

Torch.AI™ Uncovers Significant Discrepancies in Maritime Fuel Consumption Data

Nexus™ human-centric machine intelligence uncovers discrepancies in maritime fuel usage data amounting to over two billion gallons while analyzing fuel consumption records

Torch.AI was challenged to make sense of a massive set of historical data describing the fuel utilization of a fleet of ships over a 20+ year period. The records were both structured and unstructured and spread across multiple files and systems—in other words, the ideal data playground for Nexus™, the AI/ML-enabled data orchestration platform from Torch Research, LLC (Torch.AI). Nexus human-centric machine intelligence unleashed valuable new insights from the data, including advanced anomaly detection and forecasting services. During the analysis, Nexus uncovered significant data discrepancies in the fuel consumption data that had alluded human analysts for 20 years. Nexus fulfilled its mission without any disruption to operations or modification to the existing data infrastructure.

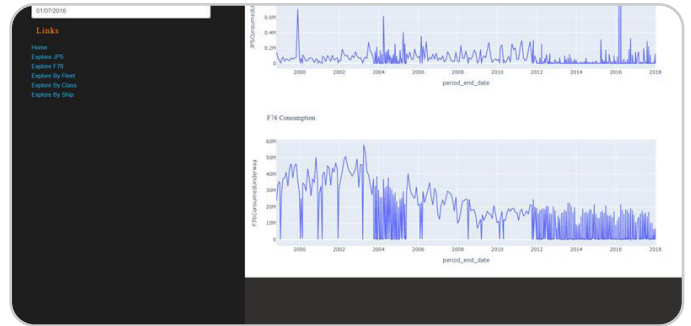
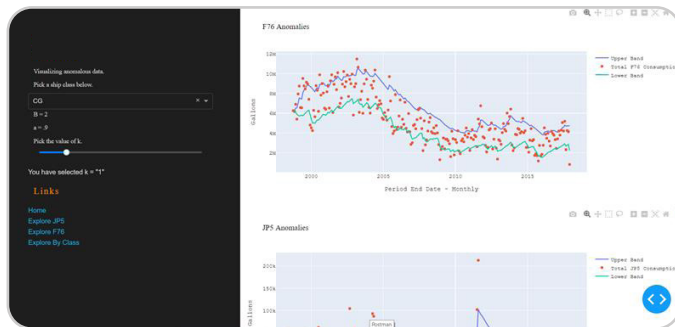
About Nexus

Nexus is the world's foremost commercial-grade data orchestration platform built with a suite of AI-powered models, algorithms, and features that facilitate the analysis, transformation, and enrichment of data in real time. Nexus holistically integrates, aggregates, tags, and normalizes structured and unstructured data from legacy systems and data providers. Nexus correlates data from any source or system, maps data to common taxonomies, applies governance specifications, and enables data enrichment and entity resolution by operationalizing AI/ML in real time. The Nexus architecture seamlessly integrates and implements any data governance definition to enforce data access and security.

Foundational to Nexus is decomposing data in any format to the object level and then repackaging that data with new richly detailed properties, all in memory while the data is in transit. The data workflow takes both structured and unstructured data from upstream and downstream sources, logs events based on time-series and location data, applies field-level meta data, and produces scalable entity resolution, schema mapping, and data fusion using our propriety knowledge graph algorithms. The result is a network-centric picture of entities, events, and locations coalesced from many sources to inform decisioning.

The Data Analytics Challenge

Torch.AI was challenged to investigate 20+ years of fuel utilization records for a fleet of ships. Nexus ingested approximately 32,000 historical warehouse records dating back to 1998. Much of the data was unstructured, spread across multiple files and systems, and normally requires significant manual effort to consolidate, clean, and otherwise prepare for human analysis. The massive data set was structured into a single, lightweight format. Nexus services then transformed the data into actionable intelligence.



Nexus Anomaly Detection used computationally efficient algorithms to track the mean and variance of the data to identify outliers. Outliers may be caused by, for example, unusual ship activity or even human error. The Nexus Forecasting service analyzed the data to predict trends and correlations. It uses a sophisticated exponential smoothing algorithm to capture seasonality and trending in data. The predictions can be valuable tools for managing fuel resources. Nexus persisted its findings in a database, enabling the creation of dashboards and other visualizations. These dashboards provided analysts with a compelling visual narrative of the data, enabling them to view fuel consumption data in new and novel ways.

Surprising New Intelligence

During its analytic processes, Nexus uncovered discrepancies—sometimes extreme—that were previously unknown and undetected. For any given class of ship, the “Fuel Consumed” records did not match the corresponding “Daily Fuel Burn” records, indicating a problem with the data collection and reporting process. Prior to Nexus, this type of numerical comparison was simply not practical given the disparate structures of the various fuel records.

Digging Deeper into the Data

After identifying the discrepancies, Nexus applied its autonomous ML-enhanced analytics to the investigation and remediation process. Using natural language processing (NLP), Nexus gleaned insights from the free-text notes found in the datasets. For example, a note may indicate that some fuel was ruined by water contamination. Using this information, combined with other advanced analytics, Nexus provided a prediction of the most likely root cause.

Our Solution

Nexus consolidated over 20 years of historical records into a single, holistic view, and enriched the data using its suite of ML-enabled technologies. This composition and orchestration of Nexus services enabled analysts to uncover new actionable intelligence and validate the accuracy (and, in some cases, inaccuracy) of their data. Although this implementation of Nexus focused on the extraction of fuel inventory-related information, the approach is extensible and applicable to virtually any data analytic challenge.

Nexus human-centric machine intelligence unleashed new intelligence that had alluded human analysts for 20 years, without any disruption to operations or modification to the existing data infrastructure.

