate user-entered parameters and cutoffs. 3) They can generate graphs and plots of the analysis frequently required for publication.

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SAARAH FATIMA
PIRBHOY

Major
Physics

Faculty Supervisor
David Russell

LOW MASS X-RAY BINARIES

Low Mass X-Ray Binaries (LMXBs) are made up of a regular star and a neutron star/ blackhole. When the accretion disc of the system becomes unstable, an outburst takes place, resulting in the emission of X-rays. For my PPTP, I checked the various parameters of the alert system, which was created using Python scripts during my senior Capstone Project. This alert system detects LMXB outbursts in real time and sends email alerts whenever there is interesting activity taking place. SWIFT J1753, GS 1354-64 and SWIFT J1357 alerts were checked to ensure that their parameters were correct and the code was adjusted accordingly. Then, a specific blackhole system, SWIFT J1910.2-0546- was studied. This binary system has an unusual extreme flaring which was previously unknown. Optical-X-ray Correlation diagrams were finalized (without the folded flaring point). The flaring of this object was compared to the flaring of other objects by calculating the recurrence time, flaring period and number of flares of different X-ray binaries which exhibited similar behavior. Finally, I studied the delay in the dip period of J1910 by plotting the light curves in UVOT, X-ray and Optical data (various optical filters) and zooming in to the dip period.

PPTP | Class of 2020

MIN KYU
JUNG

Major
Computer Science and Economics

Faculty Supervisor
Azza Abouzied

SYNNERDB: A SCALABLE DATABASE SYSTEM FOR SYNTHETIC DATA GENERATION

Synner is a synthetic data generator, developed to meet the rising demand in high quality data, which are scarcely available in public. Under current Synner's capacity, sophisticated datasets can be produced realistically in a simple manner. However, Synner stores data by row, which may bring question in its scalability performances, especially when users want to produce big data. Big data is particularly scarce making it difficult for students to test the machine learning techniques they learned outside of a classroom, let alone initiate their own projects. Additionally, startups can also face difficulty to test their products due to the lack of large datasets that are specific to their business. While Synner's current engine allows these two groups to produce realistic data that meet their circumstances, due to Synner's row-oriented storage, producing terabytes of data can raise data generation speed issues. During my PPTP, I improved Synner's scalability by integrating a column-oriented DBMS, MonetDB.

PPTP | Class of 2020

MAI LE
XUAN ANH

Major
Computer Science

Faculty Supervisor
Azza Abouzied

POLICY OPTIMIZATION TO CONTROL EPIDEMICS

We presented an epidemic management framework that combines an epidemic model with reinforcement learning. This framework focused on the interaction between the epidemic and an agent who uses tools (vaccines, isolation, etc.) to counter the epidemic. We demonstrated the reproducibility and capability of this framework in designing flexible public health interventions as well as how to train the agent to control the epidemic. Finally, we applied the framework to show qualitative results that support:

- Aggressive isolation/social distancing strategy helps to delay and lower the peak in an epidemic.
- Early action matters a lot more than late action.
- Contact tracing plays an important role in controlling the epidemic.

Epidemic framework for autonomous decider.
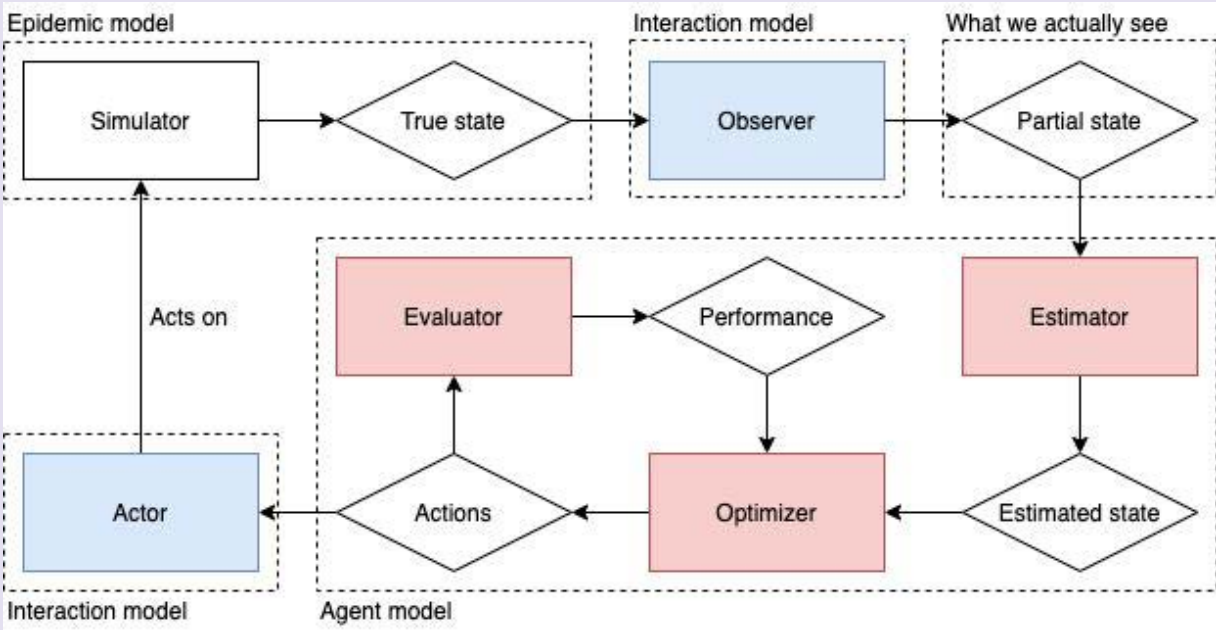
ALIA ELKATTAN

PPTP | Class of 2020

Major
Computer Science

MARCELO SANDOVAL-CASTANEDA

PPTP | Class of 2020

Major
Computer Science

Faculty Supervisors **Kartik Sreenivasan** & Olivia Cheung

BUILDING WEB-BASED PSYCHOLOGY EXPERIMENTS

NYUAD Psychology labs used to rely on experiments that can only be run locally on lab computers to conduct research, which limited the participant pool to people who were able to come to campus, and was time consuming. This became entirely insufficient when COVID-19 hit, since physical distancing measures made it impossible for people to visit the lab to conduct experiments. Consequently, the work needed to go online, and we therefore converted experiments built by the Objects and Knowledge Lab run by Professor Olivia Cheung and the Sreenivasan Lab run by Professor Kartik Sreenivasan, to web-based experiments. We also built documentation and templates that would allow students and researchers in the lab to build the experiments for the web moving forward, to facilitate research that's been halted by COVID-19 and physical distancing on the short term, and increase efficiency and convenience of running experiments on the long term. We conducted a few pilot runs, putting our completed experiments online and recruiting participants, and the process was significantly faster and more scalable than in-person experiments, while providing at least the same quality of data.

Oikonomou, Panagiotis and Stylianos Pappas. "Decentralized Bioinspired Non-Discrete Model for Autonomous Swarm Aggregation Dynamics." *Applied Sciences*, 10(3):1067 (2020). DOI: doi.org/10.3390/app10031067.

PANOS OIKONOMOU

Major
Physics

Faculty Supervisors
Mohamed Lotfi Benabderrahmane & Stylianos Pappas

DECENTRALIZED BIOINSPIRED NON-DISCRETE MODEL FOR AUTONOMOUS SWARM AGGREGATION DYNAMICS

Swarm robotics is the field that deals with the emergent behavior of multiple agents (or robots) to perform different tasks. Currently one of the biggest challenges is the miniaturization of the individual agents. We aimed to aid in the miniaturization effort by challenging whether the agents actually need any programming components like a memory or a processor onboard. Therefore, we created a model for an individual agent that does not need any conditional instructions to illustrate a targeted aggregation behavior when in a swarm. To do this, we looked at how ants collaborate in nature in order to develop a mathematical model that guides how they aggregate in multiple spots at specific numbers. The aim was to use that model to create a framework for swarms of microscopic agents that can simulate this behavior. As a result, we ended up with a description of the physical properties that a material should have so that when it is put in a swarm it will aggregate to specific targets.

Simulation of aggregation of 250 nodes in 5 randomly placed areas (tasks) over time.

CHUAN CHANG

Major
Physics

Faculty Supervisor
George Shubeita

MONTE-CARLO SIMULATION OF INTRACELLULAR CARGO TRANSPORT BY KINESIN-1 MOLECULAR MOTOR

Inside a cell, macromolecules such as nutrients or wastes must be transported from one location to another. The slow speed of simple diffusion means that the cell must rely on another mechanism for rapid and directional macromolecular transport – through motor proteins. One such motor protein is kinesin-1, which moves along the microtubules in the cell, one step at a time, following a mechanochemical cycle driven by ATP hydrolysis. As the motor steps, it drags along a cargo containing the macromolecules to be transported. The significant thermal motion of the cargo, the mechanical coupling between the motor and the cargo via an elastic tether, and the force-dependence of the motor's mechanochemical cycle suggest that the stiffness of the tether may have an effect on certain transport properties. Using Monte Carlo simulations run on NYUAD's Dalma high-performance computing facility, I studied the effect of tether stiffness on cargo transport by the kinesin-1 motor protein.

