CMPE 280 Hackathon

Macroeconomic Researcher Food Security Time Series and Large Language Chat GPT Dashboard.

Github :

Team Details: Group 14

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Problem Statement :

The Macro Economic Researcher Dashboard stands as an advanced analytical tool designed to elevate food security analysis by employing time series data visualization and interactive artificial intelligence. This cutting-edge tool seamlessly integrates a Large Language Model (LLM) to decipher budget documents, extracting pivotal financial insights essential for understanding the macroeconomic elements influencing food security.

Introduction :

The issue of food security is intricately linked with macroeconomic policies and budgetary considerations. The Dashboard capitalizes on state-of-the-art Large Language Model (LLM) technology to delve into the analysis of intricate budgetary PDFs. Traditionally, this process has been laborious and demanded a profound understanding of the specific domain. However, with the Dashboard, this challenge is addressed, streamlining what was once a time-consuming task. The sophisticated LLM efficiently distils the complexity of budgetary documents, extracting essential information and transforming it into actionable insights. This not only expedites the analytical process but also empowers users with a comprehensive understanding of the macroeconomic landscape, thus enhancing their ability to make informed decisions pertaining to food security.

Objectives :

- Streamline the process of analyzing budgets concerning food security.
- Facilitate quick and user-friendly access to budget insights impacting macroeconomic research.
- Support policymakers in making informed decisions based on comprehensive data analysis.

Features and Design:

Time Series Data Visualization

- Historical and current data on food security presented through interactive charts and graphs.
- Customizable metrics for targeted analysis of specific data points.
- Comparative tools for the comparison of different datasets to reveal trends.

Budget Document Analysis

- The Large Language Model (LLM) parses uploaded budget PDFs, summarizing key financial figures and narratives.
- Natural language processing extracts specific budget items related to food security.
- Insights from budget documents are linked to time series data to illustrate direct impacts on food security.

Large Language Model Chat Interface

- Users interact with the LLM through a chat interface to inquire about the budget data.
- The model provides explanations, summaries, and predictions based on queried budget documents.
- The chat interface caters to both technical and non-technical users, ensuring accessibility for all stakeholders.

Problem Solution:

- **Data Overload:** The dashboard mitigates information overload by synthesizing vast amounts of data into visual formats and digestible summaries.
- **Complex Document Analysis:** The LLM automates the extraction of relevant data from complex PDFs, eliminating the need for manual and error-prone tasks.
- **Real-time Insights:** With the ability to analyze documents on-the-fly, the platform provides crucial real-time insights for timely decision-making.

Results:

The homepage of the Macroeconomic Researcher Food Security Time Series and Large Language Chat GPT Dashboard offers a clean and user-friendly interface for macroeconomic analysis. Serving as a central hub, it allows researchers to access and interact with economic data, utilizing advanced AI tools to gain insights efficiently.

Visual Design and User Interface:

- **Minimalistic and Clutter-free Layout:** The dashboard embraces a minimalistic design, ensuring users can concentrate on crucial data without unnecessary distractions.
- **Intuitive Navigation:** Sidebar categorization facilitates seamless switching between different economic indicators and datasets, such as 'Macroeconomic (USD)' and 'Agricultural Table.'
- **Responsive Graph:** A central feature is the responsive graph showcasing the USA's GDP over time, reflecting a user-centric approach to data representation.

Data Representation:

- **Time Series Analysis:** The prominently displayed graph on the main page illustrates the USA's GDP in current US dollars over time, revealing a general upward trend with key inflection points corresponding to historical economic events.
- **Interactivity:** The interactive graph allows users to hover over, zoom in, and potentially click on data points for more detailed information.
- **Country Selection:** A dropdown menu for selecting a country implies dynamic updates to the graph, enabling the display of relevant data for comparative macroeconomic analysis.

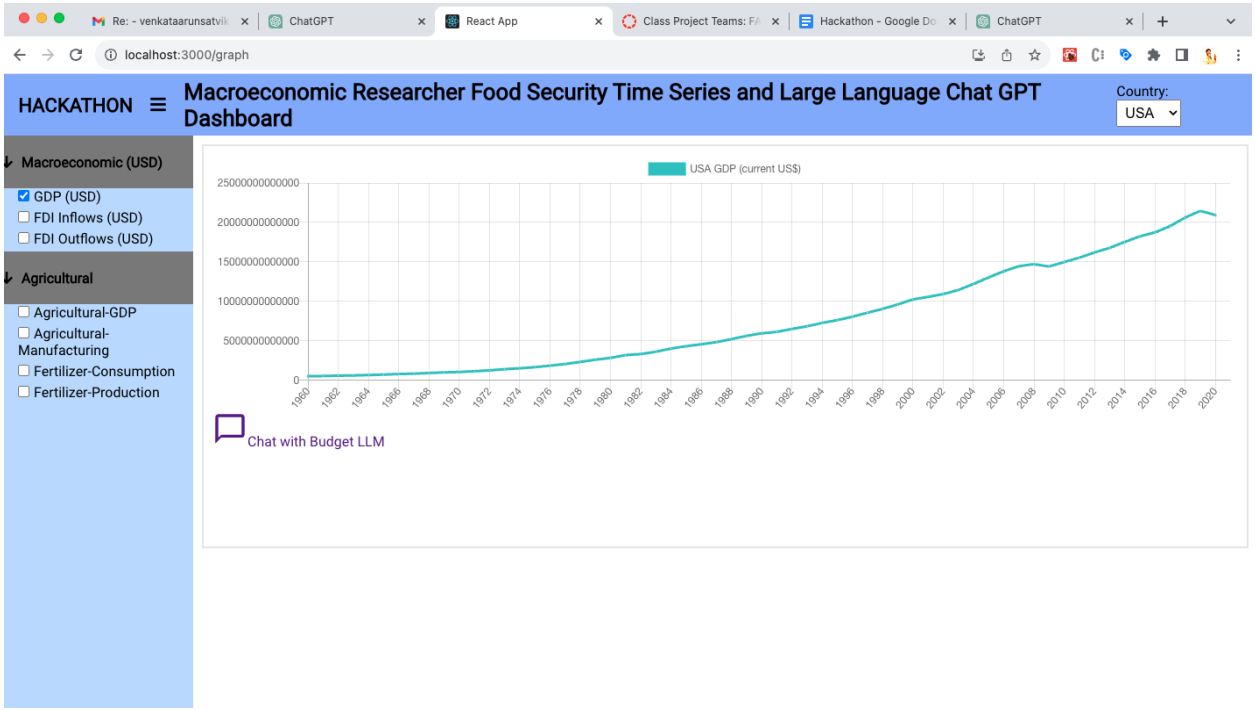
Large Language Model Integration:

