International Islamic University Chittagong

Department of Computer Science and Engineering

Course Title:

Artificial Intelligence Lab

Course code:

CSE -3635

Project Dossier:

WorldWatch AI- An Interactive Geopolitical Intelligence Dashboard

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Submitted to

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1. Introduction

In today's interconnected world, decision-makers in business and policy face a deluge of information. It is increasingly difficult to identify relevant geopolitical events, understand their potential impact, and make timely, informed decisions. The core problem is not a lack of data, but a lack of actionable intelligence derived from that data.

WorldWatch AI is a comprehensive, interactive intelligence dashboard designed to solve this problem. Developed within a single, powerful Google Colab notebook, it transforms raw global news into a multi-faceted analytical tool. The system automates the entire intelligence cycle: from data collection and processing to analysis, prediction, and actionable recommendation.

- The dashboard provides users with five distinct intelligence views:
- A Unified News Feed to monitor global and local events.
- A Geospatial Threat Map to visualize the geographic concentration of risk.
- A Trend Analysis view to track the rise and fall of different risk categories over time.
- A Market Pulse monitor to correlate news events with real-time financial indicators.

A predictive AI Economic Advisor that forecasts the near-term economic outlook and provides strategic recommendations based on the principles of machine learning.

This project demonstrates the power of combining Natural Language Processing (NLP), Rule-Based Expert Systems, and Machine Learning to create a sophisticated, end-to-end decision support system.

2. Software Requirements

The entire project is self-contained and runs within a Google Colab environment. The necessary software dependencies are automatically installed when the primary code cell is executed.

Cell Name: [1] Installations & Imports

Core Environment:

Python 3.x: The underlying programming language.

Google Colab: The cloud-based notebook environment that provides the execution runtime and user interface.

Core Data Science & Utility Libraries:

pandas & numpy: For high-performance data manipulation, aggregation, and numerical operations.

requests & feedparser: For fetching data from the NewsAPI web service and RSS feeds, respectively.

pytz & datetime: For robust handling of timezone-aware date and time information.

Geospatial Libraries:

geopy: Used to perform geocoding, converting location names found in news articles (e.g., "Kyiv") into geographic coordinates (latitude and longitude).

folium: Used to render the interactive Geospatial Threat Map.

Visualization Libraries:

ipywidgets & IPython.display: The core framework for building the interactive dashboard layout, including tabs, buttons, and output areas, directly within the notebook.

plotly: For creating dynamic, interactive charts used in the Trend Analysis and Market Pulse tabs.

Artificial Intelligence & Machine Learning Libraries:

scikit-learn: The fundamental machine learning library used to implement the RandomForestClassifier for the AI Economic Advisor.

vaderSentiment: A rule-based sentiment analysis engine used for natural language processing tasks.

yfinance: To fetch historical financial market data (e.g., VIX index), which serves as the "ground truth" for training our predictive model.

3. Hardware Requirements

The project is designed to be cloud-native, minimizing local hardware dependencies.

Recommended Environment:

Any modern computer with a web browser (e.g., Chrome, Firefox, Edge).

A stable internet connection to access Google Colab and the external data APIs.

Minimum Local Environment (if not using Colab):

CPU: Dual-core processor or better.

RAM: 8 GB or more is recommended to handle the data processing and machine learning model training.

Storage: Minimal local storage required (~200 MB for libraries and data).

Internet Connection: Required for all data-fetching operations.

The use of Google Colab is strongly recommended as it provides the necessary computational resources for free and eliminates any complex local setup.

4. Methodology

The project's methodology directly implements several core concepts from the Artificial Intelligence syllabus. The data flows through a sophisticated pipeline where each stage applies a specific AI technique.

Cell Name: [2] Full Backend Logic (Pipeline, Helpers, AI Models)

Natural Language Processing & Knowledge Acquisition :

The system begins by ingesting unstructured text data from global news APIs and RSS feeds. This raw data is processed using Natural Language Processing techniques to prepare it for analysis. The run_automated_pipeline() function serves as the primary mechanism for this Knowledge Acquisition.

Rule-Based Expert System:

The classify_text() function acts as a classic Rule-Based Expert System.

Knowledge Base: The UPGRADED_KEYWORDS dictionary serves as the "knowledge base," containing domain-specific terms and their associated risk weights.

