

Critical AI Engagement

Crafting Assignments that Encourage Productive Engagement with Al Carl Ehrett, Watt Family Innovation Center

Watt AI: What we do

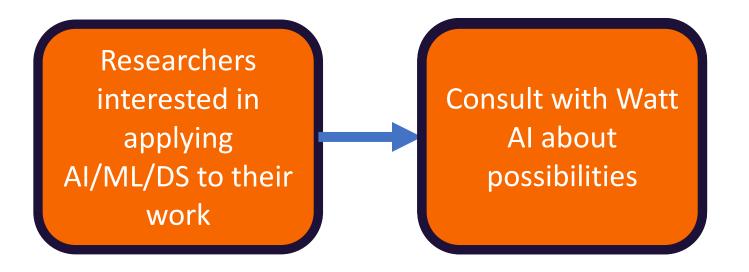


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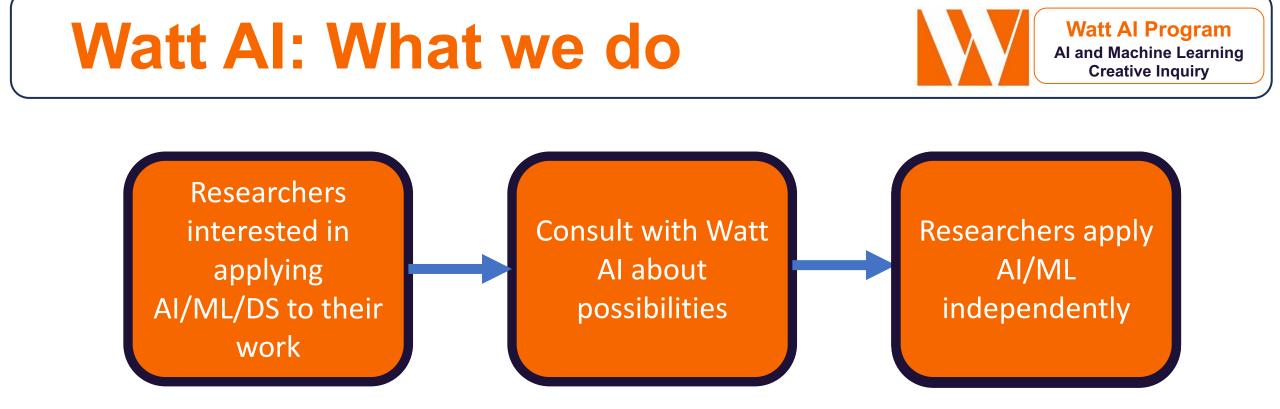


