ANIMAL SCIENCES

AN.01 : Uma Nagella
Outside mentor or Research Institution--see Form 1C

The Effect of Caffeine on Neurodegeneration in Drosophila melanogaster
This project explores the effects that caffeine has on Drosophila neurodegenerative mutants by testing lifespan and motor function over time.

AN.02 : Nina A Hayes and Amy E. Kimel
Comparing Planaria, Hydra, & Daphnia as Models For Toxicology Studies
Determine which organism (Planaria, Hydra, or Daphnia) provide a more sensitive test of a substances toxicity by comparing the median lethal dose, reproduction, & acute immobilization for each organism against several substances.

AN.03 : Jake Agranovich and Jonathan Mathew
Screening For Novel Compounds That Decrease Parasitic Nematode Fecundity
Using a free-living nematode (C.elegans) to model its parasitic nematode cousin, expose free living worm to various concentrations of novel compounds (St. John Worts, Ginkgo Biloba, and Echinacea Purpurea) & measure number of viable eggs & fecundity

AN.05 : Audrey Gang
Outside mentor or Research Institution--see Form 1C

Immune modulation by hair follicle stem cells during wound healing
During wound healing, hair follicle stem cells (HFSCs) repairing the damaged skin may be exposed to inflammation that could damage to them. The study explored how CD80 orchestrates regulatory T cells to protect HFSCs during tissue regeneration.

AN.06 : Mirika Jambudi
Outside mentor or Research Institution--see Form 1C

Interleukin-33 expression is upregulated in colon stem cells after irradiation
The project studied the role of Interleukin-33, a pleiotropic cytokine involved with intestinal immunity, following TBI intestinal damage. It characterized the colonic stem cell compartment, and developed a whole-mount immunofluorescence method.

AN.07 : Harrison Phillips
Outside mentor or Research Institution--see Form 1C

Effects of Sex on the Dental Asymmetry of Papio Hamadryas
The purpose of studying the hamadryas baboon in this project is to identify certain markers for excess stress when comparing males to females. This can be accomplished by measuring the dental asymmetry of each individual and then comparing the resul

AN.08 : Gillian Barcus and Dylan Cochin
The Addiction Potential of Bread and Cheese
Determine if casomorphin or gluteomorphin, biologically active opioid peptides found in bread and cheese, can potentially be addictive, cause withdrawal symptoms, display sensitization, tolerance, or cross sensitization with nicotine.

AN.09 : Jeffrey Ho
Outside mentor or Research Institution--see Form 1C

Exploring E-Cigarette Condensate Toxicity of Menthol and Nicotine in PCLS
My research aimed to contextualize the damage done to the lung when a smoker transitions to vaping. This research can inform health policies regarding e-cigarettes accessibility, and further inform health-protective behaviors in individuals.

AN.10 : Saule Juskelyte
Outside mentor or Research Institution--see Form 1C

Comparison of Baits for the Capture of Invasive Rusty Crayfish
This project investigated the effectiveness of various baits in capturing crayfish in the Mianus River watersheds at Westmoreland sanctuary, for the purpose of removing invasive rusty crayfish.

AN.11 : Aastha Shukla
Temperature Effect on DNA Methylation & Photoperiod on Nasonia Diapause
Determine if increasing temperature influences the effect that DNA methylation or altered photoperiod has on Nasonia diapause as well as gender ratio and eye color by mating Nasonia under varying conditions and comparing results of offspring

AN.12 : Samantha Lazar and Juliet Cohen
Escape Behavior of Wood Ants - Selfish or Unselfish?
Determine the strategy wood ants use & time ants take to escape single exit & multi exit rooms under stress from wolf spiders or citronella, tested by measuring time intervals between escapees & number of ants exiting different exits, & escape order

BIOMEDICAL ENGINEERING

BE.01 : Jaesuck Park
Forward Head Posture Correction Through Real-time CVA monitorization, Supplementing OpenCV
> Forward head posture is one of the most common symptoms to students and workers. I have created a device and a vibration motor for the Arduino to alarm the user and monitoring real time device, using the OpenCV to strengthen the experiment's data.

BE.02 : Ambika Polavarapu
Outside mentor or Research Institution--see Form 1C

Exploratory and Control Study of Endolysosomal Pathway in Alzheimers Disease
> This project analyzed how proteins are trafficked through the endolysosomal pathway and how pathway dysfunction may be a risk factor for Alzheimers Disease through image analysis

BE.04 : Allison Kwak
Investigating the Sitting Posture Correction Effect of the Smart Chair
> With many commercial products on the market for the correction of sitting posture, it is unclear whether there is any medical effect. This experiment uses the Balance Feedback System (BFS) to see if the user's sitting posture could be improved.

BE.05 : Jonathan Slohoda
Novel trans-tibial prostheses with 3D-printed honeycomb and trabecular structures.
> Utilizing 3D printing to integrate natural structures like trabeculae, honeycomb, and model bursae to redesign traditional prostheses. The device is proposed to improve heat diffusion, airflow, and strength, while lowering cost, friction, and weight

BE.06 : Yuxuan Tian
Design of oxygen-carrying autonomous following vehicle for pulmonary rehabilitation
> My study aim to build a smart car based on Arduino that could bring the oxygen tank following patients, control oxygen output and inspect the patient condition.

