L3HARRIS
FAST. FORWARD.

TRANSFORMING DATA INTO KNOWLEDGE: TRAINING AN LLM WITH INTERNAL RESOURCES

Final Intern Presentation

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August 6th, 2025

Who Am I ?

- First Internship
- Senior year in University of Puerto Rico Mayagüez Campus
- Computer Science Undergraduate Student
- Interest/Hobbies
  - Videogames
  - Movies/TV Shows
  - Reading

UPR
Recinto Universitario de Mayagüez

Overview

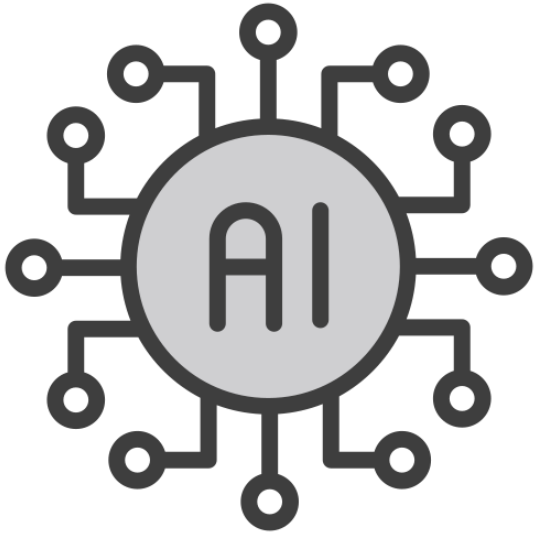
Goal: Provide a recap of my summer internship by explaining the tasks I worked on, the obstacles I overcame and the lessons I learned

Agenda:

- Overview
- Tools/Languages
- Pre-processing Scripts
- Logic Metrics
- Evaluation Questions
- Obstacles and lessons learned
- Path forward

Common Acronyms

- AI = Artificial Intelligence
- ML = Machine Learning
- LACI = L3Harris AI Concept Incubator
- LLMs = Large Language Models



AI/ML Overview

Artificial Intelligence

Is the field of study

Machine Learning

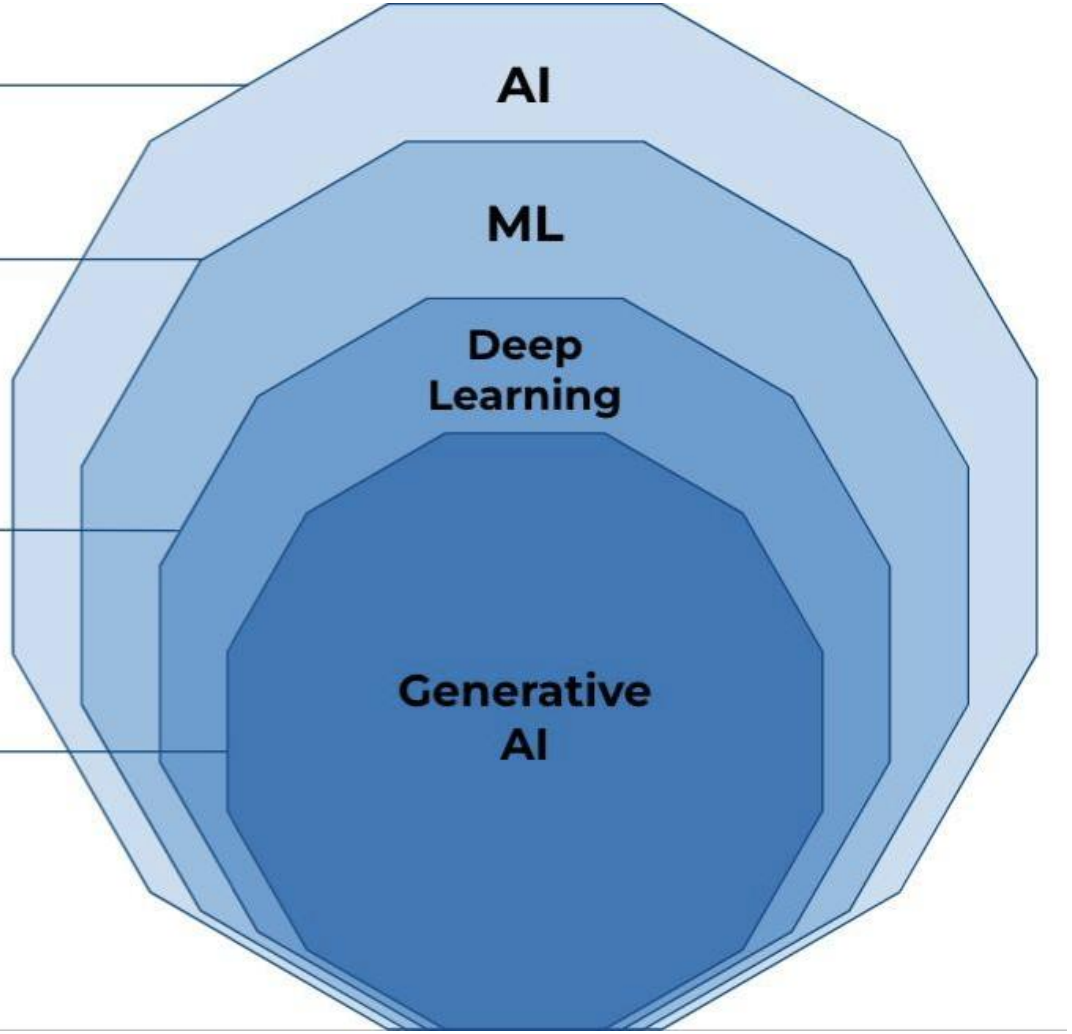
Is a branch of AI that focus on the creation of intelligent machines that learn from data. Another very well know branch inside AI is **Optimization**.

