DKU 2025 Summer Research Scholars Approved Project Listing

- Read through the project descriptions, and identify any that are of interest. You are not restricted to only your major field. The summer research experience can be an important seed in developing your Signature Work project.
- Compensation this year for a full summer of research will be in the form of a 5,600 RMB stipend, a 6,200 RMB campus dining card that can be used throughout the 2024-25 academic year, and on-campus housing for students who are on campus.
- Directly contact the faculty member to discuss the research expectations; it is the supervising faculty member who nominates students for the position.
- Your initial contact with the faculty will be important in determining whether or not you will be considered for a position. Your email should be polite, professional, and concise. It should contain information that clearly shows your interest in the project as well as your capability in being a successful contributing participant.
- If nominated by a SRS mentor, you will need to provide the mentor with
    - your name, NetID, your major (if declared), whether you will require on-campus summer housing, and whether you expect to be remote or in-person.
    - a brief description written by the student describing the proposed project and his/her role in carrying out the work (250-500 words). This description must demonstrate the student's understanding of the research to be undertaken, explaining both the research question and the approach. It should be written in the student's own words and may include references if applicable.
    - a brief description written by the student of how the research will contribute to the student's signature work and/or future plans, if applicable (250 words maximum).
- After receiving the nominations, Academic Services will verify eligibility. Ineligible students include: students graduating in May, students who are on leave of absence, or will be on leave of absence in the fall, students who are taking summer course work at DKU or elsewhere, students who did not complete the requirements of previous funding, students who have summer funding from other sources, students who are not in good academic standing, students who will have completed eight or more semesters, or students with any other impediment to actively completing the SRS program.
- Academic Services will send out the confirmation letter, which will also contain program-wide expectations of participating students.
- Some projects have more than one student position available, and faculty with more than one project have some flexibility in how they allocate positions. Faculty are initially limited to supervising three or fewer positions, even if they have more than three projects approved.
- Pay attention to future listings, as there could be additional opportunities added if funding becomes available.

Project Title, Researcher, and email	Project Description
Antimicrobial Resistance in China: Implementing Awareness Campaigns **Annemieke van den Dool** **av196@duke.edu**	This research projects examines how various stakeholders in China implement public awareness campaigns on antimicrobial resistance (AMR) as part of China's national and provincial-level action plans on AMR. This project involves qualitative analysis of awareness campaigns by analyzing newspaper articles and social media posts. The selected student will design the research framework, collect and organize data, and support in conducting the analysis. Weekly meetings with and participation in my Policy Process Research Group will provide mentorship and a collaborative environment. This is an excellent opportunity for students interested in public policy, health policy, and communication. Due to the nature of the project, Chinese native language skills are required.
Policy making in China: A literature review of problem prioritization **Annemieke van den Dool** **av196@duke.edu**	This research project explores how problems gain sustained attention from policymakers in China, focusing on health and environmental legislation. This literature review will analyze English and Chinese journal articles and contribute to a book manuscript on policymaking in China. The student will design the research framework, collect and screen relevant articles, and apply qualitative content analysis. Weekly mentorship meetings and participation in Dr. Van den Dool's Policy Process Research Group provide a collaborative learning environment. This SRS position is a good fit students interested in public policy, governance, or Chinese studies. Because of the project's nature, native Chinese language skills are required.
Rural Lives, Queer Connections: A Study of MSM CBOs and HIV Interventions in Rural Yunnan **Andrew Wortham** **aw541@duke.edu**	Join us to conduct ethnographic research on HIV/AIDS prevention interventions with rural gay men in Yunnan, China. We will be surveying four prefecture level Community Based Organizations and interviewing rural queer people about their gender identities, health practices and differences with urban counterparts. Through this research we hope to provide important insights into a demographic of queer Chinese who are not typically represented but at greater risk of contracting and spreading HIV/AIDS. I am looking for a student who is studying public health, gender and sexuality or anthropology. They should be fluent in Chinese, with preferences to students familiar in southwest Chinese dialects, LGBT+friendly and good social skills. Priority would also be given to a student who is interested in turning this project into their signature work and would be willing to return with me for future fieldwork.
Biodiversity Restoration in Monoculture Plantations in Giant Panda Habitat **Binbin Li** **bl113@duke.edu**	This project aims to understand how the monoculture plantation Japanese Larch influences biodiversity over time, focusing on giant panda habitats. This project is supported by National Science Foundation of China. The candidate will be responsible for species identification from existing field data, data analysis and report writing. The candidate will learn to utilize remote sensing, field surveys, and cutting-edge modeling to contribute to conservation science. We seeking biology or environmental science majors with coursework in ecology or conservation. Prior experience with statistical software (R, Python) is preferred. Must have keen attention to detail for species ID from camera trap footage, strong analytical skills, and readiness for potential fieldwork. Commitment required through Summer 2024 with possible continuation into the 2024-2025 academic year for the preparation of publication and conference presentation.
Patterns and drivers of bird window collisions in China **Binbin Li** **bl113@duke.edu**	We invite applications for research positions focused on the investigation of bird-window collision incidents across Chinese urban landscapes. This critical research project, spanning from Fall 2024 to Spring 2025, seeks to discern collision trends and contributing environmental factors. Responsibilities include data cleansing, statistical analysis, GIS mapping, and preparation of an annual report scheduled for September 2025. Candidates should be currently enrolled in Environmental Science, Biology, Statistics, or a related discipline, demonstrating prerequisites in data analysis and GIS. Experience in ecological research and a commitment to wildlife conservation are preferred. The project outcomes may lead to further publication and presentation prospects. Eligible students are encouraged to apply for this opportunity to contribute to important avian conservation efforts and gain substantial experience in applied environmental research.