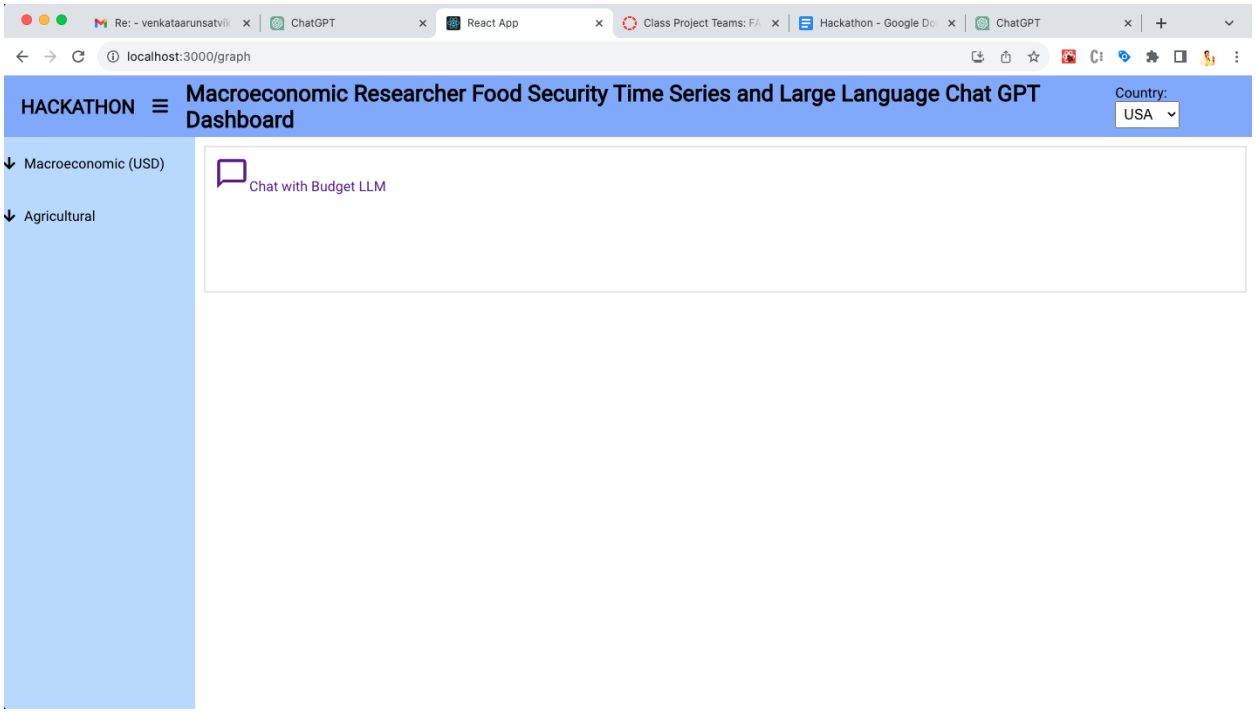
- **Chat with Budget LLM:** The inclusion of a 'Chat with Budget LLM' feature suggests an integrated AI assistant proficient in processing natural language queries. This facilitates conversational interactions, enabling users to extract data insights or seek specific information seamlessly.
- **Actionable Insights:** Positioned to provide actionable insights from budget files and other macroeconomic documents, the LLM feature streamlines data analysis and enhances decision-making capabilities.

Accessibility and Engagement:

- **Accessible Data Insights:** The dashboard strives to lower the entry barrier for complex macroeconomic analysis, catering to users with varying expertise levels.

- **Engagement through Interaction:** The 'Chat with Budget LLM' feature introduces an engaging, interactive element, encouraging users to explore data through conversational AI. This approach potentially makes complex data analysis more approachable and less technical.