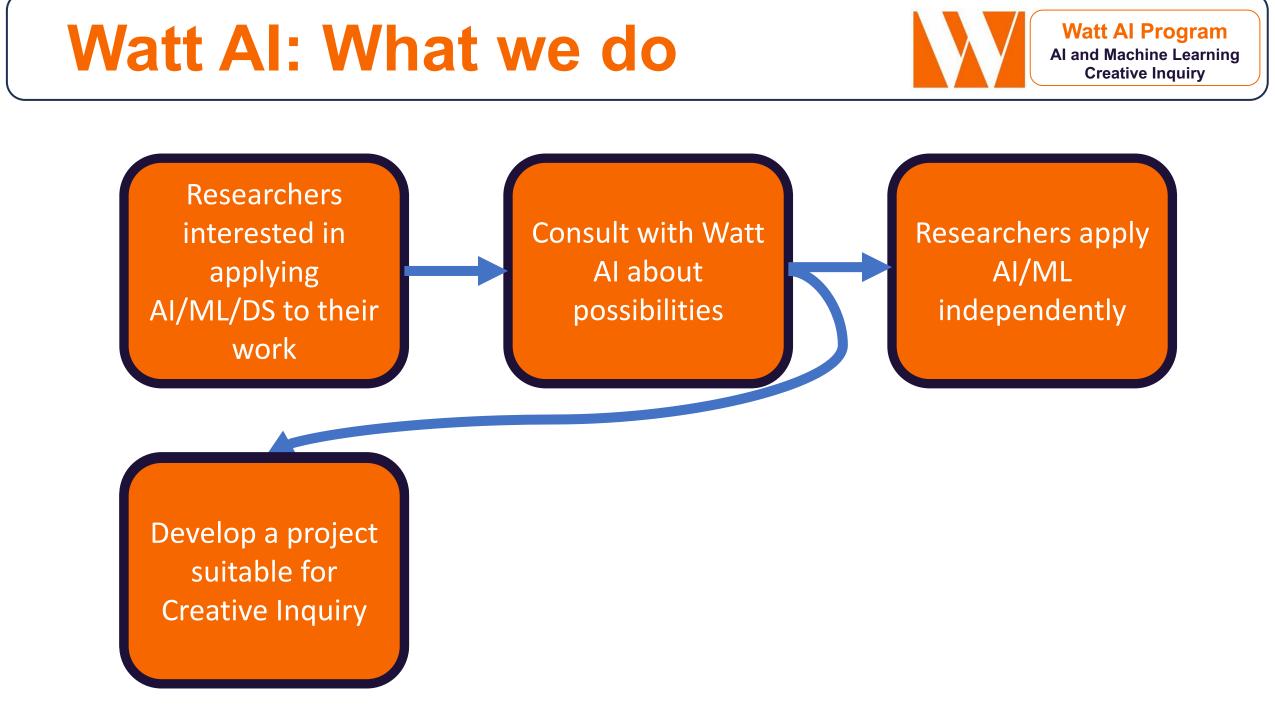
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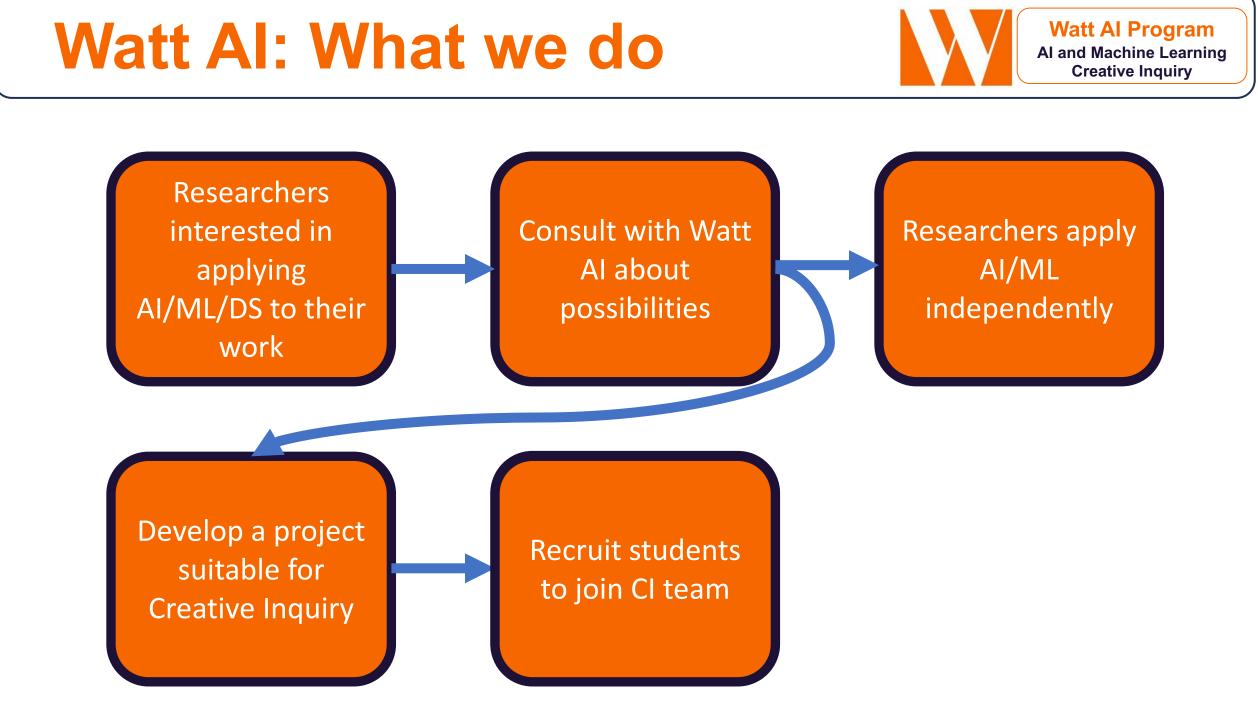
Researchers interested in applying AI/ML/DS to their work

