ASDRP

Aspiring Scholars Directed Research Program

EVENT SCHEDULE

SUMMER 2021 SYMPOSIUM & EXPO VIRTUAL EDITION

600 researchers

Over 80 research projects

35 faculty advisors

Saturday - August 21, 2021

10:00 AM - 1:00 PM via Zoom

Scientific Poster Presentations

Multidisciplinary Collaborations

Schedule		*Page 2*
Zoom Link Info		*Page 2*
Authors & Abstracts	*Expo*	*Pages 3 - 14*
Group Numbers		*Pages 3 - 14*

ASDRP Summer 2021 Symposium & Expo

Saturday, August 21, 2021

10:00 AM - 1:00 PM (PDT)

Zoom Link: https://zoom.us/j/93177466688?pwd=T2ZtUHFuUllFb0IySFBTMm5ZTUpVZz09 Meeting ID: 931 7746 6688 Passcode: 511319

Presentation Times	Einstein Room 1	Franklin Room 2	Kepler Room 3	Newton Room 4	Lyell Room 5	Pauling Room 6	Mendel Room 7	Curie Room 8	Dalton Room 9	Hubble Room 10	Curie Room 11
10:00-10:15 AM	**Welcome & Opening Remarks**										
10:15-10:30	1	2	3	4	5	6	7	8	9	10	11
10:30-10:45	56	57	58	59	60	61	62	63	64	65	66
10:45-11:00	23	24	25	26	27	28	29	30	31	32	33
11:00-11:15	45	46	47	48	49	50	51	52	53	54	55
11:15-11:30	67	68	69	70	71	72	73	74	75	76	77
11:30-11:45	12	13	14	15	16	17	18	19	20	21	22
11:45-12:00	78	79	80	81	82	83	84	85			
12:00-12:15	34	35	36	37	38	39	40	41	42	43	44
12:15-1:00 PM	**Awards Presentation & Closing Ceremony**										

All presentations are organized by Expo Group Number. Please see the Symposium & Expo Abstract Submissions below for the corresponding group number associated with the project and researcher you wish to watch.

Guests: You are free to invite guests (spouses, friends, family, etc.). All guests must have the zoom link because the expo will be recorded. Feel free to share the attached flyer with friends & family!

ASDRP Summer 2021 Symposium Expo

August 21, 2021 - 10:00 AM - 1:00 PM (PDT)

Department	Field of Research	Expo Group Number	Research Group	Title	Abstract	Authors	Keywords
Biological, Human and Life Sciences	Microbiology	1	Kaur	Identification of Mycorrhizal Fungi in Urban Garden Soil	The vast majority of plant species benefit from mutualistic relationships with mycorrhizal fungi. Mycorrhizae protect the plant from root pathogens and significantly improve uptake of water and vital nutrients. Therefore, fungi play a huge role in the survival of plants in natural ecosystems as well as in man-made gardens. In this study, we investigated the species of mycorrhizal fungi in an urban garden. Specifically, we hoped to find Cenocuccum geophilum as it is a common mycorrhizal fungus found in Northern California.	Soumya Appalla Matthew Pang Kimberly Khow	Cenococcum Geophilum | Mycorrhiza | Fungi | Microbiology | Urban Garden
Chemistry, Biochemistry, and Physics	Biochemistry	2	Brah/Clark	G-Quadruplex Binding with Berberine Based Ligands	The G-quadruplex (G4) is formed in nucleic acids by guanine-rich DNA sequences and is commonly researched in the development of cancer treatments. Compounds such as berberine are a promising novel area of research in terms of G4 stabilization, providing a possible non-cytotoxic chemotherapy substitute by stunting cancer growth by inhibiting the reverse transcriptase hTERT. The large planar aromatic surface of the G4 is a promising rationale for the binding of cyclic, planar ligands with aromatic characteristics of berberine-based ligands. Our research suggests that contrary to previous research, intercalative binding plays a very small role in binding specificity. We developed berberine-based ligands that effectively bind to and stabilize the G4's activity. Our research found that smaller drugs required binding to the phosphate backbones of the G4 for thermodynamic favorability, but that larger molecules were generally favorable with higher observed binding affinities. Smaller ligands pursued a different pathway of stabilization than more traditional ligands by binding to the formed grooves characterized in the G4's helical structure, making heavy use of polar interactions. The favorability of larger molecules was mostly attributed to pi-pi stacking with the endplate and interactions with the central cations; larger molecules needed to achieve a certain amount of curvature in order to successfully bind to the grooves in the G4.	Sankrith Ramani Isha Tailor Aashita Krupadanam Chloe Poon Smriti Kallahalla Stephanie Cheung Vivek Parashar	Biochemistry | Guanine Quadruplex | GQuad | G4 | Berberine | Cancer Research
Biological, Human and Life Sciences	Biology, Medicinal Chemistry	3	Renganathan	Role of Piperine as a Bioenhancer in Thymoquinone Encapsulated Nanolipid Carriers (NLC)	Thymoquinone (TQ), a phytochemical compound obtained from black cumin (Nigella Sativa), has been known to possess anti-oxidative, hepatoprotective, neuroprotective, anti-diabetic, anti-inflammatory, anti-mutagenic, and anti-carcinogenic qualities. Its anti-inflammatory and antioxidant properties prevent damage to cells and induce apoptosis in cancer cells. Unfortunately, TQ's poor aqueous solubility leads to limited oral bioavailability. Piperine (PP), from the plant Piper Nigrum, combined with TQ, enhances TQ's anticancer effects as well as its bioavailability by increasing thymoquinone's solubility. Furthermore, TQ has lipophilic tendencies, the inability to dissolve in polar solvents such as water, which is where nanolipid carriers prove to be beneficial in the delivery of TQ and PP. NLCs are delivery systems that improve water solubility, increase dosage amount, reduce toxicity during administration, and provide long-term storage. To calculate the effectiveness of thymoquinone and piperine loaded NLCs, the release rate and entrapment efficiency of the drugs were measured using the nanodrop spectrophotometer. With such measurements we can determine the the concentration of drugs we are working with and the amount retained by the NLCs. One example of TQ's many anticancer mechanisms that we looked into into is its ability to target copper located in most cancer cells to induce oxidative damage; this damage can be quantified with a gel electrophoresis/comet assay. With such assays and further testing, we hope to prove piperine's importance as a bioenhancer in TQ-loaded NLCs.	Archana Satish Harshita Bathina Sameeksha Ramesh Shreya Gulati Julianna Chang Aarti Anand	Biochemistry | Medicinal Chemistry | Anticancer Research | Bioavailability | Thymoquinone (TQ) | Piperine | Nanolipid Carriers | Nanoparticles
Computer Science and Engineering	Artificial Intelligence	4	Johnson	Emotion Classification of the 2020 Presidential Candidates Using Deep Learning	Our project serves to develop a machine learning model that analyzes the features of audio clips from political speeches and addresses given by Trump and Biden during the 2020 presidential campaign season. Upon analysis, the model measures relation to a specific emotion from the following categories: neutral, calm, happy, sad, angry, fearful, disgust, and surprise. First, we use web-scraping to collect audio data of the 2020 presidential candidates' speeches. These are then rescaled into sizes comparable to the training data used to develop our machine learning model to determine emotions identified in each. The result provides more insight into both Donald Trump's and Joe Biden's stances in their presidential campaign. Our project aims to provide a more calculated way to determine the stance of a given speech.	Claire Qin Eesha Palasamudrum Pranav Singh Tiana Zhou	emotion classification | Machine Learning | Politics | Presidential Election | Mfccs
Computer Science and Engineering	Data Science	5	Johnson	Sentiment Analysis Comparison of Joe Biden Speeches Before and After the 2020 Presidential Election	This project aims to analyze the post-election sentiment of Joe Biden in contrast to his sentiment prior to the election. The opinions of Biden are presented through his words, and sentiment analysis is used determine his emotions and thoughts regarding key topics in political discussions. For example, when positive words such as "unison" or "we the people" are used in general, it leaves a lasting effect on the audience because the speaker is creating the impression that everyone is one, together, leading to a positive sentiment. In this project, our group will be analyzing speech transcripts of Joe Biden, to determine his polarity and subjectivity within the topics of the economy, covid/vaccine, social justice, and security, along with a neutral category for speeches that do not belong to any of the topics listed. We can then contrast Joe Biden's post-election polarity/subjectivity with his pre-election polarity/subjectivity, which were recorded from the project prior to the current one, using plots and figures. The polarity score is defined as the positivity/negativity of a speech, on a scale of -1 (most negative) to 1 (most positive). The subjectivity score represents how subjective a speech is, on a scale of 0 (objective) to 1 (fully subjective). By using transcripts of Biden's pre- and post- election speeches, we identify his sentiment based on polarity and subjectivity. His speech is then categorized into lists to determine whether the he is more positive/negative and objective/subjective in regards to the above topics.	Pranavi Gollanapalli Leila Maboudian Ankith Bachhu Darshan Gupta	Python | Coding | Machine Learning | Natural Language Processing | Data Science | Sentiment Snalysis | Emotion Research | Polarity | Subjectivity | 2020 election | Joe Biden | Statistical Analysis | T-test | Kruskal-Wallis | Dunn's Test
Computer Science and Engineering	Environmental Computational Science	6	Downing	Developing a Framework for a Multi-Sensor Soil Data Collection & Analysis System	For decades, many farmlands have had their productivity hampered by environmental pollutants from surrounding industrial infrastructure. However, the development of several physical sensors has allowed farmers to monitor the soil's health and prevent such loss. Here, we focus on developing a framework for collecting and analyzing soil data. Humidity, temperature, and nitrogen/phosphorus/potassium (NPK) sensors will be integrated onto a small form factor compute platform (e.g.: Arduino or Raspberry Pi). A client-server architecture will be built as the repository for a predictive, mathematical model to enable future data analysis. As environmental chemical changes alter the productivity of the soil, data collected by the proposed device will allow fluctuations [which impact soil health] to be identified and used as predictors for remediatiative treatment.	Ansh Gupta Aditya Khare Aneesh Thakkar Divit Purwar Kaushik Pendiyala	Soil Analysis | Environmental Sensors | Internet of Things | Environmental Computational Science
Chemistry, Biochemistry, and Physics	Computational Biochemistry and Structural Chemistry	7	Brah	Discussion on AB42 Protein and Computed Ligand Binding Affinities for Development of Principal Inhibitors	Scientists and clinicians have been trying to find a cure for Alzheimer's, a neurodegenerative disorder, for decades. However, the causes for the disorder are still not quite fully understood. The amyloid-beta, or AB42, peptide is a primary component of amyloid plaques, extracellular deposits located in the brains of those suffering from Alzheimer's. It is the significant role that the AB42 protein plays in Alzheimer's disease that makes it a predominant target for mitigation, if not inhibition. This study covers the structure binding affinity and activity of a series of ellagic, gallate, and flavonoid analogs as AB42 inhibitors. We used the solution structure of the amyloid beta-peptide (1-42) in our study. In silico methods were used to design analogs and model protein-ligand complexes including the AB42 peptide and the novel compounds. After examining all the compounds that were designed and docked, we found that compounds with a greater number of benzene rings, such as L4, L6, and L8, have higher binding affinities and are viable targets for organic synthesis; we also found that compounds with chlorine or fluorine at the ends tend to have higher binding affinities as well. Overall, in our hybrid (L) series, we found that the initial ligands (L1-L10) displayed higher binding affinities. On the contrary, our higher numbered ligands (L-10 onwards) depicted lower binding affinities, mostly within a range of 19.0-25.0. In our non-hybrid series compounds, we discovered that ellagic acid and polyphenol, both whose structures consist of more benzene rings, had higher binding affinities than gallic acid and propyl gallate. Thus, we concluded that the most optimal ligands for inhibition of the AB42 peptide, were the ligands with the highest binding affinities, L1-L10, ellagic acid, and polyphenol. This paper will cover the history of the AB42 protein as well as our findings throughout our time of research.	Aaryana Afroz Siri Manthapuri Tanisha Mehta Oliver Zhang	AB42 | Alzheimer's | Binding affinity | L series | Ellagic acid | Gallic acid | Polyphenol | Propyl gallate
Computer Science and Engineering	Computational Neuroimaging	8	Jahanikia	fMRIusic: Understanding the Brain Network Associated with Measuring Accuracy of the Perception of Musical Genres With and Without Audio	Functional Magnetic Resonance Imaging, known as fMRI, is a non-invasive neuroimaging technique. It utilizes BOLD signals to construct high resolution images of brain activity from subjects instructed to perform tasks or respond to stimuli within an MRI machine. By using neuroimaging tools and techniques, such as AFNI and Freesurfer, we will preprocess and analyze a fMRI dataset obtained from the Psychoinformatics Lab at the University of Magdeburg in Germany. The dataset comes from fMRI scans of 20 participants who were shown clips of the movie "Forrest Gump" with different genres of music featured in the movie, such as Country, Symphonic, and 50s Rock'n'Roll. The participants were asked to guess the genre of a piece of music with and without audio. The aim of our research is to identify the networks of the brain associated with guessing a music genre correctly without audio. In previous studies, researchers have gathered a large amount of data regarding the functions and growth of our auditory network. One key aspect of the network is its relation to music and the effects music has on the brain. Both playing and listening to music have been found to increase the plasticity and strength of the brain. These activities also trigger reactions that are only achievable through musical stimulus. We aim to understand and explain the role of the auditory network in genre association.	Shiho Amster Tiffany Ho Aditya Anantaraman Julia Wind Leo Sun Brandon Brewer Maya Poghosyan Anisha Grover	Neuroimaging | Neuroscience | Bioinformatics | fMRI | Music | Visual Network | Auditory Network

