

Can a hybrid green wall system effectively filter greywater by reducing turbidity, surfactants, nitrates, and phosphates?

Can an AI model be used to accurately predict filter lifespan, efficiency, and discharge?

1. Provide a list of readings, assignments, activities, and goals that you completed so far. Please list them in chronological order with dates of completion for each task.

Introduction to Machine Learning, Neural Networks, and Deep Learning 6/23

Machine Learning in Drug Discovery and Development Part 1: A Primer 6/24

EnviroPiNet A Physics-Guided AI Model for Predicting Biofilter 6/25

The UWO dataset – long-term observations from a full-scale field laboratory to better understand urban hydrology at small spatiotemporal scales 6/26

Python Basics on the Python course 6/25

Develop research question and hypotheses 6/25

2. Provide a list of readings, assignments, activities, and goals that you plan to complete before your next EQ.

Translate one of the datasets into English from Swiss

Find relationships between groups in the datasets

Analyze the two articles with the two datasets

3. How much experience do you have with coding and python?

I have little experience with coding and python. In ninth grade, I took an Intro to computer programming class where we covered basic level Java.

4. Briefly describe your motivation to participate in the iResearch Institute summer program. What are your short-term goals for summer and long-term goals for the next few years?

My short term goals for the summer are to familiarize myself with Python, and to have a good amount of data analysis done. I am planning to use Python throughout the school year to aid me in my project and bring it to another level, and I am hoping that I can get into the lab as soon as possible in the school year to start my wet bench experiments, and use the data analysis to support my project.

5. What is your learning style?

I like to learn with lectures so that I have the freedom to take my own notes, and I feel when I take my own notes, I can take in and remember information more effectively.

6. What are some other non-school/work-related activities you enjoy? Also please share a fun fact about yourself.

Some other non school activities I enjoy are playing sports and listening to music. I play golf and soccer for my school, and I listen to a variety of music, mostly R&B and hip-hop. I like to collect

vinyls and especially from my favorite artists, which include The Weeknd, Giveon, The 1975, Tyler, the Creator, SZA, Bruno Mars, and more.

7. Have you completed setting up your work environment? GitHub, SourceTree, and Python

Yes

8. List problems you encountered during the work environment setup. If you were able to resolve them, please briefly describe how?

I ran into some storage problems, but I was able to solve that by simply clearing some files on my computer that I no longer needed.

9. List 5 good programming practices?

Proper Documentation and Commenting

Avoid Creating Global Variables

Exception handling

Create Separate Environments

Use inbuilt functions

(Sharma, 2023)

10. What is Machine Learning? How is it different from Deep Learning? Provide two examples of ML algorithms and two examples of DL algorithms.

Machine Learning (ML) is a specific method of automating intellectual tasks that are usually performed by humans. ML is a field that focuses on the learning aspect of AI by developing algorithms that best represent a set of data. Deep Learning (DL) is also a method of automating intellectual tasks that are usually performed by humans. DL is a subset under ML. Two ML algorithms include linear and logistic regression; two DL algorithms include artificial neural networks and convolutional neural networks (Choi et al., 2020).

11. For a classification problem, how would you balance an unbalanced dataset?

You would balance an unbalanced dataset by undersampling the inactive group. This prevents model bias towards predicting a specific category, like the active and inactive groups (Talevi et al., 2020).

12. Please review the tutorial videos and complete the programming task provided under the “Tutorial and Programming Task” section on the Notion Wiki.

Title	About	Input	Output
Innovative approaches to greywater micropollutant	This article is a review about technologies for treating laundry greywater, and how AI can be integrated into these treatment	Greywater samples, contaminant concentrations,	Pollutant removal efficiencies, AI model accuracy

removal: AI-driven solutions and future outlook	systems.	parameters for operation	
Multi-output neural network model for predicting biochar yield and composition	This study develops a machine learning approach to predict the yield and chemical composition of biochar based on biomass feedstock properties and pyrolysis conditions.	Proximate composition, ultimate composition, pyrolysis conditions	Yield, carbon content, hydrogen content, oxygen content, nitrogen content
Machine learning (ML): An emerging tool to access the production and application of biochar in the treatment of contaminated water and wastewater	This article is a review of the global challenge of water pollution and how biochar can be effectively used to adsorb organic and inorganic water contaminants.	Pollutants, biochar (feedstock type, synthesis methods, conditions), ML algorithms,	Predicted biochar properties, adsorption performance, process optimization
Machine learning models for predicting biochar properties from lignocellulosic biomass torrefaction	This article discusses predicting biochar characteristics based on the properties of lignocellulosic biomass and specific torrefaction parameters.	Biomass properties, torrefaction conditions,	Elemental composition, proximate composition, biochar yield
Synthesis optimization and adsorption modeling of biochar for pollutant removal via machine learning	This article review is about machine learning applications in biochar production and its use as an adsorbent for pollutant removal.	Feedstock source, processing parameters, biochar physicochemical properties, pollutant characteristics	Biochar yield, physicochemical properties, GWP, EROI, MPSP, adsorption capacity, removal %