Deep Learning

Is a subset of Machine Learning methods, based on **Artificial Neural Networks.** Examples: CNNs, RNNs

Generative AI

A type of ANNs that generate data that is similar to the data it was trained on. Examples: GANs, LLMs



Tools/Languages

Development
- ✓ Visual Studio / Python
- ✓ Git

Testing
- ✓ LACI
- ✓ Excel File

Agile Scrum Methodology
- ✓ Jira
- ✓ Bitbucket
- ✓ Confluence
- ✓ Scrums Meetings

LACI

What is LACI?

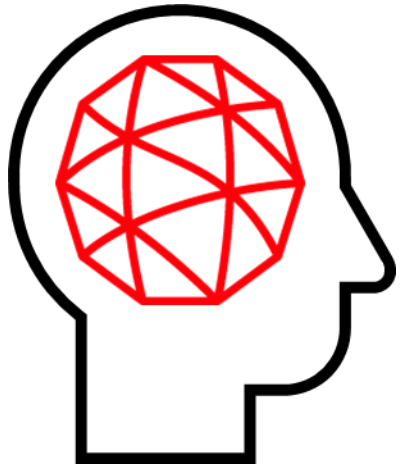
- ✓ The LACI System provides a framework to experiment with Generative AI technologies and tools.

What Is the objective?

- ✓ Provide AI assistance across employee base to realize internal engineering efficiencies using internal Special Project Funding.

What are the requirements for LACI?

- ✓ Open-source software
- ✓ Scalable, low-cost, on-prem hardware
- ✓ Support L3Harris proprietary information