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Department	Field of Research	Expo Group Number	Research Group	Title	Abstract	Authors	Keywords
Chemistry, Biochemistry, and Physics	Organic Chemistry	9	Njoo	Utilizing Proton NMR to Monitor Reaction Kinetics Towards the Evaluation and Development of Anticancer Berberine Derivatives	Berberine, a natural product alkaloid, has been shown to exert biological activity via in situ production of singlet oxygen, a highly reactive oxygen species, when photo irradiated. Berberine utilizes singlet oxygen in its putative mechanism of action, wherein it forms an activated complex with DNA and photosensitizes triplet oxygen to singlet oxygen to specifically oxidize guanine residues, halting cell replication, leading to cell death. This has potential application in photodynamic therapy, alongside other such compounds which also act as photosensitizers and produce singlet oxygen in situ. The quantification of singlet oxygen in various photosensitizers, including berberine, is essential for determining their photosensitizer efficiencies. We hypothesized that the singlet oxygen produced by photoirradiation of berberine would be superior to the aforementioned photosensitizers when irradiated with UV light, but inferior under visible light conditions, due to its strong absorbance of UV wavelengths. Here, we present the usage of time course 1H nuclear magnetic resonance (NMR) spectroscopy to trap singlet oxygen via a 4+2 cycloaddition with terpinene, as well as towards the development of berberine derivatives via reduction and grignard reactions by using proton NMR to monitor reaction completion.	Sarah Su Emma Le Karthikha Sri Indran Meher Jain David Iglesias Anushka Peer Niharika Nambiar Aashi Shah Simone Merani Shelley Li Alivia Zhang Darshita Prathap Aishwarya Subramanian Samantha Wu Sanhita Nittala	Berberine | Photosensitizer | Rose Bengal | Methylene Blue | Singlet Oxygen Photosensitizer | Reduction | Grignard
Computer Science and Engineering	Quantum Machine Learning	10	McMahan	Quantum Convolutional Neural Networks via Variational Quantum Circuits for Efficient Image Classification	Quantum Machine Learning (QML) is a multidisciplinary field involving machine learning algorithms and quantum computing concepts. It has numerous possibilities and can outperform classical machine learning algorithms due to the phenomenal computational speedup and vastly increased capacity for computation. Because machine learning relies heavily on probability, the quantum computing environment is beneficial since it can significantly reduce resources that a ML model needs when learning from high dimensional data. To test this quantum advantage in the Noisy Intermediate Scale Quantum (NISQ) era, we implemented a Quantum Convolutional Neural Network (QCNN) using Tensorflow Quantum. Our QCNN architecture parallels a classical Convolution Neural Network (CNN) structure except in the quantum domain. Machine Learning algorithms involve three main stages: representation, evaluation, and optimization. QML focuses on the construction of the quantum model representation and optimization. The data encoding/decoding and the cost function optimization are performed on a classical computer, while a quantum computer simply calculates the probabilities of the states in the Variational Quantum Circuits (VQC). Based on probabilities generated by the quantum computer and optimization algorithm executed in a classical computer, the rotation parameters in the VQCs are updated after each backpropagation cycle. Precisely, the QCNN consists of a classical-to-quantum image data encoder, a cluster state quantum circuit, a series of Quantum Convolutional and Pooling Layers via Variational Quantum Circuits, and a fully connected neural network leading to the output. In our case, the QCNN extracts features from 2D images, and its performance is compared by metrics like accuracy and run-time.	Diptanshu Sikdar Max Cui Adrian Kao Abhik Das Ahmet T. Bayrak Jagannath Prabhakaran	Quantum Machine Learning | Noisy Intermediate Scale Quantum (NISQ) | Convolutional Neural Networks
Computer Science and Engineering	Neuroscience	11	Jahanikia	Understanding the Phases, Applications, and Exploring Real-Time Data from the Human Connectome Project (HCP)	The Human Connectome Project is a large-scale initiative involving teams of researchers at institutions around the world. The main goal of the project is to create a completed map of the human brain through the use of various MRI scanners and digital software. The map will serve as a baseline for future studies of brain connectivity during physical development, aging, and neurodevelopment, as well as aiding in the study and classification of neuropsychiatric and neurological disorders. The end goal of connectomics is to understand how brain areas are connected and contribute to human behavior, and how complicated systems are altered or exhibit different functions in individuals with neurological and psychiatric diseases. Once completed, the human connectome will provide valuable insights into what makes humans human, and what accounts for diversity in the behavior of healthy adults. This review includes an overview of the history of the HCP, a comparison between the brain network and the connectome, and a look into the C. elegans connectome, which is the first and only organism with a completed brain map. Our project aims at creating a comprehensive book/textbook to disseminate the knowledge of the Human Connectome Project, which includes studying all aspects of the project from its phases, to its costs, to its modalities, to its assessments, fMRI techniques, applications and implementations to psycho degenerative diseases.	Gia Oscherwitz Hansika Daggolu Harvey Sandhu Sashvath Koyi Shreya Daschoudhary Sriya Gonuguntla Yashvi Monani	HCP | Brain Network | Connectome | fMRI | C. elegans Connectome | Neuroscience
Computer Science and Engineering	Social Psychology	12	Jahanikia	MCSMI assessment; a novel assessment Measuring the Creativity of Social Media Influencers	Creativity assessments are used to determine how creative an individual is; some assess to what degree of achievement someone has attained in a certain skill whereas other assessments ask individuals to think of ways to repurpose or create something in a certain amount of time. The Creative Achievement Questionnaire (CAQ) currently assesses achievement in categories like music, art, dance, design, and scientific discovery, among other topics as well. Another assessment, the Inventory of Creative Activities and Achievements (ICAA), assesses the frequency of actions alongside the degree of achievement attained. One category not currently present in the CAQ or ICAA is creative influencers — people who use social media to promote their creative skill and influence others to learn what they do or get endorsements from companies to help promote their skill. We aim to create an assessment that will determine whether an individual is a creative influencer and possibly add this assessment to the CAQ or ICAA. The modern age has changed the traditional definition and view of creativity due to the presence of social media, so determining the difference between creative social media influencers versus just social media influencers is crucial. In this research study, we are examining different types of creativity assessments, the types of questions we believe are appropriate for assessing whether an individual is a creative influencer based on an analysis of their current social media and the types of platforms they run.	Amritha Srinivasan Megan Pau Maaya Selva Kaavya Pravin Rucha Kulkarni Ambika RamaduraiDhriti Avala Geetika Tammineni,	Creativity | Social Media Influencers | CAQ | ICAA
Chemistry, Biochemistry, and Physics	Organic Chemistry	13	Yamamoto	A Stability Study of Torula Yeast RNA, with Applications in Drug Delivery	In being an unstable, typically single-stranded molecule, RNA plays a variety of roles within the genome, through its unique properties of binding and condensation; with its applications in gene interference and alteration, the nucleic acid has been considered as a molecule with great clinical potential. In our research, we are investigating RNA stability and condensation with goals of improving clinical drug delivery via cytoplasmic transport, specifically in how its capabilities for compaction can be leveraged as a delivery vehicle. In respect to the possibility for calcium phosphate to protect RNA, we are utilizing it to test the degradation of the nucleic acid. We will do so by adding ribonuclease (RNase), a group of enzymes responsible for degrading RNA. RNase is present in an abundance of areas, including in the air; therefore, we must use DEPC (diethyl pyrocarbonate) to prevent RNA degradation before the RNase is intentionally added. Over the summer, we began the characterization of the yeast RNA through gel electrophoresis, the results of which would serve as a baseline for future degradation curve experiments. In the future, we plan to bind our RNA to calcium phosphate to determine the degradation curve using RNase fetal bovine serum, which simulates in vivo environments. We will compare the degradation curves of RNA alone to RNA with calcium phosphate. Furthermore, we will utilize the calcium phosphate nanoparticle to facilitate RNA compaction, in order to encapsulate the nucleic acid inside delivery vehicles, such as liposomes or lipid nanoparticles.	Harry Wang Paree Merchant Nathan Chiu Aarya Ghosalkar Anika Kulkarni	Biochemistry | RNA Condensation | Drug Delivery | mRNA Delivery | Calcium Phosphate | Nucleic Acid Degradation | RNA Assaying
Computer Science and Engineering	Human Behavior	14	Jahanikia	Studying the impact of the COVID-19 pandemic on the sleep quality of vaccinated versus unvaccinated individuals	The COVID-19 pandemic has drastically altered typical living habits, including vital circadian cues, and is linked to new pressures, new responsibilities, and new concerns about one's health and financial security, all of which are likely to disrupt sleep. Our research group aims to study the effects of the COVID-19 vaccine on sleep quality during the pandemic by assessing vaccinated and unvaccinated participants. Our team designed an eligibility questionnaire based on our analysis of various populations (healthcare workers, children, night shift workers) to reduce the chances of outliers in our study. Here, we will further discuss the reasoning behind our eligibility questionnaires and how we're currently creating a questionnaire to assess the sleep quality of our participants in which each question is backed by previous research on sleep and COVID-19.	Ananya Ravi Anika Mantripragada Avi Uppalapati Claire Wu Destiny Pinto Erin Yang HeeJee Yoon Ishya Mukkamala Matthew Kang Onkaar Paul Tejas Ganesh	COVID-19 | COVID-19 vaccine | sleep quality | pandemic| sleep disorder
Computer Science and Engineering	Computer Science/Data Science	15	Mui	Analysis and Comparison of Political Bias in News Aggregators	News media is an extremely important source of information that keeps the public informed on current events and politics. Unfortunately, all news is biased. Different sources are slanted in different directions, and to varying degrees. News aggregators are websites that pick articles from various news outlets to ostensibly deliver a mixed bag of information from across the political spectrum. But news aggregators use algorithms to determine which articles are displayed, and as such, they can fall victim to biases in AI and machine learning. Three of the most well known news aggregator programs are Google News, Apple News, and Yahoo News. We would like to determine, through rigorous analysis of data collected from these sources, the extent of their biases. Some important questions to be analyzed include whether the three sources are biased (and how much, if they are), whether the rank of the articles plays a role in this bias evaluation, and whether there is a hollowing out effect that reduces the frequency of center articles and amplifies the proportion of extremes.	Arav Sachdeva Elijah Huang Joshua Yeung Kushal Kodnad Sneha Agarwal Sumukh Murthy	Algorithmic Bias | News Media | News Aggregator | Statistics | Political Bias