Project Title, Researcher, and email	Project Description
AI-Driven Multi-Agent World Simulation Game System **Bing Luo** **bl291@duke.edu**	Our project aims to develop a world simulation engine that combines Large Language Models (LLMs) with structured narrative game frameworks. We're designing a system that balances authored storytelling with player agency through a novel three-layer architecture: world state management, multi-agent NPC interactions, and dynamic player engagement. (following skills are preferred) 1. World State AI Developer/Researcher: -Develop core Finite State Machine architecture and narrative coherence systems; -Required: Strong ML background, experience with state management systems 2. Agent/Multi-Agent System Developer: -Create LLM-based NPC system and coordinate multiple AI agents; -Required: Experience with multi-agent frameworks, LLMs (API integration, prompt engineering), Python Students will use modern multi-agent LLM frameworks (LangGraph, MetaGPT). Outcomes include potential academic publications, open-sourced game demo, and hands-on experience with cutting-edge AI technology in gaming.
ChatDKU: a RAG-Agent AI Chatbot for DKU Community **Bing Luo** **bl291@duke.edu**	The ChatDKU project seeks motivated individuals to contribute to the ongoing development of an advanced AI assistant tailored for the DKU community. Utilizing state-of-the-art technologies such as Retrieval-Augmented Generation (RAG), AI agent and secure local hosting, ChatDKU delivers precise, context-specific assistance for students, faculty, and staff. Available roles include Agent Developer, Language Model Specialist, Quality Evaluation Specialist, Data Analyst, Backend/Frontend Developer, and DevOps Engineer. Applicants should possess strong programming skills and have completed at least one relevant course (e.g., COMPSCI 201). Participants will engage in a dynamic learning experience, refining their expertise in AI development, natural language processing, and system engineering. This project offers opportunities to contribute to academic research, potential publications, and real-world applications, significantly enhancing participants' academic and professional profiles.
The Solar System is a Mountain: A Chinese Monk's Vision of the Cosmos **Ben Van Overmeire** **bv43@duke.edu**	This project examines the Buddhist cosmology of Taixu (1890–1947), a pivotal figure in modern Chinese Buddhism. Taixu uniquely merged traditional Buddhist cosmological ideas, like the "world mountain" Sumeru, with modern astronomical insights, envisioning the solar system as a cosmic Sumeru. The study seeks to explore how Taixu reconciled science and Buddhism, focusing on an untranslated essay. This involves a collaborative translation project with two student researchers possessing expertise in Chinese Buddhism, literary Chinese, and basic astronomy. The outcomes will include an open-access translation, a co-authored academic article, and a contribution to the PI's book project. The project aligns with the interdisciplinary field of astroculture, addressing gaps in Buddhist perspectives on outer space and China's cultural contributions to space exploration. Students will gain hands-on research, translation, and critical thinking skills.
Developing a Deep Learning Model to Integrate Human Mobility and Digital Footprints for Climate Change Mitigation **Charles Chang** **cc672@duke.edu**	Human mobility plays a vital role in understanding behavioral patterns critical to societal well-being, for example, mitigating climate change, enhancing economic activities, and preventing epidemic outbreaks. Traditional methods of estimating human mobility, such as surveys, are often time-consuming and labor-intensive. In this project, I propose to develop novel models that can integrate human mobility and digital footprints, using Transformer and Graph-Neural-Network (GNN). My plan is to demonstrate that the Transformer and GNN models can significantly outperforms alternative machine learning approaches, including both traditionally feature-rich models and classic deep learning models. Moreover, they can also demonstrate strong flexibility and potential in downstream tasks, achieving high accuracy in different settings after fine-tuning with small samples. Students with strong background in computation are encouraged to apply.

Project Title, Researcher, and email	Project Description
The impact of human activities on the benthic community at Lianyungang coastal wetlands in northern Jiangsu **Chi yeung Choi** **cc798@duke.edu**	Using benthic community as the indicator of the health of intertidal wetland, we aim to evaluate the impact of tidal wetland destruction on benthic community at Lianyungang by quantifying the species diversity, abundance and biomass of benthic organisms during different destruction stages. The two research students will be responsible for the sorting, counting, measuring and identifying of the benthic organisms that will be collected in May 2025, as well as the data processing, analysis and write-up or the 4 years dataset. Students will gain valuable first-hand experiences in processing biological samples and handling relevant data. The process of identifying benthic organisms allows the student to learn taxonomical knowledge in zoology. These students will also be part of a team with proven success in grant application and publication, further enriching student's research experiences. Applicant should have a strong interest in ecology and have completed relevant course such as BIOL208
Confucian, Daoist and Buddhist Roots of Modern Governance for Happiness **Claudia Nisa** **cfn6@duke.edu**	There's a growing global interest in measuring and promoting happiness as a government objective. This modern concept seems to echo ancient philosophies by refocusing on the well-being of citizens rather than purely economic metrics. Yet, which principles influence a government aiming to promote happiness may depend on the specific interpretation of happiness and the mechanisms through which a government believes such happiness can be best facilitated. If happiness is understood as social harmony and moral education, Confucianism may be more influential. If it is individual freedom and alignment with the natural order, Taoism might be the main guide. If the emphasis is on the alleviation of suffering and mental well-being, Buddhism could have the greatest influence. Ultimately, governments may draw from all three philosophies to varying degrees, or not at all, and simply be based on modern conceptions of well-being and welfare from Psychology and Economics.
Taking the heat out of heat: Understanding mechanisms for psychological flourishing under high temperatures for climate resilience **Claudia Nisa** **cfn6@duke.edu**	Scientific debates about heat are now mostly linked to climate change. However, climate change has undermined the study of potential positive effects from warmer temperatures, and neglected potential cultural differences e.g., cultural groups originated from the Global South such as African Americans or Latinos typically associate heat with happiness and social gatherings. Research has stopped exploring positive aspects of the relationship between heat and well-being, and this perspective may be crucial for climate resilience. This project aims to explore and understand the complex nuances between heat and mental health, examining both protective and risk factors, at the biological, psychological and cultural level. It aims to understand the factors and mechanisms that may moderate the response to heat either a path towards anxiety, depression and psychosis, or toward a path of resilience, adaptation and – perhaps – even emotional flourishing.
Nutrient Transport between River and Groundwater: Implications for Coastal Eutrophication Control in the Yangtze River Delta **Chuanhui Gu** **cg294@duke.edu**	The tidal river serves as a vital nitrogen source for coastal areas, with interactions between the river and its bed significantly influencing nitrogen loads. This project focuses on understanding how river-groundwater interaction regulates nitrogen transport and transformation in a tidal river. By uncovering the mechanisms driving tide-influenced nitrogen dynamics, the research aims to establish a theoretical framework for protecting and managing tidal rivers. The findings will have important implications for scientific approaches to controlling coastal red tides and other non-point source pollution. The project seeks to quantify the effects of tidal dynamics on river-groundwater interaction and nitrogen retention in a coastal river. STEM majors who have completed BIOL 110 and CHEM 110 are especially encouraged to apply, with preference given to candidates with field or lab experience in chemistry or biology. Interested students should send their CV to Prof. Chuanhui

