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An AI-powered assistant to provide in-depth insights and predictions.

Team Information

Team Name: **Insighty**

Team Members & Roles:

Members	Roles
Ahmed Ashraf	AI/SW Architect
Youssef Aly	Data Scientist / AI/ML Engineer
Sidi El Chaikh	UI/UX / Frontend Developer
Mohaned Walid	Frontend Developer
Osama Hardan	Data Scientist / AI/ML Engineer
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Theme Track: **Main Topic: Traffic | Sub-Topics: Population, Environment and much more!**

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Project Overview

Qatar's rapid development generates vast amounts of data across various domains, including **traffic, environment, population, finance, trade, and properties**. Extracting meaningful insights from these datasets is crucial for informed decision-making. Our project introduces **Insighty: an AI-powered chatbot** integrated with an interactive heatmap and data visualizations, allowing users to explore patterns, trends, and correlations across different sectors.

Insighty empowers **policymakers, analysts, and businesses** by providing an intuitive way to analyze and discuss complex data. The AI chatbot facilitates in-depth insights, **helping users identify trends, make informed predictions, and optimize planning strategies.** Whether addressing urban mobility, economic growth, or environmental sustainability, our solution enhances data accessibility and decision-making, supporting Qatar's Vision 2030 and smart city initiatives.

Data Analysis & Approach

Our project is built on NPC datasets spanning multiple domains, including traffic patterns, vehicle density, environmental factors, population trends, finance, trade, and property data. To transform raw data into actionable insights, we followed a structured analytical approach:

1. **Data Preprocessing:** Datasets obtained from official sources were cleaned, structured, and organized to ensure accuracy and consistency. For instance, in developing the heatmap that visualizes accident-related fatalities and injuries, we established a specialized severity metric for each municipality. This approach was essential because simply summing minor injuries with fatalities fails to capture the true impact of each incident, given that the value of human life cannot be equated with a mere numerical aggregation.
2. **Visualization Tools:** We developed interactive visualizations, and a dynamic heatmap, enabling in-depth comparisons and trend analysis.
3. **AI Chatbot Integration:** An AI assistant helps users interpret data, identify patterns, and suggest optimizations across different sectors.
4. **Analytics Insights:** Users can overlay datasets to uncover correlations, anomalies, and predictive trends, enhancing decision-making including a comprehensive implementation for the different types of analytics including:
    - **Descriptive Analytics:** Track historical patterns and current state.
    - **Diagnostic Analytics:** Understand causes and relationships.
    - **Predictive Analytics:** To forecast future trends.

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- **Prescriptive Analytics:** Recommend actions and solutions.
- **Cognitive Analytics:** How could AI help with the data?

By combining AI-driven insights with interactive visualizations, our methodology simplifies complex data, making it accessible and valuable for **policymakers, analysts, and businesses seeking data-driven solutions.**

Key Outcomes

Our project has three key outcomes that demonstrate its impact on data-driven decision-making in Qatar, contributing to smarter urban planning, economic analysis, and policy development.

1. **Enhanced Data Accessibility and AI-Driven Insights:** By integrating an AI chatbot with an interactive heatmap and visualizations, we have made complex datasets more accessible to policymakers, analysts, and businesses. For instance, users can now analyze traffic accident patterns in high-risk zones, and overlay them with other data to optimize urban mobility strategies. This capability supports smarter infrastructure planning and enhances road safety initiatives aligned with Qatar's Vision 2030.
2. **Predictive Analytics for Strategic Planning:** Our database-driven approach enables predictive modeling across various domains, including traffic congestion, environmental shifts, and financial market trends. For example, real estate investors can use economic and population data trends to identify high-growth investment areas, supporting sustainable urban expansion.
3. **Multi-Sectoral Decision Support:** Unlike conventional data analysis tools, our system integrates diverse datasets, including finance, trade, and environmental factors, allowing users to derive multi-faceted insights. For example, policymakers can analyze the correlation between economic activity and trade volume fluctuations, helping them refine fiscal policies. In environmental planning, users can overlay pollution levels with urbanization trends to assess sustainability challenges and develop targeted mitigation strategies.

These outcomes underscore the project's significance in enhancing Qatar's data-driven governance, improving decision-making across multiple sectors, and fostering sustainable development.