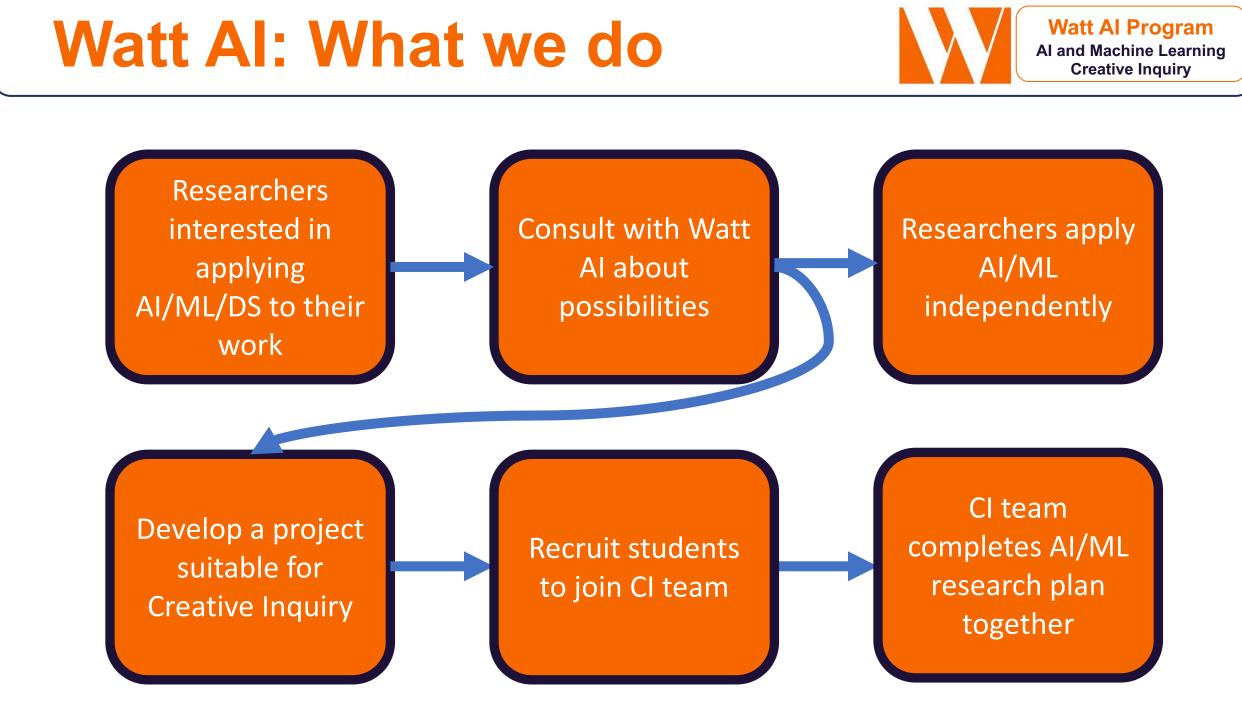


Watt Al Program Al and Machine Learning Creative Inquiry









Al tools can augment learning



You

Please write a Python code snippet that downloads the MNIST dataset, uses UMAP to reduce it to three dimensions, and then plots the resulting data in an interactive plot where each marker is colored by its MNIST digit label.

ChatGPT

python

To achieve this task, you can use the following Python code snippet. Make sure you have the necessary libraries installed before running the code. You can install them using `pip` if you haven't already.