Inference Engine: The function's logic is the "inference engine," which applies these rules to the text to deduce the most likely category (e.g., 'War', 'Trade', 'Economic'). This represents a form of symbolic reasoning.

Inductive Learning with Decision Trees :

The train_and_predict_economy() function employs Inductive Learning.

It uses a RandomForestClassifier from scikit-learn, which is an ensemble model built from numerous Decision Trees.

The model learns the complex, non-linear relationship between the features (daily aggregated risk scores from the news) and a real-world label (the VIX "fear" index). It inductively creates a model from historical examples.

Probabilistic Reasoning :

The final output of the AI Advisor is a form of Probabilistic Reasoning.

After the Decision Tree model makes a prediction (e.g., "Cautious Growth"), it also calculates a confidence score using the predict_proba() method.

This score represents the model's certainty in its own forecast, directly applying the principles of reasoning under uncertainty.

5. User Diagram (Use Case)

A Use Case Diagram illustrates the interactions between a user (the "Actor") and the system.

Actor: Analyst / Decision-Maker

Use Cases:

Run Intelligence Pipeline: The user can initiate the entire data gathering and processing workflow.

View Unified News Feed: The user can view a clean, organized list of global and local news.

Filter & Search Articles: The user can filter the news feed by source (Global/Bangladeshi), category (War, Trade, etc.), and free-text search.

Analyze Geospatial Hotspots: The user can view an interactive world map to see where risk events are concentrated.

Analyze Risk Trends: The user can view a time-series chart showing how different risk categories have evolved.

Correlate Events with Markets: The user can view a financial chart with major news events plotted directly on it to see their impact.

Simulate Event Paths: The user can use the A* algorithm in the Event Tracker to find plausible sequences of events leading to a specific outcome.

Receive AI-Generated Forecast & Advice: The user can view the AI's prediction for the economic outlook and receive strategic recommendations.

6. Dashboard Demonstration

The WorldWatch AI dashboard is a multi-tabbed interactive interface rendered directly within the Google Colab notebook.

Feed Tab: The primary interface for viewing news. It features powerful controls for filtering by source and category, along with a search bar. Global news is displayed in a card-based grid view with images, while Bangladeshi news uses a more compact list view.

Map Tab: This tab presents a dark-themed world map. Geocoded news events are plotted as colored circles. The color represents the risk category, and the size of the circle represents the severity (risk score). Clicking a circle reveals the news headline.

Trends Tab: This features a stacked area chart showing the aggregated daily risk score, broken down by category. This allows a user to immediately see which types of risk are growing or shrinking over time. A simple linear forecast for the most volatile category is overlaid.

Markets Tab: This tab provides an at-a-glance view of key economic indicators (S&P 500, Gold, Oil). Below these cards is an interactive financial chart showing the price of Gold, with major "War," "Trade," and "Economic" news events from the pipeline automatically plotted as star-shaped markers, visually connecting events to market reactions.

AI Advisor Tab: This is risk categories that influenced the forecast. Below this, it provides two sets of actionable strategic recommendations: one for businesses and one for policymakers. Finally, it includes an "Explanation Facility" that breaks down the AI methodology used, referencing the specific AI principles from the course syllabus.the most advanced tab. It displays the AI's final forecast ("Stable Growth," "Cautious Growth," or "Recessionary Pressure") in a large, clear card. It also shows the model's confidence in its prediction and the key

7. Working Demonstration

To run the WorldWatch AI dashboard, follow these simple steps:

Open the Notebook: Load the final project .ipynb file in Google Colab.

Execute the Code: There is only one main code cell that contains the entire project. Click the "Play" button to the left of this cell or press Shift + Enter to run it.

Wait for Setup: The cell will first run the !pip install commands to set up the environment. This may take a minute. After the installations are complete, the dashboard interface will appear below the cell. It will initially show "empty state" messages in most tabs.

Run the Intelligence Pipeline: Locate the blue "Run Pipeline" button in the top-left corner of the "Feed" tab. Click this button.

Monitor Progress: You will see status updates printed below the dashboard (e.g., "Pipeline starting...", "Classifying and scoring articles...", "Pipeline complete."). This process may take 30-60 seconds as it fetches and analyzes data.

Explore the Dashboard: Once the pipeline is complete, all tabs will automatically refresh with the latest data. You can now:

Scroll through the news feed.