AJ ABDUJABBOROV

Major
Psychology

Faculty Supervisor
Kartik Sreenivasan

OPTIMIZING FUNCTIONAL MAGNETIC RESONANCE IMAGING TO STUDY HUMAN COGNITION

Scientists of all disciplines create models by using simplified assumptions about real phenomena. At the Sreenivasan Lab, we use assumptions about how brain activity propagates changes in the oxygenation of blood to investigate the neurobiology of holding memories at the forefront of the mind. Though this assumption is useful and widely adopted in the neuroscientific literature, it sometimes hurts the reliability of the findings it produces, especially when the experimental task performed by participants are complex, as they are in our lab. This summer, I examined a novel way of modeling the maintenance of memory, which, rather than taking the aforementioned canonical assumption as a given, compares several plausible assumptions to the actual data to identify and apply the one with the best fit. My goal was to determine whether this method was more susceptible to accidentally fitting noise rather than signal and systematically biasing our models. By coding simulations of experimental data, I found that this approach was more accurate than the traditional method and did not overfit the data. This powerful insight will inform how the lab investigates memory in the future.

SHAKE KARAPETYAN

Major
Physics

Faculty Supervisor
Mazin Magzoub

OPTICAL FIBER FLUORESCENCE CORRELATION SPECTROSCOPY (OFFCS) FOR REMOTE MEASUREMENTS IN TISSUE

Fluorescence Correlation Spectroscopy (FCS) measurements are invaluable in obtaining the quantitative parameters of molecular processes such as diffusion. Access to these parameters is essential in designing and testing novel drug delivery strategies. However, obtaining these parameters deep inside tissue is still an experimental challenge. Despite the many recent advances, the optical-fiber-based FCS method is yet to be extended for deep tissue measurements. To address this issue, we have been developing an Optical Fiber FCS (OFFCS) method that will allow for deep tissue measurements. We have built and demonstrated the OFFCS method, based on a versatile and easily constructed schematic of the setup. We have demonstrated the feasibility of the setup and the performance of FCS measurements by achieving a low background compared to sample measurements from solutions of fluorescent dye Alexa 488. Further development of this method may unlock its use for measurements in biological settings.

Optical Fiber Fluorescence Correlation Spectroscopy Setup. Laser visualization.
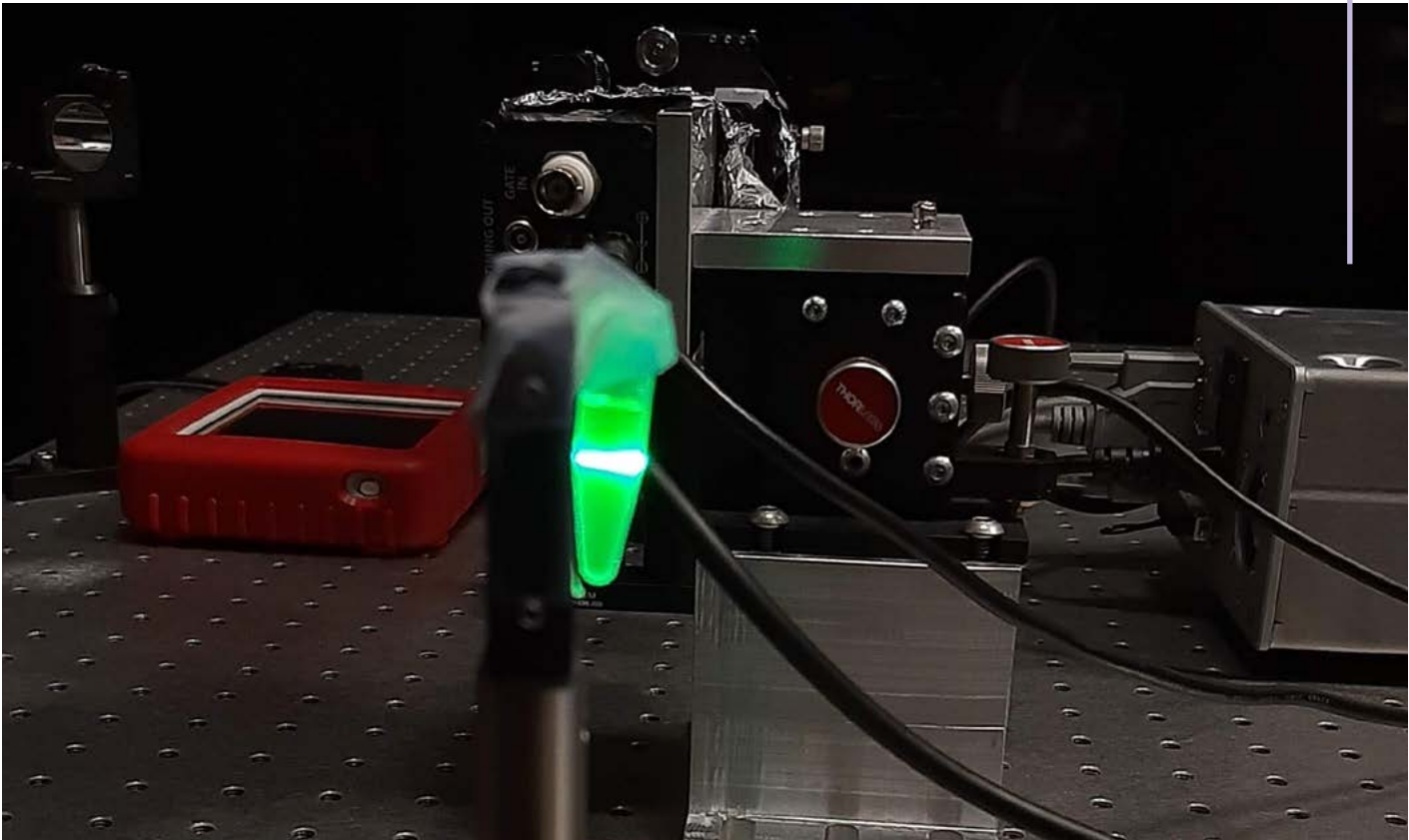
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SAMRIDHA SHRESTHA

Major
Computer Science

Faculty Supervisor
Yi Fang

ACTIVE CROWD ANALYSIS FOR PANDEMIC RISK MITIGATION FOR BLIND OR VISUALLY IMPAIRED PERSONS

During pandemics like COVID-19, social distancing is essential to combat the rise of infections. However, it is challenging for the visually impaired to practice social distancing as their low vision hinders them from maintaining a safe physical distance from other humans. This project proposed a smartphone-based computationally-efficient deep neural network to detect crowds and relay the associated risks to the Blind or Visually Impaired (BVI) user through directional audio alerts. The system first detects humans and estimates their distances from the smartphone's monocular camera feed. Then, the system clusters humans into crowds to generate density and distance maps from the crowd centers. Finally, the system tracks detections in previous frames creating motion maps predicting the motion of crowds to generate an appropriate audio alert. Active crowd analysis is designed for real-time smartphone use, utilizing the phone's native hardware to ensure the BVI can safely maintain social distancing.

Active Crowd Analysis System Flow for Pandemic Risk Mitigation for Blind or Visually Impaired Individuals.

Faculty Supervisor Nizar Habash

AIZA USMAN

PPTP | Class of 2020
Major
Computer Science

ALI SHAZAL

PPTP | Class of 2020
Major
Computer Science

JOINT ARABIZI DETECTION AND TRANSLITERATION USING SEQUENCE-TO-SEQUENCE MODELS

While online Arabic is primarily written using the Arabic script, a Roman-script variety called Arabizi is often seen on social media. Although this representation captures the phonology of the language, it is not a one-to-one mapping with the Arabic script version. This issue is exacerbated by the fact that Arabizi on social media is Dialectal Arabic which does not have a standard orthography. Furthermore, Arabizi tends to include a lot of code mixing between Arabic and English (or French). To map Arabizi text to Arabic script in the context of complete utterances, previously published efforts have split Arabizi detection and Arabic script target in two separate tasks. We presented the first effort on a unified model for Arabizi detection and transliteration into a code-mixed output with consistent Arabic spelling conventions, using a sequence-to-sequence deep learning model. Our best system achieved 80.6% word accuracy and 58.7% BLEU on a blind test set.

Yanez, Alvaro. "The Musical Geometry of Genes: Generating Rhythms from DNA." *Leonardo Music Journal*, Vol. 29, Pages 45-49 (2019). https://www.mitpressjournals.org/doi/abs/10.1162/lmj_a_01052.