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Polarization-dependent Raman study of diamond film and the impact of NV centers **Changcheng Zheng** **cz145@duke.edu**	In this project, students will get hands on training on experimental physics, particularly, Raman spectroscopy. The planned study will be the measurement and analysis of polarization-dependent Raman spectrum of diamond films, which intends to investigate the impact of defects on the vibrational modes of diamond films. Students should have taken PHYS 201 or additional self-study is needed for carrying out this project.
Ethical Issues in Medical AI and Health Economics **Daniel Weissglass** **dew34@duke.edu**	This project will engage students in explorations of key contemporary issues in global health ethics. We will focus chiefly on ethical issues related to medical AI and those related to the measurement of health (i.e., the creation of metrics used for health economic analysis). There are no strict prerequisites or requirements, but priority will be given to students who: (1) Have a related major (e.g., global health, economics, ethics and leadership, etc.) (2) Have completed a course in Global Health Ethics or Bioethics (3) Have demonstrated skills in applied ethical analysis (4) Have other related course work.
Dual Regimes of Atmospheric Jet Variability and Eddy-Jet Interactions **Ding Ma** **dm452@duke.edu**	The dynamics of the atmospheric westerly jet streams -- fast flowing, narrow air currents located in the extratropical troposphere -- is a defining factor in shaping local climates and influencing daily weather patterns. The transport of heat and moisture across vast distances by these jets underpins much of the variability seen in mid-latitude weather systems. Groundbreaking studies have established that these jet streams are characterized by dual regimes, exhibiting distinct directional flows and strengths which significantly affect the development and trajectory of mid-latitude storms. However, the current understanding of how different climate regimes influence the jet variability remains tenuous, partly due to the chaotic nature of atmospheric eddies. The present study seeks to better understand the dynamical mechanisms governing jet variability using data analysis.
Generative Modeling in Curved Spaces **Dongmian Zou** **dz95@duke.edu**	Artificial Intelligence Generated Content has revolutionized the creation of data-driven outputs from language models to AI-generated images, driven by neural network techniques including transformers and diffusion. While these models have achieved remarkable successes in Euclidean spaces such as text and images, they can fail when dealing with data that inherently resides in non-Euclidean geometries. To address this, this project explores the adaptation of generative neural network architectures to curved geometries such as hyperbolic and spherical spaces. These spaces enable more accurate modeling of hierarchical structures and complex interactions, with a key focus on applications such as molecular generation. This project bridges the fields of AIGC, geometric deep learning, and scientific discovery and is suitable for students who are eager to explore math foundations and/or novel applications of machine learning.

Project Title, Researcher, and email	Project Description
Enhancing Cross-Species Compatibility in Organoid Cultures Through Protein Engineering **Eunyu Kim** **ek225@duke.edu**	Research Opportunity: Enhancing Cross-Species Compatibility in Organoid Cultures Interested in bioinformatics and molecular biology research? This project examines species-specific protein variations critical for organoid growth and aims to optimize culture conditions through protein engineering. What You'll Do: Analyze protein sequences with bioinformatics tools (e.g., Clustal Omega, ConSurf); Conduct phylogenetic analyses to identify conserved regions; Draft a manuscript summarizing findings. What You'll Gain: Experience in bioinformatics and molecular biology; Skills in data analysis and scientific writing; Preparation for advanced studies or research. Eligibility: Completion of BIOL 110 and BIOL 202; Interest in bioinformatics and molecular biology. Timeline: June–August: Sequence analysis, phylogenetics, and manuscript drafting; Join this exciting research experience and contribute to advancing organoid science!
Contaminants of Concern: Microplastics in environmental water bodies near DKU campus **Floyd Beckford** **fab25@duke.edu**	While images of the accumulation of plastics in our oceans and rivers captivate our attention, contamination from microplastics and nanoplastics are becoming a greater concern. These now-ubiquitous articles in the environment have adverse effects on human and animal life. They can transport other types of harmful pollutants on their surfaces and threaten biodiversity. The identification and quantification of microplastic particles in the environment is of high importance. This research project will investigate the nearby streams (water and sediment), for microplastic contamination. While this project will focus on the identification of the microplastic particles, a complete environmental analysis of the water/sediment sample will be carried out to establish whether there are intersecting pollutant presence. The student will be engaged with the project from design to execution. It is targeted at students who have an interest in environmental chemistry for their SW or major. CHEM 150
Synthesis and characterization of plant-derived nanoparticles of magnesium and manganese. **Floyd Beckford** **fab25@duke.edu**	With environmental concerns central to modern synthesis, attempts have been made to develop new methods for the synthesis of NPs. In particular NPs fabrication using plant extracts represents an eco-friendly way, utilizing naturally occurring secondary metabolites. This project seeks to investigate the green synthesis and characterization of magnesium and manganese NPs. The use of microwave-assisted synthesis of the NPs will be explored. Subsequent to synthesis the NPs will be extensively characterized to determine size and shape. The NPs will be incorporated into polyvinyl alcohol or chitosan polymers to generate new materials. These new materials will also be structurally analyzed including by infrared microscopy. Other potential areas of study include environmental applications such as pollutant removal from water or establishing/determining the anticancer and antimicrobial profiles of these nanoparticles. All work will involve undergraduate research assistants. Pre-req: CHEM 150.
Synthesis of fluorinated Re(I)-based organometallic releasing complexes for imaging and anticancer applications **Floyd Beckford** **fab25@duke.edu**	Cancer is among the leading causes of death worldwide. So, the design of new antitumor agents and the search for delivery vehicles for new and existing drugs is of paramount importance. The most attractive features of metallodrugs lie in their biological and chemical diversity, which is typically distinct from organic molecules. The use of rhenium as a scaffold for inorganic therapeutics is still in its infancy and one of the goals of my research is to develop new ligand systems that would allow for a wide range of rhenium(I) organometallic complexes to be investigated for diverse biological functions. It is well suited for students who have an interest in medicinal chemistry from the perspectives of chemistry and biology/molecular science. CHEM 201