Click the filter buttons (e.g., "War," "Trade," "Global") to see the interface update in real-time.

Navigate to the "Map," "Trends," "Markets," and "AI Advisor" tabs to view the full suite of analytical tools.

8. Project Workflow Diagram:

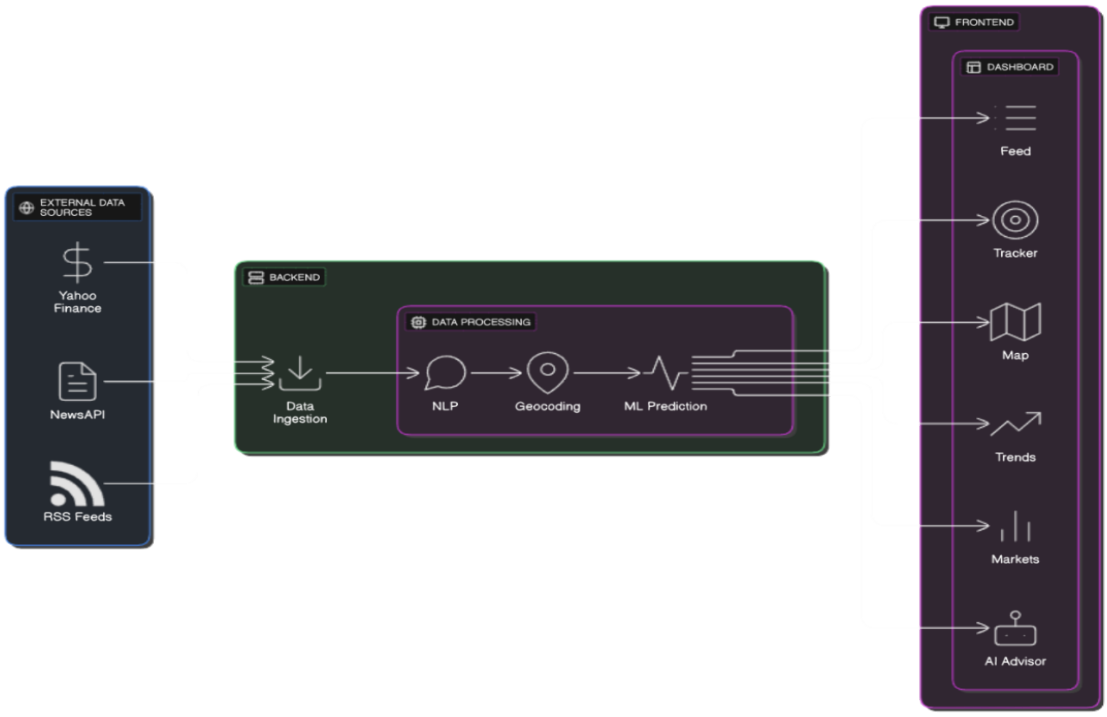


Figure: Project implementation Structure

9. Project Interface:

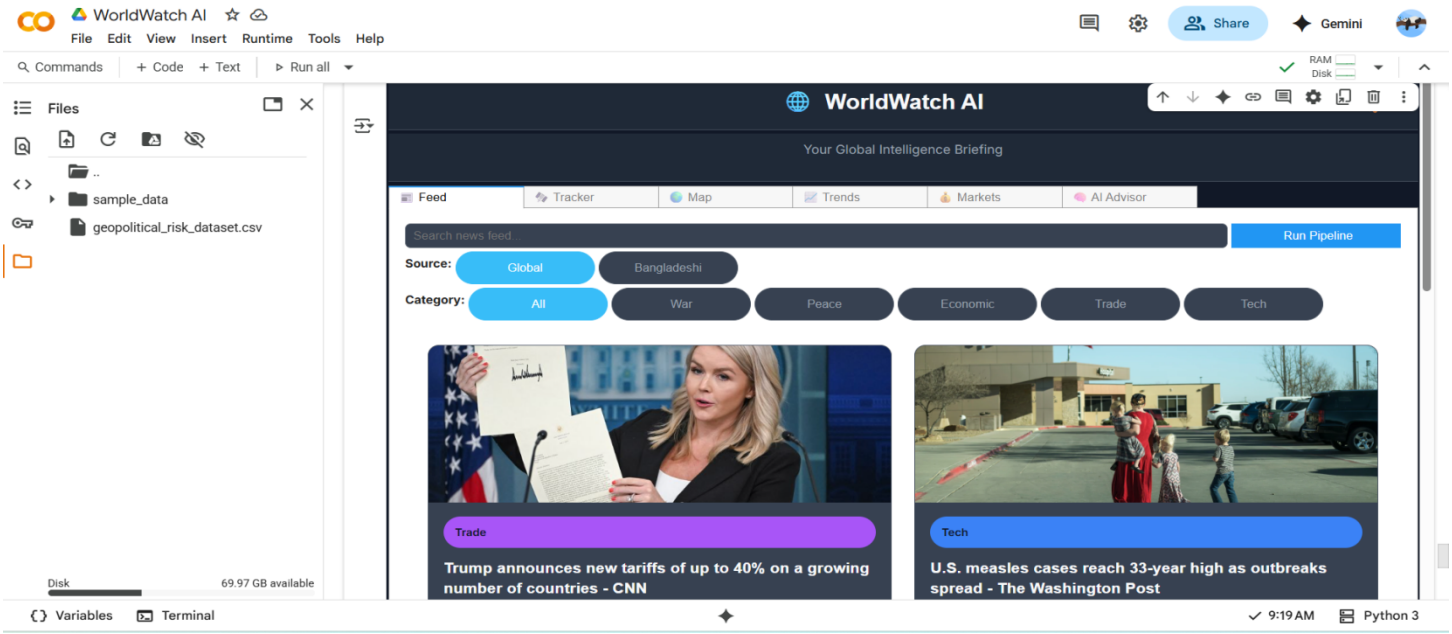
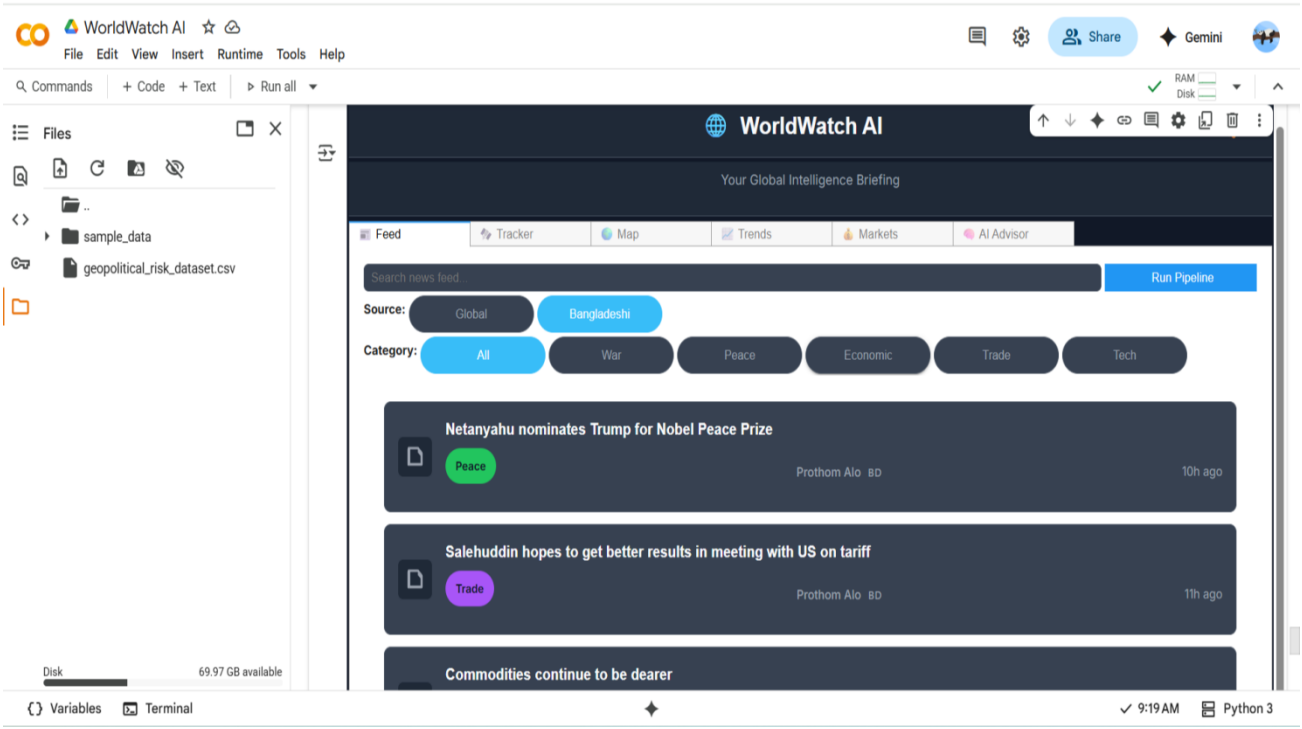