BANA ALAMAD

Major
Biology

Faculty Supervisor
Youssef Idaghdour

ATAC-SEQ PROFILING OF PERIPHERAL BLOOD MONONUCLEAR CELLS IN RESPONSE TO P. FALCIPARUM INFECTION

This research project focused on documenting the temporal changes in chromatin accessibility of circulating immune cells at three stages of Malaria: before infection, during asymptomatic parasitemia, and during symptomatic parasitemia. First, an Assay for Transposase-Accessible Chromatin (ATAC-seq) protocol was developed and optimized to frozen Peripheral Blood Mononuclear Cells (PBMCs) collected from malarial children from Burkina Faso. Sequencing of bulk and single-cell ATAC-seq libraries generated high quality sequencing data that was analyzed using multiple pipelines. These analyses generated the first ATAC-seq data in malaria and provided genome-wide insight about the temporal changes in chromatin accessibility and cell-types implicated across individuals at different infection stages. Furthermore, scATAC-seq data analysis revealed chromatin accessibility patterns that are masked in bulk ATAC-seq analysis. These results provide chromatin accessibility maps in PBMCs of malarial children that will be the foundation for future epigenetic studies aiming for a better understanding of in vivo host immune response to P. falciparum infection.

Over the summer, I was also involved in a COVID-19 research study. This study was a collaboration between NYUAD and external parties, and I was involved in sample collection and processing in the lab.

Bana collecting samples to be processed in the lab, as part of the COVID-19 study.
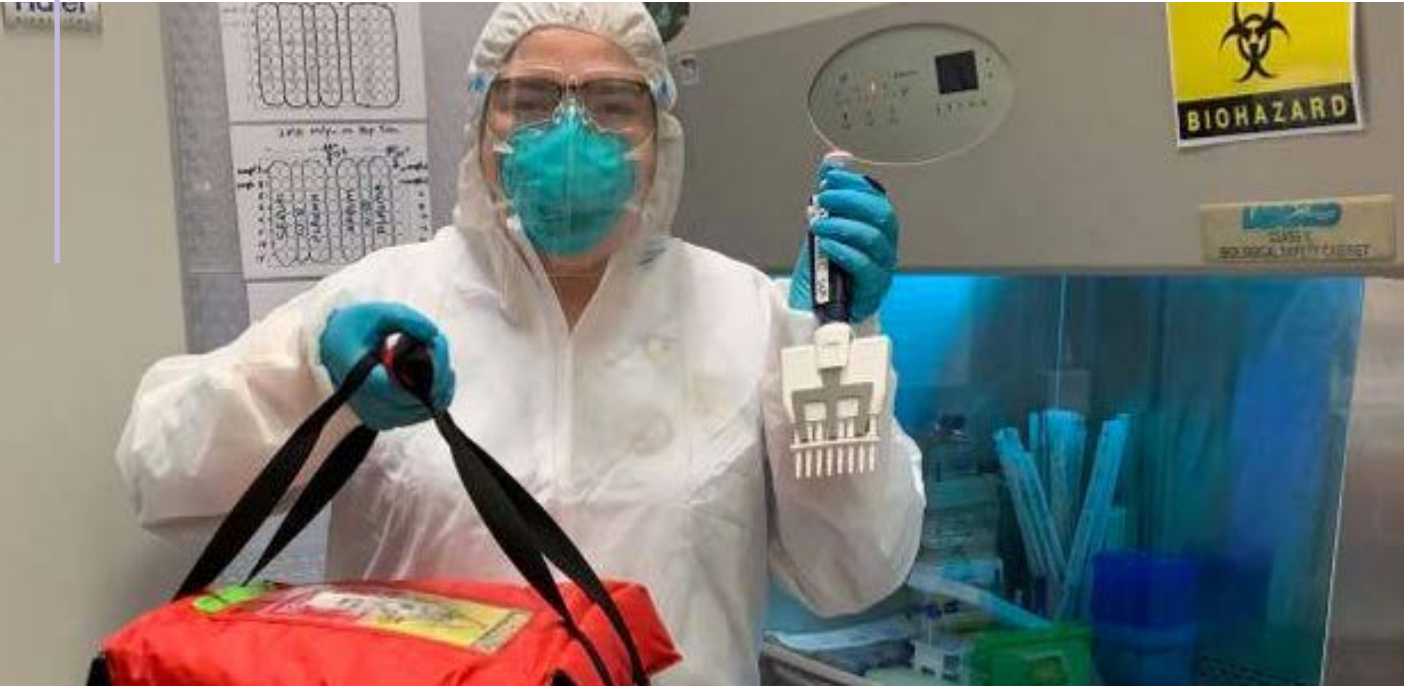
ALONSO PEREZ-LONA

Major
Mathematics and Physics

Faculty Supervisor
Sergei Dubovsky

CENTER SYMMETRY BREAKING IN YANG-MILLS-CHERN-SIMONS 2+1 SU(N) THEORIES

Center symmetry is present in pure Yang-Mills (YM), and is related to confinement. On a (2+1)-dimensional spacetime, and with a SU(N) gauge group, we sought to determine whether this symmetry is broken (and how) by adding a Chern-Simons (CS) term to the YM Lagrangian. Observing that center symmetry is a symmetry of CS at the quantum level, we first looked for hints of spontaneous breaking in pure CS. To do this, we used several methods in parallel, notably Dehn surgery to compute vacuum expectation values (vev's) of Polyakov loops on the 3-sphere, and deriving a SU(N) Verlinde formula with loops. Since compact manifolds, and trivial compact circle bundles, respectively, are required for these methods, we took their infinite-volume limits to obtain sensible results. We also canonically quantized the torus times the real line using the axial gauge. There, we considered spatial Wilson loops instead, whose vev's are the order parameters of true center symmetries. All these methods showed spontaneous symmetry breaking on pure CS. Consequently, this showed spontaneous breaking in the strongly-coupled limit of YMCS. We briefly explored domain walls solutions to understand the theory better.

Action of Yang-Mills-Chern-Simons (YMCS) theory.

$$S = S_{YM} + S_{CS} = $$
$$-\int d^3x \, \frac{1}{2e^2} \mathrm{Tr}(F_{\mu\nu}F^{\mu\nu}) + \frac{k}{4\pi} \int d^3x \, \mathrm{Tr}(AdA - \frac{2}{3}iA^3)$$

Fili, Natalia, Yukti Hari-Gupta, Bjork Aston, Ália dos Santos, Rosemarie E. Gough, **Bana Alamad**, Lin Wang, Marisa L. Martin-Fernandez and Christopher P. Toseland. "Competition between Two High- and Low-Affinity Protein-Binding Sites in Myosin VI Controls Its Cellular Function." *Journal of Biological Chemistry* (2019). DOI:10.1074/jbc.ra119.010142.

Each year, NYU Abu Dhabi hosts a small number of UAE-based students as short-term research interns. Students interested in gaining experience on research projects are paired with NYUAD faculty members. In AY 19-20, students from Cranleigh High School, who demonstrated an interest in a potential career in academia, took part in research internships at NYU Abu Dhabi.

THEA ROSEN

Faculty Supervisors
Dipesh Chaudhury
& Basma Radwan

I interned in the Chaudhury Lab, where I gained insight into experimental practices in neuroscience research. The lab uses a rodent model of stress together with physiological and molecular techniques to investigate the effects of stress on the neural circuitry and molecular pathways that link brain regions that encode mood, circadian rhythms and sleep-wake cycle. What I enjoyed most with my internship at NYUAD was the ability to experience real-life university studies and see the different components involved with conducting a full experiment. This experience allowed me to see how a large-scale experiment is done, which gave real-life application to the work I was doing in class.

"

Dipesh Chaudhury
Assistant Professor of Biology; Principal Investigator, Laboratory of Neural Systems and Behavior

For students interested in a career in science or medicine, gaining some experience in a professional research lab is helpful for them to learn how a hypothesis is translated into a research project. Moreover, they will also learn how to design and run experiments, as well as be able to communicate findings in a clear and concise manner.

ALIZEH KIZILBASH

Faculty Supervisors
Francesco Arneodo, Adriano Di Giovanni
& Lolowa Alkindi

My internship involved gaining insight into vibration tests and terrestrial gamma ray flashes. What I did at NYU was more than just work experience - I felt like part of the research team within the physics department. The experience I had was very valuable, and it has made me really appreciate how many components there are to completing research at a post-graduate level. The team was happy to have me, a high school student, be a part of their team; they supported me with access to resources and always made sure that I understood what was going on (which was very important, as the research was so specialized). All in all, I thought that it was a phenomenal opportunity, and I am very fortunate I was able to take part. This experience has positively impacted my projected university journey.

AZAMAT ALIBEKOV

Faculty Supervisors
Pance Naumov & Tim Kahs

My internship took place in the Naumov Lab, where I ganed insights into the chemistry of oil (petroleomics). Throughout the internship I was supported by my supervisor and learned many new concepts. There was a lot of practical work involved, which was the best part of the experience as it is rare to get the opportunity to work with such complex equipment. We had weekly meetings and there was a strong sense of structure. This experience influenced my university choice, and I am now applying to study Chemistry at university. I felt this lab experience gave me real insight into what is to come next year.