BE.07 : Sahasra Pokkunuri
Outside mentor or Research Institution--see Form 1C

Improving Psychological resilience to acute stress and anxiety : A Non-Invasive solution to attain sympathovagal balance using novel neuro-cardiac biomarkers
> Exploring the possibility of using heartbeat evoked potential and heart rate variability as neuro-cardic biomarkers to predict the activation of sympathetic nervous system and triggering parasympathetic nervous system to combat chronic stress.

BIOINFORMATICS and COMPUTATIONAL BIOLOGY

BF.01 : Ishir V Rao
Modeling and Optimization of Epidemiological Control Policies through Reinforcement Learning
Public health strategies for SEIRD epidemic model are optimized using deep reinforcement learning algorithm. Results show benefits of three unique strategies across four levels of restrictions (lockdowns, etc.) balancing economy & infection rates.

BF.02 : Ryan Samuel Park
CONTINUATION

ARIEL: Adversarial Neural Evolution for Viral Mutation Prediction and Proactive Therapeutic Design
A novel computational approach to forecasting viral mutations, and designing protein drugs that can combat those predicted mutations.

BF.04 : Mihir Rao
Novel Local Radiomic Bayesian Classifiers for Non-Invasive Prediction of MGMT Methylation Status in Glioblastoma
Developed a novel local radiomic Bayesian classification approach to detect DNA-level glioblastoma gene methylation from raw 3D tumor tissue mpMRI voxel-intensities; stable and accurate non-invasive statistical alternative to surgical biopsies.

BF.05 : Catherine Feng
Outside mentor or Research Institution--see Form 1C

Machine Learning Algorithms for Analyzing Multicategory Cancer Outcomes
Using multiple metrics and clinical & transcriptomic data from the TCGA database to optimize Random Forest and Multinomial Logistic Regression models to predict 4 category survival outcomes of cancer patients and help design personalized treatments

BF.06 : Isha Gangavaram
Outside mentor or Research Institution--see Form 1C

Automatic Iceball Segmentation during MRI-guided Focal Cryoablation for Prostate Cancer
AI-based automatic iceball segmentation software to monitor the iceball growth during cryoablation. Custom automatic segmentation software was implemented in Python with imaging machine-learning frameworks. Utilized 3D Slicer, open source software.

BF.07 : Brian Fei-Perng Wang
Outside mentor or Research Institution--see Form 1C

Interactive Data Visualizations for Addressing Public Health Issue of Obesity
This project is to create an interactive data visualization app that presents US obesity trend using CDC health data for use by different audiences such as policymakers and anyone who may not have the time/resources to analyze the data themselves.

BF.08 : Zack Sun
Detection of Covid-19 Symptons using Neural Network on Medical Radiographs
This project was created during the height of the Covid-19 pandemic. The goal of this project is to create a reliable machine learning algorithm that can vastly acclerate the process of identifying Covid-19 patients.

BF.09 : Saaz Mahadkar
Predicting Movement and Behavior of Huttons Shearwater
> Traditionally TDR monitors have been used to record the diving behavior of birds. My project deals with forecasting movement and predicting behavior, eliminating the use of TDRs, making this data more accessible to researchers and conservationists.

BF.10 : Jolene Wang
Outside mentor or Research Institution--see Form 1C

Predicting Late-Stage Progression of Knee Osteoarthritis Using Deep Learning Technology
> My project is on predicting knee osteoarthritis progression from Kellgren Lawrence Grade 3 to 4 in one year using deep learning technology. Patients cartilage thickness/volume readings from MRI images and their clinical data are used as predictors

BF.11 : Priya Patel
Outside mentor or Research Institution--see Form 1C

Novel Machine Learning Approach to Isolate the Impact of Political Discourse on COVID-19 Vaccination Hesitancy
> This project studies the correlation between COVID-19 vaccination rates and political parties, in particular human behavior and demographics (with public datasets). The methodology used advanced machine learning techniques and statistical analyses.

BF.12 : Elliott Yoon
Predicting Alzheimer s Disease Using Convolutional Extreme Gradient Boosting
> Alzheimer's Disease (AD) is a neurodegenerative disorder and is the most common cause of dementia. Early detection of AD is key to preventing cognitive decline and improving the efficacy of treatments. Because of this, many researchers have successf

BF.13 : Nathan Zhang
Outside mentor or Research Institution--see Form 1C

Predicting Diabetic Retinopathy Using Machine Learning
> This project aimed to analyze the National Health and Nutrition Examination Survey and to develop the best machine learning model to predict the disease.

BF.14 : Oran S. Goodman
Outside mentor or Research Institution--see Form 1C

RE-Finder: Predicting Site Specitivity of Restriction Enzymes Using NLP
> In RE-Finder, Natural Language Processing techniques were applied to restriction enzyme data to learn the relationship between restriction enzyme protein sequences and enzyme sites with the goal of predicting the site-specificity of new enzymes.