🗂 Copy code

import numpy as np import matplotlib.pyplot as plt import umap from sklearn.datasets import fetch_openml

Load the MNIST dataset

mnist = fetch_openml('mnist_784')
X = mnist.data.astype(float) / 255.0 # Normalize pixel values to [0, 1
y = mnist.target.astype(int)

Reduce the dataset to three dimensions using UMAP umap_model = umap.UMAP(n_components=3) umap_result = umap_model.fit_transform(X)

Create an interactive 3D plot using Plotly
import plotly.express as px

fig = px.scatter_3d(
 umap_result, x=0, y=1, z=2,
 color=y,
 labels={'color': 'Digit Label'},
 title='UMAP Visualization of MNIST Dataset in 3D'
)

Customize the plot

fig.update_traces(marker=dict(size=3))
fig.update_layout(legend_title_text='Digit Label')
fig.show()

This code will download the MNIST dataset, reduce it to three dimensions using UMAP, and create an interactive 3D scatter plot using Plotly where each marker is colored according to its MNIST digit label. Make sure you have the necessary libraries installed, such as `umap-learn`, `scikit-learn`, `matplotlib`, and `plotly`. You can install them using `pip` if you haven't already.

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```

Al tools can undermine learning

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3. For a random variable X with pdf/pmf given by f(x):

- (a) Show that E(a + bX) = a + bE(X), where a, b are constants.
- (b) Show that $Var(a + bX) = b^2 Var(X)$.
- (c) Suppose we observe a random variable Y that depends on another observed value, x, through the relation

 $Y = \beta_0 + \beta_1 x + \epsilon,$

where β_0, β_1 , and x are constants, and $\epsilon \sim N(0, \sigma^2)$. Use parts (a) and (b) to find (i) E(Y) and (ii) Var(Y).

You

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(a) Show that E(a + bX) = a + b E(X), where a; b are constants.
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(ii) Var(Y).

Go step by step, and show your work at each step. Use LaTeX formatting. < 6/6 >

ChatGPT

Certainly! Let's go step by step and use LaTeX formatting for each part of the problem.

(a) To show that E(a + bX) = a + bE(X), we will calculate the expected value of a + bX using the definition of expected value:

$$E(a+bX)=\int_{-\infty}^{\infty}(a+bX)f(x)\,dx\,,$$

where f(x) is the probability density function (pdf) or probability mass function (pmf) of X.

Now, let's simplify this expression:

$$E(a+bX)=\int_{-\infty}^{\infty}(a\cdot f(x)+bX\cdot f(x))\,dx$$

Using the linearity of the integral, we can split it into two parts:

$$E(a+bX)=a\int_{-\infty}^{\infty}f(x)\,dx+b\int_{-\infty}^{\infty}X\cdot f(x)\,dx$$

The first integral is just the expected value of a constant, which is the constant itself:

$$E(a+bX)=a+b\int_{-\infty}^{\infty}X\cdot f(x)\,dx$$

The second integral is the definition of the expected value of X, E(X):

$$E(a+bX)=a+bE(X)$$

So, we have shown that E(a+bX)=a+bE(X) .

Two questions



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How can we craft assignments that *thwart* a student trying to *avoid* learning?



How can we craft assignments that help support a student trying to learn?

Two questions



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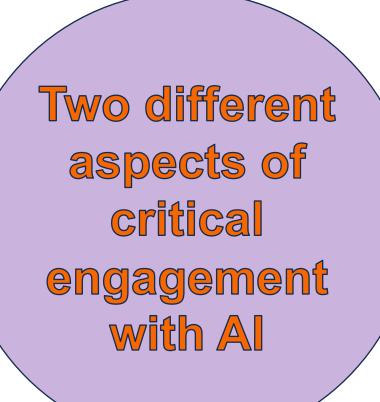
Watt Al Program Al and Machine Learning Creative Inquiry

