Project #	Project Title	Brief Project Description	Required/Desired Skills
1	Distributed Machine Learning for Geospatial Analysis, Smart Agriculture, Controlled Environment Agriculture, and Smart Grids	We will work on distributed machine learning algorithms (e.g. Federated Learning) and their applications in different practical problems such as geospatial data analysis, power grids, and smart agriculture (including controlled environment agriculture).	Python Programming, Machine Learning (TensorFlow/PyTorch), basics of Linux operating systems.
2	Developing Immersive Biobehavioral Assessments with AI-enhanced Computing for Smart Tele-treatment of Addictive Disorders	We are proposing to transform the current paradigm of biobehavioral assessments for AD by integrating Virtual Reality (VR), biosensor, and Artificial Intelligence (AI) technologies. Using Unity engine and platform, we will integrate biosensors to render real-time tracking of biobehavioral signals while a patient is performing interactive screening tasks in immersive VR. Then, we will identify those biomarkers associated with craving behavior in each modality of dataset. Finally, we will apply the cross-modality deep feature learning framework to those identified biomarkers to discern and predict the stage of AD.	Acquire and stream biosensor data in real time; Design and implement Virtual Reality tasks; Integrate multi-modality time series data for feature extraction and predictive modeling.
3	Predictive Monitoring Human Operational Performance in face of Multiple Spaceflight Stressors using Multi-modal Biobehavioral Markers	In this proposed research, we will use inversion table and virtual reality-based ADT to simulate an operational task with simultaneous exposure to stressors specific to isolation and confinement, distance from earth, and sensorimotor adaptation, while the time-series biobehavioral data from the operator including ECG, eye movements, joystick navigation, and reach-to-tap performance will be recorded for identification of biomarkers in response to those stressors. Then, a machine-learning model will be implemented to those identified biobehavioral biomarkers for predicting the outcomes of operational performance. We hope the research findings will shed light on using multi-modal biobehavioral biomarkers to monitor and assess astronaut operational performance that is under the influence of multiple spaceflight stressors. The experimental protocol can be also developed as a battery test for training and selecting competent astronauts for missions involved with multiple stressors.	Unity programing for Virtual Reality immersion and interaction; Skills of collecting eye-tracking data using HTC Pro Eye; Skills of acquiring and analyzing time-series data from wearable ECG sensor and 3D Logitech joystick; Skills of performing Time Series Forecasting, Machine learning, and Deep Learning
4	Understanding the Interplay of Climate Variability and Human Activity on Urban Flooding Patterns in the United States	This research aims to develop an integrated approach to understand the interplay between climate variability, land cover changes, and physiographic factors influencing flood frequency and magnitude in inland U.S. cities. It will use Monte Carlo simulation, LCMAP dataset, water balance analysis, and multiple regression techniques to enhance community resilience and prevent humanitarian crises.	Python programming (required), ArcGIS (desired)
5	Using imaging drones and computer vision to understand salmon ecology and management	Every summer millions of sockeye salmon migrate across the Pacific Ocean and up the waterways around Bristol Bay, Alaska supporting the largest salmon fishery in the world. Imaging drones and mounted cameras are used to record the salmon as they swim up streams and into their final nesting ponds. Custom deep learning-based computer vision pipelines are designed to detect and track every fish, as well as to study their interactions other fish and predators like brown bears. The software includes object detection, multi-object tracking, keypoint detection, and 3D landscape reconstruction. Students interested in this ongoing project can focus on specific aspects such as training object detection models or using photogrammetry tools, with Python programming being a necessary skill.	Interest in one of the following: machine learning, software development, remote sensing, ecology
6	Understanding human-wildlife interactions through animal trails	There is much new human development, whether housing developments, natural resource extraction, or fencing, that is expected to have effects on wildlife and their ability to persist in Wyoming. Many current tools for observing animals, however, such as GPS collars, record data at resolutions in space and time too course to study detailed interactions between animals and human landscape features. Animal trails, physical trails visible in the environment, result from many animals, such as mule deer or pronghorn, moving along the same routes through a given landscape and record, at the centimeter level, areas of high animal use. Up to this points, these ubiquitous features of landscapes have been ignored as a way of measuring animal movement and space use. We will use ultra high resolution satellite imagery (30cm) paired with deep learning processing to quantify networks of animal trails around fences and other types of development. We will pair this data with information about animal use from trail cameras to ultimately better understand the relationship between humans, animals, and their shared landscapes.	Interest in at least one of the following: computer vision, networks, software development, ecology
7	Analyzing GPS collar and remote sensing data to understand migratory behavior and habitat use in Wyoming's mule deer	Across Wyoming's diverse landscapes, mule deer employ different movement strategies (i.e., resident, migratory) to maximize individual fitness. However, no analysis has yet evaluated the type of habitats/landscapes that favor migratory vs resident behavior in mule deer, or how those landscapes influence factors such as migration timing. Using a dataset of >1900 individual mule deer collected by Wyoming Game and Fish Department (WGFD) over the last 2 years, we propose to have a student intern use data visualization tools (i.e., Migration Mapper) to classify individual movement behavior, and assist in developing code-based workflows to link these movement behaviors to remotely sensed environmental predictors of movement. The project is of high priority to the Mule Deer Monitoring Program, a statewide mule deer research effort led by the University of Wyoming and WGFD. An outcome of the internship will be a report issued to WGFD, and potentially a peer-reviewed publication.	Knowledge of mule deer ecology and management Basic knowledge of R Basic knowledge of GIS data Interest in conducting analyses/research that has relevance to wildlife management and conservation
8	Bridging the Gap Between Spatial and Community Synchrony to Unravel Drivers of Metacommunity Variability	Ecosystem stability is influenced by the synchrony of its components over time. Understanding mechanisms driving synchrony and variability in metacommunities can enhance ecosystem stability predictions and inform conservation decisions. This project explores how disturbances, dispersal, and interactions impact metacommunity dynamics, seeking a motivated undergraduate to assist with data wrangling and preliminary analyses using Cedar Creek Ecosystem Science Reserve data. The student will learn data cleaning, handling missing data, standardizing formats, and applying statistical models to investigate community dynamics. They will work closely with a PhD student, gaining valuable research experience in a supportive environment.	Interest in ecology or conservation biology preferred, Familiarity with the programming language R preferred but not required
9	Enhancing K-12 Computing Education through Integration of Computer Science Practices and Emergent Technologies	The purpose of this work is to enhance the integration of computer science and emergent technology tools in K-12 education throughout Wyoming. The research aims to develop curriculum and integration strategies to support classroom teachers' integration of computer science standards. The project team will pilot the materials and submit a proposal for external funding to expand the project.	Understanding of foundational CS principles and concepts and developing engaging learning materials especially using educational technologies such as Scratch, ChatGPT, Sphero, and Minecraft to work with K-12 stakeholders.
10	Developing Computational Modeling Capabilities for Biomedical Applications	This project aims to advance the field of biomedical materials by exploring the self-assembly of nanoparticles through an integrative approach that combines experimental research with computational modeling. Focused on developing a fundamental understanding of the mechanisms driving nanoparticle assembly for applications such as in vivo sensing and targeted drug delivery, this project will utilize cutting-edge computational tools to predict and simulate the assembly processes.	Interest in nanoparticle synthesis and characterization, and familiarity with the GROMACS software or a willingness to learn it. Previous experience in laboratory work and/or computational modeling would be beneficial but is not mandatory