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Comparative Functional Analysis of DEK Knockout and Wild-Type Cell Lines **Ferdinand Kappes** **fk58@duke.edu**	This project aims at elucidating functional differences in cell lines with a constitutive DEK knockout and overexpression of DEK or fragments thereof. You will be conducting mammalian cell culture alongside essential molecular biology techniques (SDS-PAGE, immunoblotting, cell manipulation, immunofluorescence) in order to understand the molecular functions of this unique human oncogene. You should be a sophomore or above with some experience in cell culture and molecular biology techniques.
Shared Immersion: Comparing Headset and 3D projection **Giovanni Santini** **gs324@duke.edu**	This project deals with shared immersivity: multiple users collaborating inside the same virtual space, or living, together and at the same time, the same experience. The aim will be to compare two technological approaches: VR headset and 3D projection. Students will be required to work with either Unity or Unreal on the realization of an immersive application for both headset and projection. Depending on each student's skills and interests, they might be assigned either to development or visual design as primary role, while they are expected to contribute to discussions for experience design, interaction design, and narrative/storytelling. The end product will be an immersive experience, providing the base of further user-evaluated research, likely landing in at least one publication in conference or journal. Required skills: 3D modelling (Maya/Blender/Zbrush/c4D etc.) – Intermediate to Advanced; Development (Unreal Engine /C++ or Unity/C-sharp) - Intermediate to Advanced.
DNA Damage Repair Pathways in C. elegans **Hyun-Min Kim** **hk284@duke.edu**	This project focuses on investigating the role of DNA damage repair genes in C. elegans (worms) and their interaction with cytotoxicants—substances that induce DNA damage. Students will explore how these repair mechanisms function in response to environmental toxicants, a key aspect in understanding aging, disease, and cancer. In this hands-on research, students will engage in literature review, experimental design, data collection, and analysis using assays like qPCR, phenotyping, and immunofluorescence. Ideal candidates should have an interest in molecular biology, toxicology, or genetics. Previous coursework in biology or related fields is recommended. This project offers valuable lab experience, and scientific writing skills. Eligibility: Background in biology or related fields preferred.
Assessing the Impact of China's 1979 Election Law on Women's Representation in Local People's Congresses **Jason Douglas Todd** **jdt34@duke.edu**	Chinese law and policy are passed in a five-tiered system of legislatures called People's Congresses (PCs), from a single National People's Congress at the top, down to 30,000 township PCs. A legal change in 1979 for the first time allowed citizens to vote directly for deputies to county PCs, but this reform also provided a route through which any traditional gender biases which voters may have held could impact the identity of PC officeholders. This project aims to estimate the effects of the 1979 Election Law on women's representation through archival research into the historical rosters of county and prefecture PCs. Student researchers must possess native Chinese fluency, intermediate skills in Microsoft Excel. Social science majors and students demonstrating patience, attention to detail, and digital literacy are preferred.
Epigenetic Control of Plant Arsenate Tolerance through HAM1 **Joohyun Lee** **jl1047@duke.edu**	This research project investigates the unique role of the HAM1 gene in plant adaptation to arsenate stress using Arabidopsis as a model organism. Our preliminary findings suggest that HAM1 mutants show enhanced tolerance to arsenate stress, potentially through altered H4K5 acetylation patterns. The project employs a comprehensive approach combining phenotypic analysis, transcriptomics, Cut&Tag, and ATAC-seq to unravel the molecular pathways governing arsenate stress responses. Two undergraduate students will participate in all aspects of the research, from experimental design to data analysis, gaining hands-on experience in advanced molecular biology techniques and bioinformatics. The project aims to produce publishable findings that contribute to understanding plant stress adaptation and developing more resilient crops. Students will develop essential research skills, including experimental design, data analysis using R and Python, and scientific communication for SW.

Project Title, Researcher, and email	Project Description
Epigenetic Regulation of Cadmium Detoxification in Arabidopsis through Histone Acetylation **Joohyun Lee** **jl1047@duke.edu**	This research investigates the role of histone acetylation in plant heavy metal tolerance using Arabidopsis as a model system. Our preliminary data shows that HDAC2a mutants display enhanced cadmium tolerance, suggesting a novel epigenetic regulatory mechanism. The project combines physiological analysis, transcriptomics, Cut&Tag, ATAC seq to understand how histone acetylation status influences cadmium detoxification pathways. Three undergraduate students will participate in all aspects of the research, gaining expertise in molecular biology techniques and bioinformatics. The project aims to produce publishable findings that advance our understanding of epigenetic regulation in plant stress responses while providing students with comprehensive research training through their Signature Work projects.
Understanding the Role of LIF2 in Nitrogen Deficiency Response in Arabidopsis **Joohyun Lee** **jl1047@duke.edu**	This research project investigates the crucial role of the LIF2 gene in plant adaptation to nitrogen deficiency using Arabidopsis as a model organism. Our preliminary findings suggest that LIF2 mutants exhibit enhanced resistance to nitrogen-limited conditions, potentially through epigenetic regulation mechanisms involving interactions with CLF and LHP1 proteins. The project employs a comprehensive approach combining phenotypic analysis, transcriptomics, and Cut&Tag sequencing to unravel the molecular pathways governing nitrogen stress responses. Two undergraduate students will participate in all aspects of the research, from experimental design to data analysis, gaining hands-on experience in advanced molecular biology techniques and bioinformatics. The project spans one year, including intensive summer research, and aims to produce publishable findings that contribute to understanding plant stress adaptation and developing more sustainable agricultural practices.
Functional and Mechanistic Study of Triazine Compounds in Enhancing Retinoic Acid-Induced Differentiation of Human Myeloblastic Leukemia (AML) Cells **Jianbo Yue** **jy337@duke.edu**	We have identified and synthesized highly efficient and specific triazine inhibitors of endosomal trafficking, including 6J1. These compounds significantly inhibit cancer metastasis and enhance anti-cancer immunity in mouse models, representing a novel class of anti-tumor drugs. They also enhance HL60 cell differentiation induced by RA, though the mechanism remains unclear. This Summer Project will investigate how triazine compounds, with RA, induce AML cell differentiation via endosomal trafficking. Given the link between endosomal dysfunction and diseases like cancer, this project could uncover new mechanisms and support triazine compounds' clinical trials for AML therapy. Our mission is to transform leukemia into a manageable chronic disease, improving patient survival and quality of life.
Assessing Carbon Footprint of Carbon Capture and Utilization Technologies **Ka Leung Lam** **kl405@duke.edu**	Carbon capture and utilization (CCU) refers to many types of technologies that convert captured CO2 into products such as chemical feedstock, synthetic fuels, carbonated products. The captured CO2 can be sourced from emitting industries or the atmosphere. While CCU is promising for contributing to a low-carbon future, the full life cycle carbon emissions of CO2 derived products are dependent on many factors. Taking a “cradle-to-grave” approach to consider the full life cycle of the CO2 derived products is therefore essential to achieve system-wide net zero or negative emissions. This project aims to assess the carbon footprint of implementing different CCU technologies. Eligibility requirement: i) basic chemistry background, ii) experience in data processing and visualization, and iii) preferably ENVIR203 or ENVIR206.