Impact & Applications

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- Our AI-powered solution enhances decision-making across urban planning, economic strategy, environmental management, and smart city initiatives, contributing to Qatar's digital transformation and sustainable development. By integrating AI-driven analytics with interactive visualizations, policymakers, businesses, and researchers can analyze trends, optimize resources, and make data-driven decisions.
- Government Authorities can leverage in-depth insights for better infrastructure planning and policy adjustments. Businesses and investors can assess market trends and demographic shifts for strategic growth. Smart City Initiatives benefit from AI-driven analytics that support sustainable urban expansion and innovation.

Recommendations

1. Use AI-driven analytics to optimize infrastructure planning, resource allocation, and traffic flow management.
2. Integrate in-depth monitoring to address economic shifts, environmental concerns, and urban expansion challenges.
3. Develop sustainable policies for public transport, resource management, and economic diversification aligned with Qatar's Vision 2030.
4. Our platform empowers decision-makers with actionable insights, driving data-backed transformation across key sectors.

Technical Implementation

Our project is composed of several integrated components designed to enhance data accessibility and analysis across multiple sectors:

- **AI Chatbot:** Developed using **Next.js**, the chatbot assists users in exploring and interpreting data across various domains, including traffic, environment, finance, and population trends, offering insights and comparisons through an intuitive conversational interface.
- **Interactive Heatmap and Visualization Dashboard:** Built with libraries like **D3.js and Recharts**, providing dynamic charts and an interactive heatmap that allows users to visualize patterns, filter datasets, and compare trends across different sectors.
- **Database Integration and Predictive Analytics:** A robust database stores historical data across multiple fields, enabling the development of **predictive models** that forecast trends in congestion, environmental changes, economic shifts, and urban development.

This architecture ensures seamless interaction between AI-driven insights, visual analytics, and data storage, making complex datasets more accessible and actionable for policymakers, researchers, and decision-makers.

Screenshots & Demonstrations

Landing page AR

Description: This screenshot displays the Landing page in Arabic where the input bar appears to initialize the chat, beside a button to choose different chart types