Fig : 1


WorldWatch AI
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geopolitical_risk_dataset.csv
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WorldWatch AI
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AI Advisor
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Bangladeshi
Category:
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War
Peace
Economic
Trade
Tech
Netanyahu nominates Trump for Nobel Peace Prize
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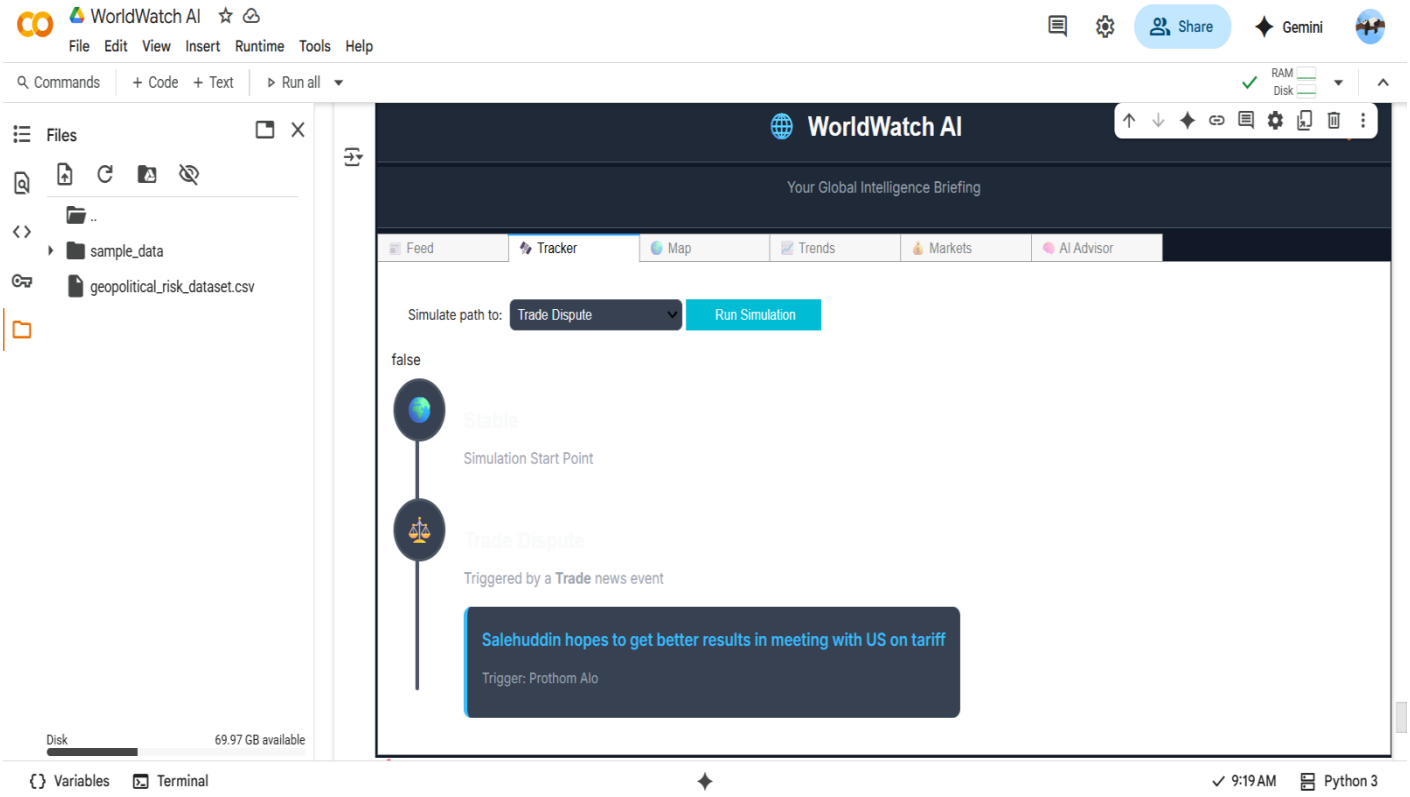
Salehuddin hopes to get better results in meeting with US on tariff
Trade
Prothom Alo BD
11h ago
Commodities continue to be dearer
Variables
Terminal
9:19 AM
Python 3