BF.15 : Ria Bhavaraju
Outside mentor or Research Institution--see Form 1C

Diagnosing Parkinsons disease based on Clinical Data using 5 machine learning models
> The project used 5 machine learning models: Decision tree, SVM, KNN, Logistic Regression, and Random Forest in order to diagnose Parkinsons patients based on clinical data from the Michael J. Fox Parkinsons disease.

BF.16 : Evan Wen
Outside mentor or Research Institution--see Form 1C

Interpretable Automated Diagnosis of Retinal Disease Using Deep OCT Analysis
30 million Optical Coherence Tomography (OCT) imaging tests are issued every year to diagnose various retinal diseases, but accurate diagnosis of OCT scans requires trained ophthalmologists who are still prone to making errors. With better systems f

BF.17 : Angris Krishnamurthy
Mu Variant Predictive Model 2021
My project goal is to develop an algorithm that can predict future trends of the current mu variant such as the number of death cases per day, the number of hospitalizations per day, and the infection rate in an area.

BF.18 : Maxwell Chen
Deciphering Imagined Speech from Brainwaves with Deep Learning Models
All thinking produces brainwaves, but how brainwaves relate to thoughts is unsolved. Here, deep learning classifiers are used to identify words from the brainwave signals they produce for significant medical and technological use

BF.19 : Edward Sun
Outside mentor or Research Institution--see Form 1C

Application of Machine Learning in Predicting Molecular Properties
Using two different neural network models, the molecular properties of various organic compounds, such as their melting points, were analyzed and predicted.

BEHAVIORAL SCIENCE

BS.01 : Jenny Ye and Natalie Yum

Effect of Sleep Duration on Dream Qualities

In this study, the duration of sleep will be recorded and measured with questionnaires to observe how different amounts of sleep affect dreams in terms of emotional intensity, distress involved, and bizarreness.

BS.02 : Emily Hickey

Effect of Pandemic Induced Screen time Increases on Student Performance

Students will be surveyed regarding screen time use and about their educational experience before, during and after lock down. Results will be analyzed; correlations between screen time, motivation, and grades will be investigated.

BS.03 : Elliott Seo and William Lee

Effects of Sound Frequency and Music Sentiment on Mental Cognition

The objective of this study is to evaluate the degree and direction to which memory, attention, and emotional response are affected by binaural beat exposure and certain genres of music.

BS.04 : Julia Yi and Olivia Chen

Understanding Inequality of Mental Health of US Adults During the Covid-19 Pandemic

The social and economic effects of the pandemic is comparable only to the crash of the Great Depression. Many people experienced anxiety, depression, confusion, and stress. This study uses the Household Pulse Survey conducted by the U.S Census Burea

BS.05 : Tara Mahon

Technology Inflicting Restlessness Deriving from Boredom

The modern usage of technology and its implication of restlessness, derived from the emotion of boredom frequently being alleviated with technology use. Further Examining relationships of habit to determine satiation levels of technology.

BS.06 : Arya Shah

Biometric Changes In Musicians vs. Non-musicians During Auditory Meditation Sessions

The study aims to compare pulse and respiratory rate changes during auditory Aum and white noise sessions for musicians and non-musicians using paired t-tests, and discover the correlation between musical expertise and those biometric changes.

BS.07 : Krishna Bhatt

Role of education on climate change awareness and pledge

I will be using a survey to analyze pledges to climate change and opinions of climate change after exposure to climate-change awareness within the academic curriculum. I will collect results from students that are from my high school.

BS.08 : Aiden Wang
Outside mentor or Research Institution--see Form 1C

Review Of Influence Of Sleep Deprivation On Adolescents Academic Performance

A review-based research that examines the need for sleep in adolescent brain development, issues of sleep deprivation, and how SD affects the academic performance of adolescents. Did not involve human or animal sub and bio or hazardous materials.

BS.09 :   Samantha Gavina

Emotional Perception Analysis Using Audio and Visual Cues While Masked
> Analysis of the relationship between auditory and visual cues with emotional recognition accompanied by the usage of masks. A correlation study will investigate how auditory and visual cues may affect how individuals perceive masked emotions.

BS.10 :   Sarah M. Pajaro
> **CONTINUATION**

The Relationship Between Clinical Burnout and Appreciation Among School Nurses
> Identifying the relationship between the presence of clinical burnout and frequency of appreciation received by administration, colleagues, and patients, among school nurses compared to nurses in hospitals.

BIOSTATISTICS

BT.01 : Xinyue Fan
Outside mentor or Research Institution--see Form 1C

The Identification of Novel Targets to Upregulate MHC-1 Molecules
Dysregulation of MHC-I pathways is a major immune evasion mechanism for cancer cells. This project aims to identify molecules that regulate MHC-I-signaling and to provide new targets to overcome intrinsic immunotherapy resistance in cervical cancer.

BT.02 : Julia Chen
Machine Learning and its role in breast cancer detection.
Is the IGSAGAW-CSSVM model or RS-SVM model more accurate with a lower misclassification cost for the future of breast cancer diagnosis?