Project Title, Researcher, and email	Project Description
Assessing Sustainable Development Goals using Satellite Imagery and Machine Learning **Ka Leung Lam** **kl405@duke.edu**	In 2015, the United Nations announced a set of 17 Sustainable Development Goals (SDGs) in the 2030 Agenda for Sustainable Development. Data coverage and openness remain obstacles to progress tracking in many countries. Nontraditional data sources are needed to fill this gap. To address this challenge, satellite imagery and machine learning have been increasingly applied to assess progress towards various SDGs, especially those related to critical infrastructure. This project aims to explore the use of satellite imagery and machine learning for tracking progress of selected SDGs. It will utilize ground truth survey data, satellite imagery, and machine learning models. Eligibility requirement: i) proficient in Python and PyTorch, ii) demonstrated experience in machine learning, and iii) STATS 302 (preferred).
Earth-abundant nanostructured materials for advanced energy and sustainability applications **Kwang Leong Choy** **klc137@duke.edu**	This project involves the development of eco-friendly and earth-abundant nanostructured materials for energy conversion and energy storage applications. These nanostructured materials could provide sustainable solutions for clean energy and facilitate the processing and assembly of low-dimensional materials into energy devices. Various nanostructured materials will be synthesized using a non-vacuum chemical approach and characterized using a combination of XRD, SEM, FTIR, UV-Vis, and Raman techniques. The electrochemical properties of the nanostructured materials will be evaluated. The relationship between process, structure, and properties of the nanostructured materials will be established, and their applications in energy storage and sustainability will be explored.
Longitudinal Analysis of Intrinsic Capacity and Its Impact on Adverse Health Outcomes among Older Adults: A Global Perspective **Lijing Yan** **ly41@duke.edu**	In this project, we will investigate the associations between changes in intrinsic capacity (a composite measure including five domains of cognition, locomotion, vitality, sensory function, and psychological well-being) and major hard health outcomes, including all-cause and cause-specific mortality. We plan to use four large cohorts of older adults: the Chinese Longitudinal Healthy Longevity Survey (CLHLS), the China Health and Retirement Longitudinal Study (CHARLS), the English Longitudinal Study of Ageing, and the Health and Retirement Study (HRS) in the USA. Each student will be responsible to analyze one dataset. If you are interested in healthy longevity studies and biostatistical data analyses, you won't want to miss this opportunity suitable for students in global health and data science! To join us, you are expected to (1) be passionate about health/aging research; (2) be competent in using Stata or R. We offer opportunities for publications and signature work.
Decisions at the End of Life - Does it Matter Who Decides? **Ming Gu** **mg424@duke.edu**	The concept of a "good death" warrants considerable attention, not only for its intrinsic value but also due to the substantial financial implications associated with end-of-life care. Policymakers tasked with the challenge of either improving the quality of the death experience or curtailing escalating costs must start by thoroughly comprehending the factors influencing healthcare utilization towards life's end. Cultural factors significantly affect the death experience; for instance, within Chinese society, the taboo surrounding discussions of death frequently circumvents a patient's ability to actively participate in their own end-of-life care decisions. By cross-country comparison, this study aims to unveil the impact of decision makers on the end-of-life experience, contrasting the outcomes based on whether decisions are made by the spouse, children or the individuals themselves. Students who have proficiency in using STATA or equivalent software are highly encouraged to apply.

Project Title, Researcher, and email	Project Description
Exploring Potential Medical Revolution with XR and AI Technologies **Ming-Chun Huang** **mh596@duke.edu**	The healthcare landscape is on the brink of a transformative revolution, fueled by the integration of artificial intelligence (AI), extended reality (XR), and large language models (LLMs). This project aims to explore how these advanced technologies can be harnessed to revolutionize the delivery of medical services, enhance patient outcomes, and reshape the future of healthcare practices. By leveraging AI-driven insights, immersive XR environments, and cutting-edge human-computer interaction (HCI) principles, this research focuses on creating innovative solutions that address both individual and systemic healthcare challenges. The objective is to establish an intelligent healthcare ecosystem that employs XR and AI to simulate and respond to complex medical scenarios. We are recruiting SRS who have a strong research interest and potential to revolutionize healthcare through XR and AI. Selected students are expected to work on the DKU campus using the research lab at AB 3003 this summer.
GNNASeR: Graph Neural Network based Algorithm Selection for Routing Problems **Mustafa Misir** **mm940@duke.edu**	This project focuses on developing GNNASeR, a cutting-edge Graph Neural Network (GNN)-based Algorithm Selection (AS) framework for solving routing problems like the Traveling Salesman Problem (TSP) and Vehicle Routing Problem (VRP). By leveraging the graph structure of routing problems, GNNASeR eliminates the need for hand-crafted features and optimally matches problem instances with state-of-the-art algorithms. Students will gain hands-on experience in machine learning, combinatorial optimization, and advanced GNN architectures. Key tasks include framework implementation, experimentation, and co-authoring a peer-reviewed publication. Eligible applicants should have programming experience in Python, familiarity with machine learning and deep learning concepts, acquired through courses such as STATS 302 / COMPSCI 309, MATH 405, and COMPSCI 101 / STATS 102, besides interest in optimization problems. This project offers a unique opportunity to work on a interdisciplinary project.
MC-GNNAS-Dock: Multi-Criteria Graph Neural Networks for Molecular Docking **Mustafa Misir** **mm940@duke.edu**	This project aims to enhance GNNAS-Dock, a Graph Neural Network (GNN)-based algorithm selection system for molecular docking, by integrating multiple performance criteria through multicriteria performance indicators. The resulting system, Multi-Criteria GNNAS-Dock (MC-GNNAS-Dock), will provide a more comprehensive evaluation and improve the accuracy of molecular docking predictions. Students with a solid foundation in machine learning and deep learning, demonstrated through completion of courses such as STATS 302/COMPSCI 309 and MATH 405, are ideal candidates, with a background in chemistry being advantageous but not required. Through this project, students will gain hands-on experience in deep learning, molecular docking, and research methodologies, developing valuable technical and research skills applicable to academic and professional pursuits in fields like computer science, data science, and computational chemistry.
Transformer based Heuristic Selection for Selection Hyper-heuristics **Mustafa Misir** **mm940@duke.edu**	This project aims to advance the field of Selection Hyper-Heuristics (SHHs) by incorporating Transformers, a cutting-edge machine learning architecture, for sequence prediction. The goal is to develop a Transformer-based SHH system for solving combinatorial optimization problems, leveraging the HyFlex framework and evaluating its performance across multiple problem instances. To participate, students should have introductory knowledge of machine learning, deep learning, and Java programming, acquired through courses such as STATS 302/COMPSCI 309, MATH 405, and COMPSCI 201. Eligible students should be majoring in Computer Science, Data Science, or a related field, with a strong interest in machine learning and optimization. The project offers hands-on experience with state-of-the-art techniques and contributes to a scientific manuscript for peer-reviewed publication, providing valuable experience for academic and professional growth.