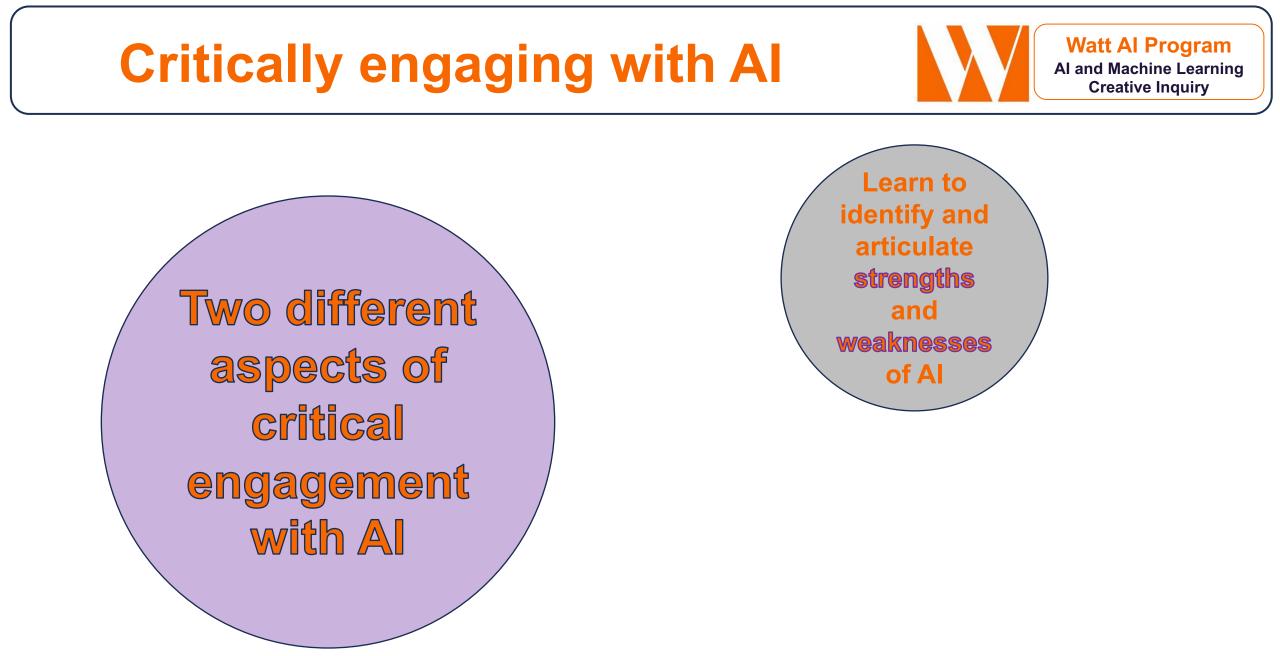
How can we craft assignments that *thwart* a student trying to *avoid* learning? How can we craft assignments that help support a student trying to learn?