BT.03 : Nicholas Yoo
Outside mentor or Research Institution--see Form 1C

Analysis of Gene Expression Between Alzheimer s Disease and Normal Cell in Entorhinal Cortex
Purpose of research was to analyze differential gene expression between specific cell types in the entorhinal cortex and identify differences between normal and Alzheimers Disease cells. Statistical theory and math principles were used.

BT.04 : Param Malik
Identification of Novel Prognostic Biomarkers for Metastatic Glioblastoma Multiforme (GBM)
Gene expression datasets of GBM were obtained from TCGA, and somatic mutations noted with highest frequency among observed patients files were analyzed for oncogenic capacity, metastatic contribution, and potential for prognostic signature.

BT.05 : Andy Zhao
Outside mentor or Research Institution--see Form 1C

Molecular Mechanism of EGFR-TKI Resistance in Human Lung Cancer Cells
Both whole transcriptome RNA sequencing and piRNA chip screening were employed to search for dysregulated signaling pathways responsible for the acquired resistance to osimertinib, the specific tyrosine kinase inhibitor in lung cancer cells.

BT.07 : Tamar Peleg
Outside mentor or Research Institution--see Form 1C

Lifespan expanding agents effect on skeletal morphology in genetically-diverse mice
Study measurements from micro-CT of femur mid-diaphysis, femur distal metaphysis, distal femur subchondral bone, and L5 vertebra from genetically diverse female and male mice using statistical and data analysis tools for skeletal morphology impact.

BT.08 : Atharva Atul Kulkarni
Outside mentor or Research Institution--see Form 1C

Biomarker prediction for metastatic breast cancer using Genome sequencing data
Computational analysis of breast cancer gene sequencing data to predict: Gene mutational pattern in early/late tumor recurrence. Functional mapping of early recurrence biomarkers. Clinical significance and therapeutic exploitation of biomarkers

BT.10 :   Siyuan Bao
Outside mentor or Research Institution--see Form 1C

Physiologically Based Serum Ferritin Thresholds for Iron Deficiency in Adults
By correlating serum ferritin with physiological markers (hemoglobin, sTfR, ZPP, etc.), the study aims to establish sensitive serum ferritin cutoffs for iron deficiency in adults, by examining the blood iron status of 983 healthy NYC blood donors.

BT.11 :   Gael Gonzalez-DeLaLuz and Aliza Lopez
Outside mentor or Research Institution--see Form 1C

Analyzing Trauma Disorder Utilizing Human Postmortem Brain Transcriptomics
Merging differential gene expression/network analyses of postmortem brain tissue trauma, we identify transcriptomic changes in PTSD subjects brains (sexual, physical, military, or other trauma) & report marked sexual dimorphism in transcriptomes.

BT.12 :   Grace Hu
Examining the Correlation Between Mosquito Host-Attraction and Hosts Age
This project examines how significant of an impact hosts age may have on how attractive they appear to mosquitoes. This attraction was quantified as the number of people who were infected with mosquito-carried viruses in the U.S.

CELL BIOLOGY & MICROBIOLOGY

CB.01 :   Sean Woo
Outside mentor or Research Institution--see Form 1C

Homologous Histone Acetyltransferases KAT2A (GCN5) and KAT2B (PCAF) Roles in the Intestinal Epithelium
   Poly IC treatment will be used to stimulate KAT2DKO organoids and upregulate the interferon response. qPCR analysis will be performed. This will elucidate the effects of KAT2A and KAT2B in the intestinal epithelium.

CB.02 :   Jinsuh Kim and Nicole Golub
In Vivo Screening for Endogenous and Exogenous Antimicrobials in Caenorhabditis
   Infect C. elegans with bacteria to stimulate immune response. Extract immune substances & assay against Gram - & Gram + bacteria. Infect C. elegans and introduce unique compounds with potential antimicrobial activity to C. elegans & measure lifespan

CB.03 :   Luke Mosca
Outside mentor or Research Institution--see Form 1C

Investigating Candidate Genes for Multiple Sclerosis: A Bioinformatics Analysis
   This study utilized an integrative genomics and systems biology approach to examine gene correlates of HLA-DRB1, the strongest genetic risk factor for multiple sclerosis, which were then narrowed and analyzed by open source databases.

CB.04 :   Aaryan Pugazendhi
Outside mentor or Research Institution--see Form 1C

Nitric Oxide Modulates Fungal-Mediated Macrophage Metabolic Stress
   This project examines nitric oxide overproduction in macrophage activation and inflammatory disorders, ranging from asthma to Alzheimer's disease. We identified a successful inhibitor of NO synthase, providing a therapeutic target for said disorders

CB.05 :   Subin Pyo
Outside mentor or Research Institution--see Form 1C

Nutrigenomic program of intestinal stem cell in pediatric development and IBD
   This project investigates whether and how the nutrigenomic program regulates Intestinal stem cell activity in pediatric development and Inflammatory bowel disease.