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Department	Field of Research	Expo Group Number	Research Group	Title	Abstract	Authors	Keywords
Computer Science and Engineering	Algorithmic Bias	16	Mui	Using image processing techniques to mitigate bias in pre-trained facial recognition models.	Many facial recognition systems to this day have been observed to make biased decisions. The large majority of these biases are caused by a representation bias in their training datasets. This disproportionality amongst demographics present upon training has led to controversy about the fairness of these models due to many of them being unknowingly racist. In an effort to mitigate these biases without wasting resources to completely retrain the model, we will be using advanced facial filters to better balance accuracy across demographics. Our research will clearly demonstrate that skin color affects accuracy in our observed facial recognition model and illustrate the substantial difference in results once skin tone is modified. In this presentation, we will go over how the model functions and demonstrate its bias. We will then explain our mitigation technique in-depth and also demonstrate our image alteration substantially diminishes the previously observed bias.	Nathaniel Thomas Avishi Goyal Abhimanyu Warrier Rohit Mamidipaka Shaunak Warty	Computer Science | Artificial Intelligence | Machine Learning | Algorithmic Bias | Facial Recognition | Image Processing | Data Analysis
Chemistry, Biochemistry, and Physics	Medicinal Chemistry	17	Renganathan	Natural Product Polyphenol Inhibition of Amyloid-Beta Aggregation	Polyphenols such as EGCG, curcumin, and resveratrol have been studied in relation to Alzheimer's Disease; specifically, these molecules are thought to stop the aggregation of the amyloid-beta protein. Other research in the field suggests that polyphenols are also able to inhibit the aggregation of prion proteins, associated with numerous neurodegenerative diseases such as Parkinson's Disease and Huntington's Disease. Current research in the field explores the mechanisms of inhibition by these molecules. Our group has been using C. Elegans as a model organism to test the efficacy of different polyphenols. We have also computationally examined the aggregation of the amyloid-beta and prion proteins as well as the binding affinities of various polyphenols to the aforementioned proteins.	Ayush Patel Aadya Ponangi Nandini Mannem Isabella Murray	Polyphenols | Amyloid-beta | Alzheimer's Disease | Natural Products | Biochemistry
Computer Science and Engineering	Artificial Intelligence	18	Subramaniam	Predicting Emotions in Images with Machine Learning	In this project, we are training an AI model to recognize four emotions—Happiness, Sadness, Anger, and Surprise. The model will detect these emotions through pictures. We implemented the Tensorflow methodologies to train this model to efficiently recognize a specific emotion when given an image. This model can be utilized in psychiatry to diagnose patients with depression or dementia. Today, we will be discussing our process for making this model.	Advik Kunta Sanat Samal Vaidehi Karve Sriram Kudamala	Machine Learning | Computer Science | Tensorflow | Emotions | Artificial Intelligence |
Computer Science and Engineering	Machine Learning/Artificial Intelligence	19	Mcmahan	Using past incidents of forest fires and meteorological data to accurately predict and efficiently reduce the spread of wildfires in California	Predicting fires is a crucial part of forest fire management. With these predictions, firefighters can more efficiently use their resources to protect the general population and the environment. In this research paper, we will use machine learning to analyze historical fire behaviors and accurately predict the spread of wildfires in California. This data includes fire location (latitude and longitude), the number of acres burned, and meteorological factors (wind speeds, humidity, temperature, and precipitation). Observing methods of prevention and their efficiency is incorporated into this aspect of the analysis. After first classifying wildfire size as A-F based on the number of acres burned, this research paper will use classification algorithms like logistic regression, support vector machine, and random forest classification to predict the size of wildfires using meteorological data and determine the most effective methods of preventing and fighting wildfires based on classification categories.	Sejal Bilwar Sahil Mehta Siddharth Taneje Yash Chanchani Saarth Gaonkar	Wildfires | Wildfire Prevention | Wildfire Risk | Wildfire Predictive Analysis | California Wildfires
Computer Science and Engineering	Quantum Physics	20	McMahan	Solving the Schrödinger Equation for the Ground State Energy of Various Atoms through the Hartree Fock Method in Python	While the Schrödinger equation can be solved exactly for hydrogen, a single-electron atom, there is currently no method for obtaining the ground state energy level of a multi-electron system without approximation. This paper compares the accuracy of the Hartree-Fock method with various other methods, gathered through outside references, when solving the ground state energy of various atoms through the Schrödinger equation, including Lithium, Boron, Carbon, Nitrogen, and Sodium. The first part of our research consists of running a Python script to obtain the ground state energy and the runtimes of each iteration using the Hartree-Fock method. Comparing our results with other methods, such as Finite element, Hylleraas, Monte Carlo, we then analyze the degree of differences and their respective errors. This paper gives an overview on the current methods in approximating the Schrödinger equation for multi-electron systems and provides some insight in understanding the nature of the quantum mechanical world of many electron systems	Katherine Xie Archith Iyer Jay Wu Pareekshith Krishna Rushil Shah Sweekrit Bhatnagar	Schrödinger equation | Hartree-Fock | Ground State Energy | Variational Method | Quantum Physics
Biological, Human and Life Sciences	Environmental Biology	21	Suresh	Detecting Steelhead Trout (Anadromous Oncorhynchus Mykiss) Presence in the Alameda Watershed after Habitat Modification Using Environmental DNA Sampling Technique	Dams, diversions, and other infrastructure Alameda Creek built initially for flood control, pose an undeniable threat to migrating fish species. One such species is the Steelhead trout, the anadromous (ocean-going) life-history form of O. mykiss (a salmonid native to the Pacific's cold-water tributaries). With their ordinary route obstructed and breeding grounds demolished, the Steelhead trout's abundance in the Alameda Creek watershed decreased extensively to the point that all Distinct Population Segments of the Steelhead Trout were eventually listed as threatened under the Endangered Species Act. In response to these habitat modifications, the Alameda County Water District has installed and/or is in the process of installing fish ladders and fish screens. Baseline steelhead population data is essential to investigate the efficacy of these restoration measures. We used a relatively non-invasive approach, i.e the environmental DNA sampling method, which involved collecting and filtering water samples from 3 sites along the Alameda Creek, running Polymerase Chain Reaction on DNA extracted from the residue (using primers specific to steelhead), and analyzing the products via gel electrophoresis. This presentation will cover how our results will help enhance current conservation methods.	Chahak Gupta Anushree Marimuthu Sylvia Lyu Shelley Fernando Alexzendor Misra Emily Dai	Anadromous | Distinct Population Segment | Environmental DNA | Salmonid | Habitat Modification | Polymerase Chain Reaction | Gel Electrophoresis | Restoration
Biological, Human and Life Sciences	Neurobiology	22	Truong	Investigating the effect of alpha-synuclein aggregation in Parkinson's disease using a transgenic C. Elegan model	Parkinson's disease (PD) is a progressive neurodegenerative disorder that affects individuals over 65 years old, making up ~2% of the US population. PD, has been linked to the aggregation of misfolded alpha-synuclein (a-syn) proteins in the brain, like other neurodegenerative diseases such as dementia with Lewy bodies (DLB) and multiple system atrophy (MSA). The misfolding of a-syn is caused by a mutation in the SNCA gene which leads to insoluble aggregates of proteins present in dopaminergic neurons, causing progressive neuronal cell death. Our project is studying the effects of a-syn aggregation in transgenic C. elegan models with overexpressed a-syn in its muscle walls to understand the underlying effects of alpha-synuclein in movement and learning. We are investigating the potential therapeutic effects of curcumin, a polyphenol with antioxidant and neuroprotective properties, to reduce the aggregation of a-syn and possibly recover movement deficits induced by a-syn aggregation in transgenic C. elegans. Overall, we hope our research will further the development of curcumin as a therapeutic treatment for Parkinson's disease.	Bhumika Iroji Arushi Singhal Amulya Harish Anirudh Ramadurai Aryan Makhija Sunanditha Vempati Karan Saini Sophie Menon Neha Nabar	C. Elegans | Parkinson's Disease | Curcumin | Alpha-Synuclein | Neuroscience | Biological Assays
Computer Science and Engineering	Quantum Chemistry, Computational Chemistry, Chemistry, Physics, Quantum Physics, Particle Physics	23	Leung	Improving the Multireference and Parallel Processing Capabilities to Optimize a Radium Atomic Clock for Dark Matter Detection	Dark matter, which makes up the majority of the universe, can only be observed through its effect on other particles indirectly. To that end, researchers recently found deviations in the expected quantities of electrons and positrons (the antimatter counterpart to electrons) produced when beryllium-8 nuclei decays from a high energy to low energy state. This deviation could be explained if the nucleus emitted a boson with a mass of 17 MeV that split up into an electron and positron later on. This particle change can be detected by atomic clocks; because atomic clocks can sense deviations from the natural oscillation of an atom, they are hyperprecise measurement tools. As such, they are optimal for detecting particle anomalies like the boson described above. Last year's project succeeded in implementing GRASPy, a python module that works to simplify atomic calculations. Furthermore, using electron density outputs, the previous group also calculated the particle shift of Hydrogen 1s to 2s analytically, and graphed these results. Finally, the previous group ran wavefunction calculations for radium with one excitation to ascertain the candidacy of radium for dark matter. The objective of our project is to build upon last year's progress, particularly with regards to including MPI (Message Passing Interface) so we can run calculations with two excitations, and improving the multireferences for radium. We created a loop that optimized the selection of multireferences for radium with one and two excitations. To enable this calculation, we implemented MPI, which allows for parallel processing and will speed up more complex processes. To verify the functionality of the MPI wrapper, we are using Example 4 from the GRASP manual to ensure that there are no discrepancies between calculations in GRASP and GRASPy. Finally, we are creating an integration function to calculate the particle shift of radium.	Arjun Bhamra Laasya Babbellapati Sriya Netix Dhruv Gautam Heidi Wang	Radium | GRASP | GRASPy | Dark Matter | Quantum Physics | Chemistry | Object Oriented Programming | Atomic Clocks | Particle Physics | X17
Computer Science and Engineering	Artficial Intelligence (MedTech)	24	Subramaniam	Detecting Intracranial Hemorrhages In Computerized (Axial) Tomography Images Using Image Classification Technologies Such As TensorFlow And OpenCV	Machine learning models and deep learning techniques have been proven to be quite helpful to clinical professionals accurately diagnose many medical conditions. Inspired by the recent use of machine learning models, we develop a deep learning model that detects intracranial hemorrhages in CT brain scans. The model classifies the scans into two classes, hemorrhagic and normal. We evaluate this model using multiple public datasets. Our model 1) increases the speed of diagnosis, removing the significant dependency on highly trained professionals 2) reduces the cost for diagnosis, 3) increases accessibility in rural areas, where highly trained specialists may not be found, and 4) reduces the strain on overworked radiologists that have to go through thousands of CT scans a day.	Shivi Narang Aarav Baphna Vajraang Padisetti Aditya Venkatraman	Intracranial Hemorrhage | Machine Learning | Computerized Tomography Scans (CT) | Neural Networks | TensorFlow

ASDRP Summer 2021 Symposium Expo

August 21, 2021 - 10:00 AM - 1:00 PM (PDT)

Department	Field of Research	Expo Group Number	Research Group	Title	Abstract	Authors	Keywords
Computer Science and Engineering	Machine Learning	25	Subramaniam	Calculating Covid-19 Death Rate: A Classification Problem	Death Rates from COVID-19 are often imprecise calculations calculated based on socioeconomic factors of individuals, not actual places. This makes it hard for lawmakers and healthcare professionals to differentiate between the quality of care and where resources need to go. With the data we collected, our objective was to create an accurate model to hypothesize a realistic death rate for a certain location. Our first step was to collect data for each county which we'd use to train our model. We calculated the death rates from Covid-19 using CDC's data and collected data for other demographics from the 2019 Census estimates. After putting the data together onto a spreadsheet and cleaning it, we were ready to create our model. Via packages and sub-packages in Python's database, we created a random forest model that would achieve our design.	Ajay Bodla Sai Pisupati Reema Chintalax Divyanshu Bhadoria	COVID-19 | Computer Science | Machine Learning | Classification | Data Collection
Computer Science and Engineering	Bioinformatics	26	Cunha	Understanding the effects of Dasatinib, a selective tyrosine kinase receptor inhibitor, in the context of HT29 Colorectal Cancer Cells	Colorectal Cancer (CRC) is a malignant tumor type that is found in the colon and rectum. CRC remains to be the second most common cause of cancer-related death and the third most commonly diagnosed cancer among both men and women in the United States ("Colorectal Cancer - Statistics"). To further study CRC, we used single cell RNA sequencing data obtained from a research group at University of Texas, San Antonio(Chun-Lin Lin et al., 2020). We hope to further characterize the role of dasatinib treatment on colorectal cancer cells. Several pipelines were, and will be, conducted. Those pipelines include: clustering DNA expression data and finding which variants are common or different between the treated and untreated cancer cells by using raw sequencing reads from the dataset. So far, our analysis has been conducted using various R packages, especially the DESeq2 package, to normalize the data and calculate important statistical metrics (log fold change, p-value, etc.). This helped us find genes that have the lowest p-adjusted values, meaning that they had the greatest change between the treatment and control (statistically significant). Ultimately, choosing to analyze a cancer cell dataset using bioinformatic methods helps us discover novel genetic relationships in the context of CRC, which can aid in drug discovery.	Aditi Thanekar Anusha Chittari Anika Aeka Aditi Shankar Ujwala Nettam Celina Mao	Bioinformatics | Colorectal Cancer | Data Analysis | Biostatistics | Medicinal Drugs | Dasatinib | Precision Oncology |
Chemistry, Biochemistry, and Physics	Organic Chemistry	27	Clark	Synthesis of Novel Polyphenol Analogs to Combat the Effects of Alzheimer's Disease by Limiting Amyloid Beta 42 Aggregation	Our research looks at the potential inhibitory effects of gallic acid derivatives on AB42 aggregations theorized to cause Alzheimer's, a neurodegenerative disease. Studies have shown that gallic acid, a hydroxybenzoic acid in a variety of plants, has the ability to bind to AB42 polypeptides and prevent its aggregation. The hydrophobic benzene rings and hydrophilic alcohol groups increase the binding affinity to hydrophobic and hydrophilic residues on the molecule respectively. Synthesis of gallic acid derivatives involves protection of the alcohol groups, usually with TBS-Cl, followed by coupling reactions and deprotection. So far, we have mainly focused on synthesizing gallic acid coupled to either glycerol or ethylene glycol. In the future, we plan to synthesize 2,3 Dihydroxybenzoic acid coupled to ethylene glycol and glycerol and use a ThT assay to assess the efficacy of our compounds.	Saket Budhia Srishti Venkatesan Kenneth Chen Adrienne Ferguson Tanay Subramaniam Sana Husain Kush Shah Keerthana Ravi Shankar Avaneesh Wazarkar Saloni Sao Maddy Zhang	Chemistry | Organic Chemistry | Alzheimer's Disease | AB 42 Aggregation | Polyphenols | Gallic Acid
Computer Science and Engineering	Machine Learning	28	Fendell	Time Series and Regression Models to Forecast Earthquakes	Earthquakes pose numerous threats to this world, significantly due to their unpredictability. Seismologists are aware of the various signals that precede an earthquake, including P-Waves, seismic waves that are undetectable by humans, and EEW systems, which consist of sensors that could possibly inform local residents of an earthquake through the recognition of seismic shaking; however, these scientists are yet to have found much concrete results in predicting earthquakes that may occur a month or two in the future. As a result, our team aims to ultimately discover new earthquake patterns, and forecast the magnitude of these natural disasters in the near future. The following presentation will discuss a time series analysis model to predict seismological patterns, and various forms of regression to predict the magnitude of earthquakes.	Stavya Gaonkar Ansh Bhatia Apoorva Bathula Rohan Kolala Aditi Ravindra	Time Series Analysis | Forecasting | Regression | Earthquakes | Machine Learning
Biological, Human and Life Sciences	Marine Biology	29	Benson	Investigating the efficiency of the saltwater mussel Mytilus californianus's ability to filter microplastics from aquatic ecosystems	With a rise in plastic pollution, life in marine ecosystems is facing increasingly drastic threats. Within plastic pollution, microplastics, or plastics smaller than five millimeters, are actively contributing to this rise. These microplastics may adversely affect aquatic life by manipulating organisms' functions. However, novel research has demonstrated that as filter feeders, mussels may have the ability to minimize such pollution. Therefore, we explored the potential that mussels may have in filtering and retaining microplastics. Given the rising trends of microplastic pollution, different-sized mussels from a local tidepool were exposed to varying levels of microplastics over a period of time. After exposure, the retained microplastics from the mussels were isolated, quantified, and analyzed using a mussel digestion process, dissecting microscope, ultraviolet light, centrifuge technology, and FTIR spectroscopy. Elementary data suggests that mussels may be able to efficiently filter microplastics, illuminating the role mussels play in microplastic pollution. While we are still pursuing results, these findings may prove to be insightful for addressing an environmental issue presently affecting aquatic ecosystems.	Serena Ramanathan Manu Thakur Bhoomi Jain Aanika Bedi Dylan Wang Sai Tanvi Kodangal	Microplastics | Pollution | Mussels | Mytilus californianus | Marine Biology | Marine Ecology | Centrifugation | FTIR Spectroscopy | Sediment Separation | Microplastic Filtration & Purification
Computer Science and Engineering	Machine Learning	30	McMahan	COVID-19's Impact on Economic Trends in the United States Utilizing Machine Learning	The rising impact of COVID-19 on the United States economy is an increasing concern due to the risk of inflation. By analyzing the future implications of this trend, we can be better prepared to mitigate the consequences of inflation. This is significant as shifting economic trends have a plethora of consequences, including the potential to erode purchasing power of currency over time, rise in scarcity of certain commodities, and increased uncertainty in the stock market. The purpose of this study is to understand the connection between the pandemic and multiple sectors in the economy. Using machine learning analysis, this study analyzes graphs and datasets of historical inflation trends, and uses both to help predict future inflation trends. Furthermore, the study also analyses rising unemployment which greatly changes consumer spending patterns and differentiates the impact of inflation on different sectors in the economy.	Ashmit Gaba Marvin Gandhi Anna Han Aradhya Kapoor Arnav Soni Sparsh Bansal	COVID-19 | Machine Learning | Economic Trends
Computer Science and Engineering	Database	31	Johnson	Building a MySQL Database for Soil Rehabilitation Research (LEAF)	During soil rehabilitation research, the researchers at ASDRP collect a large amount of data such as the ppm of various heavy metals, pH measurement, and soil bacterial average. Such data needs to be stored in an efficient way to ensure scalability. As a solution, we built a mySQL database to store this data. Through foreign key architecture, stored functions, and prewritten SQL code, this database can be used for future statistical research and communication from machines. This will take in data from remote instruments, physical location measurements as geographical coordinates, and lab results from instruments and be able to relate to one another through foreign key architecture. Additionally, to create more comprehensive and rapid analyses, we define functions to return date wise or id wise selection for average, count, minimum, and maximum.	Anurag Jakkula Surabhi Kuchibhotla	MySQL | Database | Data Science | Soil Rehabilitation
Chemistry, Biochemistry, and Physics	Biochemistry	32	Yamamoto	Calcium Phosphate Solid Surface-assisted Chemical Modification of IgG	In the past decade, antibody drug conjugates (ADCs), a subdivision of biotherapeutics, have demonstrated significant advances in cancer therapy. ADCs exhibit tissue specific properties by binding to overexpressed epitopes on certain cancer tissues, reducing side effects from small molecule drugs on non-target tissue. To date, there are eleven ADCs approved by the FDA and a large number of ADCs undergoing clinical trials. Recently, chemical modification research involving improving HuIgG's ability to form immunocomplexes has gained popularity. Common modification methods include fluorescence signals upon binding and employing polyethylene glycol (PEG) to extend IgG's half-life, solubility, and stability. However, these modification methods on HuIgG are not site-specific. Thus, unregulated conjugation interferes with the antibodies' ability to bind with the antigen as lysine residues are present even in the paratopes of the antigen. In order to investigate the controlled modification of human IgG, we have utilized Calcium Phosphate (CaP), an effective protein absorber whose high density of phosphate groups allows for maximized binding onto free amine groups. As a result, a controlled modification method is produced. We used fluorescein isothiocyanate as a fluorescent model drug for conjugation. Next, we verified the preservation of antibody structure and investigated the steric effects of our treatments through the use of SDS-PAGE and HPLC, and LC/MS. Finally, we will run computational simulations to visualize ADC modification sites to further support our research. This research provides insight into using biochemical methods to control site selectivity in ADCs. We hope to understand the steric effect of chemical modification to ADCs and to expand upon antibody biotherapeutics with this research.	Sophia Fung Neha Arunkumar Jerome Wu Shelley Fernando Annapoorni Meiyappan	Antibody Drug Conjugates | Cancer Therapy | Calcium Phosphate | SDS-PAGE | High-performance Liquid Chromatography | Liquid Chromatograph Mass Spectrometer | Chemical Modification | Fluorescein Isothiocyanate
Chemistry, Biochemistry, and Physics	Medicinal Biochemistry	33	Renganathan Group	Studying the effects of Trigonella foenum-graceum on hyperglycemic Caenorhabditis elegans	Type 2 diabetes is an illness causing a lack of insulin/insulin resistance which affects the way the body processes sugar. This causes high blood sugar levels and other associated health concerns. Trigonella foenum-graecum or fenugreek is a plant in which its phytoconstituents -- such as amino acids, phenolics, flavonoids, saponins, and alkaloids -- have been researched and shown to exhibit hypoglycemic, antioxidant and therapeutic effects. This study aims to find which of the aforementioned compounds has the greatest anti-diabetic effect through conducting a series of in-vivo assays, such as nile red staining and pharyngeal pumping assay, on the microscopic C. Elegans model; as well as studying the results of colorimetric assays measuring the antioxidant activity of each phytoconstituent.	Chloe Chan Amrita Guha Shruti Varahala Shrimayi Chaganti Sathvik Sriram Dipti Venkatesh	Fenugreek | Nile Red Staining | Pharyngeal Pumping | Antioxidant