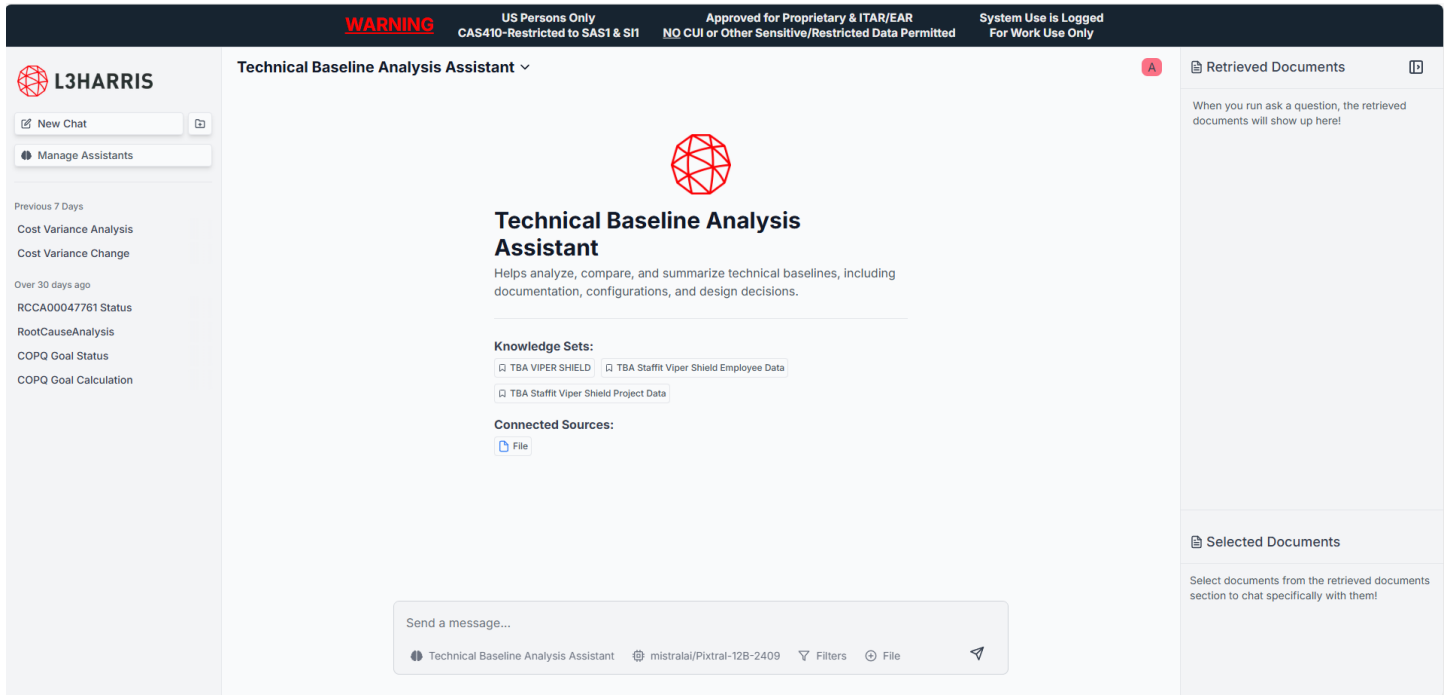
Onyx: Organizational Knowledge (AKA Danswer)

What is Onyx?

- An AI platform connected to your company's docs, apps, and people. It is an open-sourced organizational knowledge chat interface to find information faster for user specific document upload, assistant creation, and document sets.

What Is the objective?

- It provides a feature rich Cchat interface and plugs into any LLM of your choice. Keeps knowledge and access controls sync-ed across over 40 connectors like Google Drive, Slack, Confluence, etc.

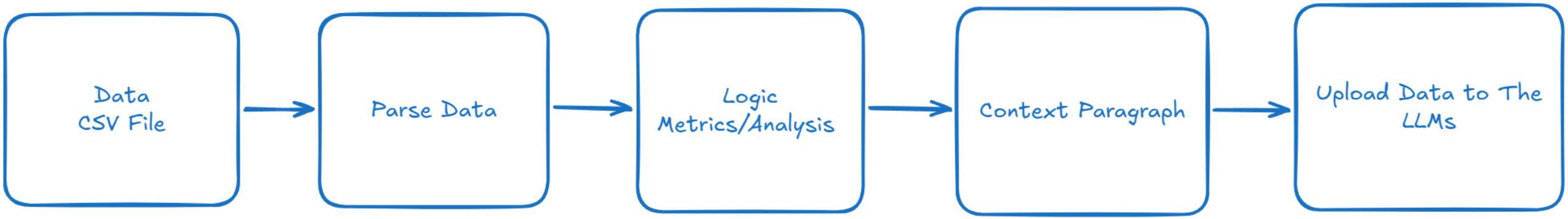


Preprocessing Scripts

What is a preprocessing scripts?

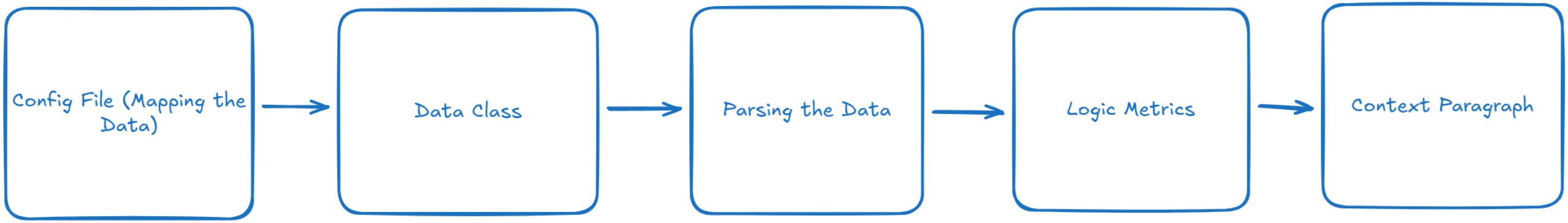
Data preprocessing is the process of transforming raw data into more usable format for analysis or Large Language Models.