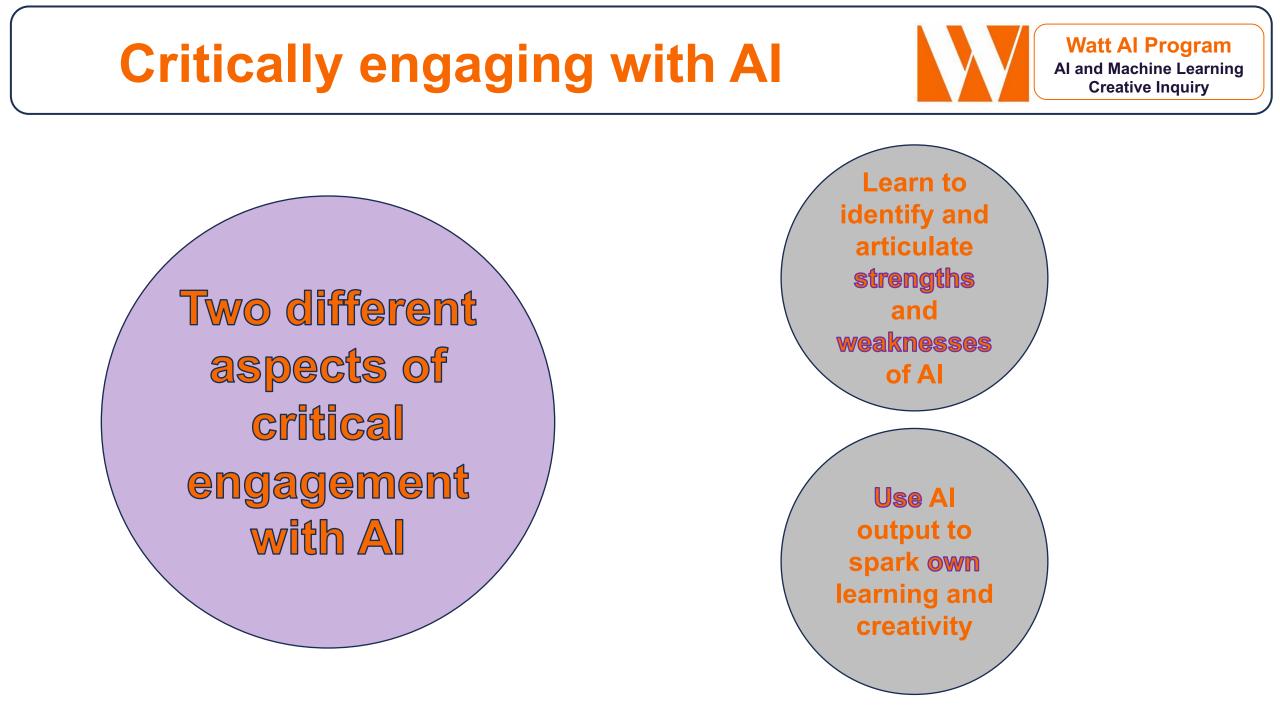
Critically engaging with Al



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Watt Al Program Al and Machine Learning Creative Inquiry

Model capabilities can be very opaque.

Students can engage AI more productively if they think critically about what the model does and does n't "understand".

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ASSIGNMENT:

For each of a given set of capabilities, craft a prompt which helps determine if the model has or lacks the capability.

Assess the model's output.



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Example 1: Intro to Ethics For each of a set of ethical theories, prompt an LLM to explain the theory. Determine whether the explanations are correct.

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Example 1: Intro to Ethics For each of a set of ethical theories, prompt an LLM to explain the theory. Determine whether the explanations are correct.

Example 2: Symbolic logic For each of a set of logical fallacies, construct a prompt exhibiting the fallacy. Determine which fallacies a LLM can detect and diagnose, and which it cannot.

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Example 3: Algorithms & Data structures For each of a set of algorithms, have a code-writing model implement it. Then assess the time complexity of the model's solution. Note any inefficiencies.



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Milestone 1: Can understand spatial relationships



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"A balloon floating above a Clemson Tiger's head"



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Watt Al Program Al and Machine Learning Creative Inquiry

Milestone 2: Can count to ten



Watt Al Program Al and Machine Learning Creative Inquiry

Milestone 2: Can count to ten

"Numbers 1 through 10, in order"



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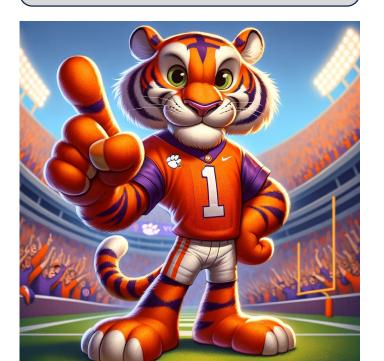


Watt Al Program Al and Machine Learning Creative Inquiry

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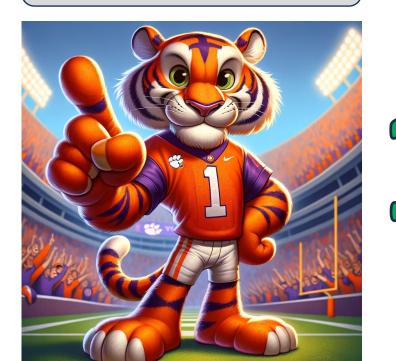


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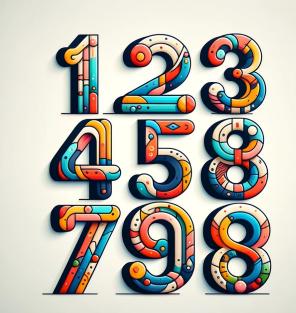


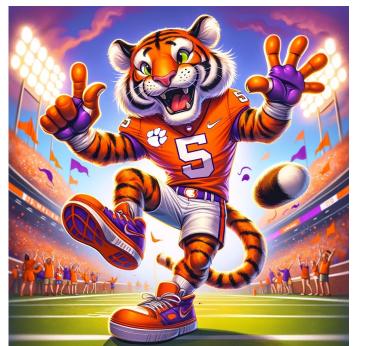


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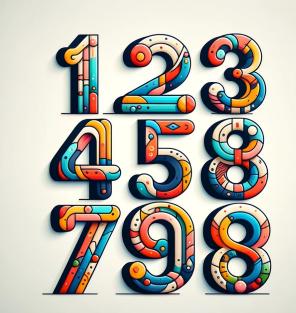




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Watt Al Program Al and Machine Learning Creative Inquiry

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Students can engage Al more productively if they think critically about how Al can complement their own learning.