ASDRP Summer 2021 Symposium Expo

August 21, 2021 - 10:00 AM - 1:00 PM (PDT)

Department	Field of Research	Expo Group Number	Research Group	Title	Abstract	Authors	Keywords
Computer Science and Engineering	Astrophysics	34	Downing	Using Abnormalities in Stellar Radius Error Values as a Method to Identify mini-Black Hole Candidates.	In April of 2021, Jayasinghe et al. reported the discovery of a small, black hole binary companion to the red giant V723 Mon. The discovery of a black hole this small is very important as it closes the mass gap between the smallest known black holes and the smallest theorized. The black hole's mass, distorting the surrounding spacetime fabric, affects its binary companion by stretching it's stellar envelope causing the star to take the shape of an ellipsoid. Under normal circumstances we expect stellar radius errors 1 and 2 (measures of the accuracy of the stellar radius [st_rad]), to asymptotically approach zero. However, stars with a mini-black hole companion would have stellar radius error increase as the stretching of the star into an ellipsoidal shape makes it harder to ascertain the stellar radius. Using the data found in the NASA Exoplanet Archive, we used an algorithm to initially look through the M and K type stars for any stars that meet our criteria. While we haven't found any definitive candidates yet, we assume that with more time series data, and by further refining our algorithm, we will have a solid methodology to identify possible mini-Black Hole binary pair candidates.	Andrew Lu Arda Ertug Aryaman Gupta Caden Burkhardt Doğa Dinçbaş Ishaan Kale Jeff Chen	Astrophysics | Mini Black Holes | Stellar Radius | Stellar Radius Error | Data Analysis
Computer Science and Engineering	Astrophysics	35	Leung	Utilizing Fast Radio Bursts to Trace Intercluster Filaments and Constrain the Hubble Constant and Cosmic Curvature of the Universe	Fast radio bursts (FRB) are brief, low-frequency radio pulses that typically originate billions of light years away from Earth. The free electron content along the line of sight causes the burst to be smeared out in time. The amount of smearing (quantified by the dispersion measure) allows FRBs to effectively map the distribution of matter in the Universe, specifically in the warm–hot intergalactic medium (WHIM), a proposed solution to the missing baryon problem. As the WHIM is normally not visible to telescopes due to its composition of ionized hydrogen, FRBs provide a unique opportunity to probe the structure of the Universe. By observing the relationship between galaxy clusters documented by the Abell catalogue and FRBs documented by the Canadian Hydrogen Intensity Mapping Experiment (CHIME), astronomers can learn details about the regions of the Universe that the bursts pass through. This paper presents a large-scale search on the relationship between the filaments of galaxy clusters and FRBs. We detect a curvature in the dispersion measure stack and tend to trace out the large-scale structure in the universe. To further strengthen the signal, we stacked data from CHIME and the Abell catalogue. Finally, we examine the possible candidates for a gravitationally lensed FRB. Since the time delay between the images of lensed FRBs can be measured to extremely high precision, we present the results of a search for strongly-lensed FRBs, which can be used to constrain the Hubble constant and cosmic curvature of the Universe.	Joey Huang Krrish Kainth Aly Nathoo Aryan Yenni Dhyuti Gowda	Fast Radio Bursts | Galaxy Clusters | Gravitationally Lensed Frbs | Intercluster Flaments | Hubble Constant | Cosmic Curvature | Warm–hot Intergalactic Medium
Computer Science and Engineering	Astronomy	36	Downing	Using Keplerian Mechanics to Identify Habitable Exoplanets	The search for habitable exoplanets has been going on for over a decade and it is unreal to think that not even one of the several thousand exoplanets known can support basic life. Whether or not a planet can support life or liquid water requires that a variety of factors, such as planetary and stellar characteristics, work in harmony with each other. The research we performed focuses on filtering the thousands of known exoplanets and their host stars through various methods to search for traces of life. We start by looking at the Circumstellar Habitable Zone (CHZ) of each host star, which is a region of a stellar system in which water could potentially exist. Our group used data from the NASA Exoplanet Archive (Planetary Systems Dataset) and created Python codes that would calculate the CHZ for each stellar type. In the dataset, there were multiple entries for each exoplanet, indicating different sources of information, thus, we programmed a code that provides us with the most recent and accurate data, while avoiding errors, such as false-positives. Apart from that, two main methods were used in our research: Keplerian Mechanics and Albedo. In the end, our group theorized 10 exoplanets that are capable of supporting life.	Hrithik Pai Prachi Soni Sanjay Ravishankar Rahil Pasha Divya Bhamidipati Varsha Vinod Rishabh Manur Meha Selva Alexander Khazanovsky Shreyans Porwal Alexander Lau Anwitha Epuri Shree Jay Pragati Mettu	Machine Learning | Habitability | Exoplanets | Circumstellar Habitable Zone | Stellar Types | Albedo
Chemistry, Biochemistry, and Physics	Computational Chemistry	37	Brah	Designing novel compounds that bind to the GABAA receptor	Gamma Aminobutyric Acid (GABA) is the brain's primary inhibitory neurotransmitter that binds to the GABAA receptor, a channel-forming protein that allows the passage of chloride ions into cells (Mihic). The GABA neurotransmitter blocks certain signaling neurons by binding to the GABAA receptor. In this study, we sought to create novel small-molecule inhibitors by modeling protein-ligand interactions with the GABAA receptor. Different compounds were analyzed, along with their binding affinities to the GABAA receptor. We aimed to improve the binding affinity between different types of compounds and the GABAA receptor by modifying existing compounds with known binding affinities using Chimera and Avogadro. These compounds primarily include benzodiazepines, barbiturates, and neurohormones. These drugs alter neuronal excitability and act as anxiolytics and anticonvulsants to treat conditions such as seizures and anxiety. We designed a library of novel compounds which were docked against the GABAA receptor to assess binding affinity. Based on our molecular docking and analyses, we found that the high affinity ligands were polar with amine, carboxyl, and hydroxyl functional groups at the first carbon position. We have developed several compounds to be screened via synthesis and cell line assays in the future based on their promising molecular profile.	Sriya Cheemalamarri Nithya Cheemalamarri Tanya Naveen Cara Burgess	GABA | GABAA Neurotransmitter | Binding Affinity | Ligand | Compound | Receptor | Molecular Docking | Small-molecule inhibitor
Biological, Human and Life Sciences	Biology	38	Gupta	A Comprehensive Review of Safety, Efficacy, and Dosage of Ramipril, Enalapril and Lisinopril.	Hypertension is a leading cause of death in the United States, and ACE inhibitors have proven to be potent for arterial relaxation. The results of double-blind studies with randomized controlled trials were analyzed for the ACE inhibitors lisinopril, ramipril, and enalapril. Our paper used electronic databases such as Wiley Online Library and NCBI to collect necessary medical research. In patients with mild to moderate (Stage 2) hypertension (SDBP = 90-115 mm Hg), there was a significant decrease in all four types of blood pressure at a dosage of 10 mg compared to placebo for enalapril ($P < 0.01$) and ramipril ($P < 0.05$). Lisinopril shows a strong linear dose-response relationship, but lacks a significant difference from placebo at 10 mg lisinopril, with the exception of SSBP ($P < 0.05$). At a dosage of 10 mg of ACE inhibitor, enalapril is the most effective and lisinopril is the least effective compared to placebo in decreasing blood pressure in patients with mild to moderate hypertension. By comparing and assessing various factors of different ACE inhibitors, hypertension can be mediated safely with low prescription and high efficacy, reducing death by cardiovascular disease overall.	Daphne He Aarya Morgaonkar Ishanvi Kommula Naina Sabbineni	Hypertension | ACE inhibitors | Lisinopril | Ramipril | Enalapril | Safety | Efficacy | Drug comparison | Double-blind | Dosage
Biological, Human and Life Sciences	Marine Biology	39	Benson	The Effect of Human Disturbances on Non-Protected and Protected Intertidal Zones	The issue that led to this research project was the human taking of species in non-protected areas that has severely affected the food chains in tide pool ecosystems, and in turn, the diversity of such tide pools. The question we had was to what extent human impact has had on these non-guarded sites, and how they compared to sites that were protected. Due to humans being able to take species from non-protected sites including but not limited to: Moon Snails, Shore Crabs, Rock Crabs, Limpets, Turban Snails, Sea Urchins, Mussels, Oysters, Hermit Crabs, and even Octopuses, the ecosystems of the non-protected tide pools have been severely affected and skewed. For example, because of predators being taken to the point of them being entirely absent from these inter-tidal locations, many species of seagrass and other organisms have in return grown drastically, due to the uncompetitive space. This cause and effect is observed throughout these locations, with either predator or prey being taken, which hurts or helps another species. While something like sea urchins being taken is not necessarily a bad thing, due to their impact on kelp forests, it is however likely affecting the abundance and diversity of other species in these areas, and the same goes with the other species being fished. To prove our theory and the reality of the issue, we went to a non-protected site known as Maverick's Tide Pool. Once there, we took data by using quadrats, with random placement by the means of transect lines. Once we had an accurate amount of data to represent the tide pool as a whole, we analyzed photos of the quadrats, determined the variety of species, abundance of species, as well as the size (and health) of organisms, all with the help of ImageJ. While we have been facing complications to be able to take data at a protected site, we were able to compare our results with previous data from Fitzgerald, a protected site. In the protected areas, the likely observation of diversity and abundance of species will be normal, due to there being a much smaller impact from outside forces. This means that without the considerations of diseases or invasive species, the tide pools are thriving in the way they should; the food web is normal, with no species outnumbering another. While in the non-protected tide pools, seagrass has more or less overrun the whole area due to the absence of key predators, this is not the case with protected tide pools; everything is thriving at a normal pace, and the diversity is kept in check, due to nothing being taken. This is until further data has been obtained. The significance of this is the fact that many such tide pools across North America will continue to be stripped of their important species, which will only lead to the ecosystem being hurt.	Arohi Chirputkar Emma Tran Isaac Lee Ian Chen Rose Liu Rowan Campbell	Tide pools | Diversity | Abundance | Human Disturbance

ASDRP Summer 2021 Symposium Expo

August 21, 2021 - 10:00 AM - 1:00 PM (PDT)