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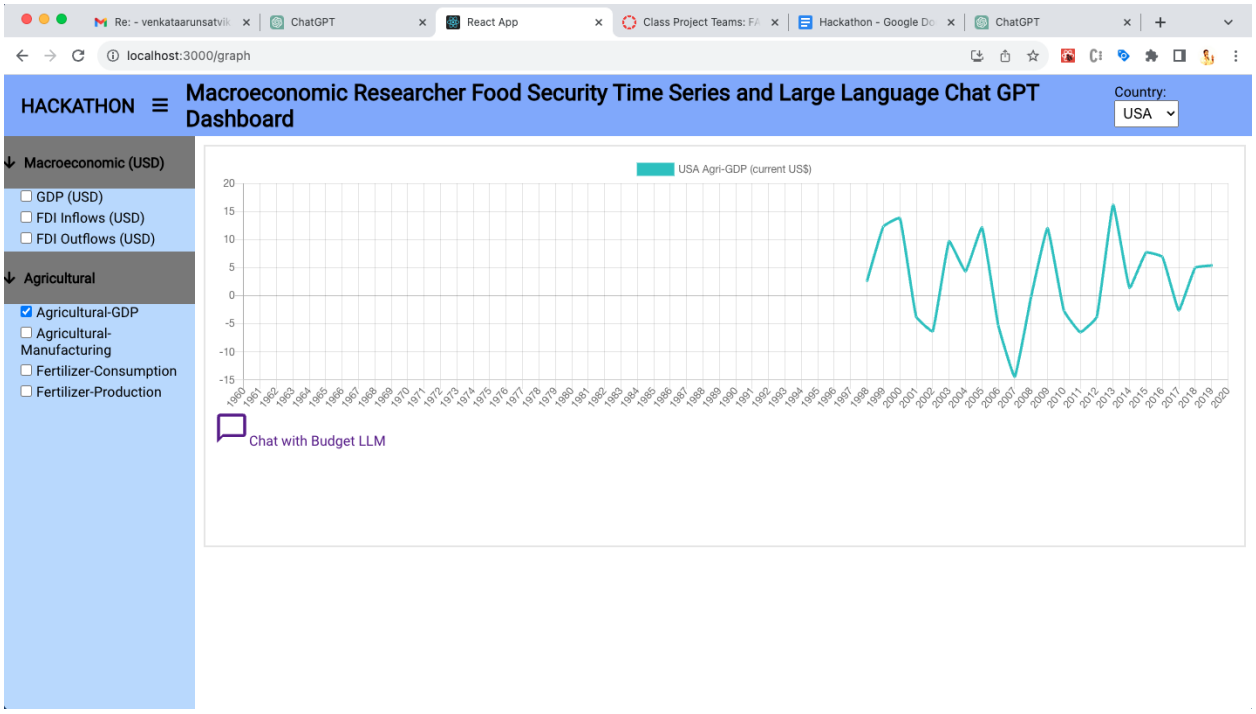
Macroeconomic Researcher Food Security Time Series and Large Language Chat GPT Dashboard
Country:
USA
Macroeconomic (USD)
GDP (USD)
FDI Inflows (USD)
FDI Outflows (USD)
Agricultural
Agricultural-GDP
Agricultural-Manufacturing
Fertilizer-Consumption
Fertilizer-Production
USA FDI-Inflows (current US$)
USA FDI-Outflows (current US$)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Macroeconomic Researcher Food Security Time Series and Large Language Chat GPT Dashboard
Country:
USA
Macroeconomic (USD)
GDP (USD)
FDI Inflows (USD)
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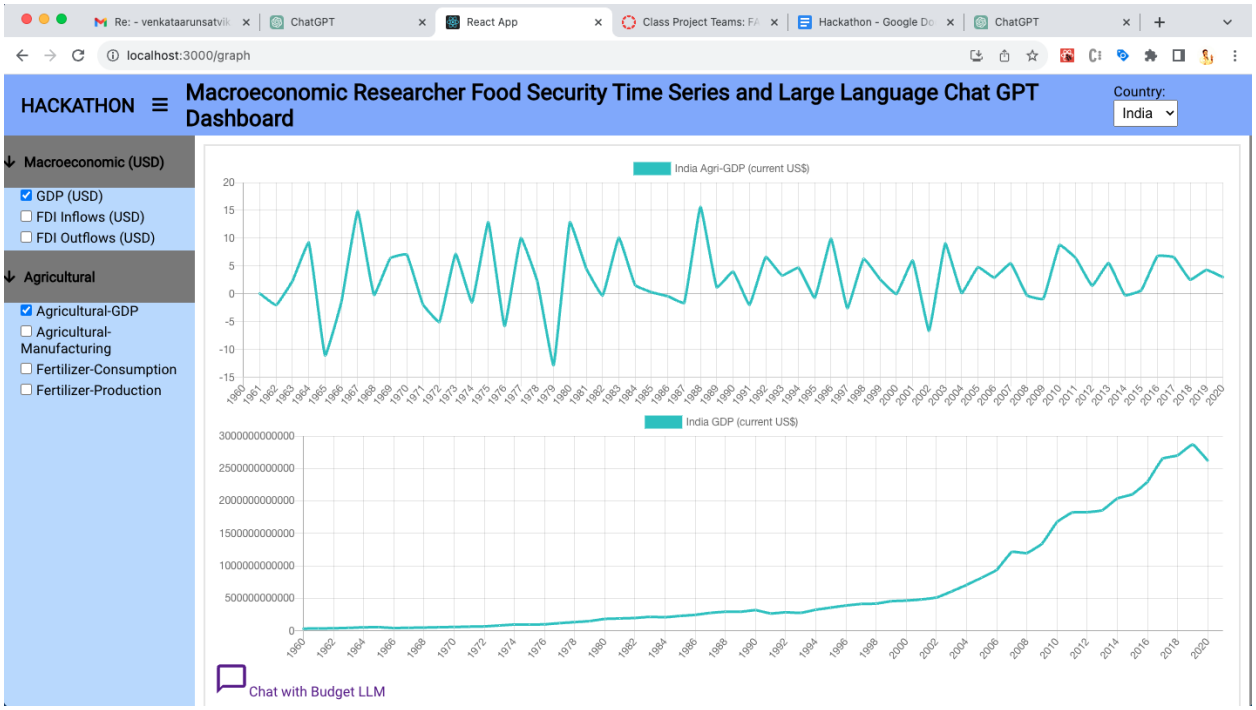
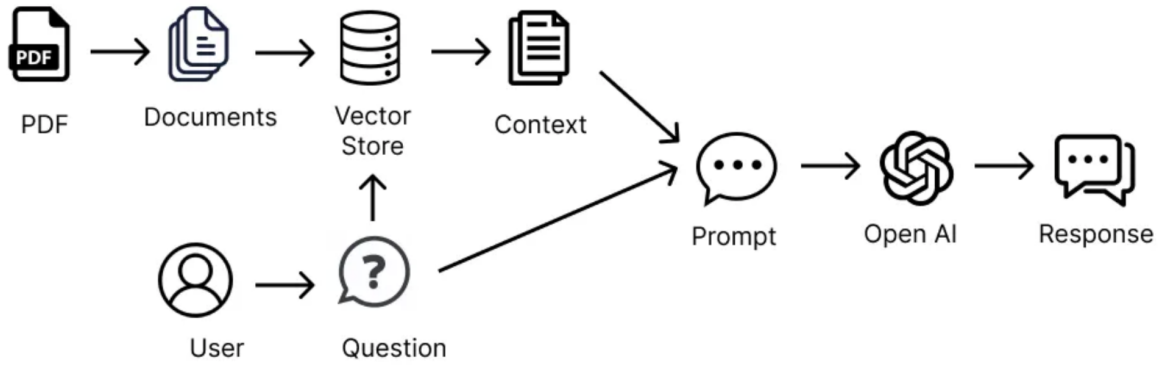
Agricultural
Agricultural-GDP
Agricultural-Manufacturing
Fertilizer-Consumption
Fertilizer-Production
USA Agri-GDP (current US$)
Chat with Budget LLM



Chatbot Interface Design:

- **Minimalist and Non-intrusive:** The chatbot interface adopts a minimalist and non-intrusive design, appearing as an unobtrusive expandable chat window at the bottom of the screen. This ensures accessibility without overshadowing the primary content of the dashboard.
- **Accessibility:** A prominent "Chat with Budget LLM" button at the bottom right provides an easy and quick way for users to engage with the chatbot at any point during their interaction with the dashboard.
- **Conversational UI:** Modeled on popular messaging platforms, the chat window design includes a clear area for users to type their messages and a send button to dispatch queries to the chatbot.
- **Integration:** Seamlessly integrated into the dashboard interface, the chatbot allows users to interact without navigating away from data visualization or other dashboard functionalities.
- **Prompting Engagement:** The chat window features a placeholder text, "Type a message...," serving as a call to action to encourage users to interact with the chatbot for queries or assistance.