CB.06 :   Rhea Raghu
Outside mentor or Research Institution--see Form 1C

Overexpression of ERAP2N in Human Trophoblast Cells Promotes Cell Death
   Genes like ERAP2N are regulated to ensure a healthy pregnancy. However, ERAP2N expression kills trophoblast cells by immune cells. To understand this, differentially expressed genes were surveyed to elucidate these cell death promoting mechanisms.

CB.08 :   Erin McCarty and Jolie Lefkowitz
TMV Infected & Non Infected Plant Phytochemical Extracts as Antimicrobials
   Comparing TMV infected and non-infected tomato & pinto bean plant phytochemical extracts for antimicrobial properties against viruses, fungi & Gram positive & Gram-negative bacteria.

CB.09 : Lucy Zhao
Outside mentor or Research Institution--see Form 1C

Alzheimer and its related SNPs and genes

This study organize the major SNPs and genes that are potentially related to the occurrence of GD in humans. This study has located the genes that are related to those SNPs and closely examines a selected sample.

CHEMISTRY

CH.01 :   Marco D. Marples
Encapsulation by Adsorption in Superabsorbent Polymers
Hydrated Sodium Polyacrylate samples containing an organic compound that will be treated with a concentrated salt solution causing ion adsorption creating a two-phased solid capable of delivering water soluble components.

CH.02 :   Katie Koo
Outside mentor or Research Institution--see Form 1C

Developing a Biodegradable Packaging Material Using Banana Peel Plastic
Polystyrene has become increasingly detrimental to the environment. The goal of the research done was to modify existing procedures to create banana peel based bioplastic and develop a biodegradable packaging material that can replace polystyrene.

CH.03 :   Jeffrey Xu
Outside mentor or Research Institution--see Form 1C

Maximizing the Peptide Peak Intensities of Microdroplet Digestion with Nanoscale Mass Spectrometry
This project seeks to analyze and optimize the enzymatic digestion of proteins in micronsized droplets (microdroplets) via electrospray mass spectrometry techniques for protein sequencing and analysis in the bottom-up proteomics approach.

CH.05 :   Jeffrey De Leon Vaca
Determining the Effectiveness of Anti-Icing Salt Solutions on Roads Surfaces
Salt brines will be made with varying pH leveled salts testing the effectiveness of anti-icing roads. The salt brines will be tested using the shaker method and data will be collected using a statistical test to compare the effectiveness of each one

CH.06 :   Zhijian Mao
Outside mentor or Research Institution--see Form 1C

Ultrathin carbon encapsulating PtFe on N-doped CNTs for methanol electrooxidation
A robust ultrathin-layer N-doped carbon or graphene encapsulating PtFe nanoparticles/N-doped CNTs (PtFe@NCNT-P) electrocatalyst has been developed by plasma-enhanced chemical vapor deposition (PECVD) to satisfy the demands for efficient MOR.

CH.07 :   Gordon Sun
Outside mentor or Research Institution--see Form 1C

Evaluation on degradation of PET, PBT, and PTT Polymers by an Engineered Leaf Branch Compost Cutinase
The project extrapolates the use of a PET hydrolase enzyme (LCC) to the PTT and PBT polymers in order to test enzymatic degradation. After applying the enzyme, the results were simulated and modeled to predict degradation results for each polymer.

CH.08 :   Muhil Thendral
Outside mentor or Research Institution--see Form 1C

Water purification with heavy metal removal using endemic plants
The goal of the project is to achieve a methodology for purification of water with heavy metal removal at low cost using endemic plants so that people living under the poverty line in developing countries can readily use it with little to no cost.

COMPUTER SCIENCE

CS.01 : Willy Chan
The Effect of Different Moral Frameworks on Reinforcement Learning Behavior and Performance within Serious Games
>This project studies a Serious Game in which an ambulance decides between which patients to save. The simulation is played by different reinforcement learning agents to assess the quantitative impacts of different ethical frameworks on AI behavior.

CS.02 : Tejas Khare
Outside mentor or Research Institution--see Form 1C

Using Machine Learning for Integrated Data Analysis of Fusion Diagnostics
>We introduce machine learning models using normalizing flows for rapidly inferencing plasma characteristics (neutral density) from Lyman-alpha emission data in tokamaks, to increase computational efficiency and better understand fusion plasmas

CS.03 : Jack Madigan Grbic
The Use of Artificial Intelligence Algorithms to Design Novel Architectural Structures
>AI used a prompt to design images of a new parking garage from real world images which were used to generate alternate views that created a 3d model of the structure.

CS.04 : Prathamesh Mitesh Trivedi
Outside mentor or Research Institution--see Form 1C

Increasing the Effectiveness of Image Transformers in Computer Vision
>This project aims to determine a way to reduce the amount of operations that image transformers use, so as to aid in its widespread use in the field of computer vision, which is as of yet unrealized due to the required computational resources.

CS.05 : Anthony Zhai and Suchisrit Gangopadhyay
Outside mentor or Research Institution--see Form 1C

CGBNet: A Deep Learning Framework for Compost Classification
>CGBNet is a deep learning framework that utilizes computer vision to automate the process of composting by classifying between carbon-rich (brown) and nitrogen-rich (green) compost materials to help construct a successful compost pile.