Department	Field of Research	Expo Group Number	Research Group	Title	Abstract	Authors	Keywords
Biological, Human and Life Sciences	Biomedical Science	40	Gupta	A comprehensive review of dietary and nutritional-based therapeutic approaches for ALS	Amyotrophic Lateral Sclerosis (ALS) is a neurodegenerative disease that causes patients to progressively lose their motor function. In this study, we review research conducted on transgenic mice that have a human SOD1 transgene with a G93A mutation. One key approach that is used to extend the lifespan of ALS patients lies in nutritional and dietary management approaches, given that ALS patients tend to experience rapid weight loss and metabolic instability as the disease progresses. Our review paper analyzes the effects of the ketogenic diet and the Deanna Protocol with regards to increases in mice longevity. Transgenic mice put on the Deanna Protocol had an increase in mean survival by 7.5% compared to the control group on the standard diet, whereas the mice fed the ketogenic diet had a mean survival increase of 20%. However, due to the nature of the differences between disease development and progression and the varying effects of the aforementioned diets in mice and humans, further research is still needed to conclude that the same diet-related benefits lie in human ALS patients as well.	Addison Arlidge Garv Mehdiratta Ashlee Liu Cynthia Zhi Dishita Rajan	Neurodegenerative diseases I Amyotrophic Lateral Sclerosis I Nutritional treatment I Transgenic mice I Metabolic dysfunction I Statistical data analysis
Chemistry, Biochemistry, and Physics	Computational Medicinal Biochemistry	41	Brah	Understanding the Effect of Functional Groups on the Development and Structure-Activity Relationship (SAR) of Novel Benzimidazole KRAS Inhibitors	The KRAS (Kirsten rat sarcoma viral oncogene homolog) gene encodes for the KRas protein whose expression contributes to cell differentiation and proliferation. The KRas protein provides instructions to the mitogen-activated protein kinases (MAPK) pathway (which relays signals from cell surface receptors to DNA via a protein chain) and the PI3K/AKT pathway (which helps control cell cycle: cell inactivity, apoptosis, and cell multiplication). Mutations associated with the KRAS protein are responsible for several cancers including pancreatic, colon, and lung. Consequently, the understanding of how to inhibit the KRAS protein has been of importance in the scientific community and current research has yet to fully develop a viable inhibitor. In this study, we computationally investigate the structure-activity relationship (SAR) and druggability of a library of novel benzimidazole analogs as KRAS inhibitors. We focused on the KRAS G12D protein that when mutated, replaces the glycine at the twelfth amino acid position with aspartic acid. Overall, it was found that molecules modified with polar but uncharged functional groups of amino acids had the highest binding affinities when computationally docked to the KRAS protein. Of these, glutamine, serine, and proline were the most likely to enhance the binding affinities of benzimidazole derivatives. All ligands tested are suitable for organic synthesis.	Harshita Krupadanam Pradyun Singh Nathan Weng Suhas Yarra Sreekar Vemula	Benzimidazole | Biochemistry | KRAS, Computational Chemistry | Cancer | Drug Research | G12D
Biological, Human and Life Sciences	Marine Biology	42	Benson	The Effects of Ocean Acidification on Barnacle Feeding and Predator Avoidance Behaviors	As more carbon dioxide is pumped into the atmosphere, the acidity of the ocean will be drastically altered, affecting marine life. The purpose of this study is to determine how decreasing pH levels affect barnacle feeding habits, as well as predator detection and avoidance behaviors. This experiment was carried out on both Balanus aquila and Tetraclita rubescens (also known as acorn barnacles and volcano barnacles) by placing a few of each type into saltwater tanks with differing pHs. The control tank, at a pH of 8.1, mirrored the current ocean's pH level, while the other two tanks, at a pH of 7.8 and 7.5, were meant to replicate the projected acidity of the ocean in the future. Barnacles were fed zooplankton every three days, and the amount they ate was measured by how often they extended their cirri in one minute, immediately after being fed, then after 10, 20, and 30 minutes. We also tested for predator avoidance behaviors by touching the barnacles with a sponge to mimic the feeling of a major predator, sea stars. We noticed that whenever the sponge touches the barnacles, the barnacles close up as a means of protection. Further study is needed to quantify how predator avoidance behaviors change with decreased pH levels. From preliminary analysis and observations, we believe that the barnacles in decreased pH levels are feeding more than those in the control tank. As the acidity of the ocean increases, our preliminary data indicates that barnacles' feeding rates may increase. We believe this is a result of their metabolic needs increasing; however, this is something that requires further study.	Nadia Bianco Harshini Vakkalagadda Anjali Kalidindi Catherine Zhang Kamya Kainth	Acorn Barnacles | Volcano Barnacles | CO2 Levels | Marine Biology | Ocean Acidification | Global Warming | Defensive Behaviors | Feeding Habits
Biological, Human and Life Sciences	Marine Ecology	43	Benson	Investigating the ecological impacts of invasive mud snail species Ilyanassa obsoleta on native San Francisco Bay mudflat inhabitants	Ilyanassa obsoleta, native to the Atlantic coast, is a foreign yet abundant mollusk in the San Francisco Bay mudflats. Its presence in the Pacific coast was first recorded in 1907. The mud snail has since been recognized as an invasive species in the San Francisco bay, known to disrupt the native ecosystem through resource domination, larvae predation, and mass reproduction. In this study, we attempt to analyze the impact of I. obsoleta's presence on the biodiversity, species abundance, and size distribution of native species. Our team collected and processed samples from the Berkeley Marina and Point Emery mudflats and used biostatistical methods to draw relations based on the samples' weights and sizes. We plan to extend our project by acquiring more field data, especially in sites observed to have an abundance of I. obsoleta, and diversifying our means of processing and analysis.	Aryel Zhang Rachel Jiang Jennie Wang Alonzo Bradford Pranav Praka	Ilyanassa obsoleta | Invasive species | San Francisco Bay | Mudflats | Marine ecology | Biodiversity | Species abundance | Size distribution
Computer Science and Engineering	Machine Learning	44	Mui	Gun Violence	Posing as one of today's most trending topics in the news, Gun Violence in the United States has and still continues to corrode the country's peace. In today's society, the threat of gun violence has become more imminent. Whether it be an increase in gun-related hate crimes, school shootings, or domestic violence, the prominence of mass shootings has led to increased media coverage as well as debate surrounding the second amendment. A significant problem arises from not just the shootings themselves, but the media reports as well. All media sources have their own vantage points in terms of what happened, and this has the potential to create bias towards certain races, stereotypically putting them at risk.	TimothyGao Mahika Modi Sudharsan Gopalakrishnan Tanvi Ganapathy Soham Garg Christopher Pak	Gun Violence | News | Racial Bias
Computer Science and Engineering	Data Analysis	45	Mcmahan	Comparing traffic congestion to the economy	With an increasing population and a fluctuating economy due to the COVID-19 pandemic, it is essential to understand our economy and the variables that relate to it. As a result we wanted to find correlations between the economy and things we experience everyday in a growing city, like traffic. Upon finding these correlations we hoped to be able to predict future economic trends. Because we were examining the traffic we decided to originally focus on the transportation sector of the economy and chose to find correlations between the gas prices and traffic; however, as a result of the present issues in the pandemic it was decided that rather than limiting our scope to just the transportation sector within the economy we would also be examining the correlations between unemployment rates (a growing issue during the pandemic) and traffic. Therefore, the question is whether traffic is one of the variables that correlates significantly with the economy. Through the use of data analysis we will evaluate the extent to which traffic corresponds to the economy by correlating it to gas prices and unemployment.	Krishiv Aggarwal Kashvi Bhatia Shaunak Roy Namya Asrani Arianna Hsu Animan Patil	Economy | Traffic congestion | Traffic congestion prediction | COVID-19 | Gas Price | Pandemic
Biological, Human and Life Sciences	Environmental Science	46	Suresh	Impacts of Vegetation Recovery on Wildfire Affected Soil	Wildfires are the most common natural disaster in California, with 2020 being the worst fire season on record. Besides the cost of wildfires on humans, they also have a significant effect on the environment. Although wildfires can benefit ecosystem health, frequent and repeated burnings may inhibit complete vegetation recovery and sterilize the soil. While the separate effects of fires and ecological factors on soil and vegetation have been studied extensively, our project aims to confirm past findings for a California site and also relate wildfire-affected soil with post-fire vegetation recovery. Using GIS, we mapped vegetation cover and soil quality measurements, such as pH and above-ground litter volume, to determine the relationship between post-fire poor soil quality and vegetation recovery.	Kai Doemling Jiaming Yuan Alissa Doemling Ashley Heck Kari Lee	Environmental Science | Wildfires | Environment | Vegetation Restoration | Vegetation Restoration | Soil Quality | GIS
Chemistry, Biochemistry, and Physics	Medicinal Chemistry	47	Renganathan	Effect of Paclitaxel on Cephalotaxine & Sulforaphane for Improving Bioavailability	Cancer is identified by the uncontrolled growth of rapidly dividing, mutated cells, serving as the collective term for a multitude of similar conditions categorized through cell growth and proliferation. The disease continues to lead death tolls worldwide and extends to communities across the board regarding socioeconomic status. As a result, anticancer therapies with sufficient bioavailability and high efficacy are in demand. Our research focuses on two potential natural anticancer compounds, sulforaphane and cephalotaxine, to improve the bioavailability of the FDA-approved drug paclitaxel. Sulforaphane (SFN) is a sulfur-rich isothiocyanate found in cruciferous vegetables. Multiple in-vitro and in-vivo studies have shown sulforaphane's chemopreventive activity against several types of cancer through the suppression of cellular proliferation, metastasis, angiogenesis, and other hallmarks of cancer. Cephalotaxine (CET) is a secondary metabolite of Cephalotaxus Harringtonia, a coniferous plant belonging to the family Taxaceae. CET has shown some anticancer activity, although it has not been widely studied. Through molecular docking and anticancer assays, we have investigated both natural compounds and their relation to cancer.	Sahana Ravishankar Arushi Dinker Arnav Gupta Maddie Ho Dishita Rajan Megna Sankaranarayanan Sarah Wu	Cephalotaxine | Sulforaphane | Anticancer, Molecular Docking

ASDRP Summer 2021 Symposium Expo

August 21, 2021 - 10:00 AM - 1:00 PM (PDT)

Department	Field of Research	Expo Group Number	Research Group	Title	Abstract	Authors	Keywords
Computer Science and Engineering	Electrical Engineering and Mechanical Engineering	48	Dani	Parameters of an Efficient Unmanned Aerial Vehicle to Gather Data on Martian Surface Composition and Evidence of Microbial Life	Although information about Mars is limited, NASA and individual researchers have gathered data through the Ingenuity Helicopter, reflecting a growing interest in aerial exploration of the Martian environment. Unmanned Aerial Vehicles (UAV) are developed to maneuver through the rocky terrain and harsh weather conditions on Mars. This study sought to use previous research to form the parameters for an efficient UAV that would carry out the scientific objectives of investigating surface composition and potential microbial life. Given the different UAV rotor blade and wing designs, such as the Fixed Wing Profile, the Multi-rotor blade, the Single-Rotor blade, and the Hybrid VTOL structures, the capabilities of the designs in a Martian environment were compared based on past UAV data. The system, the quad-copter multi-rotor design, was selected due to its efficiency, accessibility, and confined space operation. Due to the aerodynamics of the low Reynolds number Martian atmosphere, a thin, cambered airfoil with a sharp leading edge presents an effective structure for the rotor blades. We also established electrical parameters using constraints such as payload and efficacy in quantitative analysis of topography. For the powering systems we are using a rechargeable lithium-ion battery which would be charged at 30 minute intervals using a solar powered charging station. The propulsion system will be powered by four individual DC brushless motors which would be working simultaneously at ~5000 rpm to provide the adequate amount of thrust through the harsh atmosphere of Mars.	Thanvi Anand Utkarsh Agarwal Sri Manasa Jandhyala Ashita Singh Athena Zapantis Shweta Arun	Mars | Drone | UAV | Sensors | Airfoils | Rotor Blades | Topography | Microbial Life
Biological, Human and Life Sciences	Microbiology	49	Kaur	Identification and Analysis of Plant Growth Promoting Bacteria in LEAF Community Garden Soil	In today's largely populated modern world, crop yield is becoming increasingly more important. To increase crop yield, new modern technologies for farming are continuously being innovated. The aim of this study is the identification of Plant Growth Promoting Bacteria (PGPBs) and their properties. In order to conduct the experiment, soil samples were collected from the community garden LEAF (Local Ecology and Agriculture Fremont). These samples were grown in agar solutions, and the two bacterial strains that grew from them were analyzed to determine the species of the bacteria. Using a DNA extraction kit, DNA was removed from the bacteria and then amplified versions were sent to RF Biotech for DNA sequencing. The DNA sequences were then used to determine that the two bacterial species in question are Bacillus cereus and Morganella morganii. Afterwards, multiple assays were used to measure the efficiency of each bacterial species to absorb various substances that would be helpful for plant growth. The aim of this research is to better understand which bacterial strains are more beneficial for plants, and which ones are more harmful. Through having greater zones of inhibition, the bacterial species M. morganii proved to be more efficient in the CAS and phosphate solubilization assays. On the other hand, the bacterial species B. cereus proved to be more efficient in the CMC and Amylase assays. These results will assist LEAF in enriching their soil in order to increase their crop yields by allowing them to increase the concentration of advantageous bacteria and decrease that of detrimental bacteria.	Pooja Ramadas Dhruv Pathak	Microorganisms | Bacteria | LEAF | Plant Soil
Chemistry, Biochemistry, and Physics	Biochemistry	50	Brah	Research and Design of FTO Inhibitors as a Potential Treatment for Obesity	FTO, a protein that is critical for body weight regulation, has been linked to increased fat mass , metabolic homeostasis, and obesity. This correlation has made inhibition of the FTO protein a research area of particular interest and a potential pathway to treat obesity and other related diseases. For the past eight weeks, our computational group has focused on researching scaffolds and ligands to create and dock molecules that can bind to and thus inhibit the FTO protein. So far, we have worked on six different series. Each series is focused on the derivatives of a particular compound that is known to be an FTO inhibitor. Some examples include catechin and fluorescein derivatives. In collaboration with members of the Clark group, we have synthesized the successful compounds to further analyze their effectiveness in various applications and efficiency as FTO inhibitors.MarvinSketch was used to draw the chemical bonds, Avogadro was used to edit and visualize the molecules, and Autodock Vina was used to dock the molecules with the FTO binding sites 3LFM and 4ZS3.	Arushi Sharma Ananya Suryadevara Miriya Mayenkar Arnav Surpur Madhuhaas Gottimukkala Stuti Mukherjee	FTO Protein | Biochemistry | Obesity | Computational | Molecule Design
Computer Science and Engineering	Machine Learning	51	Papano	Rendition of the Pac Man Arcade Game | Pocket Pac Man	Using the basis of the original Pac Man arcade game, this Java based computerized version uses different methods and styles of coding to complete its functions. My aim was to use the features of Pac-Man to create a java based version of that. A user it able to enjoy the game with visually appealing infrastructure, easy playability, a clear out look of the overall game and more. Pocket Pac Man is able to function with quick movements and clean coding that allows user friendly accessibility along with usage.	Upasana Puranik	Pac Man | Machine Learning | Java | Coding | Arcade Game | Game
Chemistry, Biochemistry, and Physics	Organic Chemistry, Medicinal Chemistry	52	Njoo	Synthesis, Computation, and Optimization: A Study of the Cyclic Peptide Natural Product Psychrophilin E	The field of natural product chemistry, specifically surrounding cyclic peptides, has seen a surge in popularity as scientists continue to study their benefits as therapeutics. Known for their structural stability and ability to target specific receptors without hydrolyzing, cyclic peptide natural products may be at the forefront of the next major medical breakthroughs. Our research focuses specifically on the cyclic tripeptide Psychrophilin E. We are working on the total synthesis of Psychrophilin E, a novel compound with antiproliferative properties. Its natural counterpart is extracted from the marine-derived fungus Aspergillus versicolor ZLN-60. It has a very inefficient isolation method—requiring 100L of fungus to produce 30mgs of product—and thus having both ecological and economic repercussions. Therefore, we hope to synthesize Psychrophilin E and further analogs to overcome these obstacles. Such analogs include the glycine analog, which can have a greater binding affinity to its biological target than Psychrophilin E itself. A greater binding affinity leads to a more effective molecule. As such, our research presents the possibility of a new antiproliferative compound, with possible benefits in anticancer therapeutics. Its potential lies in the treatment of disorders such as rheumatoid arthritis and cancer. Furthermore, through the creation of analogs of Psychrophilin E, we hope to optimize its properties and efficacy. Further studies can help to gain a greater understanding of its usage in medical and pharmaceutical settings.	Kuvam Bhatnagar Krithikaa Premnath Modakar Kurma Pratyush Singh Samantha Wu Andrew Chen Natasha Gupta Meher Jain Nailah Cannon Rosie Chen Shamita Bhattacharjee Harsha Rajkumar	Psychrophilin | Cyclic Peptides | Total Synthesis | Organic Chemistry | Medicinal Chemistry
Computer Science and Engineering	Data Science	53	Subramaniam	Factors Influencing Private School and Public School Enrollment in California	Many factors affect a student's enrollment in public and private schools across the 58 counties in California. We collected data on the median income, demographics, the condition of public schools, and the level of education of each to reach a conclusion. This data determines the percentage of students that are enrolled in private schools. A machine learning algorithm is utilized to find patterns in the data. Based on hypothetical demographics data, the algorithm will predict the percentage of private school enrollment.	Amrita Pasupuleti Neha Yelgireddy Kabir Sahni Apoorva Kulsh	Machine Learning | School Enrollment | Demographics | Data Science | Population Statistics | Public School | Private School
Chemistry, Biochemistry, and Physics	Organic Chemistry/Medicinal Chemistry	54	Njoo	Benchtop nuclear magnetic resonance spectroscopy enables the discovery and optimization of novel trifluorinated 2,4-dihydropyrimidine compounds as antiproliferative agents	Benchtop nuclear magnetic resonance (NMR) spectroscopy has enabled the monitoring and optimization of chemical transformations while simultaneously providing kinetic, mechanistic, and structural insight into reaction pathways, with quantitative precision. Moreover, the complementary application of benchtop NMR in the synthesis of fluorinated chemical entities has drawn significant interest from medicinal chemists as fluorinated motifs can significantly alter the biological profiles of drugs and improve pharmacokinetic properties. In this study, 19F NMR spectroscopy was utilized to monitor the synthesis of novel trifluorinated analogs of monastrol, an antiproliferative small molecule kinesin Eg5 inhibitor, and to probe the mechanism of the Biginelli cyclocondensation, the multicomponent reaction used to synthesize dihydropyrimidine and related scaffolds. After isolating a trifluorinated hexahydropyrimidine product that did not dehydrate through the Biginelli cyclocondensation, we performed this final dehydration step and optimized reaction conditions to obtain 6-trifluoromonastrol. This workflow was also applied to the synthesis of a trifluorinated analog of LaSOM 63, a compound previously reported to induce apoptotic cell death through the inhibition of ecto-5'nucleotidase activity. To further our studies, we used computational approaches to model the energetic pathways for the final dehydration in the formation of monastrol, LaSOM 63, and their respective trifluorinated analogs. Here, we present discoveries regarding the fluorination of both monastrol and LaSOM 63, while applying benchtop 19F NMR spectroscopy to analyze their reaction kinetics.	Selin Kocalar Emma Le Neha Mandava Krithikaa Premnath Aishi Rao Aishwarya Yuvaraj Xina Wang	Monastrol | Biginelli cyclocondensation reaction | Kinesin Eg5 | Cell cycle arrest | Dihydropyrimidine | Multi-component reaction | Benchtop NMR
Computer Science and Engineering	Machine Learning	55	Johnson	Visual Emotion Classifier	This visual emotion classifier utilizes machine learning to output a measurement of the emotions being exhibited on camera. The program aims to access a live camera feed and trained off of a data set consisting of thousands of categorized facial images, it will read the emotional state of the user. This will prove useful in situations in which being aware of social cues is a challenge for the user. Additionally, by being able to visually classify the emotion of whoever is visible on the camera feed, the program has the potential to signal blind people on the emotional state of those around them, helping them connect with others easier. Finally, after the emotional analysis is complete, a playlist that corresponds with the user's mood is suggested to the user to be played at their convenience.	Shubham Pruthi Aathitya Selvam Dhruva Paul Vibhav Darsha Pratyush Vempati	Machine learning | Facial Recognition | Emotion Recognition | Expression Analysis Classifier | Deep Learning | Data Science