Chatbot Architecture:



PDF: The system receives PDF documents containing budget data, serving as the initial input for the chatbot.

Documents: PDFs are converted into a readable format through text extraction and preprocessing to organize and clean the data.

Vector Store: Processed documents are converted into vectors using techniques like word embedding, translating text into a numerical format understandable by machine learning models.

Context: Vectors help establish the context within the documents, essential for the chatbot to provide accurate and relevant responses, especially in the case of budget PDFs.

User: Represents the end-user engaging with the chatbot.

Question: The user poses a question in natural language related to the content of the PDF documents.

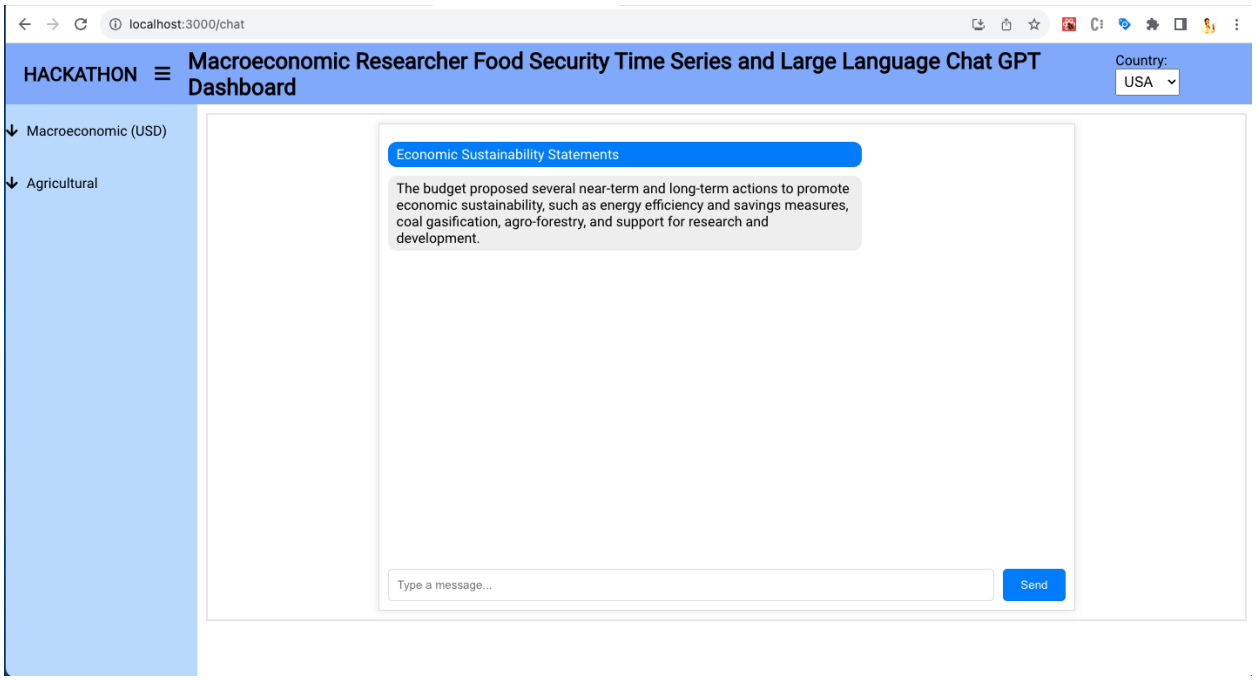
Prompt: The user's question is converted into a suitable prompt for the Large Language Model (LLM) through additional processing, ensuring compatibility.

OpenAI: The prompt is sent to OpenAI's LLM (like GPT-3 or an equivalent model). The LLM utilizes the context provided by the vector store to understand the prompt and generate a relevant response.

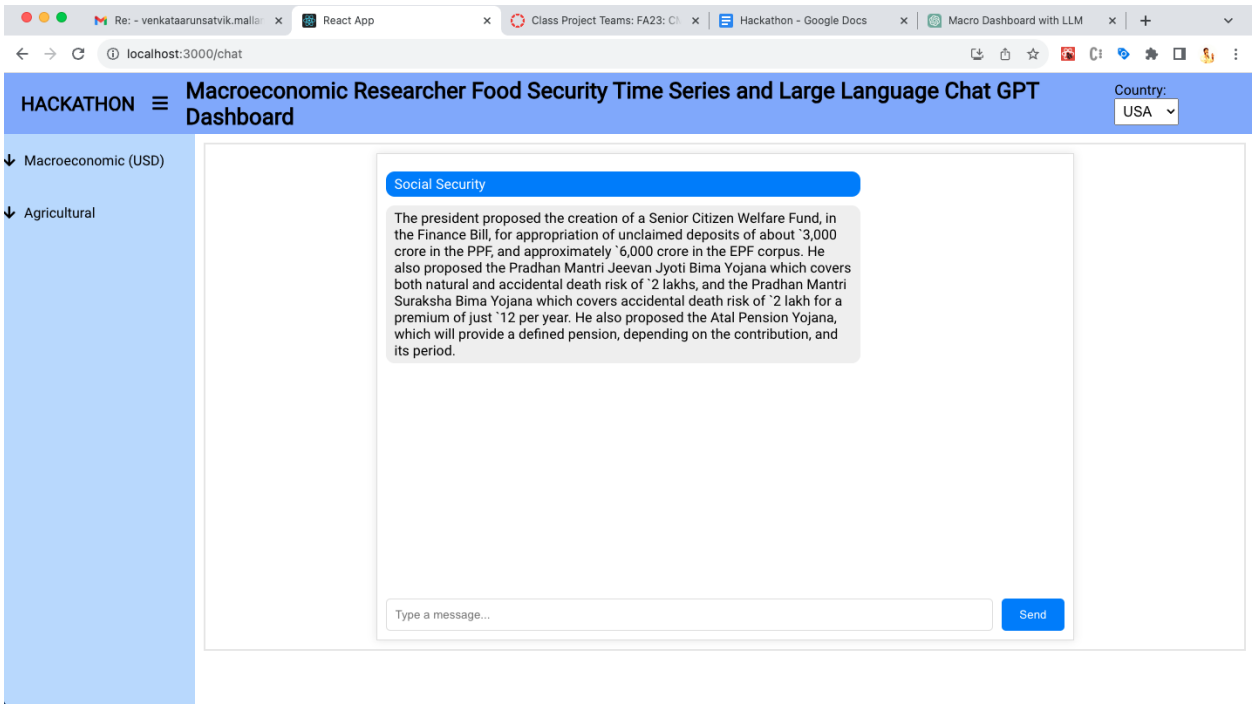
Response: The LLM sends back a response, which is then relayed to the user, aiming to answer the user's question using information gleaned from the PDF documents.