CS.06 : Damien Ko
Speed and Error Rate of Quantum Computing vs. Classical Computing
>Quantum Mechanics is based on the foundation of uncertainty and harnessing it. Most of the studies within the field are derived from the principle of Superposition. I will utilize this aspect into computer processing through Python.

CS.07 : Andy Xu
Outside mentor or Research Institution--see Form 1C

VAPOR: A Novel Approach to Energy Forecasting in a Microgrid
>VAPOP uses a novel machine learning architecture called a liquid neural network to forecast energy supply and demand values within a photovoltaic microgrid. VAPOR helps reduce carbon emissions and improve the feasibility of renewable energy.

CS.08 :   Yunsung Lee and Akul Sethi
Using Recurrent Neural Networks to Compare Political Bias in Media
> Comparing & using long short-term memory (LSTM) & gated recurrent units (GRU) neural networks to quantify political bias in entire articles of Wikipedia, other encyclopedias, and the media to determine the extent of media bias.

CS.09 :   Elaina Mann
Spiked Region-Based Convolution Neural Network in Object Detection
> Evaluating the Efficacy and Energy Efficiency of a Spiked Region-Based Convolution Neural Network in Object Detection

CS.10 :   Lawrence Han
Outside mentor or Research Institution--see Form 1C

Is this news real? Fight fake news with deep learning NLP
> Fake news is a big issue. We studied how to best use state-of-the-art deep learning models BERT in NLP to capture the characteristics of linguistic behaviors pertinent in any given news article to build an effective fake news detector.

CS.11 :   Stephen Andrews
Automatic Speed Tracking Tool for Amateur Sports
> Speed is an important factor in goal scoring in sports like soccer. In my project I create a tool that automatically tracks players movement from video frames, providing an inexpensive way for youth or amateur athletes to track their performance.

CS.12 :   Shikhar Ahuja and Aarush Gupta
Parametric Variational Linear Units (PVLUs) in Deep Convolutional Networks
> In this research, we aim to improve deep convolutional neural networks used in computer vision tasks. By modifying activation functions, a fundamental component of neural networks, we improve state-of-the-art image recognition models.

CS.13 :   Ryan Rana
Outside mentor or Research Institution--see Form 1C

Around-The-Pipe Audio Based Water Tracker for Home Residents
> A device that uses machine learning to analyze sounds of water flow to produce an estimation for the amount of water flowing through various pipes in a household.

CS.14 :   Erik Lee
Outside mentor or Research Institution--see Form 1C

AI in education: application of dimensionality reduction algorithms for identifying interdisciplinary topics
> By analyzing the 2-dimensional visualization of related sections in college science textbooks, the project aimed to measure and visualize the interrelatedness between STEM topics through two different dimensionality reduction algorithms.

CS.15 :   Jacob Winick
Outside mentor or Research Institution--see Form 1C

Utilizing CNNs to Detect Gravitational Waves Amongst Various Noise Types
> The use of a CNN in order to distinguish the presence of a gravitational from different types of noise including newtonian, quantum and seismic noise.

CS.16 : Youhao Steve Wang
Outside mentor or Research Institution--see Form 1C

A Quantum Optimization Algorithm for Single Machine Total Weighted Tardiness Minimization
To solve the single machine total weighted tardiness minimization problem, a quantum optimization algorithm is proposed to make the desired constrained optimum solution to be measured with the highest probability.

CS.17 : Amogh Joshi
Outside mentor or Research Institution--see Form 1C

Detecting Weapons from Live Video Feeds using Deep Learning Methods
Detection of weapons and similarly handled objects from live video using deep learning methods (namely feature pyramid networks, multi-scale detection), assessment of my trained models using standard metrics, and computational optimization.

CS.18 : Aashika Jagadeesh
Outside mentor or Research Institution--see Form 1C

Combating Bias Amplification in Degenerate Feedback Loops With Bayesian Choice Models
I compared the effects of content-based filtering approaches and Bayesian choice models in their abilities to propagate bias in recommendation systems. This was done through deep learning techniques. Statistical analyses were conducted on results.

CS.19 : Zayn Rekhi
SufaceNet: Planetary surface segmentation via deep learning.
SurfaceNet proposes a deep learning approach to the segmentation of planetary surfaces. It uses a deep convolutional neural network coupled with Makrov Random Fields to produce accurate segmentations.

CS.20 : Alexandra Yanowitz
Outside mentor or Research Institution--see Form 1C

Exploring scenario-based need for EV Charging Locations in New Jersey using ILIT Location Analysis Model.
​​I identified the areas suitable for Electric Vehicle charging stations falling under qualified opportunity zones in Environmental Justice Communities of NJ and identified residential EV charging needs using the Regional EV Charging ILIT.

ENGINEERING

EN.01 :   GEONHUN LEE
Outside mentor or Research Institution--see Form 1C

Design of Emergency Evacuation Guide System in School Building Using Data Transmission in Audible Frequency Range with BFSK Method
> This study tries to design an emergency evacuation guidance system in the school building using audible band data transmission with the Frequency Shift Keying Modulation method, helping control the guide lamp.