ASDRP Summer 2021 Symposium Expo

August 21, 2021 - 10:00 AM - 1:00 PM (PDT)

Department	Field of Research	Expo Group Number	Research Group	Title	Abstract	Authors	Keywords
Computer Science and Engineering	Artificial Intelligence	56	Papano	Creating a Machine Learning Agent with Python using Q-Learning to Play Pac-Man	We created an algorithm that learns how to play Pac-Man efficiently. Q-learning, a value-based algorithm, accomplishes this task. A value-based algorithm that runs through generations and records which actions lead to the best results. In Pac-Man's q-learning equation, the variables taken into account are the current surroundings, which include the positions of the ghosts, and the coins' positions. The agent will run through many generations, making random decisions and after each generation, a new q-value is assigned, representing the rewards of the selected action. Each subsequent generation will use previous information to either make the best possible move or "explore" by choosing another random action. In addition, we used screen scraping to view the game as it runs. The code would scan the game and turn it into a 2D array. Using this state, we can assign values to actions taken. To make our AI smarter we used A-Star search to predict the ghost's future steps. A-Star search is used to find a path in a matrix. After acquiring the location of each ghost we set its predicted target location in accordance to Pac-Man's location. The algorithm will take a step into the future by looking at all the possible nodes it can travel to. It will then evaluate the distance from each future node to the target location and pick the node which has the least distance. Lastly, the Q-table will store all the q-values that we have accumulated throughout the generations, telling us which actions lead to, hopefully, better outcomes and, through trial and error, solving Pacman.	Brandon Tsai Parth Sharma Kevin Xu Srinidhi Srinivasan Aaryan Kondapalli Ansh Parikh	Q-learning | Reinforcement Learning | Pac-Man | Python
Computer Science and Engineering	Machine Learning	57	Subramaniam	Calculating the Shortest Path between Two Places using a Graph Database	Our aim is to calculate the shortest path between two places using a graph database with the help of Neo4j. We created a map on the Neo4j database and inserted a shortest path algorithm which calculated and found the shortest route. This presentation will cover how we created our graph database, calculated the shortest route, and explain how it could be used in the real world.	Ansh Singhal Mihi Nagariya Avinash Ravindra Nikhil Prabhakar	Neo4j | Nodes | Edges | Shortest Path
Computer Science and Engineering	Machine Learning	58	Fendell	Using machine learning to differentiate between leaves with and without Sudden Oak Death	Sudden Oak Death is a disease found in different species of trees that causes the leaves of infected trees to decay and eventually kills the trees. The decay is characterized by parts of the affected leaves turning darker in color, typically brown or black. The disease is caused by a water mold pathogen. California, having high tree population density compared to the rest of the United States, is especially subject to the consequences of Sudden Oak Death. In order to make handling the task of researching this disease easier, our group's aim is to create a machine learning model capable of differentiating between leaves with and without Sudden Oak Death. This presentation will go over the steps and process behind creating the model, including getting our dataset, preprocessing it, choosing a model, and training it.	Abhinav Valmeti Eshan Prakash Ishaan Ganti Kaitlyn Kwan Kavin Saravanan	Machine Learning | Sudden Oak Death | Python | Computer Science | Image Recognition
Computer Science and Engineering	Machine learning, Medicine	59	Subramaniam	Detection and classification of malignant and benign breast tumors using histopathological image classification.	Breast cancer is a ubiquitous form of cancer; the diagnosis rates are on an upward trend, increasing by half a percent per year. Despite enormous medical progress, breast cancer has remained the second deadliest cause of cancer death worldwide. However, it is often difficult to diagnose breast abnormalities early on. The computer will use image processing and AI to help radiologists screen and detect chest abnormalities more efficiently.	Surarchita Seerla Aniket Dey Nitya Kuppireddy Aditi Ghosh	Breast Cancer | AI | Image Processing | Carcinoma| Machine Learning | Histopathological | Mammogram | Neural Network
Biological, Human and Life Sciences	Microbiology and Environmental Genetics	60	Kaur	Study of Rhizobium Bacteria in Local Soil From Leaf C.R. Stone Garden	The purpose of this study is to identify the presence of mutualistic bacteria strains in Leaf Garden Fremont soil and investigate symbiotic relationships of the bacteria with the foliage in the garden. Rhizobium is a nitrogen fixing bacteria that forms mutualistic relationships with plants, usually legumes, and converts nitrogen in the air into something the plant can intake for nutrients (Miransari, 2016). For this study, our researchers from the Kaur Group at ASDRP collected soil samples from Leaf C.R. Stone Garden, an urban community garden in Fremont and went through multiple procedures and observations to determine if there was rhizobium in the soil. Three samples were taken from 3 areas at the garden with 50 grams of soil in each sample. Additionally, identification was conducted to classify the foliage in the area the soil samples were collected from in order to determine the plants that rhizobium is able to form mutualistic relationships with.	Riya Puvvada Anirra Kutty Iha Bharadwaj Tanisha Deep Aparna Sureshbabu	Bacteria | Mutualistic Relationship | Rhizobium | Microbiology
Computer Science and Engineering	Computational Neuroscience, Computer Science, App Development	61	Jahanikia/Downing	Aggregation of Computer-Based Cognitive-Training/Personalized Brain-Care/Music-Therapy Interventions into the CognoTrain App	With an estimated 50 million dementia cases worldwide, this neurodegenerative disease is becoming more prolific than ever. Methods of CBCT/CBCR (Computer-based Cognitive Training/Rehabilitation or Brain-Care) and music therapy have shown effectiveness as a means of positive intervention for geriatric groups of Alzheimer's dementia patients, leading to mental state and quality of life improvements and decreases in patients' Clinical Dementia Rating. Though these interventions have led to positive outcomes, their development and testing occurred irrespective of one another. However, a combination of these techniques would potentially produce an unprecedented level of amelioration. In this presentation, an overview of Jahanikia Neuro Lab's efforts to achieve this result will be delineated, contextualized by current works in the field that prove the isolated efficacy of these methods.	Pratyay Pandey Showmen Talukder Shashank Sastry Jonathan Ma Harsh Gurnani Bryan Ambrose Daniel Zhu	Computational Neuroscience | Alzheimer's | Dementia | Cognitive Training | App Development
Biological, Human and Life Sciences	Neuroscience	62	Truong	Investigating the Effect of Amyloid Beta Aggregation on Associative Memory In Transgenic Alzheimer's Disease Models	The aggregation of the protein called amyloid-beta has been theorized to cause Alzheimer's disease (AD), the most common type of neurodegenerative dementia. This aggregation forms plaques around neural cells which causes cell lysis. Our research project is directed towards understanding how amyloid-beta (Aβ) aggregation affects learning and memory formation.To study the effects of Aβ aggregation, we are using the model organism called Caenorhabditis elegans with over-expression of Aβ in neurons To understand the effects of amyloid-beta aggregation on C. elegans, we test the C. elegans' short-term and long-term associative memories through STAM and LTAM assays. We hypothesize that Aβ aggregation in the neurons will significantly reduce the duration of associative memory and negatively affect motility. The results yielded by the STAM assay demonstrated that the Aβ aggregation affected the duration of short term associative memory in transgenic C. elegans strain relative to the control. Given this behavior, we expect similar trends in their long term associative memory assay. By understanding the effect of Aβ aggregation on associative memory in transgenic C. elegans models of AD, we will be able to develop appropriate treatments to assess its effectiveness in treating neurodegeneration and memory-related disorders.	Jay Subbiah Aden Sun Simran Tawari Sripradha Manikantan Ashneet Dhami Rhoya Raman Riya Sanampudi Daniel Nguyen Tanvi Sri Sai Penugonda	Neuroscience | Alzheimer's Disease | C. Elegans | amyloid-beta
Computer Science and Engineering	Machine Learning	63	Subramaniam	Using Machine Learning to Classify Between Liberal and Conservative News Articles	The current political scene is very divided between liberals and conservatives. Psychologically, there are fundamental differences between the two. Conservatives typically have larger and more active right amygdala than liberals, an area associated with fear processing. This project aims to classify between liberal and conservative articles using machine learning. In the context of this study, liberals are individuals who urge the government to take action in order to solve the peoples' problems. Whereas conservatives believe in individual responsibility. In order to classify between the two perspectives, various keyword extraction strategies were used with traditionally conservative and liberal news outlets. Keyword extraction was first done manually and then using machine learning. The ability to classify between liberal and conservative viewpoints is an extremely valuable tool because it gives us an insight into some of the varying factors between the two groups.	Aanvi Singhani Aashrith Bandaru Arnav Cherukuthota Natan Lan	Machine Learning | Keyword Extractions| Polictics | Liberals | Conservatives
Computer Science and Engineering	Machine Learning	64	Subramaniam	Using Machine Learning to Predict Housing Prices	The prices of houses have many factors, ranging from concrete numbers such as square footage to very nuanced factors such as location. As such, estimating a house's price even with a few factors can be very difficult. Our project aims to rectify this by using a machine learning algorithm to estimate a house's price based off of several listed factors. It will be trained using past data for houses pulled from elsewhere. Importantly, COVID-19 has largely driven housing prices up, so data from 2020 and 2021 will be ignored in favor of data that represents a better indication of houses' true prices.	Yash Ravipati William Sartorio Eric Shi Parsa Basseri	Housing | Machine Learning
Chemistry, Biochemistry, and Physics	Medicinal Biochemistry	65	Renganathan	Synthesis Of Benfotiamine Prodrug Derivatives And Their Diabetic Neuropathy Activity In C. Elegans Models	Diabetic neuropathy, a complication caused by both type 1 and 2 of diabetes, is a type of nerve damage experienced most commonly through pain and numbness in the legs. It affects over 200,000 diabetic patients in the US alone. This condition occurs through glycation: when free reducing sugars combine with amino groups or lipids, leading to the formation of irreversible advanced-glycation end products (AGEs). Accumulation of AGEs, especially in hyperglycemic environments, can lead to severe chronic complications. Benfotiamine (BFT), a synthetic S-acyl derivative of thiamine (vitamin B1), has been researched for its anti-glycative and anti-inflammatory properties, specifically in preventing the formation of AGEs and enhancing alternative pathways. However, BFT has a low bioavailability since it is sparingly soluble in water, octanol, and oils, ultimately decreasing its efficiency and absorbance in cells. While higher doses could serve as a potential solution, it may be dangerous due to the risk of adverse side effects and lack of research directed towards potential implications. Therefore, the purpose of this research is to synthesize prodrug derivatives of benfotiamine to safely improve its bioavailability and effectiveness. In this presentation, we will focus on comparing the effectiveness of benfotiamine and thiamine to the effectiveness of our synthesized azo prodrugs, urea prodrug, and benzoic acid prodrug through in vivo pharyngeal pumping assays on C. elegans and in-silico analysis.	Emily Wang Nandini Mannem Rohit Suresh Shikha Kathrani Diya Gupta Vinay Vinod Deanna Wood	Benfotiamine | Diabetic neuropathy | Prodrug | C. elegans | Pharyngeal pumping | in vivo | in-silico | Azo coupling | Urea prodrug | Benzoic acid