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ASSIGNMENT:

Watt AI Program Al and Machine Learning

Creative Inquiry

For a given task, use an AI tool to complete the task.

Explain why the model behaved as it did, and assess own learning while using the model.

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Creative Inquiry

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Creative Inquiry

Example 2: Literature review Prior to reading an academic article, list the questions you hope it answers. Ask an LLM to summarize the article. Read the summary, and update your list of questions.

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Creative Inquiry

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Example 3: Machine learning Use an AutoAI model to select a regression algorithm and optimize its hyperparameters for a given dataset. Explain why the model made those selections.

Watt Al Program Al and Machine Learning Creative Inquiry

Essay assignment

Select one of the prompts listed below, and produce a 5 paragraph essay response to the prompt.

In selecting your prompt, you should choose a subject about which you currently feel **entirely clueless**.

In producing your response, you should use <u>ChatGPT</u> (or similar) alone, with no other sources, to write your essay. You can simply induce ChatGPT to write the essay, or you can collaborate with ChatGPT, as you prefer. You must pretend to have at least one source that is not ChatGPT. Try to write as correct and convincing of an essay as you can.

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How confident are you in this essay? Do you feel that it provides * a good answer to the prompt? (1: Not at all confident, 5: Very confident)

Do you think the information in your essay contains inaccuracies? *

3

2

Some inaccuracies, but mostly not

I think my essay is mostly or wholly inaccurate

Many inaccuracies

O No

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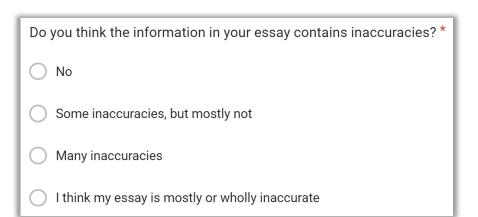
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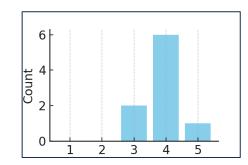
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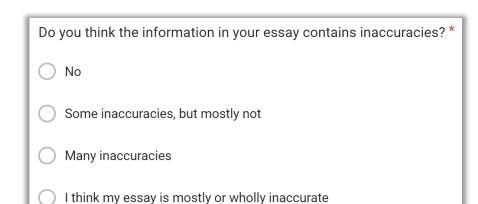
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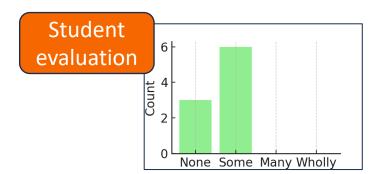
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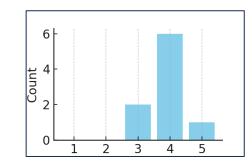
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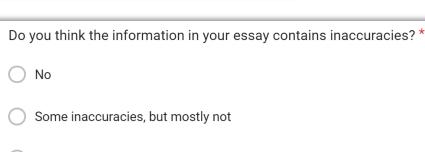
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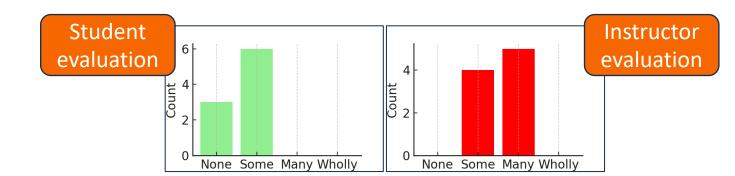
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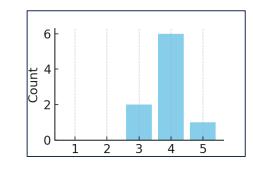


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Get involved!