Project Title, Researcher, and email	Project Description
China's Development Finance in Africa: Pragmatism, Opportunism, and Legacy **Pippa Morgan** **pam53@duke.edu**	This project aims to update and expand the draft book manuscript 'China's Development Finance in Africa: Pragmatism, Opportunism, and Legacy' to include the most recent literature and new data on China's engagement in Africa. The book explores how different interest groups within China's bureaucracy and business world shape its development finance across African countries. Students will assist in conducting a comprehensive literature review and gathering and analyzing quantitative data. Candidates with a background in China's international relations and experience conducting literature reviews are encouraged to apply for the Literature Review Assistant position. Students with strong quantitative data analysis skills are encouraged to apply for the Data Analysis Assistant position. Preference will be given to candidates with Chinese proficiency. Both positions offer an opportunity to build research skills while contributing to scholarship on China's role in the world.
Environmental impact of foreign aid projects **Paula Ganga** **pdg12@duke.edu**	In this work, I seek to examine the environmental impact of foreign aid projects. Foreign aid is big business. I examined this topic in a recent article published in the journal Studies in Comparative International Development. That work shows the negative impact of tied aid on economic growth. I plan to explore this topic further by focusing on how aid impacts the environment. The ability of individuals to pursue economic opportunities in the future will depend on whether or not they are affected by climate change. Aid disbursed by large international organizations, individual donor countries and large NGOs can potentially improve this situation or worsen it.
Science Networks Through Revolution: The Enduring Legacy of Overseas Chinese PhD Scholars, 1902–1961 **Peiyuan Li** **pl227@duke.edu**	This project explores the critical role of Chinese scholars who earned PhDs abroad before 1949 and returned to China during the 1980s. These scholars reintroduced Western academic traditions and scientific methodologies, shaping China's modern science and technology landscape and fostering global academic engagement. Using the Academic Family Tree database, the study examines the influence of intellectual networks on knowledge dissemination, network effects, and rebuilding academic traditions in post-reform China. Students will assist in data collection, network mapping, and thematic analysis, contributing to an important interdisciplinary study. Eligibility Requirements: Majors in political economy or related fields; Strong research and analytical skills; Familiarity with data visualization tools (e.g., R) is preferred; Experience with historical or archival research is a plus.
Sugar addiction: behavioral and neurochemical changes in the rat. **Pedro Rada Rincon** **pvr3@duke.edu**	It has been debated whether a natural behavior could become pathological (addiction). Research done in my lab has shown that in fact, sugar can be addictive in an animal model of intermittent sugar access. Rats will show signs of opiate withdrawal, depression, and anxiety. In this model, the subject also shows craving, dose escalation, tolerance, sensitization, and changes in dopamine receptors in the nucleus accumbens similar to other drugs of abuse like cocaine. This summer, we would like to follow up on these experiments trying to determine the difference between sugar consumption in high sugar consumption rats vs low sugar consumption rats and determine whether the behavioral changes and neurochemical changes mimic other drugs of abuse.
Decoding Episodic Memory Through Eye Movement Patterns During Construction in Non-Human Primates **Sze chai Kwok** **sk695@duke.edu**	This project investigates the relationship between eye parameters, particularly viewing patterns and episodic memory consolidation and retrieval in macaques. The experimental design involves a structured encoding and construction paradigm, wherein blank screens replace key segments of video stimuli during the construction phase. The study hypothesizes that eye movements during these blank screen intervals will reflect the trajectory of the remembered video content while also correlating with neuronal activities, thereby shedding light on the interplay between neural patterns of episodic memory and visual behavior. The primary objective is to elucidate the cognitive mechanisms linking memory processes to ocular and neural dynamics and to explore whether eye movement parameters can decode memory stages and identify specific stimuli. This project is suited for those pursuing a major in the Behavioral Science–Neuroscience track or aspiring to careers in computational neuroscience research.

Project Title, Researcher, and email	Project Description
Decoding temporal structure of episodic memory **Sze chai Kwok** **sk695@duke.edu**	Temporal order judgment (TOJ) task has been a classical task choice in neuroscience, with large amount of research focus on the routine of it. With models that aim to explain the temporal structure of memory, the neural activity and mechanism during TOJ is worthy of attention. The project aims to study the underlying neural mechanism of memory retrieval when doing temporal order judgment tasks. We also focus on the retrieval method of temporal memory. Students with skills in neuroscience, mathematics, data science, and other related disciplines are welcome.
Monkey Neural Signal and Detection **Sze chai Kwok** **sk695@duke.edu**	We are seeking students to join our SRS project focused on analyzing neural signals from monkeys to understand brain activity patterns and train spike detection techniques. Using advanced neurophysiological tools, such as multi-electrode arrays, students will engage in data collection, preprocessing, and analysis. Participants will develop skills in neuroscience research, spike detection and other techniques for data analysis. This project is ideal for students with an interest in neuroscience and data analysis. Preferred majors: Neuroscience, Computer Science, Data Science or related fields. Course prerequisites: Basic knowledge of neuroscience, programming or data analysis. Skills: Strong analytical and problem-solving skills; experience with data analysis or programming (Python, MATLAB) is a plus
Functional Interactions between the Central Circadian Clock and Recognition Memory Processes in Mice **Shu Tam** **st462@duke.edu**	Light/dark cycles exert profound effects on cellular physiology, and they are powerful modulators of brain network activity and cognitive functions in diurnal and nocturnal species, including humans. In recent years there has been a surge of interest in the role of the central circadian clock in regulating our cognition, especially regarding how learning and memory performance can be optimized at different times of day. In this project, we aim to examine how memory performance in laboratory mice varies at different times of day, and crucially, whether there is any functional interaction between the central circadian clock in the suprachiasmatic nucleus and the hippocampus, driving time-of-day differences in memory performance. This project will allow students to gain hands-on experience in neuroscience research and is particularly suitable for those who want to declare a major in Neuroscience and those who want to pursue a career in biomedical research.
Minimization of Trommsdorff Effect Using Catalytic Approaches **Tan Zhang** **tz120@duke.edu**	The Trommsdorff effect or auto-acceleration is a commonly seen phenomenon in polymer synthesis. The increases in viscosity and the exothermic nature of the reaction lead to a dramatic temperature increase during the reaction, which can be very dangerous. In this project, you will use several novel eco-friendly catalytic approaches to minimize the Trommsdorff effect and analyze the resulting synthetic materials. The prospective candidate should have taken CHEM 201/202.
Valorization of Biomass into Wearable Electronics, Medical Devices, and More **Tan Zhang** **tz120@duke.edu**	Nowadays, more products are required to be biodegradable for eco-friendly applications or to be biocompatible for medical applications. Biomass includes polysaccharides, proteins, and other organic molecules that are abundant in nature. They have unique chemical and physical properties that have not been fully utilized. In this project, you will use one of your favorite biomasses to produce functional devices and materials for your target application. The prospective candidate should have completed at least one of the following courses: CHEM 201, BIOL 305, and MATSCI 201.