ASDRP Summer 2021 Symposium Expo

August 21, 2021 - 10:00 AM - 1:00 PM (PDT)

Department	Field of Research	Expo Group Number	Research Group	Title	Abstract	Authors	Keywords
Computer Science and Engineering	Algorithmic Bias	66	Mui	Reddit Echo Chambers	As the popularity of social media and online news media rises, echo chambers, especially political echo chambers, are becoming an increasingly relevant problem in modern political discourse. An echo chamber is a phenomenon commonly found in social media sites where users are consistently exposed to information or posts with similar opinions, usually those that align with the user's own views. For example, a left-leaning user may find the recommendations page of their news feed flooded with only left-leaning news articles or editorials. Often in an echo chamber (most notably the ones on social media sites that attract groups of politically active users), people start to blindly trust those with similar opinions to an unhealthy extent, to the point where they take everything that is said to them within their group as the truth. These bubbles can also lead to extreme distrust of people and ideas that come from outside of their group (Nguyen, 2019). As a result, this phenomenon hinders the ability of those inside these echo chambers to listen to differing opinions and consider a political situation holistically, which leads to more misinformed citizens. Through our research, we will examine how political sentiment shifts in different subreddits over time and analyze the severity of the echo chamber effect on Reddit.	Akhilesh Basetty Ethan Wang Tanvi Goyal Varun Rao Vinay Venkatesh Vivian Li	Politics | Echo chambers | Reddit | Data mining | Data analysis
Biological, Human and Life Sciences	Neurobiology	67	Truong/Downing/Njoo	Investigating the Influence of Clozapine on Schizophrenic Transgenic C. Elegans Models	Schizophrenia is a chronic mental illness characterized by a distorted perception of reality, affecting 20 million people worldwide (World Health Organization, 2019). Current treatments are only palliative treatments, using typical and atypical antipsychotic drugs and psychosocial therapies to mediate symptoms such as social isolation, aggression, and apathy (Bustillo et al., 2001). Clozapine is an atypical antipsychotic drug that acts on both dopaminergic and serotonin receptors, mediating symptoms of depression, hallucinations, etc. In this study, we assessed the efficacy of clozapine on treating depression and avolition displayed by transgenic C. elegan models of schizophrenia. The transgenic C. elegan model has a genetic mutation in the daf-2 gene, resulting in avolition and altered social feeding behavior, which are representative of antisocial behaviors and schizophrenic symptoms in humans. The overall goal of this research is to understand the effects of clozapine as a treatment for depressive symptoms in schizophrenic patients. Following the administration of clozapine over 72 hours, we observed an improvement in the behavior of the E1370 schizophrenic worms' depressive symptoms in which they were more likely to move faster and gravitate toward their desired food source, similar to the untreated wild type worms. Surprisingly, wild type worms treated with clozapine began to display a lack of motivation and slow movements, suggesting that clozapine may pose negative effects to healthy non-schizophrenic C. elegans. This research provides an in-vivo aspect to clozapine's effect on an animal model and can be used to assist the development of therapeutic drugs that will treat and alleviate depressive symptoms found not only in schizophrenia, but in various psychiatric diseases.	Arushi Maheshwar Cameron Tran Gia Oscherwitz Isha Kale Khushi Kethana Mohika Pandey Raynard Khow Sinchana Hallyal Sylvia Ni Yuanjun Cai	Neurobiology | Schizophrenia
Chemistry, Biochemistry, and Physics	Medicinal Chemistry	68	Njoo/Truong/Downing	Synthesis of Novel Rivastigmine Analogs	Neurodegenerative diseases such as Alzheimer's and schizophrenia continue to perplex scientists due to their complexity. Our group aims to not only synthesize neuro-active drugs but also test them with various biological assays and observe our results quantitatively in an effort to advance the field of science which has perplexed many scientists for decades through the cross-section between multiple areas of research in neuroscience.	Shreya Anand Shloka Raghavan Suhani Babu Niharika Nambiar Erika Yu Alivia Zhang Udbhav Avadhani Neha Mandava Tvisha Nepani Aishi Rao Elena Green Sanhita Nittala Anushka Peer Sruthi Sudarsan Aishwarya Leela Alice Finkelstein	Neuroscience | Organic Chemistry | Schizophrenic Worms
Chemistry, Biochemistry, and Physics	Organic Chemistry	69	Njoo	Efforts towards controlling site selectivity of C-H Activation and Fluorination of Eugenol via photocatalyzed radical formation.	Fluorination of organic compounds has emerged as a significant topic in medicinal chemistry due to the multiple benefits a drug obtains with the presence of a fluorine group. Here, we conduct a conditions screen to fluorinate eugenol and its hydrogenated derivative dihydroeugenol through excitation and radical formation via a photocatalyst, followed by capture and fluorination of the position with a fluorinating agent. Our efforts involve computational modeling as well as methodology studies with various photocatalysts and fluorinating agents, in addition to radical initiators to attempt the site-selective fluorination of eugenol and dihydroeugenol.	Udbhav Avadhani Priya Chanda Charissa Luk Krithikaa Premnath Aashi Shah Tiffany Wang Alivia Zhang	Photocatalysis | Small Molecule | Organic Chemistry | Fluorination | Photo-fluorination | Radical formation |
Chemistry, Biochemistry, and Physics	Medicinal Chemistry	70	Njoo	Optimizing conjugation and linker chemistry in the development of novel photoreleasable antibody drug conjugate technology	Globally, cancer is the second leading cause of mortality. Anticancer therapeutics are actively being expanded and improved upon to combat this illness. As more small-molecule anticancer drugs are developed, a major obstacle to overcome is their limited selectivity and cytotoxicity to healthy cell lines, causing side effects such as hair loss, anemia, and weakened immune systems, therefore lowering its overall therapeutic efficacy despite their high potencies. However, within the expansive array of anticancer therapies under clinical development, antibody drug conjugate (ADC) technology is an emerging pharmaceutical drug that can suggest a decrease in the numerous adverse side effects associated with the non-specific cytotoxicity of chemotherapy, thereby bringing great potential to the field. Antibody drug conjugates are composed of a cytotoxic payload, often a small molecule chemotherapeutic drug, conjugated to a large antibody via a degradable linker. Especially over the last decade, ADC's have gained traction for its tumor specific drug delivery capabilities through target antigen selection and efficacy in treating various malignancies. Currently, there are nine FDA-approved ADC's such as anti-HER2 fam-trastuzumab deruxtecan-nxki (ENHERTU) against metastatic breast cancer, anti-Trop-2 Sacituzumab govitecan (TRODELVY) for triple-negative breast cancer, as well as many more tested against different cancers in promising clinical trials. ADC's that are currently being developed and tested make use of a variety of not only antigen targets, but also on various cleavable linkers that are sensitive to environmental conditions such as pH, proteases, or glutathiones. Here, we present our development of a novel photo labile linker bridging cytotoxic small molecules to a large tumor targeting antibody. With the usage of 2-nitrobenzyl protecting groups, maleimide alkylation, click chemistry, and monitoring synthesis and photorelease through the application of 1H NMR and mass spectrometry, we also provide further mechanistic optimization of conjugation and linker chemistries.	Kuvam Bhatnagar Rosie Chen Neha Mandava Harsha Rajkumar Xina Wang Alice Zhou	Cancer | Antibody drug conjugate technology | NMR | mass spectrometry
Chemistry, Biochemistry, and Physics	Computational Chemistry	71	Njoo/Downing	Machine learning driven approach for quantitative definition of chemical synthetic pathway complexity through variational autoencoder and regression approaches.	Data driven algorithms such as machine learning have allowed for advancements in high throughput virtual screening of therapeutic compounds by reducing screening costs to determine hit drug candidates. Here, we propose an end to end machine learning platform to predict the synthetic complexity of chemical compounds. Our approach breaks down chemical synthesis pathways into factors including the total number of steps, reaction time, maximum and minimum temperature, and overall yield that then go through a t-SNE dimensionality reduction process. We found that the data fit a Gaussian distribution upon completion of the t-SNE step. Feeding the data through a Variational Autoencoder produced encodings representative of the entire synthesis for each molecule. These encodings, along with the chemical descriptors of each molecule, were used to fit a regression model in order to predict the synthetic complexity of a compound. Our approach highlights the efficiency of using cheminformatics coupled with machine learning in reducing the overall cost of R&D and improving the time-to-market for the drug development process.	Aryan Agarwal Udbhav Avadhani Tanish Baranwal Ameya Deshpande Dhanvi Ganti Anya Goyal Koena Gupta Timothy Hu Howard Huang Mihir Kale Tvisha Nepani Sreya Rayaprolu Akhil Samavedam Vishak Srikanth Luqman Zaceria	Machine Learning | Small Molecules | Cheminformatics | Chemical Synthesis | Autoencoders | Regression

ASDRP Summer 2021 Symposium Expo

August 21, 2021 - 10:00 AM - 1:00 PM (PDT)

Department	Field of Research	Expo Group Number	Research Group	Title	Abstract	Authors	Keywords
Chemistry, Biochemistry, and Physics	Organic Chemistry	72	Njoo	Rational design, semisynthesis, and quantitative biological mechanistic studies of andrographolide derivatives	Andrographolide, a labdane diterpenoid lactone natural product extracted from Andrographis paniculata, has demonstrated potent biological activity and therapeutic potential against cancer, Alzheimer's disease, diabetes, and multiple sclerosis. Andrographolide is also reported to significantly inhibit the Nf-κB signalling pathway, which is active in immune system function and regulation of inflammatory cells. However, andrographolide is not optimized for human systems. In order to improve upon these aspects, we present the design and semisynthesis of a library of andrographolide analogues with either modified electronics of the 12,13 unsaturated lactone to increase cytotoxicity via the addition of electron withdrawing groups or attached hydrophobic residues along the 3,19 diol region, thereby improving the bioavailability of the compound. Reactivity of the top piece butenolide warhead was quantified via a time-resolved colorimetric ex vivo Michael addition assay using Elleman's Method, wherein reduced-glutathione was the electron donor. The antiproliferative effects of these hydrophobic residues were assayed via MTT using clinically relevant Jurkat and HCT-116 cell lines, and the direct pathway of NF-kB inhibition was studied via novel RT-qPCR analysis, using 27 genes involved in both the NF-kB protein complex and the mitogen-activated protein kinase (MAPK) pathway.	Warren Chang Selin Kocalar Alice Zhou Priya Chanda Lakshman Swaminathan Jeslyn Wu Tiffany Wang Nailah Cannon Alyssa Halvorsen Modakar Kurma Aishi Rao Xina Wang Kara Tran Saira Hamid	Diterpenoid | Semisynthesis | Natural Product Chemistry | SAR | NFKB
Chemistry, Biochemistry, and Physics	Medicinal Chemistry	73	Renganathan	Synthesis of 3,4-dihydroxybenzoic Acid Linked PEG-chitosan for the Enhancement of Curcumin Bioactivity	Chitosan, a carbohydrate polymer derived from the shells of crustaceans, possesses antibacterial and weak anticancer activity. However, it is poorly soluble in water, which reduces its bioavailability. Current efforts to improve solubility include deacetylating chitosan, but the process requires harsh conditions and has led to only marginal improvements. Chitosan is also difficult to regioselectively functionalize. Though the amine on chitosan is frequently used to synthesize amide-linked copolymers through EDC and chemistry, this approach is usually hampered by low yields and does not allow for synthetic creativity. The following work demonstrates a controlled way to functionalize chitosan through its amine group while simultaneously increasing solubility. First, an aminobenzoic acid-chitosan conjugate is synthesized. Then, various linkers can be plugged in through an azo coupling reaction. Herein, 3,4-dihydroxybenzoic acid is used as a linker to attach polyethylene glycol (PEG) onto chitosan. The interactions of these polymers with the cell membrane and water were investigated to elucidate a possible mechanism of bioactivity. Curcumin, the model drug used in this study, has been shown in many studies as an effective chemoprotective agent in various human cancer cell lines as well as an antibacterial. The PEG-enhanced polymers were used to enhance the bioactivity of curcumin. The formulations were administered to HCT116 (colon cancer) cells and Escherichia coli (E. coli) K-12, and its efficacy was evaluated. This work helps shed a possible solution to the problem of effectively synthesizing chitosan derivatives by providing a universal outlet where many molecules, including linkers, can be attached to without loss of chitosan bioactivity.	Rohit Suresh Madeline Ho Ariana Bellare Anvita Das Meera Iyer	Chitosan | PEG | Anticancer | Antibacterial | Curcumin | Functionalization
Chemistry, Biochemistry, and Physics	Analytical Chemistry	74	Yamamoto	Analyzing Concentrations of Heavy Metals and Polycyclic Aromatic Hydrocarbons using X-Ray Fluorescence (XRF) in LEAF Garden	High concentrations of heavy metals and polycyclic aromatic hydrocarbons (PAHs) affect the growth of microorganisms, and research on this topic has been rising due to increasing pollution issues. Specifically, these contaminants in soil can severely alter food quality, and disrupt metabolic functions resulting in nervous system disorders, skin lesions, vascular damage, immune system dysfunction, birth defects, organ damage, and cancer. Surveying and remedying contaminants in soil is therefore of great concern to LEAF and other local non-profit community gardens, which aim to grow crops to prepare and donate food for members of the community, and serve as a means of food support. To quantify the important heavy metals in the LEAF soil, the X-Ray Fluorescence (XRF) is a powerful tool without a sample preparation process. However it is unclear about the reliability of the data with respect to the lower quantity of the metal elements in the soil. In order to verify the reliability of XRF data, we have evaluated the XRD performance using the silica samples doped with metal salts, which contain a known quantity of 4 particular heavy metals. Furthermore, we prepared samples with two different types of metal ion doping states to compare regarding structural factors of the sample. Alternate methods of determining concentration will be explored if the XRF method proves unsatisfactory. Here, a brief introduction to the harmful impacts of heavy metals and PAHs will be presented, the results gathered will be discussed, as will potential limitations of the XRF and plans to involve additional instrumentation for further research.	Lavanya Narendiran Ariana Vermeulen Claris Chan Emilie Ma Lindsey Gebhardt Aylin Salafihar	Analytical Chemistry | Heavy Metals | PAHs | LEAF Garden | Soil Analysis
Computer Science and Engineering	Machine Learning	75	Mui	Global Trade: Mutual Benefit or Imperialist Exploitation?	A common view of global trade is that rich countries generously aid and develop poor countries through trade deals and loans. However, research suggests that the opposite is true--rich countries siphon resources and labor from poor countries through unequal exchange and economic restructuring in order to develop and aid themselves. Previous research on global trade and 21st century imperialism has been relatively inconclusive and incomprehensive, particularly on the causes of such exploitation. Through analysis of the monetary outcomes of global trade, our study aims to clarify and add to the discussion of the globalization of production and examine the role of rich countries in global trade. By using multiple regression techniques and analyzing previous literature, we found that GDP per capita has a positive correlation net transfer, suggesting that richer countries exploit poorer countries. We aim to further examine the role of economic planning in reducing the likelihood of exploitation and the implications of such exploitation in modern society.	Anish Cherukuthota Abhiram Annaluru Ishan Kar Kaylee Wei	Trade
Chemistry, Biochemistry, and Physics	Medicinal Biochemistry	76	Clark	Synthesis and Structure-Activity Relationship of 2-Substituted Benzimidazole KRAS Inhibitors	The KRAS gene, first identified as an oncogene in Kirsten Rat Sarcoma virus, provides instruction towards the production of the K-Ras protein. The KRAS protein is responsible for relaying the signals instruct the cell to grow and divide or to mature and take on specialized functions from outside of the cell to the cell's nucleus. When mutated, KRAS can fail to deactivate, leading to uncontrolled cell growth and signaling, causing cancerous growths. Mutations of KRAS proteins occur in approximately 25 percent of all human cancers, including more than 90 percent of pancreatic cancers and approximately 25 percent of lung cancers. Despite its prevalence as an oncogene, KRAS's lack of clear binding sites has made KRAS one of the most challenging and elusive targets as a cancer therapeutic. However, benzimidazole derivatives have been demonstrated to play a role in suppressing KRAS-related cancer cells, and the Clark groups plan to synthesize a variety of benzimidazole derivatives, and plan on testing the compounds effectiveness through a wide array of bio-assays. These include the use of HCT116 cells to test for anti-proliferative activity, the use of MTT Assays to trach morphological change and Western Blots in order to track the ligands mechanisms.	Pratyush Singh Rosie Chen Samyukta Athreya Tejas Ganesh Zaid Vellani Kara Fitz Anish Vuppala Prisha Jain Maahir Sachdev Rishit Bhat Ishayu Shikhare Rachel Chan	KRAS | Cancer | Benzimidazoles | Oncogenes
Computer Science and Engineering	Artificial Intelligence	77	Mui	Analyzing and Adjusting for Demographic Biases in Dementia Diagnosis Natural Language Processing Algorithms	Dementia describes the impaired ability to perform various mental tasks such as memorization and decision making. Machine learning approaches to the diagnosis of dementia have shown high levels of accuracy. However, for evaluating the clinical utility of these diagnoses, it is crucial that algorithmic biases relating to demographic attributes are identified and mitigated. This research evaluates demographic bias in a natural language processing algorithm and utilizes ensemble techniques in order to improve the model accuracy.	Rohan Adwankar Srivi Balaji Justin Lin Ansh Kharbanda Anusha Chatterjee Luke Ponssen□	Dementia | Machine Learning