PPTP | Class of 2020

YOBIN TIMILSENA

Major
Economics

Faculty Supervisor
John C Ham

DOES WORKING PART-TIME DURING SCHOOLING AFFECT DROPOUT RATES AFTER THE MANDATORY SCHOOLING YEARS?

An important question for all countries is whether students working part-time affects their dropout behavior in school. While there is a fair amount of work on this issue, almost all of it is for Western, developed countries. Using Indonesian panel data, I studied the effect of working part-time in primary school and working part-time in junior high school on an individual's probability of dropping out right after completing junior high school (after which the mandated schooling ends). Contrary to the evidence for developed countries, I found that working part-time in primary and/or junior high lowers the probability a student drops out right after junior high school. This may be explained by the fact that students in Indonesia face many school charges not seen in the West, and working part-time helps them cover these charges. Moreover, I found that dropout behavior actually increases when the current unemployment rate goes up, contrary to results for the West. This can be attributed to the fact that Indonesia has a much weaker social safety net than in the West, so if a parent becomes unemployed there will be much more pressure on the children to work.

UGR | Class of 2021

MISA MORIKAWA

Major
Social Research and Public Policy

Faculty Supervisor
Paula England

JAPAN'S EXCEPTIONALITY IN GENDER INEQUALITY

Japan, despite its high economic and social development, still exhibits high levels of gender inequality - in politics, in the labor force, and in education. This research project asked the question: Is Japan exceptional in its degree on gender equality? Gender inequality can be seen ubiquitously throughout the society, but here, we focused on the gender gap in educational attainment and earnings. We explored this through a comparative analysis among Japan, China, Taiwan, Korea, and the United States, using the individual-level data on labor, employment, and demographics from the Luxembourg Income Study in 2013.

The results show that Japan has the highest level of gender inequality in attainment of higher education among the selected countries. When education is held constant, Japan shows the highest gender wage gap among US, Japan, and China at all degree levels. Results of the age cohort analysis showed that all of the countries in our sample shrank the gender gap in access to education and gender wage gap between younger and older cohorts, yet Japan shows the least improvement across the years.

PPTP | Class of 2021

SEONGYOON KIM

Major
Economics

Faculty Supervisor
Morgan Hardy

THE IMPACT OF COVID-19 ON THE LIVES OF WOMEN IN ETHIOPIA'S GARMENT INDUSTRY: EVIDENCE FROM HAWASSA INDUSTRIAL PARK

My PPTP research project focused on conducting high-frequency phone surveys on a panel of women who work in garment factories in Ethiopia's largest industrial park in the city of Hawassa, to document how their lives are changing during the COVID-19 crisis.

> " This project allowed me to apply lessons taught throughout my computer science education, while doing it for the purpose of benefiting psychology research. I've always been interested in where different disciplines intersect and in using CS skills to benefit other fields. Knowing that my work could be used by psychology students makes me more mindful of how I approach it and the real-world considerations I may not have to think about in a CS class project.

> " **Morgan Hardy**
> Professor of Economics
>
> The Post-graduation Practical Training Program is a vital bridge between SY's undergraduate research and his continuation toward a career in economics research. This work allowed him to further develop his programming and critical thinking skills while building (remote) connections with scholars across multiple institutions in Ethiopia, the UK, and the USA. These are skills and connections that SY will use as he moves forward with his own research this coming academic year.

PPTP | Class of 2020

GAURAV DEWANI

Major
Economics

Faculty Supervisor
John Wooders

MIXED-STRATEGY EQUILIBRIUM IN POKER: ARTIFICIAL INTELLIGENCE VS PROFESSIONALS

In 2016, DeepStack became the first Artificial Intelligence player to defeat professionals at two-player poker. Using empirical payoffs from the game, I studied the behavior of DeepStack and professionals with respect to von Neumann's theory of mixed-strategy equilibrium. I used two-sided t-tests and the Kolmogorov-Smirnov tests to compare the observed data with the hypothesis. I found that both DeepStack and professionals play at the predicted level of optimality, at the 95% confidence interval.

The results contribute to existing literature that show the role of experience and "professionality" in situations where people try to outguess their opponents.

Mizoram, India - one of the sites where REALM data was collected from.

UGR | Class of 2021

KATHARINA KLAUNIG

Major
Social Research and Public Policy

Faculty Supervisor
Peter Bearman

IMAGINED FUTURES

I worked on INCITE's Research and Empirical Analysis of Labor Migration (REALM)'s Imagined Futures project. which aims to understand how young adults in Kerala, Mizoram, and Sri Lanka imagine their future trajectories. Each of the sites differ in regards to migration which allows us to examine how international migration may have influenced the respondents' future trajectories. By examining interviews, I noted how the respondents saw themselves in society, how they imagined their futures in regards to aspiration and life events, and noted how they largely asked questions on perceptions, knowledge, and opinion of international migration. This research contributes to literature on migration to the GCC. I applied index and analytical codes to interviews and co-wrote memos examining select themes appearing in the interviews.

PPTP | Class of 2020

JURIA SATO BAJRACHARYA

Major
Economics

Faculty Supervisor
Edgar Kiser

EFFECT OF DEFICITS AND STATE DEBT ON STATE LEGITIMACY IN JAPAN

This research explored the effect of deficits and state debt on state legitimacy by analyzing both qualitative and quantitative data on taxation, spending, deficits, corruption, and state debt in Japan over the past 50 years. Japan is an important case study because it has one of the highest levels of state debts in the world. Preliminary findings and data suggests that limits on the growth of the state are set by limits on the capacity of states to increase taxation. This research involved a thorough literature review on the state policies during 1980-2020, focusing specifically on Japan's neoliberalism and decentralization policies, and rigorous data analysis to understand this theoretical framework.

PPTP | Class of 2020

HAFSA AHMED

Major
Social Research and Public Policy

Faculty Supervisor
Nancy Gleason

THE COGNITION GAP: WORK AND LEARNING AFTER COVID-19

The automaton economy – also known as the fourth industrial revolution (4IR) – is changing how we live and work. Today there are significant talent gaps in the global work force causing labor economists and business experts to sound alarms about the future of work. A global transition is underway, and COVID-19 is impacting the skills one needs to thrive a post-pandemic workplace. In her latest book project, Professor Gleason argues that metacognitive knowledge is the key to professional success in the fourth industrial revolution (4IR) and proposes that combining sought after human capacities requires a metacognitive awareness of how these skills interact and where we as individuals are lacking, and how we can compensate. I assisted in developing the main chapter of the book manuscript by conducting bibliographic research on metacognition, creating mixed methods research instruments, creating a database of HR managers to survey across the Middle East, and completing the IRB application for the upcoming research.

PPTP | Class of 2020

SHIVANI MISHRA

Major
Political Science

Faculty Supervisor
Kanchan Chandra

DEMOCRACY AND VIOLENCE

This research project was a collaborative effort to construct a time series database on violence in the world's major democracies – India, the US and the UK – from the 1950s until the present. Our purpose in constructing this database was to describe and explain how the transformation of democracy in the twenty-first century affects violence: Does the maturing of democracy prevent violence or enable it?

Our method was to code for events of violence drawing primarily on digital news archives for major newspapers in all three countries made available by Bobst library. We met regularly on zoom as a team, to develop and discussed the coding protocols, to train, and to brainstorm about strategies.

> As a recent political science graduate, it is deeply fascinating to learn how big datasets are constructed from scratch. For my own Capstone Project, I used data on civil war violence, without once questioning how the data was coded in the first place. I now understand the importance of questioning and acknowledging details as well as biases in a dataset before using it for research.

Kanchan Chandra
Professor of Politics

> I have found working with NYUAD undergraduates on this database project a remarkable experience. Their dedication and intelligence are inspiring, and the diversity of backgrounds they bring to the project helps illuminate new patterns, questions and blind spots.

UGR | Class of 2021

YAO XU

Major
Social Research and Public Policy

Faculty Supervisor
Barry Hashimoto

THE EXERCISE OF INTERNATIONAL CRIMINAL JURISDICTION, 1995–2020: PANEL-MATCHING ESTIMATES OF INDICTMENT EFFECTS ON CAPITAL FLOWS AND INCUMBENT POLITICAL SURVIVAL

This research project aimed to establish new evidence that the prosecutorial activities of the permanent and ad hoc international criminal courts from 1995 to 2020 have (i) caused developed democracies to manipulate development capital inflows, and (ii) induced leadership turnover in the targeted states. My research responsibility involved R programming to create a cross-sectional panel dataset with information from 1945 to 2020 for data analysis. Under the instructions of the professor, I also assisted with the creation of an original dataset on states' potential exposure to international criminal courts. I hand-coded some of the missing values in our dataset using peer-reviewed publications, government records and news articles.