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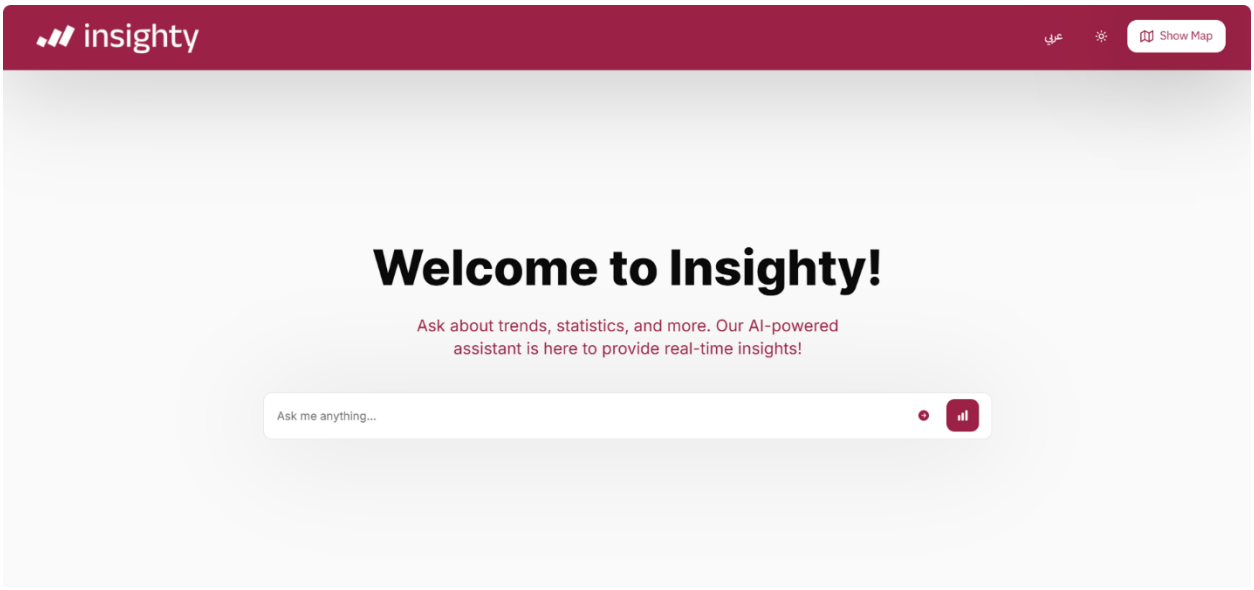
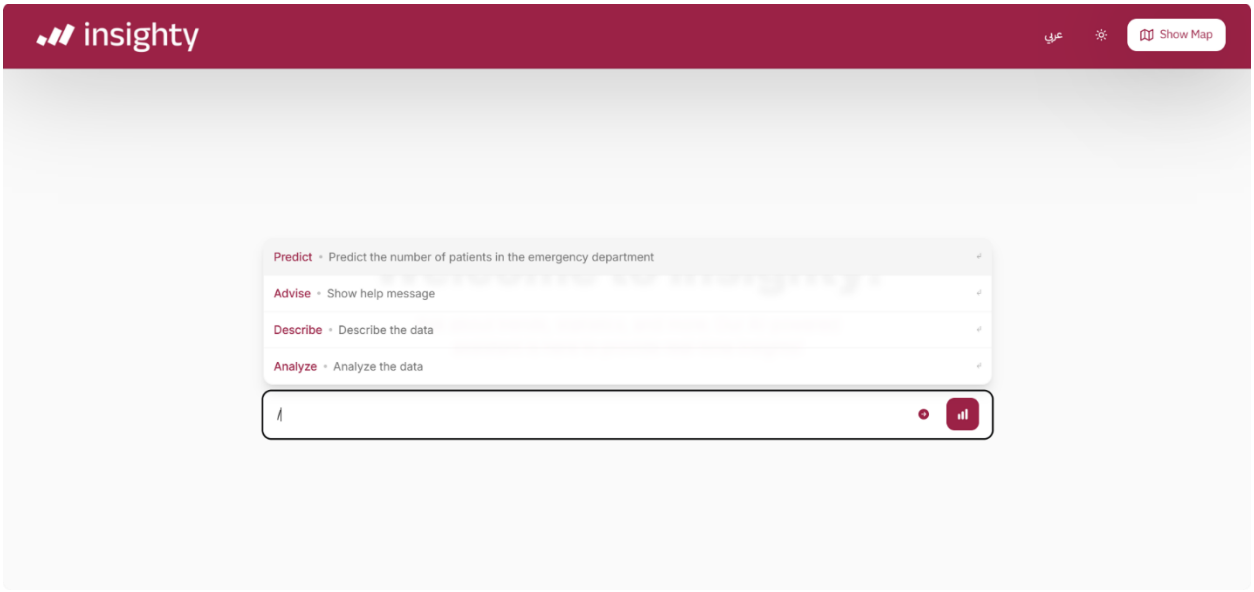


Landing page EN

Description: This screenshot displays the Landing page in English where the input bar appears to initialize the chat, beside a button to choose different chart types.