Fig : 2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AI Advisor
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Trade Dispute
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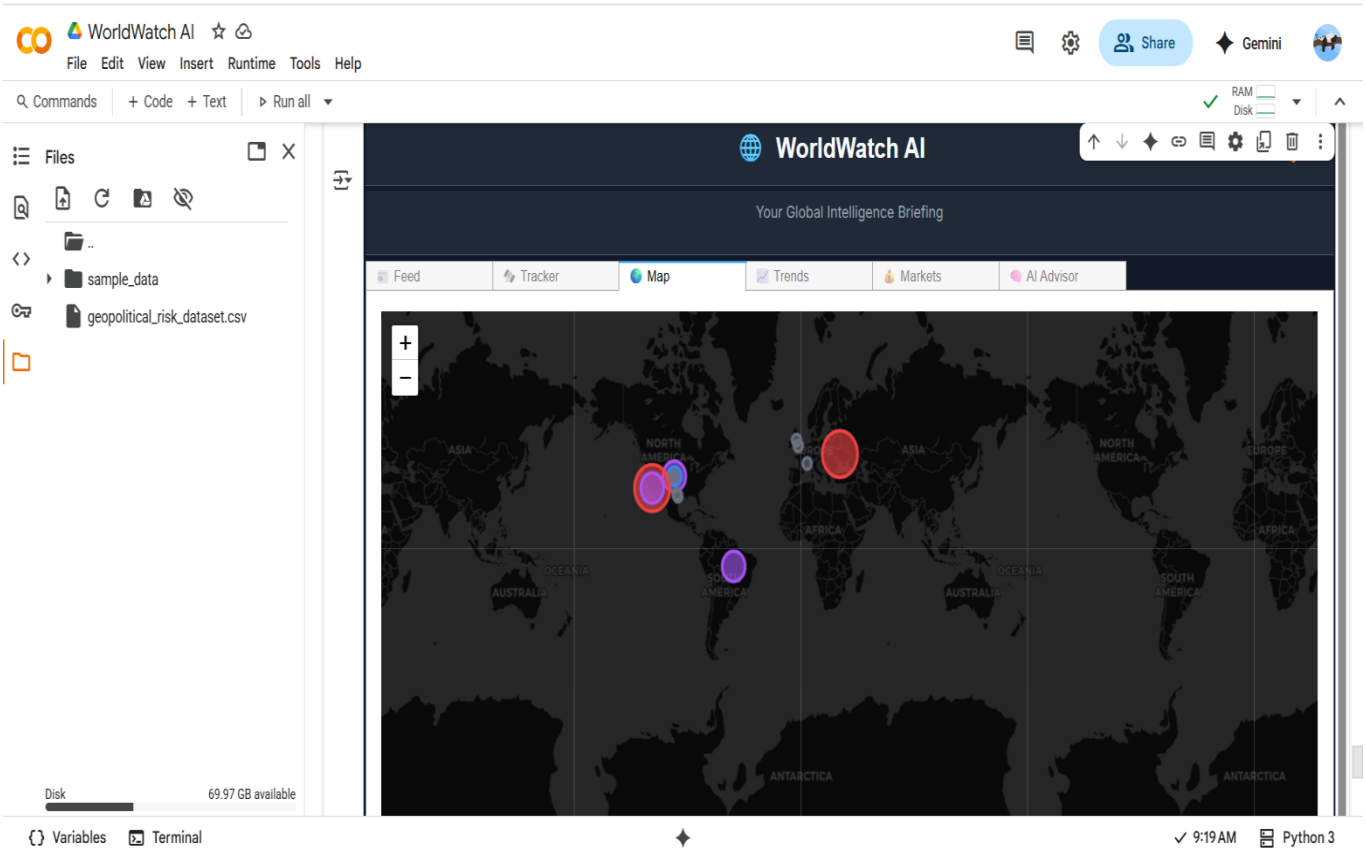
Python 3