ASDRP Summer 2021 Symposium Expo

August 21, 2021 - 10:00 AM - 1:00 PM (PDT)

Department	Field of Research	Expo Group Number	Research Group	Title	Abstract	Authors	Keywords
Chemistry, Biochemistry, and Physics	Organic Chemistry	78	Njoo	19F NMR-enabled chemical synthesis of a library of carmofur analogs as potential inhibitors of the SARS-CoV-2 main protease (Mpro)	The COVID-19 pandemic caused by the SARS-CoV-2 virus is one of the greatest challenges to public health that modern medicine has faced, as over 2.7 million people have died of COVID-19 and the number of cases continue to grow. It is crucial for researchers to develop new drugs and evaluate the efficacy of repurposed drugs to treat COVID-19. Our group utilizes 19F NMR to optimize the synthesis of carmofur, an antineoplastic agent and a potential inhibitor of the SARS-CoV-2 main protease (Mpro), as a potential treatment for COVID-19.	Udbhav Avadhani Suhani Babu Shamita Bhattacharjee Nailah Cannon Priya Chanda Rhea Karthik Emma Le Charissa Luk Neha Mandava Darshita Prathap Shloka Raghavan Thoya Raman Aishi Rao Aishwarya Yuvaraj Xina Wang Jane Wu Aishwarya Leela Jeslyn Wu Aashi Shah Sarah Su	carmofur | SARS CoV-2 | 19F NMR | Semisynthesis | 5-fluorouracil
Chemistry, Biochemistry, and Physics	Medicinal Chemistry, Physical and Synthetic Org. Chemistry, Small Molecule Therapeutics	79	Njoo	Photorelease kinetics of aryl-substituted o-nitrobenzyl prodrug linkers and synthesis of photocleavable antibody-drug conjugates	The toxicity of many pharmaceutical drugs, specifically cancer drugs, is known to have many harmful side effects on patients. One method towards reducing toxicity while maximizing efficacy of a drug is the development of prodrugs, specifically through the use of photo-cleavable o-nitrobenzyl linkers. Using aromatic and benzylic substitutions we aim to test the photo-release kinetics of various linker analogs attached to bioactives with clinical potential. One of our focuses is podophyllotoxin, a natural product anti-cancer agent which failed clinical trials due to its cytotoxicity. Applying our investigation of photo release kinetics of nitrobenzyl alcohols, we aim to amalgamate the best of small molecule research with biological macromolecules, to be at the forefront of next gen cancer therapeutic research.	Alice Zhou Selin Kocalar Tvisha Nepani Xina Wang Elena Brierley Green Erika Yu Natasha Gupta Audrey Ku	Small Molecule | Cancer Therapeutics | Photochemistry | Drug Design and Development | Optimizing Drug Delivery
Chemistry, Biochemistry, and Physics	Molecular Biology	80	Renganathan	Effect of Paclitaxel on Cephalotaxine & Sulforaphane for Improving Bioavailability	Cancer is a disease characterized by the rapid and uncontrolled division of cells, which can then spread to other parts of the body. It is one of leading causes of death worldwide, having caused nearly 10 million deaths in 2020. Paclitaxel is an FDA-approved chemotherapy drug widely used to treat various cancers, including breast and lung cancers. Sulforaphane (SFN) is an isothiocyanate found in cruciferous vegetables such as broccoli and cabbage, and many studies have demonstrated its potential in treating various cancers both in vivo and in vitro. Cephalotaxine (CET) is an alkaloid compound occurring in Cephalotaxus harringtonia, or the Japanese plum yew. CET has not been as widely studied but shows potential chemopreventive properties. Therefore, our research sought to as well as to investigate the pathways of these compounds through molecular docking, as well as to elucidate the individual and synergistic effects of these three compounds on HCT-116 (colon cancer) cell lines.	Madeline Ho Sarah Wu Sahana Ravishankar Arnav Gupta Arushi Dinker Megna Sankar Dishita Rajan	Cancer | Bioavailability | Paclitaxel | Sulforaphane | Cephalotaxine
Chemistry, Biochemistry, and Physics	Organic Chemistry	81	Njoo	Rational design and synthesis of doramectin analogs as antiparasitic natural products	Doramectin, an antiparasitic drug used in veterinary medicine, is part of a class of versatile avermectins extracted from the fermentation broth of Streptomyces avermitilis, a soil bacterium species. These 16-membered macrocyclic lactones have displayed insecticidal and anthelmintic activity, and most recently, antiviral and anticancer activity, making them biologically potent molecules of interest. Here, we compare the effects of three avermectins, doramectin, ivermectin, and abamectin, on vinegar eels and C. elegans through computational modeling and in vivo assays. Doramectin consists of disaccharide, benzofuran, and spiroketal moieties, and removal of the disaccharide yields an aglycone scaffold with two allylic alcohols. In an additional methodology work, we attempt the selective oxidation of allylic alcohols at C5 and C13, comparing their relative nucleophilicity. Moreover, the disaccharide is especially crucial due to its hydrophilicity and hydrogen bond donor capabilities - this hydrophilic head draws doramectin to the hydrophobic residues of glutamate-gated chloride channels in parasites, increasing cytotoxicity. Replacing this disaccharide with a more hydrophilic moiety will likely amplify bioavailability and bioactivity.	Suhani Babu Elena Brierley-Green Andrew Chen Emily Goyal Audrey Ku Neha Mandava Niharika Nambiar Tvisha Nepani Shloka Raghavan Aishi Rao Xina Wang Jane Wu Erika Yu	Natural Product Synthesis | Antiparasitic | Macrocyclic Lactones | Methodology
Computer Science and Engineering	Artificial Intelligence	82	Fendell	Evaluating Twitter Sentiment Analysis on Stock Prediction	Many approaches have been taken to predict stock market variability. Prior research has suggested a correlation between public sentiment and the Dow Jones Industrial Average Index (DJIA). This paper explores the relationship between Twitter sentiment and stock price fluctuations using machine learning and time series analysis. We analyze the sentiments of tweets concerning top NASDAQ companies from 2015 to 2020 and plot their correlations with S&P 500 stock prices over the same time period. We then use Granger's Causality Analysis to verify whether twitter sentiments can be used to predict stock prices for various companies. Finally, we attempt to forecast specific companies' stock prices from twitter sentiments using vector autoregression and evaluate the forecasts by comparing their Mean Absolute Error (MAE), Mean Squared Error (MSE), and Root Mean Squared Error (RMSE), finding certain stocks to be more predictable than others.	Charles Zhu Kenny Le Kush Khanna Rishi Halker	Twitter | Sentiment | Stocks | Stock market | NASDAQ | Time series analysis
Chemistry, Biochemistry, and Physics	Medicinal Chemistry	83	Njoo	19-F NMR spectroscopy enables real-time monitoring of Pd-catalyzed Buchwald Hartwig cross couplings of anilines and dichloropyrimidines towards the synthesis of novel rilpivirine analogs as non-nucleoside reverse transcriptase inhibitors (NNRTI's) in HIV/AIDS Treatment	The human immunodeficiency virus (HIV) relies on the host's cellular machinery for replication. Its genetic material, being composed of RNA, transcribes into DNA upon delivery into the host's cells through the viral enzyme reverse transcriptase (RT). This further enables the product of new viral components and further spread. Through targeted attacks on the host's immune system, acquired immunodeficiency syndrome (AIDS) often follows, which- without treatment- proves fatal. Non-nucleoside reverse transcriptase inhibitors (NNRTIs) are one class of treatment for HIV through inhibition of RT. Previous FDA approved NNRTIs include rilpivirine, which, due to its improved resistance to mutations, was chosen as inspiration for a library of novel fluorinated diarylpyrimidine analogs that were previously computational evaluated. Current attempts at synthesis utilized methods that required extreme conditions and excessive time. Here, 19-F NMR is used with the Pd-catalyzed Buchwald Hartwig cross coupling to monitor the kinetics of and optimize the synthesis of novel rilpivirine analogs. Specifically, our work investigates ligand effects in kinetics and regioselectivity of the Pd-catalyzed cross coupling of aryl chlorides and anilines, and this platform is currently being developed towards scalable syntheses of next-generation NNRTI's.	Jeslyn Wu Alice Zhou Tiffany Wang Jane Wu Shelley Li Alice Finklestein Aashika Duvoor Charissa Luk Sruthi Sudarsan	HIV | AIDS | NNRTIs | Non Nucleoside Reverse Transcriptase Inhibitors | Rilpivirine | Cross Coupling | Metal Catalysts | Palladium | NMR | 19-F | 19-F NMR
Chemistry, Biochemistry, and Physics	Medicinal Chemistry	84	Clark/Brah	Synthesis of G-Quadruplex Stabilizing Alkyl-Substituted Isatin Ligands	Quaternary DNA oligonucleotides formed from loops of guanine known as G-quadruplex structures control cell replication of oncogenes and other cancer-related genes through the regulation of enzyme telomerase. Telomerase prevents telomeres, structures at the end of DNA responsible for halting cell division and aging, from shortening, resulting in increased cell proliferation and aggravated cancer risk. G-quadruplex structures present on the telomeric ends deny the telomerase access to the telomeres. Consequentially, researchers are increasingly explore the feasibility of targeting G-quadruplex structures through ligands as an anti-tumor strategy. Certain small-molecule ligands, particularly several alkyl-substituted isatins, have emerged as promising methods to dock and stabilize the structure, inhibiting the function of the telomerase. Synthesizing these novel ligands could give rise to promising targets for cancer therapy and allow scientists and clinicians to further study the correlation between G-quadruplexes, gene expression and regulation. Here, an introduction to the formation of G-quadruplex structures will be explored, as well as our current progress in synthesizing, purifying, extracting, and processing novel alkyl-substituted isatins that function as small-molecule ligands to stabilize G-quadruplex structures, both in our laboratory and in other groups involved in the field.	Julia Vu Nandika Nambia Ananya Anand Amber Lu Zoe Chu Aadhya Pai Ruhika Muralidhar Natalie Nguyen Manasvi Pinnaka Anish Jupudy Tanisha Srivatsa Saanvi Pemmaraju	Organic Synthesis | Anti-Cancer Agents | Medicinal Chemistry | Chemical Biology | G-Quadruplex | Small Molecule Ligand | Novel Chemical Synthesis | G-Quadruplex Ligands

ASDRP Summer 2021 Symposium Expo

August 21, 2021 - 10:00 AM - 1:00 PM (PDT)

Department	Field of Research	Expo Group Number	Research Group	Title	Abstract	Authors	Keywords
Computer Science and Engineering	Robotics / Machine Learning	85	Downing	Preliminary Development for a Tactile Feedback Loop for Universal Robots UR5 Robotic Arm Equipped with RobotIQ 2F-85 Gripper	Universal Robots is a startup that creates robotic arms with a wide range of applications. Research conducted has focused on combining the automatic capabilities of these robots with artificial intelligence and computer vision to enable these robots to dynamically adapt to differing conditions and load demands. Preliminary research and experimentation with the robotic arm were conducted to gain knowledge of the robot's capabilities. The robot was used to write characters on a whiteboard, where the goal was to guide the robot to a dry erase marker where it would write text given by the user. Initially, the issues of greatest concern were a lack of knowledge of the robot's functionality and the programming interface. As these became more familiar, the challenges were related to the robot environment, such as placement of the whiteboard and eraser in order to reduce collisions. The culmination of this preliminary research has successfully resulted in a program that can write any five-letter word on the whiteboard. With preliminary research complete, research will now move towards integrating computer vision and creating a tactile feedback loop to identify objects and handle them according to their structural integrity.	Mallika Agrawal Rushil Dileep Kaveer Gera Kaushik Muthukrishnan	Tactile Feedback Loop | Computer Vision, Universal Robots | Robotiq | Robotic Arm | Gripper | Artificial Intelligence | Robotics