EN.02 :   Aryan Gupta and Shristhi Sharma
Outside mentor or Research Institution--see Form 1C

Geoengineering Aircraft Engines with High-Sulfur Fuels for Stratospheric Aerosol Injection
> We will test various mixtures of sulfur based compounds with jet fuels and measure sulfur output vs thrust in a micro jet engine for a potential Stratospheric Aerosol Injection Aircraft Engine for Geoengineering.

EN.03 :   Derek Jeon Myung
Outside mentor or Research Institution--see Form 1C

Creating an Automated Spectrophotometer Using Dual Arduino Microcontroller
> Creating a spectrophotometer with dual Arduino microcontrollers opens the possiblity of low-cost assembling procedures which grants more STEM labs and my peers accessibility for spectrophotometers.

EN.04 :   Chase Spiegler
The Effect of Straws on Bottle Rocket Ascent Time
> Previous studies used a wind tunnel to suggest that wrapping straws around the exterior of a bottle rocket can increase airflow and decrease drag. This study analyzes the impact of straws on a bottle rockets aerodynamic efficiency when launched.

EN.05 :   Nathanael Gunawan
Outside mentor or Research Institution--see Form 1C

Novel magnetic levitation train using triple-dipole-line track system
> I investigated a model prototype of a magnetic levitation system that uses graphite rods and a triple-dipole-line magnet track. Through several physics and engineering optimizations the system can serve as a future energy-efficient transportation.

EN.06 :   Kathy Zhang
Outside mentor or Research Institution--see Form 1C

Low-Cost Autonomous Octopus-like Swimming Robot for Debris and Danger Mapping During Floodings and Underground Construction
> A swimming robot that detects ground to aid people traversing in flooding areas or to measure lake map.

EN.07 :   Samhita Pokkunuri
Outside mentor or Research Institution--see Form 1C

Real-Time 3D Human Tracking and Pose Construction Using Millimeter-Wave Radar System
> Deviceless human recognition offers excellent potential for human-machine applications in healthcare and intelligent environments. This study explores the use of a portable mmWave device to construct human poses accurately in real-time.

EARTH & ENVIRONMENTAL SCIENCES

EV.01 : Prisha Malik
Outside mentor or Research Institution--see Form 1C

Examination of Insulational qualities of Mycelium fungi inoculated into natural materials
Fiberglass, results in mass pollution, causing environmentally friendly houses to not be environmentally friendly at all. In this project I injected mycelium into sawdust and straw and compared both of their insulational capabilities.

EV.02 : Saachi Kuthari
Outside mentor or Research Institution--see Form 1C

Inactivation of MS2 Bacteriophage for Water Disinfection via Microwave Irradiation
In order to devise a functional disinfection and microbial removal system, the surrogate virus MS2 bacteriophage was selected to test the efficacy of catalyst-enhanced microwave-assisted water disinfection technology.

EV.03 : Kaitlyn Stearn
Outside mentor or Research Institution--see Form 1C

Analyzing Insect Activity on Native and Invasive Plants
In order to understand how 2 sets of native and invasive plant counterparts affect the ecosystem, the insect richness and evenness that each hosted were compared to see which had the potential to support the most life.

EV.04 : Nupur Ballal
Outside mentor or Research Institution--see Form 1C

Genetic Barcoding as a Detection Method for Harmful Algae Blooms
The purpose of this study is to develop the use of genetic barcoding as an early detection method for Harmful Algae Blooms (HABs) to mitigate the environmental harm.

EV.05 : Trayee Jha
Environmental Influences on Mosquito Biocontrol
Comparing mosquito population sizes (percent dead per day) short & long-term containing DEET, dragonfly nymphs or mosquitos alone and combinations with dragonfly nymphs & detergent or fertilizer or damselfly nymphs or cyclops, or DEET with mosquitos

EV.06 : Rohan Deep Sarkar
Outside mentor or Research Institution--see Form 1C

Metals in wild rice consumed by indigenous tribes in copper mining impacted areas in Upper Peninsula (UP), Michigan
Wild rice grown in metals-contaminated sediments is of dietary and cultural importance to the Native American population in UP. I studied uptake of metals by rice plants from the sediments and pore water and assessed the ensuing human health risk.

EV.07 : Alana Kimball and Hannah Nadel
Impact of Living Walls on Indoor Environmental Factors
Growing English Ivy, Boston Ivy, or Lichen on outside walls of different self made model homes & measuring indoor temperature, CO_2, humidity, volatile organic compounds & noise levels after creating conditions to compare to homes without plants

MATHEMATICS

MA.01 : William Du
Construction of Magic Square of Squares Using Pythagorean Quadratic Triples
I first studied special triples made by quadratic residues modulo p, the construction methods, and enumeration of these triples. I then used the triples to construct magic squares of squares with different degrees.

MA.02 : Grace Yeeun Park and Joon Park
Outside mentor or Research Institution--see Form 1C

A Class of Prime-Free Integer Sequences with Polynomial Growth
We prove the existence of infinitely many pairs (t,d), where t and d are positive integers, with the property that the sequence with general term floor(n^t/d) contains no prime numbers.