Chatbot Results :

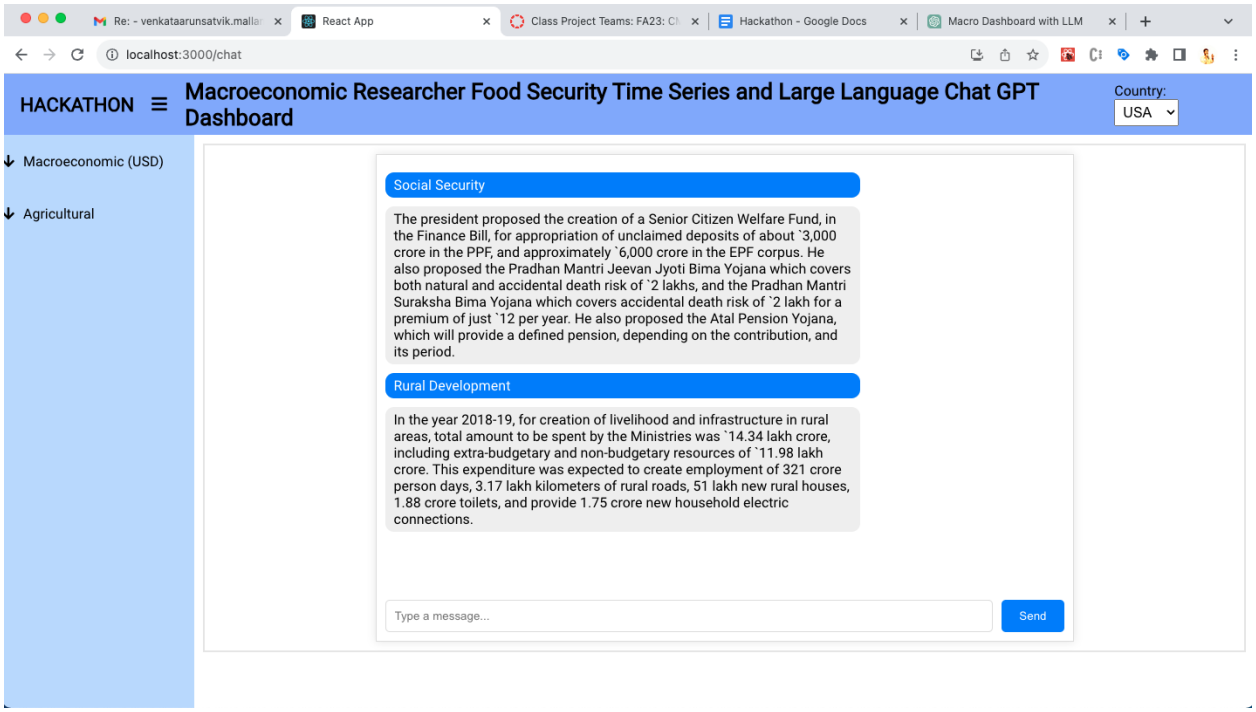
Prompt : Economic Sustainability Statements