The preprocessing script is the process of parsing the data of CSV files and take that information to the Rules(Logic Metrics). These rules make calculations to the data and create context paragraphs that are used to provide the model with data.



Creation of Templates for Preprocessing Scripts

The objective was to implement a template for the preprocessing scripts to facilitate the process on parsing the data and creating the analysis. This helps the team work more efficiently and more quickly, making everything organized and simpler.



Development of Logic Metrics

What are the Rules?

The rules apply logic to the data and output the rules in natural language. They set the metrics for LLMs to be able to answer questions based on the data.

performance.py

```python
def variance_at_complete_peroid_difference(p1: float, p2: float, p1_id: str, threshold: int) → Tuple[bool, str]:
    p: str = ""

    valid, vac = calculate_percent_difference(p1, p2)

    if not valid:
        return (False, p)

    if abs(vac) > threshold:
        # we tripped the threshold and have something to print out.
        improved = "increasing"
        if vac < 0:
            improved = "decreasing"

        p += f"WBS ID {p1_id} the Variance at Complete is {improved} by this percent {vac}% from Period 1 to Period 2. The value in Period 1 was {p1} and Period 2 was {p2}."
        return (True, p)

    return (False, p)
```

Evaluation Questions

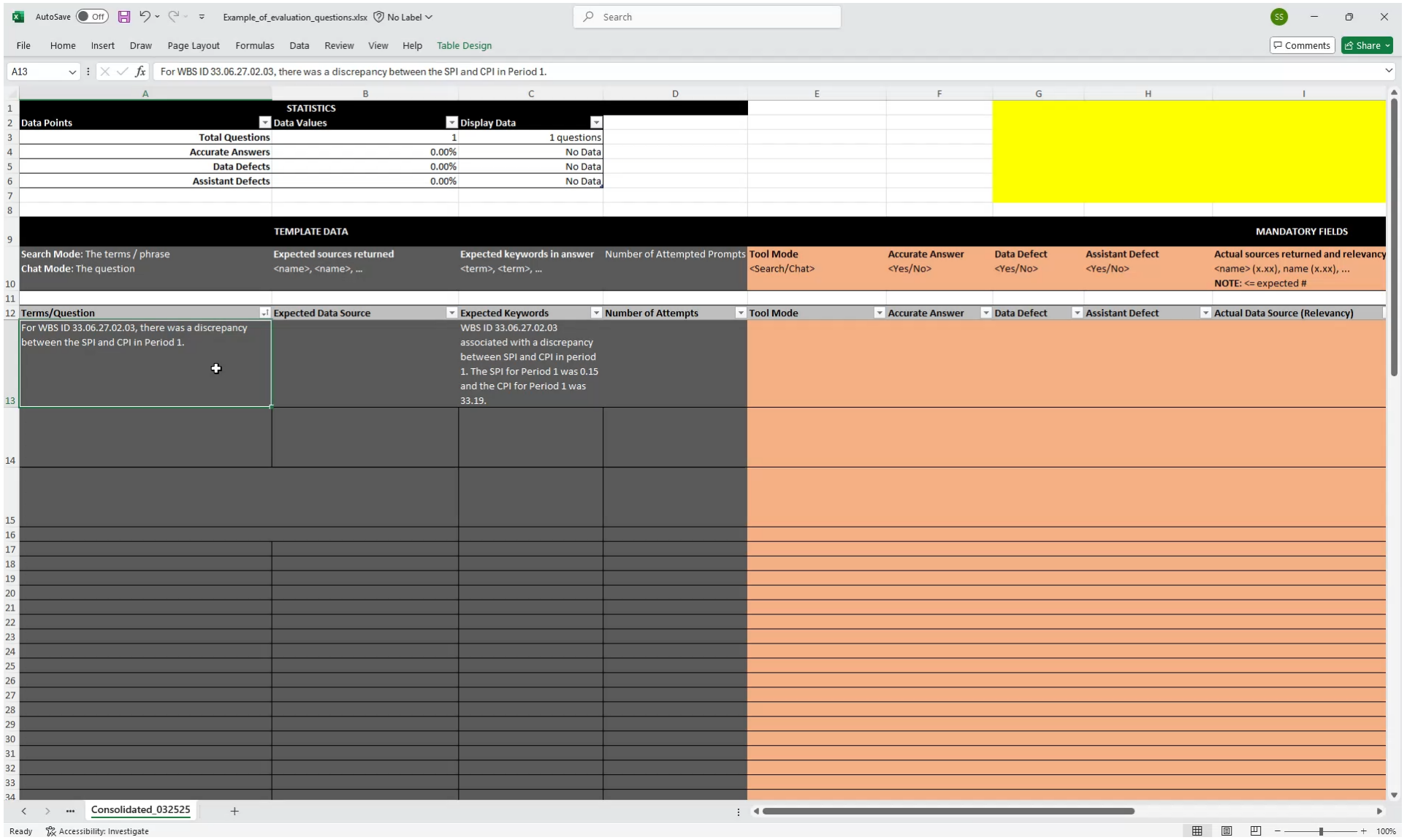
What are the Evaluation Questions?