Fig: 3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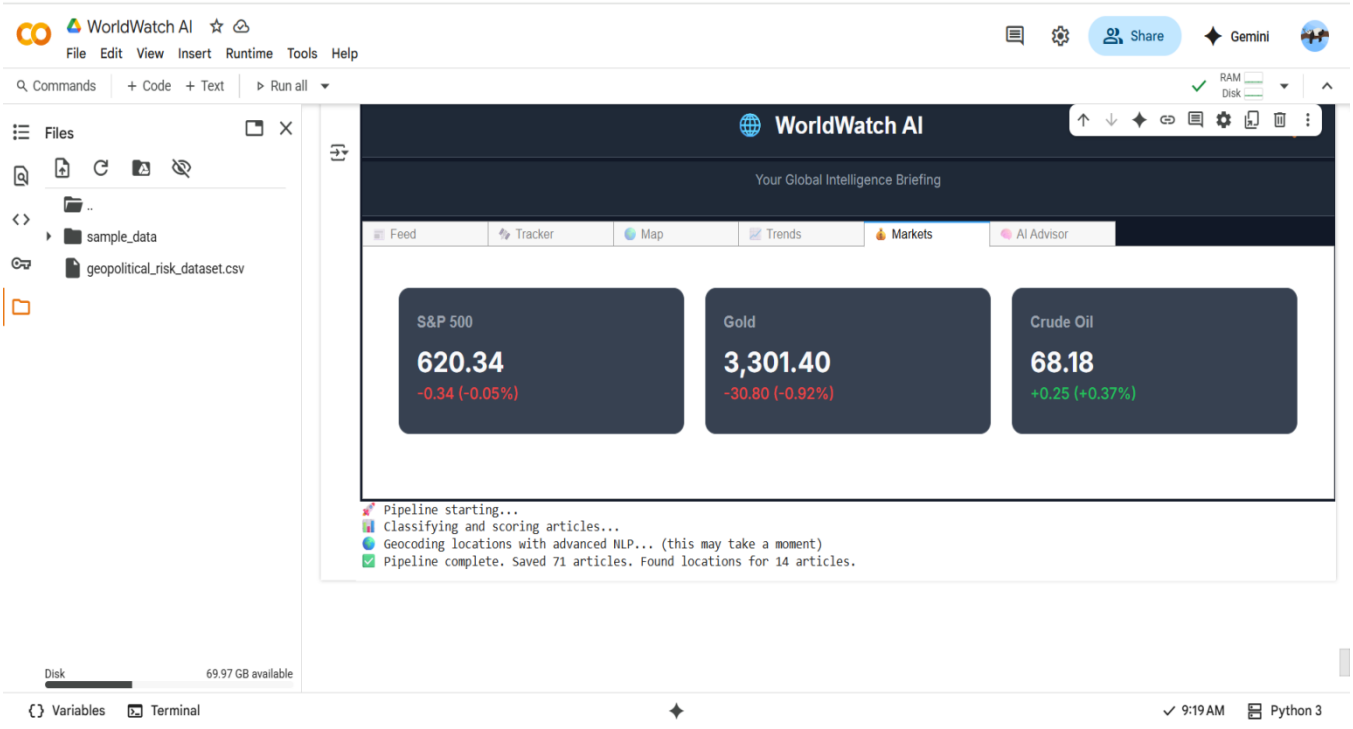
Python 3

Fig: 4


WorldWatch AI
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Disk
69.97 GB available
WorldWatch AI
Your Global Intelligence Briefing
Feed
Tracker
Map
Trends
Markets
AI Advisor
S&P 500
620.34
-0.34 (-0.05%)
Gold
3,301.40
-30.80 (-0.92%)
Crude Oil
68.18
+0.25 (+0.37%)
Pipeline starting...
Classifying and scoring articles...
Geocoding locations with advanced NLP... (this may take a moment)
Pipeline complete. Saved 71 articles. Found locations for 14 articles.
Variables
Terminal
9:19 AM
Python 3