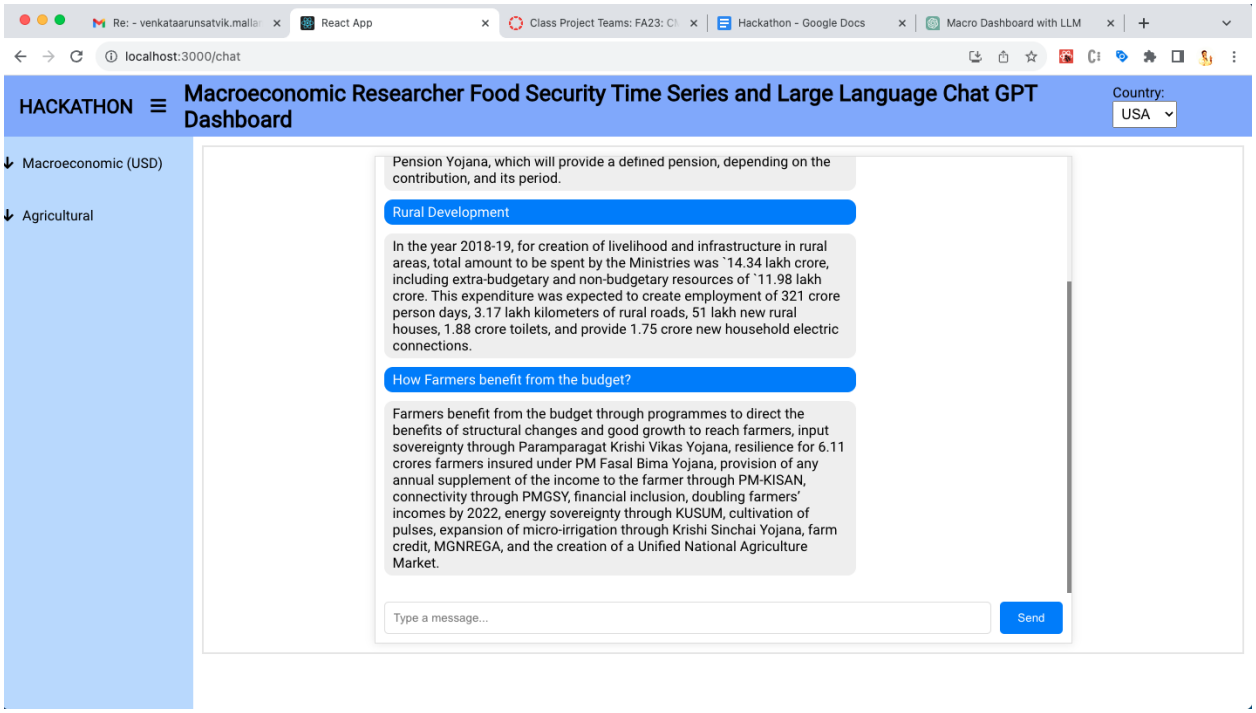
Prompt : Social Security



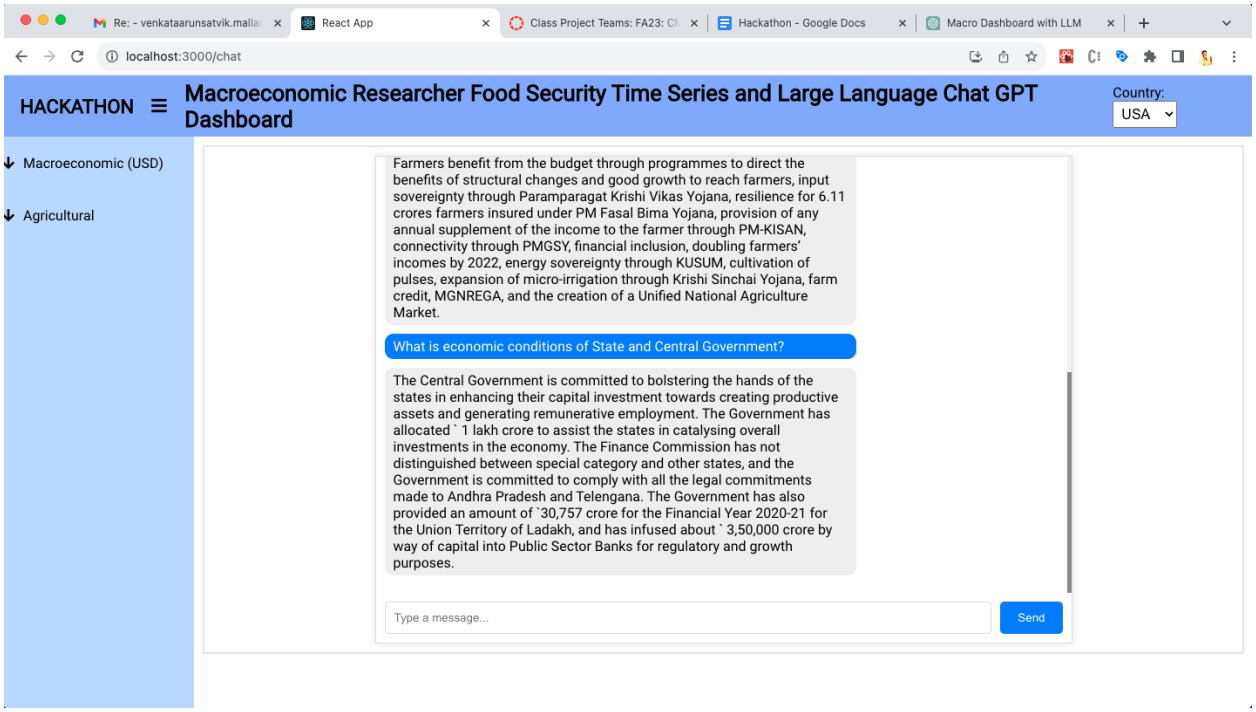
Prompt : Rural Development



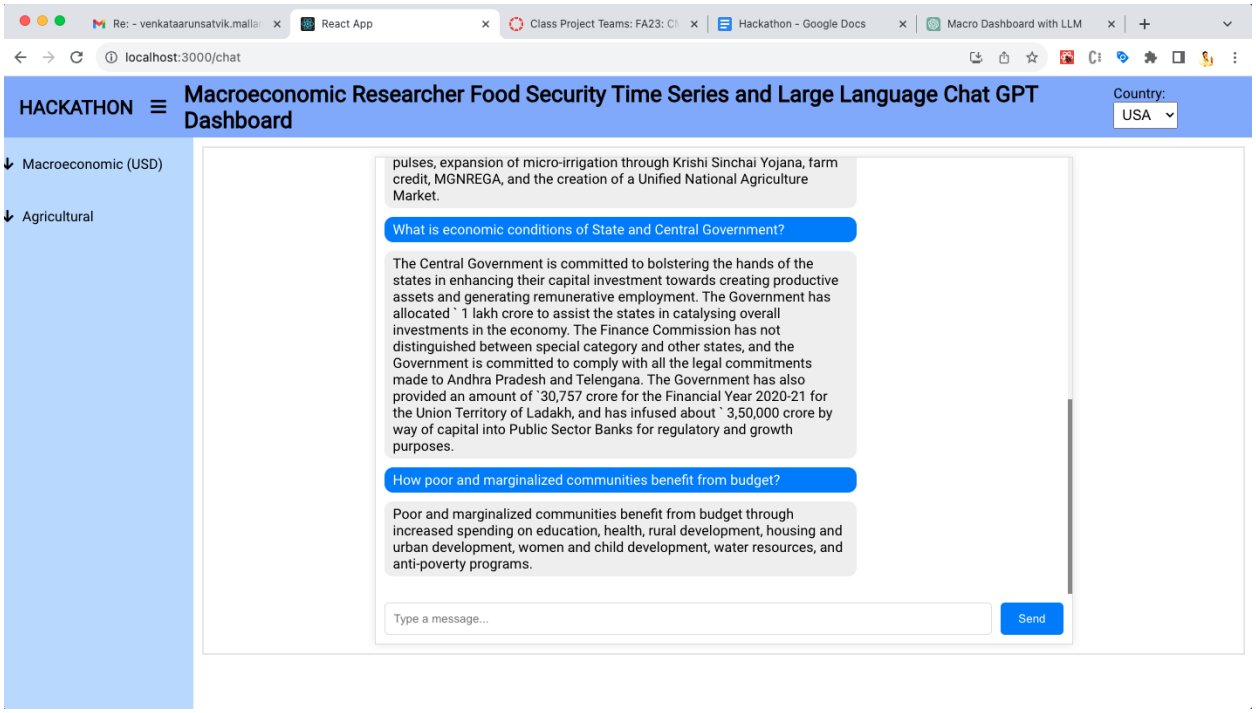
Prompt : How farmers benefit from the budget?