Project Title, Researcher, and email	Project Description
Translating Destiny of Rebirth in the Age of AI: Women and Writing in Late Imperial China (III) **Wenting Ji** **wj72@duke.edu**	This project will translate the rhymed novel Destiny of Rebirth from Chinese to English. Authored by the female writer Chen Duansheng in 18th-century China, this novel can be compared to its contemporaries, such as Dream of the Red Chamber, but it has never been properly translated into English. While translating, we will also write "cultural notes" explaining historical and cultural phenomena in the text and critically evaluate the role of AI in translation. The translations and cultural notes will be published on our website. Two types of positions are available: (1) translators, preferably native Chinese speakers familiar with classical Chinese and possessing adequate English writing skills; (2) editors, preferably native English speakers interested in Chinese literature and culture who have completed Chinese 202 or have equivalent Chinese proficiency. In addition to language skills, students with experience managing SNS accounts are highly encouraged to apply.
Exploring Student Engagement with GenAI in Academic Writing **Wenjing Li** **wl249@duke.edu**	This project investigates how first-year Chinese and native-English-speaking students at DKU engage with GenAI tools in their academic writing. It explores students' motivations, practices, and ethical considerations when using these tools, particularly how their diverse linguistic and cultural identities influence their engagement. We also explore how AI policies in various courses impact students' decision-making and ethical considerations when using AI in writing tasks. Data will be collected through surveys, screen recordings, interviews, and written assignments. Selected students will assist with data analysis, including transcribing and coding data following a thematic analysis to understand students' usage patterns and decision-making processes. Prior experience with qualitative research is beneficial but not required. Students with strong writing and communication skills and an interest in second language education or education technology are encouraged to apply.
Responsive Smart Stomata in the Bio-inspired Solar Evaporation **Weiwei Shi** **ws183@duke.edu**	Solar evaporation is an attractive technology that combines the two most abundant resources on Earth: solar energy and water. It has enabled an array of emerging applications, including contaminated water purification, sea water desalination, electric generation, steam sterilization, and fuel production. The work will focus on the design and fabrication of the bio-inspired responsive materials to achieve the solar evaporation, in response to external stimuli, e.g., light, temperature, humidity. Obviously, this project would be tremendously attractive from both an economic and an environmental standpoint, to investigate the conversions of the solar energy into the sustainable applications, e.g., water-harvesting, solar desalinations, or passive pump. Students should have the fundamental knowledge of chemistry, materials, and physics. Prerequisite courses are PHYS 121 Integrated Science – Physics, CHEM 110 Integrated Science – Chemistry, or MATSCI 201 Fundamentals of Materials Science.
Are LLMs Biased in Attributing Humanity? Investigation of Dehumanization and Its Ethical Implications in AI-Driven Decision-Making **Wen Zhou** **wz55@duke.edu**	This project investigates whether large language models (LLMs) exhibit dehumanization and how this bias influences their ethical decision-making. Despite the inclusion of moral guidelines in their development, LLMs continue to show biases that disproportionately affect historically dehumanized groups. Dehumanization—the process of perceiving individuals or groups as less than fully human—has been linked to ethical violations in human decision-making. Since LLMs display human-like social cognitive abilities associated with dehumanization, this research will explore whether they exhibit similar bias by attributing fewer uniquely human traits to certain social groups and how this may shape AI-driven decisions in ethically significant contexts. The outcomes aim to deepen our understanding of moral reasoning in LLMs and inform the development of more equitable AI systems. Candidates should have fundamental knowledge in relevant disciplines, such as social psychology or machine learning.

Project Title, Researcher, and email	Project Description
The Hukou Reform in China and Expansion of the Manufacturing Sector **Xin Jin** **xj66@duke.edu**	Structural transformation, or the process of labor reallocation across the broad sectors of agriculture, manufacturing, and service, has been widely documented across countries over time. Since 1980s, there was a gradual global decline in manufacturing employment share, and China was no exception. However, starting in 2000, China became one of the few whose manufacturing employment share reversed to increase. This period coincides with China's partial relaxation of the Hukou restrictions and joining the WTO. This project aims at studying the structural transformation of China, with a particular interest on the role of changing labor mobility restrictions under the Hukou system in this process. The project invites students who have taken ECON 101 and are interested in economic research. The ability to read Chinese is required as students are expected to read about China's Hukou reform and construct data sets from Chinese data sources. Having taken ECON 203 is a plus not required.
Developing single-ion conducting electrolytes for lithium-metal batteries **Xinrong Lin** **xl422@duke.edu**	Energy is of paramount importance for humans as it is intricately linked to all aspects of modern life. The development of advanced batteries plays a crucial role in the storage and conversion of renewable energy technology. In this project, we will develop lithium metal batteries using single-ion conducting electrolyte materials that address the long-standing safety issue in lithium battery technologies and access next generation and high-performance energy storage devices. Students who carry out this project should have taken Chem 110. Knowledge in Chem 201 and 150 would be a plus. Ideally majored in materials science – chemistry track.
High performance catalyst development for oxygen evolution reactions **Xiawa Wang** **xw195@duke.edu**	This project addresses a highly innovative and underexplored area in the field of renewable energy—solar-thermal driven chemical reactions for hydrogen production. We will use photonic crystal to replace the conventional carbon glass electrode to easily tailor the light absorption and localized heating of the system. As a meta-material, silicon-based photonic crystals (Si PhC) can be purposely tailored by micro-patterning as selective absorbers so that electrode can be optimized for a certain heating profile under sunlight illuminations. At the same time, RuO_2 can be used as the OER catalyst due to its high catalytic activity and stability in acidic and neutral conditions.Despite the significant global interest in hydrogen as a clean energy carrier, few researchers have focused on the integration of solar-thermal energy with high-performance catalytic processes. This project will be one of the pioneering one in this direction to incorporate renewable energy in hydrogen industry.
Test and optimization of thermophotovoltaic system using solar concentrators. **Xiawa Wang** **xw195@duke.edu**	This project explores thermophotovoltaic (TPV) systems using solar concentrators and novel TPV cells to efficiently convert concentrated solar energy into electricity. Students will engage with cutting-edge materials and innovative cell designs, gaining insights into the integration of solar concentrators with TPV technology. The system's potential for high efficiency in energy conversion will be emphasized, along with real-world applications like renewable power generation and waste heat recovery. While hands-on experience with solar cells is a plus, it is not required. This project is ideal for students in materials science with an engineering interest, particularly those interested in sustainable energy solutions and advanced photovoltaic technologies.
Mathematical Studies of Tumor Growth Model **Xiaoqian Xu** **xx71@duke.edu**	This project will concentrate on the studies of PDE model of tumor growth. We will use numerical to study such PDE models, including solution simulation and matching with the real data from Biology lab. The PDE model this project will be mainly used are so-called porous medium. This project is also partially supported by National Key R&D Program of China, Project Number 2021YFA1001200. The pre-requisite of this project is Math 403 and at least one numerical analysis course. Coding experience, in any language, is also preferred.