Evaluation questions are used to test the accuracy of the LLMs. In this process, I created some questions for the model based on the CSV data file. This documentation allows for a systematic evaluation of the model's performance.

STATISTICS			
Data Points	**Data Values**	**Display Data**	
Total Questions	0	0 questions	
Accurate Answers	0.00%	No Data	
Data Defects	0.00%	No Data	
Assistant Defects	0.00%	No Data	
TEMPLATE DATA			
Search Mode: The terms / phrase **Chat Mode**: The question	**Expected sources returned** <name>, <name>, …	**Expected keywords in answer** <term>, <term>, …	Number of Attempted Prompts
Terms/Question	**Expected Data Source**	**Expected Keywords**	**Number of Attempts**

MANDATORY FIELDS							OPTIONAL FIELDS
Tool Mode <Search/Chat>	**Accurate Answer** <Yes/No>	**Data Defect** <Yes/No>	**Assistant Defect** <Yes/No>	**Actual sources returned and relevancy** <name> (x.xx), name (x.xx), ... **NOTE**: <= expected #	**Actual keywords in answer** <term>, <term>, …	**CHAT MODE ONLY** <search phrase> e.g.: Searching for: "<data of interest>"	Add a comment describing any defects
Tool Mode	**Accurate Answer**	**Data Defect**	**Assistant Defect**	**Actual Data Source (Relevancy)**	**Actual Keywords**	**CHAT ONLY: Actual Search Phrase**	**Comments**

Example For Evaluation Questions



	A	B	C	D	E	F	G	H	I
1	STATISTICS								
2	Data Points	Data Values	Display Data						
3	Total Questions	1	1 questions						
4	Accurate Answers	0.00%	No Data						
5	Data Defects	0.00%	No Data						
6	Assistant Defects	0.00%	No Data						
7									
8									
9	TEMPLATE DATA								MANDATORY FIELDS
10	**Search Mode**: The terms / phrase **Chat Mode**: The question	Expected sources returned <name>, <name>, ...	Expected keywords in answer <term>, <term>, ...	Number of Attempted Prompts	Tool Mode <Search/Chat>	Accurate Answer <Yes/No>	Data Defect <Yes/No>	Assistant Defect <Yes/No>	Actual sources returned and relevancy <name> (x.xx), name (x.xx), ... **NOTE**: <= expected #
11									
12	Terms/Question	Expected Data Source	Expected Keywords	Number of Attempts	Tool Mode	Accurate Answer	Data Defect	Assistant Defect	Actual Data Source (Relevancy)
13	For WBS ID 33.06.27.02.03, there was a discrepancy between the SPI and CPI in Period 1.		WBS ID 33.06.27.02.03 associated with a discrepancy between SPI and CPI in period 1. The SPI for Period 1 was 0.15 and the CPI for Period 1 was 33.19.						

Obstacles

- **Setting up the environment**
  - ✓ Download the correct version of Python
  - ✓ Installed all the dependencies
- **Acquiring the program for development**
- **Short Time Frame**
  - ✓ Only 10 weeks

Lessons Learned and Path Forward

- ✓ Gained valuable experience applying an agile software development process.
- ✓ Developed technical skills in Python and Git.
- ✓ Gained new insights into automated designs.
- ✓ Developed the ability to adapt quickly.
- ✓ Gained knowledge on Artificial Intelligence and Machine Learning.
- ✓ Plan for the future? Have another internship next summer and continue acquiring more knowledge in my field.

I want to thank my team and all my coworkers who helped me grow and provided mentorship throughout this internship!

Questions?
Thank you for your attention!