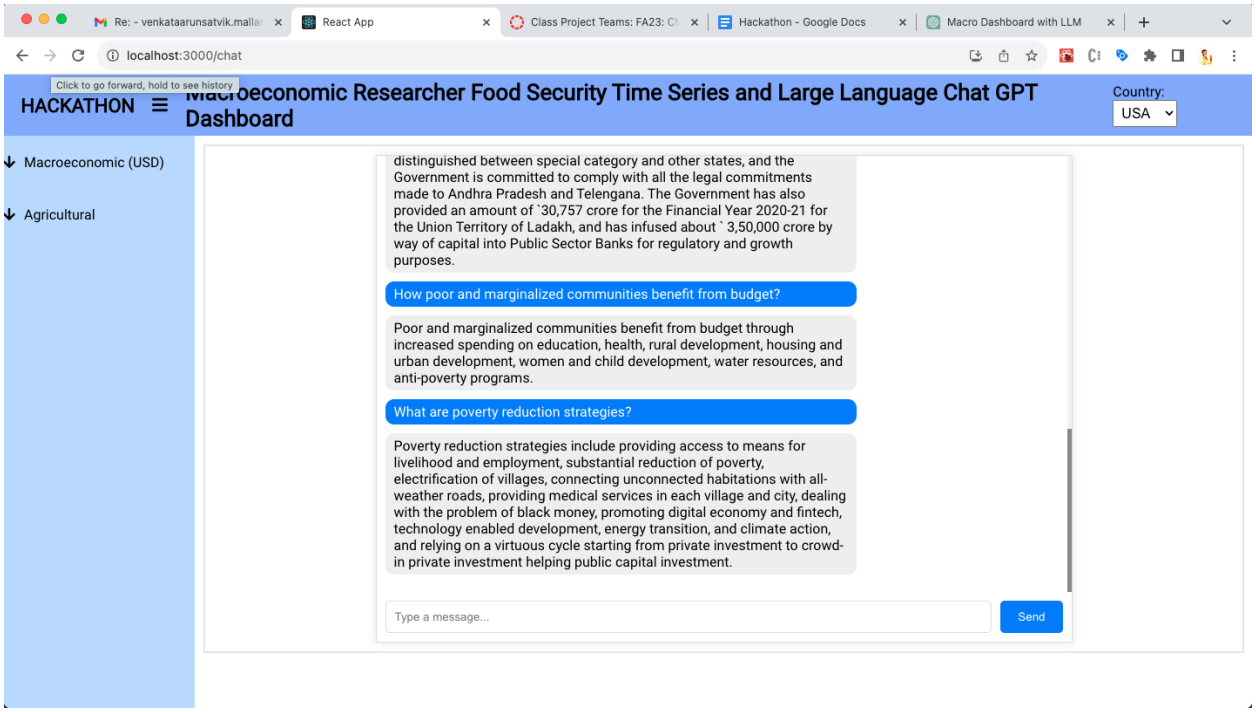
Prompt : What is economic conditions of State and Central Government?



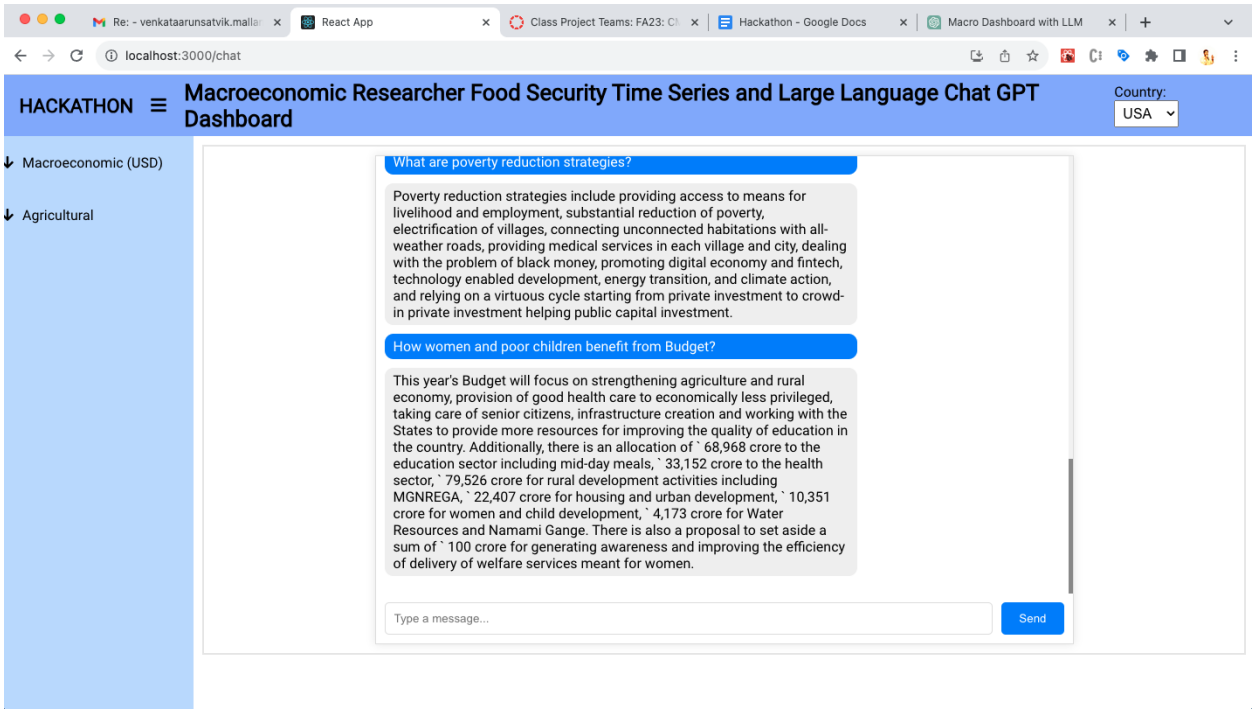
Prompt : How poor and marginalized communities benefit from budget?