Project Title, Researcher, and email	Project Description
Designing and Developing Generative AI Applications for Art Therapy **Yucheng Jin** **yj232@duke.edu**	This project explores the intersection of generative AI and art therapy to create innovative tools that promote emotional well-being and self-expression. Conducted in a human-computer interaction research lab, the project will involve designing, developing, and evaluating AI-powered applications tailored to support therapeutic art practices. Students will work on tasks such as AI model development, user interface design, and prototype development. Ideal candidates are undergraduate students majoring in Computer Science, Data Science, Computational Design, Psychology, or related fields. Preferred skills include programming experience (e.g., Python, JavaScript), familiarity with machine learning frameworks, and an interest in creative applications of AI. Prior coursework or experience in HCI, UX/UI design, or generative AI is a plus. This is an excellent opportunity for students interested in interdisciplinary research, which blends technology and creativity to support mental well-being.
Epidemiological comparison of COVID-19 vaccination strategy and vaccine efficacy **Yiu wing Kam** **yk252@duke.edu**	This research study investigates the relationship between the epidemiological pattern of COVID-19 and the efficacy of the vaccines among the different manufacturers. We will examine the design, technology, clinical trial results, and real-world effectiveness of vaccines from manufacturers at a population level. The study will also explore how efficacy varies among different populations, and age groups, and against emerging variants. This narrowed focus allows for a detailed, in-depth analysis within the broader context of vaccine development and epidemiology. This independent study deviates from regular coursework to foster a deep, interdisciplinary understanding of vaccine developments, policy design, and the complex dynamics that underpin epidemiology study, imparting essential analytical and research skills for advanced studies and future careers development. Major: Global Health. Course pre-requisites: N/A. Skills: Passion For global health.
Explore a Molecular Detection System for Norovirus Surveillance in Kunshan's Water Sources **Yiu wing Kam** **yk252@duke.edu**	This project focuses on developing a molecular detection system specifically designed for norovirus monitoring in Kunshan. The study aims to establish a sensitive and reliable method for detecting norovirus in environmental water samples by developing and optimizing an RT-qPCR assay. The project will also create a standardized field sampling protocol, ensuring the accuracy and reproducibility of future epidemiological studies, ultimately contributing to improved public health preparedness in the region. Major: Global Health. Course pre-requisites: N/A. Skills: Passion For global health research
Exploring the Impact of Smoking on Tuberculosis Incidence in China: A Public Health Perspective **Yiu wing Kam** **yk252@duke.edu**	This project investigates the relationship between tuberculosis (TB) and smoking behaviors in China, focusing on how smoking may influence the public risk of contracting TB. Despite an annual decline of 5.28% in TB-related DALYs (Disability-Adjusted Life Years), TB remains a significant public health challenge in China, accounting for 0.34% of the total DALYs according to the Global Burden of Disease Study (2021). Smoking is recognized as a key factor contributing to TB incidence and given China's large population and the increasing prevalence of smoking, it is critical to assess TB as a potential public health risk. Meanwhile, as previous research (Yang et al., 2021) indicates that smoking reduces vitamin D levels. The project involves the blood-based analysis which examines the effect of smoking behaviors on vitamin D levels. Major: Global Health. Course pre-requisites: N/A. Skills: Passion For global health research

Project Title, Researcher, and email	Project Description
Exploring the Role of PUFAs (polyunsaturated fatty acids) in ADHD disease: A mediation analysis **Yiu wing Kam** **yk252@duke.edu**	Attention-Deficit/Hyperactivity Disorder (ADHD) is a neurodevelopmental condition marked by symptoms of inattention, hyperactivity, and impulsivity. It affects children and adults worldwide and has a multifactorial origin involving genetic, environmental, and neurochemical factors. Dysregulation in dopamine and norepinephrine systems, as well as neuroinflammation, has been implicated in ADHD. Polyunsaturated fatty acids (PUFAs), which are critical for brain health, have emerged as potential modulators of ADHD symptoms. PUFAs, particularly Omega-3 (e.g., DHA and EPA) and Omega-6 (e.g., ARA), are essential for maintaining neuronal membrane fluidity, supporting neurotransmitter function, and regulating inflammation, which may influence the neurobiological mechanisms underlying ADHD. Major: Global Health. Course pre-requisites: N/A. Skills: Passion For global health research
Identification of blood-based immune biomarkers for non-small cell lung cancer (NSCLC) **Yiu wing Kam** **yk252@duke.edu**	Lung cancer remains the leading cause of cancer-related mortality worldwide, with non-small cell lung cancer (NSCLC) accounting for the majority of cases. Early detection and accurate prognosis are pivotal for improving survival rates and patient outcomes. The discovery and validation of accessible biomarkers for NSCLC are crucial for advancing personalized medicine. Recent research has highlighted the immune system's role in controlling and eradicating tumors, suggesting that immune components in the blood could serve as effective biomarkers. This summer project aims to develop the screening platform and use it to identify a panel of immune biomarkers that discriminate between NSCLC patients and healthy individuals and correlate with disease severity and prognosis. Major: Global Health. Course pre-requisites: N/A. Skills: Passion For global health research
Narrative-Driven Multi-Agent World Simulation **Ye Lu** **yl984@duke.edu**	The goal of this project is to create dynamic virtual environments that balance structured system control with player agency. Traditional virtual environments often rely on either rigid pre-scripted behaviors or unpredictable AI systems, which limits player freedom and narrative coherence. Our solution is a text-based world simulation engine that integrates Large Language Models (LLMs) with structured frameworks to create responsive and controlled simulation experiences, emphasizing game design elements such as procedural storytelling, interactive dialogue, and dynamic character arcs. This project offers a comprehensive learning experience in game design at the intersection of artificial intelligence; it allows students to develop practical skills in creating dynamic game environments, interactive narratives, and user-centered design with knowledge of cutting-edge AI technologies, preparing students to engage with professional fields in in game development and interactive media.
Learning to reconstruct the ocean's respiration **Zuchuan Li** **zl59@duke.edu**	The overarching goal of this proposed study is to reconstruct and understand the ocean's respiration through a combination of deep learning and big data acquired by satellites and robots. We expect that a combination of deep learning and big data will improve our understanding of the ocean's respiration. Students are expected to be sufficient in deep learning, machine learning, Python, and pytorch. Students majoring in data science, computer science, or applied math are preferred. Students who have taken any of these courses (Introduction to data science, Principal machine learning, statistical machine learning, and deep learning), are preferred.