Barry Hashimoto
Visiting Lecturer of Political Science

> The research project that Yao completed under my supervision involved a programming-intensive assembly of new data on the jurisdictions and prosecutions-related activities of international courts and the application of new methods for data imputation and causal inference with longitudinal data. It led to co-authorship on a working paper about the political and economic effects of international criminal prosecutions, and was essential in allowing Yao to invest much of her summer in the project while working abroad in Beijing.

JOSÉ ALBERTO GONZÁLEZ

Major
Political Science and History

Faculty Supervisor
Edgar Kiser

STATE DEBT AND STATE LEGITIMACY IN SOUTHERN EUROPE

I worked remotely alongside a team of other student research assistants, following up on work started in the spring semester regarding taxation in democracies. We reviewed the general literature on taxation, spending, and politics in Southern Europe and gathered quantitative data. This quantitative data was data on political parties for all four countries in the study (Portugal, Spain, Italy and Greece). Each week we had a meeting, in which all three of the student researchers, plus Professor Kiser and his graduate student colleague from University of Washington, discussed the direction of the project. The quantitative data analyzed included books, papers and articles related to the aforementioned countries and their situations regarding taxation and government control. Additionally, we reviewed the composition of the legislative bodies of each country since 1960. After gathering the data, we charted to see if there was any kind of relationship between leftist governments and government spending.

Andy Harris taking part in a virtual research meeting with students Fanisi Mbozi and Leroy Guantai.

FANISI MBOZI

Major
Political Science Major

Faculty Supervisor
Jonathan Andrew Harris

PAKISTAN POLLING PROJECT

As a research assistant, I investigated the location of male, female and combined (male and female) polling stations in the 2018 Pakistan election. The research was aimed at comparing whether segregated male and female polling stations located close together had the same impact on voter turnout as the combined polling station. This entailed matching station names and census areas in order to create an approximate place label for every polling station. The research work was a great opportunity to work with string data and consolidate my skills in RStudio. Also, I was part of a team of research assistants, which meant being able to collaborate with teammates on tough projects and also learning how other students were coping during the pandemic.

> ❝
>
> **Jonathan Andrew Harris**
> Assistant Professor of Political Science
>
> **Though I worked with a few different students on distinct projects, we all met weekly, via Zoom, in order to discuss our challenges and consider ways to make our work better. Even though each student may be focused on a different topic, task, or method, I find that each week, someone chimes in with a useful comment on another student's task. It really improves the quality of the work overall. Importantly, I think this part of the research endeavor helps prepare students for their future work or grad school by demonstrating the value of working in a team.**

PPTP | Class of 2020

MUHANNAD ALRAMLAWI

Major
Economics

Faculty Supervisor
Robert Kubinec

CORONANET

CoronaNet is a project that compiles a comprehensive database on all government responses to the COVID-19 pandemic. The project's main focus is to collect as much information as possible about the various fine-grained actions governments are taking to defeat COVID-19. This includes not only gathering information about which governments are responding to the coronavirus, but who they are targeting the policies toward, how they are doing it, and when they are doing it.

My roles in CoronaNet were both Research Assistant and North Africa Regional Manager. This entailed documenting Corona-related government policies using set procedures and a standard classification scheme and conducting regular performance and activity appraisals to guarantee the development of a consistent and up-to-date dataset.

"

Robert Kubinec
Assistant Professor of Political Science

At present, this project involves collaboration with researchers in three other countries (the United States, Germany and Kazakhstan). We are grateful to the 20+ NYUAD students involved, as well as NYUAD alumni Maryam AlHammadi (class of 2019) who has been heavily invested in the project and leads the Middle East research team.

Given the broad scope of this data collection effort, the students are involved in practically every stage of the process, from being responsible for collecting the most broad array of government policy data, to cleaning and validating the work of other students. Some of our students have also written policy briefs describing the spread of the virus and government efforts to combat, which are then shared through our project website.

UGR | Class of 2022

MOHAMMAD YASSER

Major
Physics

Faculty Supervisor
Felix Beck

SUPER DANK RENOVATION OF THE DUBAI COINS MUSEUM

The Dubai Coins Museum was created out of a traditional home by a pair of interior designers and first opened to the public in 2009. Due to the historical significance of its structure and location in the Al Fahidi Historical Neighborhood of Bur Dubai, many constraints had to be worked around during the initial construction which forced the direction of the museum to what it is today. This restricted the narrative of the museum which inherited the disconnectedness of the household rooms. The project that I have been working on over the summer was a collaboration between the NTSI Lab at NYUAD and the Dubai Culture & Arts Authority (DCAA) to renovate the Dubai Coins Museum.

My first steps involved creating a detailed layout and inventory of each room, and more importantly, to identify narratives existent in the contents of the rooms which we could incorporate into interactive media installations. We started brainstorming ideas for media installations and created some visualizations to present to the stakeholders from the DCAA. As a result of our work and many meetings with the project manager, we finally secured a Memorandum of Understanding (MOU) between NYUAD and the DCAA which ensures our continued involvement in designing the media installations for the renovated museum. The project continued beyond the summer and our role extends until November which allows for more students to be involved through the role of student research assistants. The MOU also outlined the potential for NYUAD students to secure internships at the Etihad Museum in Dubai during the summer of 2021.

Early design of a coin funnel.

Faculty Supervisors Rafael Song, Andras Gyorgy, Alan Healy, Ibrahim Chehade & Esteban Salvemini

Screenshots of the team presentation video for the iGEM Giant Jamboree in November 2020.

ROBA OLANA | YUJEONG OH | QUIM PAREDES
PRAJJWAL BHATTARAI | YAMAN GARG
ADRIAN VILLANUEVA | MAYA FAYED
ZERINA RAHIC | SAKURA GRANT
MARIAM ELSAHHAR | MICHELLE HUGHES
STEFFANIE DIAS | AYESHA SAMEER | JEFF HU
GRACE GU | ZURA JASHI | MARKO SUSIC
ANTONINA BAR | ABHAY MENON
## DIMITRIOS MASTROGIANNIS

THE 2020 NYUAD IGEM TEAM

NYUAD iGEM is a multidisciplinary, diverse undergraduate research group with teams currently working on synthetic biology, hardware development, and data management solutions. With a quest to develop a market ready solution, we are currently developing a rapid, point-of-care, field fungal diagnostic device.