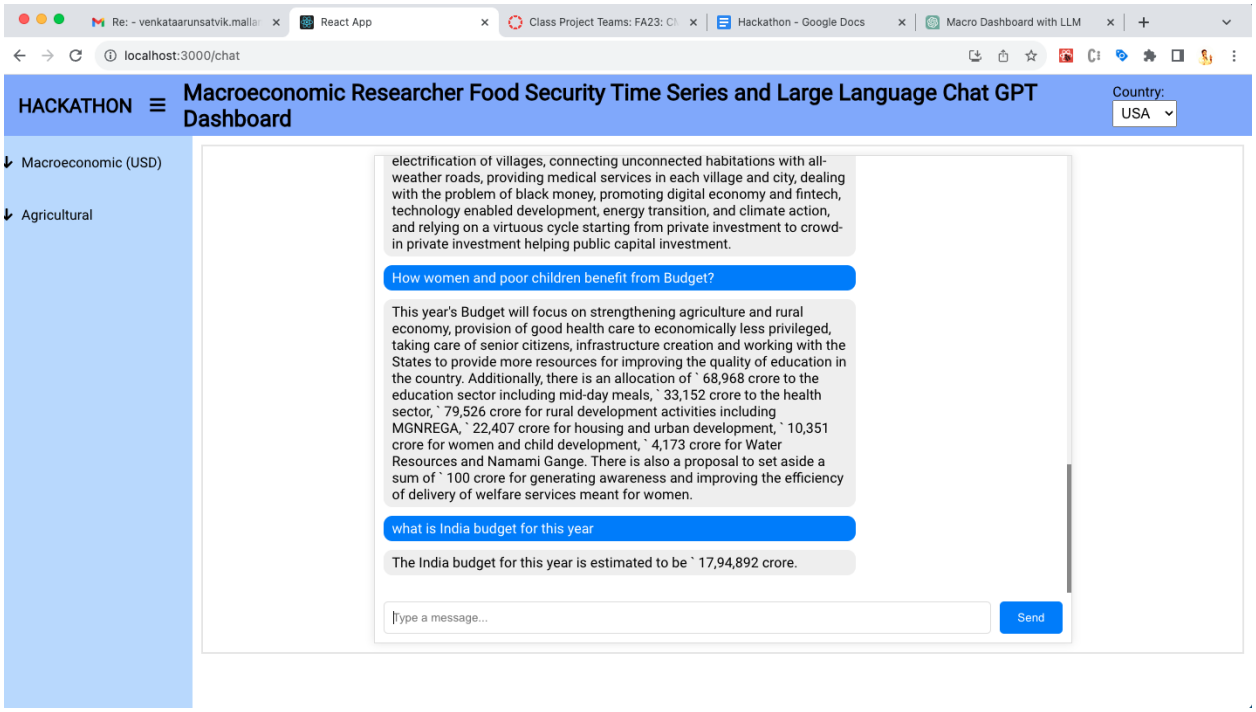
Prompt : What are poverty reduction strategies?



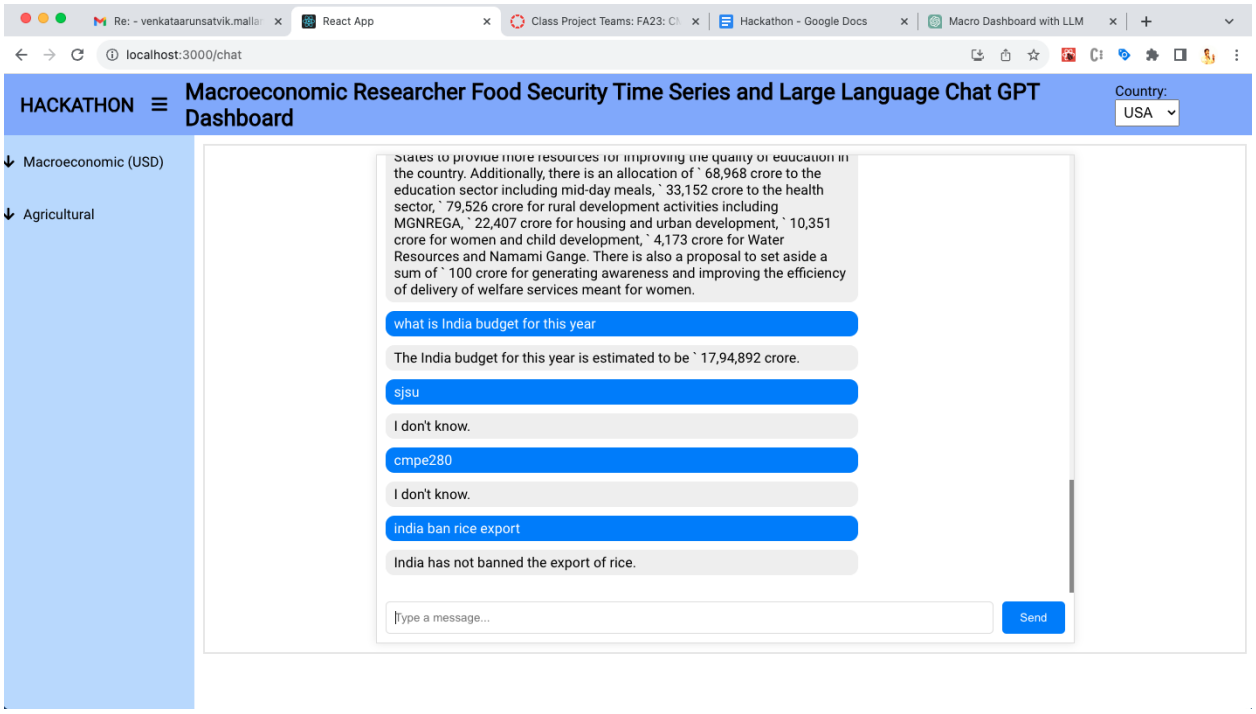
Prompt : How women and poor children benefit from budget?



Prompt : What is India budget for this year?



If given prompts outside the context of the document



Conclusion:

In summary, the Macroeconomic Researcher Food Security Time Series and Large Language Chat GPT Dashboard emerges as a revolutionary tool within the realms of food security and economic research. It seamlessly merges a user-friendly interface with robust analytics, thereby simplifying the complexities of data visualization and interpretation. The integration of time series data with the advanced capabilities of a Large Language Model transforms the interaction with intricate datasets into a conversational experience, a task traditionally demanding extensive domain expertise and significant time commitment.

This dashboard acts as a pivotal link between intricate macroeconomic data and practical insights, providing a dynamic and interactive platform that adapts to the changing needs of researchers, policymakers, and analysts. It showcases the potential of combining cutting-edge technology with user-centric design to address profound challenges in global food security. As the tool continues to evolve, it not only promises to boost the efficiency and efficacy of research in this critical domain but also empowers decision-makers to formulate policies grounded in comprehensive, data-driven insights.