MA.03 : Blake Kessler
Outside mentor or Research Institution--see Form 1C

Calculating the Educational Gini Coefficient for New Jersey Counties
A Gini coefficient was calculated to model the inequality in education funding for New Jersey school districts. This was used to assess if there is any significant inequality in how NJ schools are funded, and if that correlates with any stats.

MA.04 : Phillip K. Gao
Outside mentor or Research Institution--see Form 1C

Analysis of Impact of COVID-19 pandemic on local residential recycling rates in Somerset County NJ
-Study the impact of COVID-19 on local waste rates, e.g., residential recycling volume -Analyze the pre-and post COVID-19 volume change   -Run predictive statistical modeling to quantify the long term impact

PHYSICS & ASTRONOMY

PH.01 : Vincenzo Damato

Testing force transmission of multiple calibers through bulletproof vests.

Using high speed cameras and digital force sensors to test the amount and nature of the force transferred by a person who is shot while wearing a bulletproof vest.

PH.02 : Zara Yu

Outside mentor or Research Institution--see Form 1C

Many-Body Quantum State Control in the Presence of Environmental Noise

Cats can land on their feet when they fall and we consider a quantum version of a falling cat. Our model consists of a set of coupled harmonic oscillators where the oscillators eigen-frequencies and the couplings are time-dependent.

PH.03 : Peter Gomulka

The Antibubble Air Film as a Semipermeable   Membrane

The movement of anitubbles at different concentrations of sucrose solution will be studied. The change in density and movement of the antibubbles may reveal diffusion of water across the air film.

PH.04 : Dylan Liu-Walter

Novel Quinone-Based Deep Eutectic Solvent for Organic Flow Batteries

This research identified and investigated a novel class of organic redox-active solvents for high energy density flow batteries via molecular dynamics simulation.

PH.05 : Max Xiong

Outside mentor or Research Institution--see Form 1C

Supporting the Big Bang Theory with Cosmic Microwave Background Radiation Temperature Computations

Using quasar spectra, we can derive estimates for Cosmic Microwave Background Radiation temperatures. With this, we can see how temperatures evolve, the cooling rate, and how the universes expansion acceleration contributes to CMBR temperatures.

PH.06 : Henry Bushong

Outside mentor or Research Institution--see Form 1C

Computational Modeling of Astrophysics in the Formation of the Sun and Planets

Computational physics algorithms will be coded in C# to model proposed kinetic vortex and electromagnetic force-fields in the formation of our solar system and the planets, and translated to 4D space-time animations.

PLANT SCIENCES

PS.01 : Adarsh Patel
Relationship between Plant Growth Under Different Intensities of Artificial Light vs Sunlight
In this experiment plants grown under 4 different intensities of artificial light are comp ared to 2 control plants grown under sunlight. The results are then compared to understand which intensities and type of light is best for plant growth.

PS.02 : Jessica Ricco and Dara Viganola
The Effects of Different Antioxidants on Fruits
When apples and pears are cut and exposed to air the skin browns and the taste is altered. Many antioxidants (lemon juice, honey, coffee, hibiscus tea, and green tea) will be used to test their effectiveness in preventing this browning process.

PS.03 : Eric Wang
Outside mentor or Research Institution--see Form 1C

Effects of Various Soil Microbiomes on Native and Invasive Plants
This project uses soil collected from within and outside exclosures in the South Mountain Reservation to inoculate sterile soil. This transfers the resident microbiome and allows for analyses on how the microbiome affects native and invasive plants

PS.04 : Emily Cao and Tiffany Park
Hydroponics on Genovese Basil and Cherry Belle Radish Growth
Hydroponics has been popularized for requiring few resources. Testing these claims using root and non-root vegetables, Genovese basil & Cherry Belle radish growth was monitored over two months to compare hydroponics to traditional soil methods.

PS.05 : Katie Nguyen
CONTINUATION

Effect of Nutrient Applications on Hydroponically Grown Raphanus sativus Microgreens
Various nutrient applications will be applied to hydroponically grown Raphanus sativus microgreens and the calculated growth will be used to analyze the effects of the different nutrient applications on the controlled medium

PS.06 : Benjamin Carter and Anna Schicker
The effect of abiotic stressors on the organism tagetes
The goal of this project is to discover the effects of abiotic physical stressors on the marigold plant. We plan to determine this by testing a variety of stressors on multiple marigold plants, with multiple control subjects as well.

PS.07 : Luke Dargan and Maya Tate
Growing Substrates Effects on the Nutritional Value of Oyster Mushrooms
By conducting potassium and protein tests on mushrooms grown in different substrates, the substrate that boosts mushrooms nutritional value will be determined.

PS.09 : Abigail Kushman
Outside mentor or Research Institution--see Form 1C

The Phytoextraction of Rare Earth Elements from Cheever Mine Tailings Using Lolium Perenne
Utilizing rye grass to sequester Rare Earth Elements (REEs) from mine waste tailings. Microbial communities and the concentrations of REEs in the plant were identified and used to determine the translocation factor and process.