Fig: 5

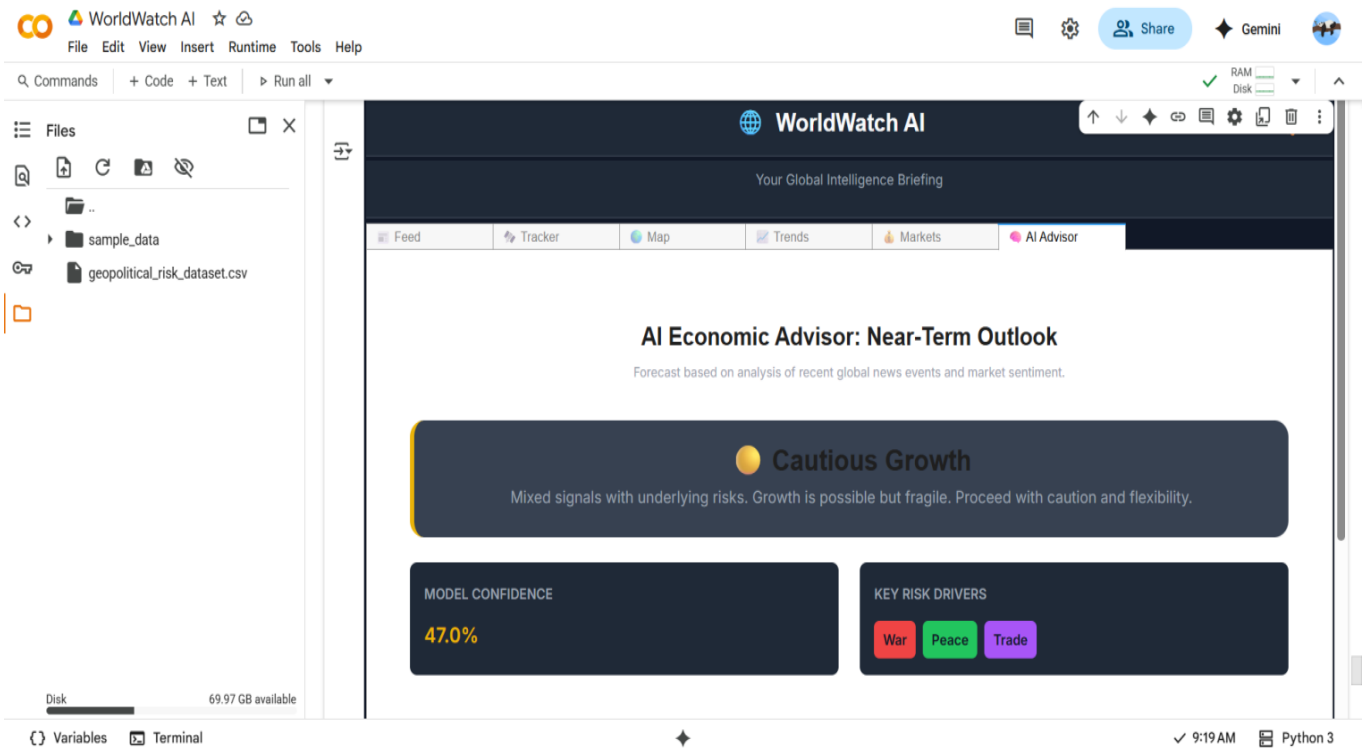

Fig: 6

10. Challenges and Future Work

Challenges:

- **Data Dependency:** The quality of the analysis is entirely dependent on the quality and scope of the news sources.
- **Model Training Data:** The predictive model currently relies on simulated historical risk data for training due to the impracticality of running the pipeline for 90+ consecutive days in a single session.
- **Keyword Limitations:** A rule-based system can miss nuanced or novel terminology.

Future Work:

- **Enhanced NLP:** Integrate more advanced NLP models (e.g., BERT, fine-tuned LLMs) for sentiment analysis and more nuanced classification to move beyond keyword matching.
- **Robust Historical Database:** Implement a persistent database (e.g., SQLite, PostgreSQL) to store historical risk data over long periods, enabling more accurate model training.
- **User Customization:** Allow users to add their own RSS feeds, define custom alert zkeywords, and specify regions of interest.
- **Real-time Alerting:** Develop a module to send real-time notifications (e.g., email, push notifications) when events matching a high-risk profile are detected.

11. Conclusion

WorldWatch AI stands as a successful proof-of-concept for a modern intelligence platform. It effectively integrates rule-based reasoning, natural language processing, and predictive machine learning to create a system that is more than the sum of its parts. By transforming raw information into structured, predictive, and visual intelligence, the project provides a powerful framework for data-driven decision-making in a complex and fast-moving world.