Since the mid-1900s, a flesh-eating fungal disease, chytridiomycosis, has been condemning more amphibian species to extinction than any other pathogen ever recorded. It has already wiped out over 90 species and caused declines in at least 500. Similar fungal diseases have also been affecting other animals such as bats, disrupting their hibernation and leaving millions dead in their paths. Usage of diagnostics for managing spread has been limited due to the testing methods being latent, expensive, and non-portable. The first stage of our project, which we plan on completing by the end of Fall 2020, involves prototyping DNA extraction methods such as bead beating and lysis buffers, reaction mediums such as microfluidics and paper-based biosensors, amplification methods such as RPA CRISPR-Cas12a, and reporting mechanisms such as fluorescence and LFA, in addition to a database and API that can integrate with any existing surveillance system. Through a rigorous approach at research and design, we are working to deliver an effective solution to animal infectious disease control.
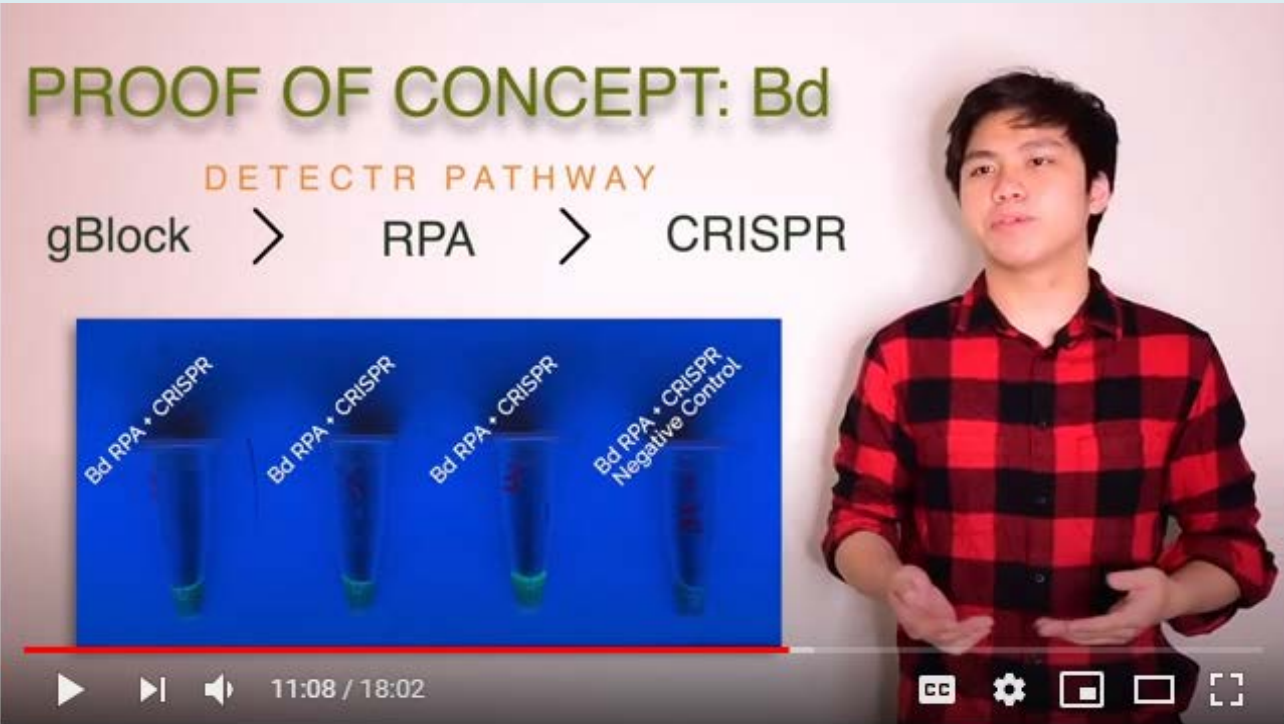
Members of the iGem team discussing options for the fungal diagnostic device.
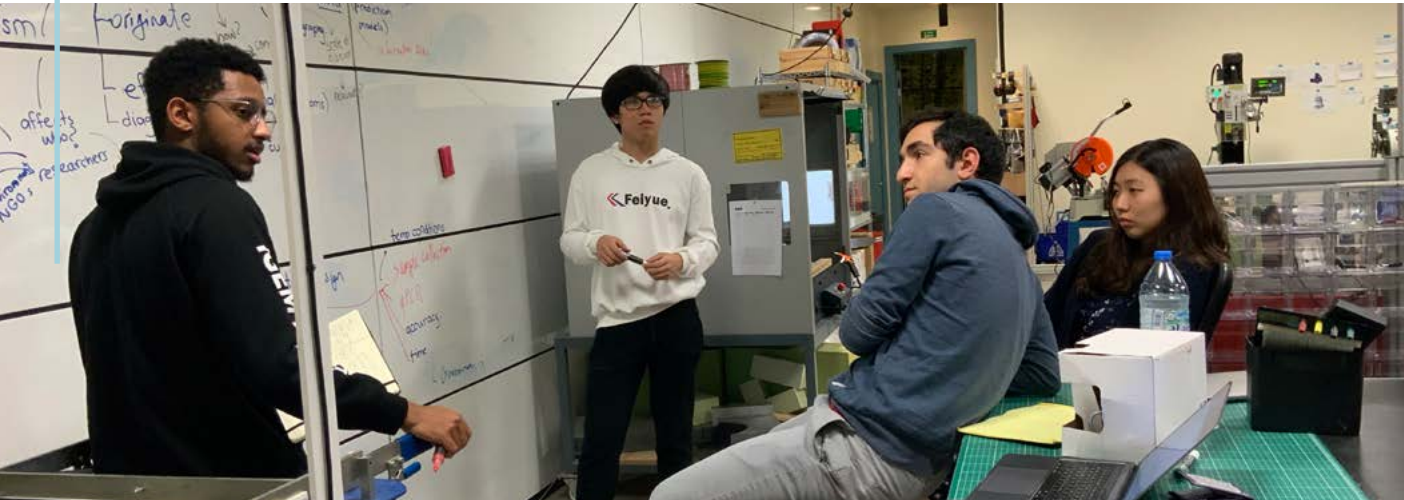
PPTP | Class of 2020

ALEXIS MOUNTCASTLE

Major
Political Science & Literature & Creative Writing

Faculty Supervisors
Robert Parthesius, Felix Beck & Alia Yunis

DHOW CULTURE AND ABU DHABI ISLANDS HERITAGE DATABASE

I worked in the Dhakira Center for Heritage Studies summer Heritagelab, which was part of the Intangible Heritage group, focusing on multimedia oral history projects about Saadiyat Island and Delma Island. I was in charge of the Saadiyat project, organizing and determining the interviews and gathering the materials needed to support a multimedia themed presentation of the oral histories. The Delma project will be present to the residents of Delma Island when travel becomes possible again, and it is led by Salama Al Qubaisi, an NYUAD Emirati researcher.

"

Robert Parthesius
Associate Professor of Heritage and Museum Studies

The Summer Heritagelab period will be wrapped-up by a proposal for a Dhakira Center Site: a virtual archive/resource/visitors center and a physical visitors center around the planned Bronze Age Boat project for the Zayed National Museum. As a pilot for this project, we hope to launch the website. This internet platform will serve as the center for both research and teaching activities for the coming distance working period, but also as an important collaboration tool with experts and heritage communities in the UAE and in our global network.

A visit to the Monsoon Winds Research Center is unique combination of research, exhibition and interaction, together in one site.

The 'Living Archive' combines storage and catalogue systems with an easy search function and open access to artefacts and heritage research.

CONFERENCE PRESENTATIONS

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The opportunity to attend international conferences allows students to acquire transferrable skills such as learning to present their research work in front of experts in their own field. It also provides students with the unique opportunity to be part of global networks, fundamental for their professional growth.

PIERGIORGIO PERCIPALLE
Associate Professor of Biology

Class of 2020

HAMZA HAIDER

DUTCH DESIGN WEEK

Eindhoven, Germany. October 2019

Dutch Design Week (DDW) is the largest design event in Northern Europe, and presents work and concepts from in excess of 2,600 designers. More than 33,500 visitors from home and abroad attended. The year's theme was 'If not now, then when?,' and the projects shared a focus on innovative sustainable materials that can be scaled up, becoming part of circular or low-waste systems. The week spread across the city from Strijp-S to Hallenweg, and delved into new technologies and concepts that can also help make our lives less resource-intensive.

The design week strongly correlated with my Capstone Project and previous research experience with Professor Felix Beck focusing on medium scale plastic recycling machines. We view the plastic crisis as an exciting and crucial design challenge and are keen to create a more circular way of life. To this end, presenting my previous work as well as networking at the Precious Plastic headquarters was a major highlight of my experience.

I had the chance to represent NYUAD as part of the highly selective Eindhoven Exchange- the design edition. I had the opportunity to become part of the local design community and form strong connections to design talent living in Eindhoven. Moreover, it also provided access to the DDW exhibitions, a program with design talks and specialized behind the scenes tour.

Through the looking glass.

The intersection of technology and waste at Design Academy Graduation Show.

Exploring traditional skills at Strijp S.

What is the true value of a single plastic shopping bag.

Class of 2020

JUNHAO "MARK" XU

THIRD INTERNATIONAL CONFERENCE ON ECONOMIC RESEARCH (ECONALANYA)

Alanya, Turkey. October 2019

Hosted by Alanya Alaaddin Keykubat University and sponsored by the central bank of Turkey and Inomics, the annual conference "allows scientists, practitioners and independent researchers outside universities to present their theoretical, analytical and experimental research that will contribute to the scientific literature and policy-makers' decisions." I was selected through a competitive process to present my paper, "How the Asian Infrastructure Investment Bank Challenges the World Bank: A Comparative Analysis of Projects by the AIIB and the World Bank in Gujarat, India." Fifty presenters from more than twenty countries shared their works in front of an audience of hundreds. As far as I know, I was the only undergraduate student – others were mostly professors, PhD students, and central bankers.

One of the keynote speeches was delivered by Dr. Marc Bachetta, the Chief of Economic Modeling and Quantitative Assessment at the World Trade Organization. He discussed why and how countries should make trade more inclusive. By chance, we visited the historical Alanya Castle together with a local student. In the three hours we spent together, I learned about what it is like to work at the WTO and received valuable advice. I introduced him to NYUAD, and he expressed great interest in visiting Abu Dhabi.

> "
>
> **The conference was a transformative experience. In addition to receiving valuable feedback on my research, I learned a lot from the speeches and presentations. I also received personal guidance from an expert at the WTO, and networked with economists from different backgrounds.**
>
> **I imagine it is quite rare for an undergraduate student to chat with a WTO economist while watching the sunset on the Mediterranean. I am very thankful for the opportunity.**

Mark presents his research paper at EconAlanya (or, the Third International Conference on Economic Research) in Alanya, Turkey.

Class of 2020

NADA AMMAGUI

## MIDDLE EAST STUDIES ASSOCIATION ANNUAL MEETING 2019

New Orleans, USA. November 2019

During this meeting, students were divided into groups according to our research topics; I was in a group called "Transnational Identities" which featured papers that addressed cross-cultural interactions. I was the first to present and received great feedback on my paper from my group's discussant, Professor Enaya Othman from Marquette University, and my peers. They expressed an appreciation for my incorporation of theoretical frameworks and for my background research, but suggested that I consider different methods of collecting data, such as visitor surveys and tracking local artistic trends, in order to best understand the role of the Sharjah Biennial on its local community. I also had the opportunity to offer other students feedback on their research, which helped me to think more critically about my own project.

