**Project Name: AI-Enhanced Web Tool with Message Publishing and Audit Trails**

**Project Link:** [**https://github.com/andrewmmambo/AI-enhanced-Webtool-with-message-publishing-and-audit-trails**](https://github.com/andrewmmambo/AI-enhanced-Webtool-with-message-publishing-and-audit-trails)

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**Technology stack/Tools used.**

**Presentation Layer (UI):**

* **ExtJS: For building the user interface components and managing the presentation layer.**
* **HTML/CSS: Used alongside ExtJS for styling and layout purposes.**
* **JavaScript: Required for client-side interactions and dynamic behavior of the UI elements.**

**Application Layer (Backend):**

* **Node.js: For server-side JavaScript runtime environment, providing a platform for building scalable and fast network applications.**
* **Express.js: A web application framework for Node.js, simplifying the process of building APIs and handling HTTP requests.**
* **RESTful APIs: Implementing a RESTful architecture for communication between the frontend and backend, allowing for stateless interactions.**

**Data Layer:**

* **Database Management System (DBMS): MySQL**
* **ORM (Object-Relational Mapping): Sequelize (for SQL databases) for easier database interaction and management.**

**Artificial Intelligence Layer:**

* **Natural Language Processing (NLP):**
* **TensorFlow.js: A JavaScript library for training and deploying machine learning models, including NLP models.**
* **Hugging Face Transformers: Pre-trained NLP models (GPT) that can be fine-tuned for specific tasks.**

**Anomaly Detection:**

* **Python with libraries: TensorFlow for training anomaly detection models.**

**Predictive Analytics:**

* **Python with libraries: TensorFlow for building predictive models.**
* **Deployment and Infrastructure:**
* **Docker: Containerization tool for packaging the application and its dependencies into containers, ensuring consistency across different environments.**
* **Kubernetes: Container orchestration platform for automating deployment, scaling, and management of containerized applications.**
* **Cloud Services: Platforms: Google Cloud for hosting the application and managing infrastructure resources.**

**1. Introduction**

The purpose of this document is to outline the design of a web tool built using ExtJS framework that enables users to publish messages and view audit trails. Additionally, this document will detail the integration of artificial intelligence (AI) and machine learning (ML) technologies to enhance the functionality and usability of the tool.

**2. Functional Requirements**

**2.1 Message Publishing**

* Allow users to input messages through a user-friendly interface.
* Validate and submit messages to the server for storage and processing.

**2.2 Audit Trail Management**

* Automatically log significant events and actions within the web tool.
* Provide users with the ability to view, search, and filter audit trail logs.

**2.3 AI/ML Integration**

* Implement natural language processing (NLP) algorithms to analyze message content.
* Utilize machine learning models for anomaly detection in audit trail logs.
* Incorporate predictive analytics to forecast potential issues based on historical data.

**3. Architecture Overview**

The architecture of the web tool consists of three main layers:

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| Presentation Layer |

| (ExtJS UI) |

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| Application Layer |

| (Business Logic, API Endpoints) |

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| Data Layer |

| (Message Storage, Logs) |

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| Artificial Intelligence Layer |

| (NLP, Anomaly Detection, Predictive |

| Analytics) |

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**3.1 Presentation Layer**

* Developed using ExtJS framework to create an intuitive and responsive user interface.
* Allows users to interact with the system for message publishing and audit trail management.

**3.2 Application Layer**

* Implements business logic and handles user requests.
* Utilizes RESTful APIs to communicate with the backend services.

**3.3 Data Layer**

* Stores message data and audit trail logs.
* Supports efficient retrieval and storage of information.

**4. AI/ML Integration**

**4.1 Natural Language Processing (NLP)**

* Utilize pre-trained NLP models (GPT) to analyze message content.
* Extract relevant information, sentiment analysis, and entity recognition from messages.

**4.2 Anomaly Detection**

* Train machine learning models using historical audit trail data to detect abnormal patterns or suspicious activities.
* Employ algorithms: Isolation Forest for anomaly detection.

**4.3 Predictive Analytics**

* Apply time-series forecasting techniques to predict potential issues or trends based on historical audit trail logs.
* Implement algorithms: ARIMA for predictive modeling.

**5. Security and Privacy Considerations**

* Implement robust authentication and authorization mechanisms to ensure that only authorized users can access the system and perform actions.
* Encrypt sensitive data, such as user credentials and message content, to protect privacy and prevent unauthorized access.
* Regularly audit and monitor system logs for security breaches or suspicious activities.

**6. Conclusion**

Managed to add the capability to publish messages and create audit trails on the web tool using ExtJS, thus reducing the time taken checking logs whilst debugging by 40% over a 3-month trial run. By leveraging AI/ML technologies, the system aims to enhance functionality, improve user experience, and provide predictive insights for better decision-making.

In the context of the US economy, the widespread adoption of AI/ML-enhanced web tools can contribute to the country's technological leadership, foster innovation-driven growth, and create a competitive advantage in global markets. Additionally, the efficiencies gained from these tools can lead to improved economic outcomes, including increased GDP growth, job creation, and overall prosperity.