Following the presentations, we gathered with all of the URW students and faculty to discuss our experience, then asked the faculty questions about research methods, post-graduate opportunities, and working in the field of Middle East Studies. This was incredibly helpful because I met the other students and was made aware of various opportunities, such as think tanks where I could work and research journals to which I could contribute. The poster session, the last portion of our workshop, then followed. I explained my project to various academics, students, and conference attendees and received constructive feedback on my project. I was approached by the editor of the Review of Middle East Studies who asked for my business card so that she could formally invite me to submit book reviews to their journal. Not only was I honored to be selected to share my research, I was humbled by the feedback that I received, which was both critical and complimentary. Since at that point I was still developing the research paper for my Capstone Project, I was able to incorporate the suggestions that I received into my Capstone Project.

Nada holding her URW certificate of completion.

Class of 2020

CATHERINE PALMER
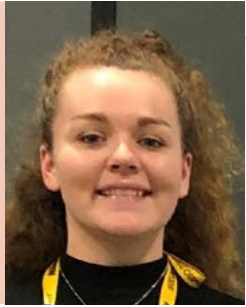
AMERICAN SOCIETY OF CELL BIOLOGY/ EUROPEAN MOLECULAR BIOLOGY ORGANIZATION CONFERENCE

**Washington, DC, USA. December 2019**

The American Society of Cell Biology (ASCB)/European Molecular Biology Organization (EMBO) conference was absolutely integral in my growth as a scientist. I had to network and advocate for myself as a young scientist without a physical support system. I attended workshops, presentations, poster sessions, and presented my own poster over the course of the four-day conference. Through this experience, I learned how to take criticism and convert it into positive work. So often in our lab on campus, we are encouraged to continue good work. At the conference, I had scientists in my field critique my work without the lens of being an undergraduate student. This put a lot of pressure on me but allowed me to grow. Likewise, much communication about our science happens with people who are already familiar with our experiments and research. ASCB invites scientists from all sorts of specializations and I got to meet people who had insight from a very different perspective compared to my usual colleagues.

Going to this conference was also the deciding factor for me in pursuing my Ph.D. My applications were due the week right before the conference and I was very uncertain whether scientific research was the right track for me. After watching talks, participating in workshops, and presenting my own work to fellow scientists, I was convinced that this was where I was meant to be. It was a true turning point in my undergraduate education. At ASCB, I was allowed to immerse myself in what full-time research would actually entail.

Catherine presenting her poster at the conference.

POST-GRADUATION RESEARCH FELLOWSHIP PROGRAM

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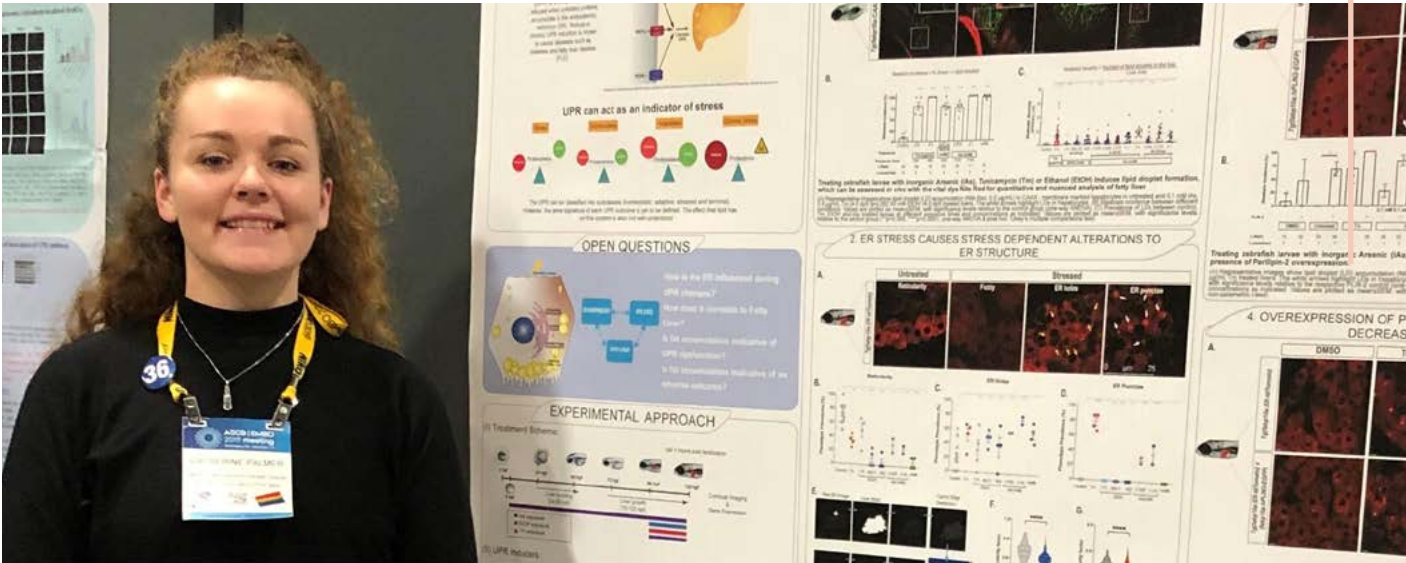
This fellowship encourages ingenuity in research pursuit, by providing recent graduates with both the opportunity and the mentorship to pave their own research paths.

TAMI GJORGJIEVA
AY 19-20 Research Fellow

Congratulations to the inaugural NYU Abu Dhabi's Post-graduation Research Fellows, who were selected from a pool of 35 strong applicants through a highly competitive process.

Each fellow came to the program with a unique academic interest. Many went above and beyond by attending conferences, giving lectures, and collaborating with UAE-based organizations. Our fellows also gave back to their community by providing research support, guidance and mentorship to fellow undergraduates.

Faculty Supervisor **Dipesh Chaudhury**

ALVARO YANEZ

THE INTERACTION BETWEEN STRESS AND SLEEP WAKE CYCLE

I investigated the effects of social stress on the regulation of sleep. My project found that sleep pressure did not build up in stress-exposed mice as it did in stress-naive mice—regardless of whether mice were resilient or susceptible to the social stressor. My findings were selected for presentation at the 12th FENS Forum of Neuroscience, the largest international neuroscience meeting in Europe. I was accepted to study medicine at The University of Manchester.

Faculty Supervisor **Andrea Valerio Macciò**

NADINE SOLIMAN

THE EFFECT OF SUPERMASSIVE BLACK HOLES ON GALAXY FORMATION

I studied models of supermassive black hole accretion and their effect on large galactic scales. During the course of my fellowship, I successfully implemented two sub-grid models and appended them to the current NIHAO Simulation Code. In addition, I completed running 20 simulations of galaxy formation for a set of 5 galaxies. I am currently pursuing a PhD in astrophysics at Caltech.

Faculty Supervisors **Nathalie Peutz & Jonathan Shannon**

CARL ALEXANDER BURLIN

(MIS-)MANAGING DISPLACEMENT: TECHNOCRACY, DEVELOPMENT, AND REFUGEE RELIEF IN JORDAN

I studied aid, protection, and forced migration in Jordan. I published two academic articles, a number of research reports, and presented my work as a guest lecturer at conferences and events in the region. I also partnered with local researchers and NGOs to assist in programs on refugee policy and law. I am now a research program manager at the Expert Group for Aid Studies in Stockholm, in addition to conducting research consultancies on human rights, aid, and migration policy on the side. I was accepted to pursue an MSc at Oxford in Refugee and Forced Migration Studies.

Alexander presenting a paper on "The EU-Jordan Compact as a Global Paradigm" as part of "Origins Future" Conference in HTW Berlin in November 2019.

Faculty Supervisor **Corinne Stokes**

LINA
ELMUSA

TRANSLATION OF SAHAR KHALIFEH'S *THE SUNFLOWER*

Through translating Sahar Khalifeh's *Sunflowers*, Abbad Al Shams, which has never before been translated into English, I aimed to expand the conversation about Arab women's roles, labor, and resistance particularly in conflict and literature. My work includes a scholarly introduction that explores issues of translation and translation theory. With inspiration of Abdelfattah Kilito's *Thou Shalt Not Speak My Language*, I explored the movement between languages, and how my translation has stripped the original of some meaning, but also contributed new layers of understanding. I explored the idea of how a novel could move into a different sphere of knowledge, but the women spoken of in the novel are stripped of mobility. Moving forward, I continue to work with translation, along with social media and journalism.

Faculty Supervisor **Borja Garcia de Soto**

RAITIS
PEKUSS

PRODUCTIVITY ANALYSIS OF CONSTRUCTION PROJECTS USING 3D PRINTING

I quantified that 3D concrete printing remains a less cost and time-efficient construction technique for geometrically simple concrete columns, which was published in the proceedings of the Digital Concrete 2020: 2nd RILEM International Conference on Concrete and Digital Fabrication organized by the Eindhoven University of Technologies, Netherlands. I also collaborated with industry representatives like Besix3D and investigated the development of 3D concrete printing in the UAE, which I presented at the 2nd International Conference on 3D Construction Printing in Tianjin, China (2019). As a follow-up to my previous studies, I suggested a new method for quantifying the geometric complexity of concrete elements and parametrically designed 10 two-meter concrete pillars which I proposed as a tribute to the 10th anniversary of NYUAD. I am now pursuing an MSc in building engineering with a specialization in structural design at TU Delft in the Netherlands.

Faculty Supervisor **Anthony Tzes**

STEFFEN
HOLTER

COVERAGE CONTROL OF COLLABORATING DRONES USING SPHERICAL CAMERAS

I focused my research on building a relative visual localization system to improve collaboration within drone swarms. The developed drone detection system was published as part of a book chapter for InTechOpen's Service Robotics and will form the basis of a larger article concerning collaborative area coverage. During my fellowship, I also wrote a journal article on the topic of Feature Extraction and Data Visualization which I started during my Capstone Project. I was accepted to pursue an MSc in computing (Artificial Intelligence and Machine learning) at Imperial College London.

Experimental setup with follower drone.

Faculty Supervisor **Jonathan Andrew Harris**

HANNAH MELVILLE-REA

PARCHED AND IMPATIENT: HOW DROUGHT SHAPES POLITICAL PREFERENCES

My research project found that voters exposed to drought increasingly prioritized policies aimed at economic stability and supported minor-parties. My paper won the Best Student Paper Prize at the 2019 Australian Society for Quantitative Political Science Conference. I was also selected as a UAE Ambassador for Nature, Social Connectedness Fellow, and presented at a number of events and conferences, within and outside of NYUAD.

Faculty Supervisors **Youssef Idaghdour & John Coughlin**

TAMI GJORGJIEVA

GENETICS AND LAW IN THE UNITED ARAB EMIRATES

I took a multidisciplinary approach to study the population genetics, and the ethical, legal and social implications (ELSI) of genetics in the UAE. In response to the COVID-19 pandemic, I worked to commence and coordinate the NYUAD COVID-19 Screening Study, and collaborated with local partners—such as Cleveland Clinic, G42 and SEHA—to build clinical projects to study various aspects of the COVID-19 disease in patients. As a Fellow, I published two papers. I am now continuing my joint work in genetics and ELSI as a pre-doctoral fellow at the National Bureau of Economic Research in Cambridge, USA.

Hannah addressing 200 school students at Jane Goodall's Roots & Shoots UAE celebration.

HANNAH MELVILLE-REA

NYU ABU DHABI POST GRADUATE RESEARCH FELLOW AND ALUM

Tami and mentor Professor Youssef Idaghdour at the American Society of Human Genetics 2019 conference in Houston, TX, USA.

NYU Abu Dhabi would like to congratulate the following NYUAD seniors, who were successful in securing research fellowships. The research fellows will take part in a year of full-time, independent and intensive research from September 1, 2020 - August 31, 2021.

Faculty Supervisor **Marzia Balzani**

HAFSA AHMED

BODIES IN DIFFERENCE: POLICY, PROGRAMS, AND PEOPLE IN THE UAE'S DISABILITY LANDSCAPE

Faculty Supervisor **Deborah Kapchan**

NADA AMMAGUI

SHAPING SHARJAH: A DIGITAL GEOSPATIAL ANALYSIS OF ART EXHIBITIONS IN OLD SHARJAH

Faculty Supervisor **Kemal Celik**

FARAH SHAHBAZ

MATERIALS LIFE CYCLE ASSESSMENT FOR REACTIVE MAGNESIUM OXIDE CEMENT PRODUCED FROM REJECT BRINE IN THE UAE

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PRAJNA SONI

QUANTIFYING THE PREDICTIVE POWER OF GLOBAL OPEN DATASETS

Faculty Supervisors **Kemal Celik & John Burt**

SARA ALANIS
(Funded by CITIEs)

ENHANCING URBAN SEAWALL SUSTAINABILITY USING ECOLOGICAL ENGINEERING

Faculty Supervisor **Kartik Sreenivasan**

AJ ABDUJABBOROV

ESTIMATING MEMORY-RELATED BRAIN ACTIVITY IN HUMANS USING FUNCTIONAL MRI

Faculty Supervisors **Mazin Magzoub & Andrew Hamilton, NYU President**

LAURA KARPAUSKAITE

TARGETED DELIVERY OF A-HELIX MIMETICS TO INHIBIT MUTANT P53 AGGREGATION AND RESTORE TUMOR SUPPRESSOR FUNCTION IN PANCREATIC CARCINOMA

Faculty Supervisor **Blaine Robbins**

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GENDER, RACE, INFORMATION AND NEGOTIATION

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SEONGYOON KIM

WHO 'YA GHANA TRUST: INTERPERSONAL TRUST AND MARKET VOLATILITY AS BARRIERS TO FIRM GROWTH
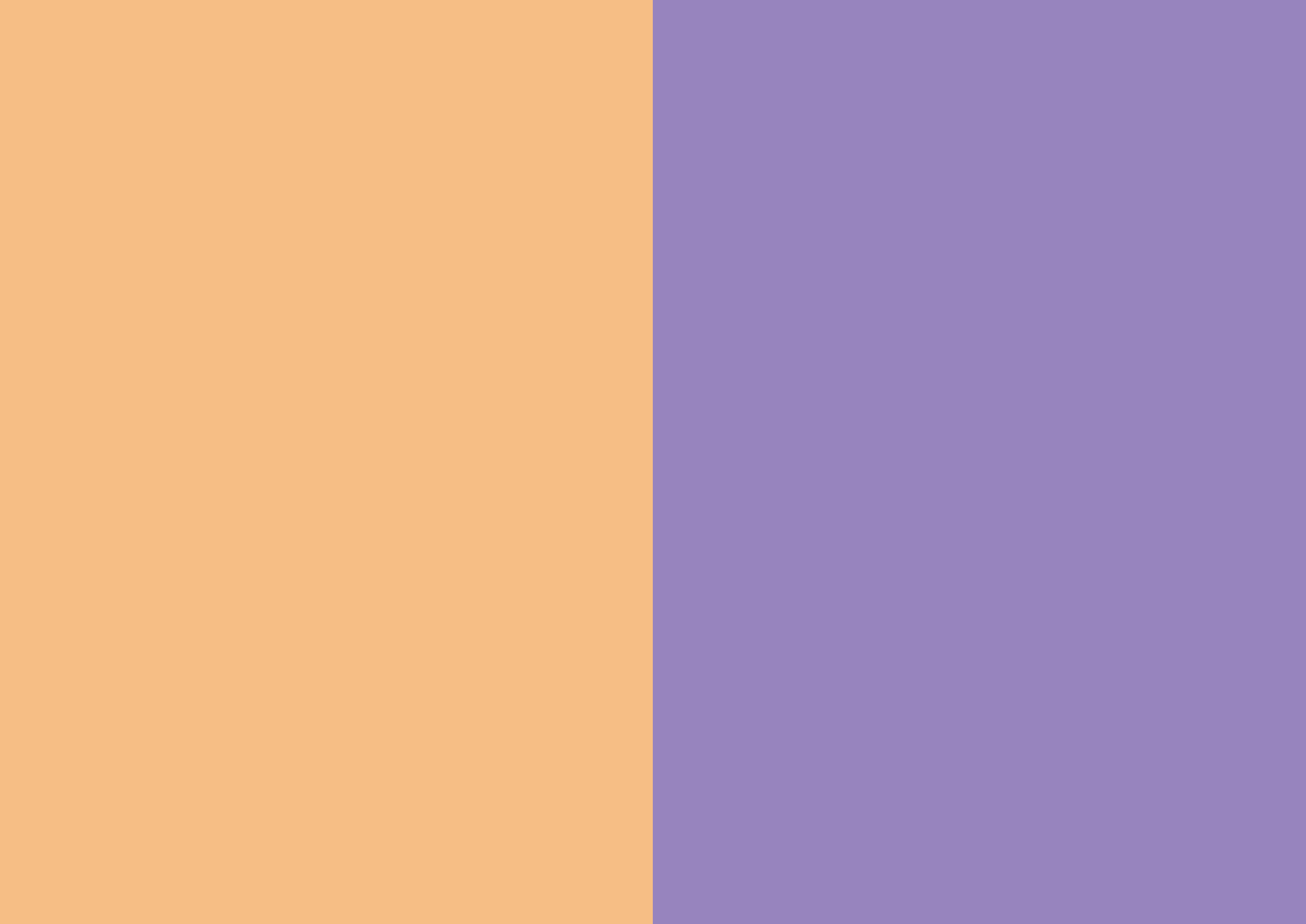
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WITH THANKS TO ALL FACULTY AND ACADEMIC STAFF WHO SUPERVISED NYU ABU DHABI UNDERGRADUATE SUMMER RESEARCHERS IN 2020.

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