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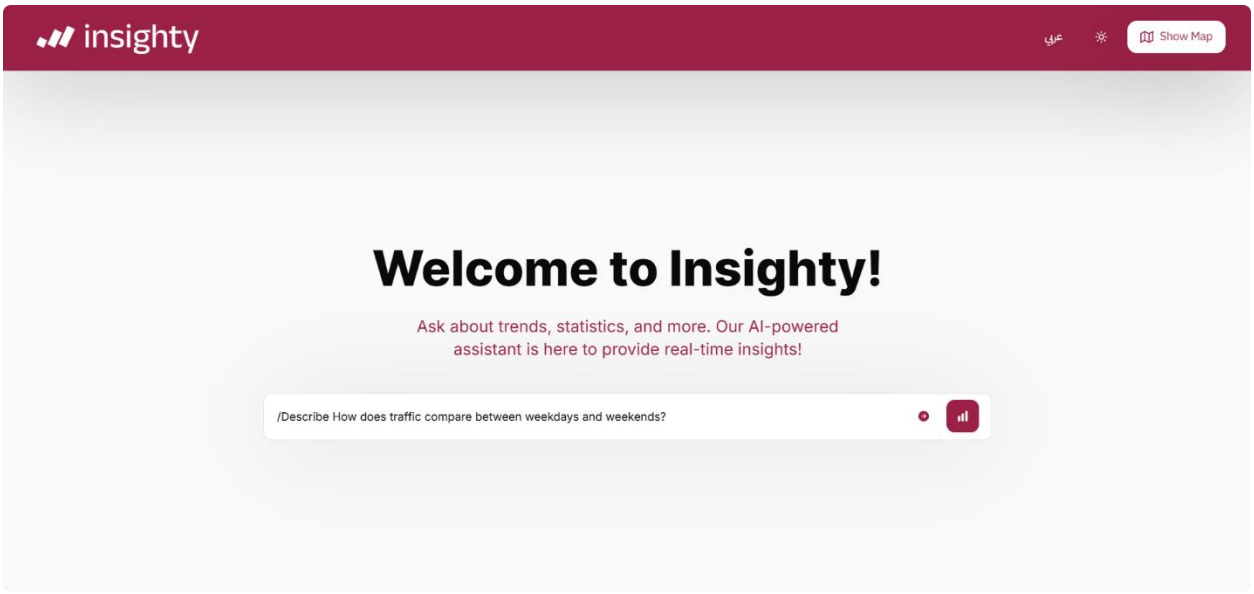

Description: This two images' highlights Dropdown-like panel presents **four AI-powered action options** that will be add to the user prompt:

- **Predict** – Predicts the number of patients in the emergency department.
- **Advise** – Displays a help message.
- **Describe** – Provides descriptions of data.
- **Analyze** – Performs data analysis.

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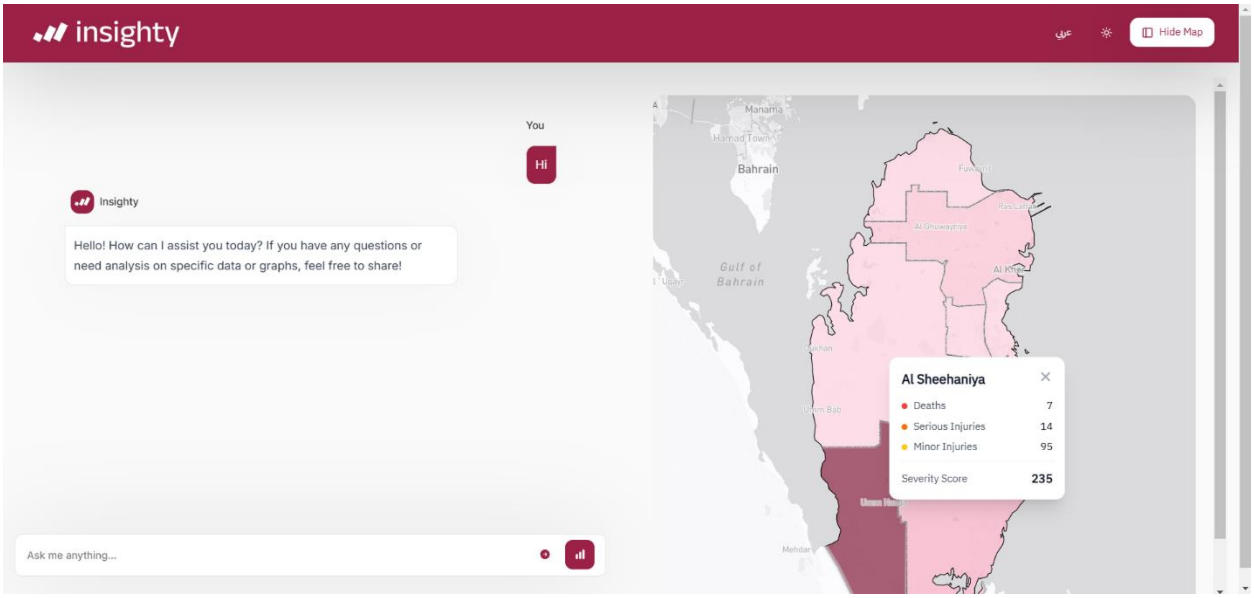
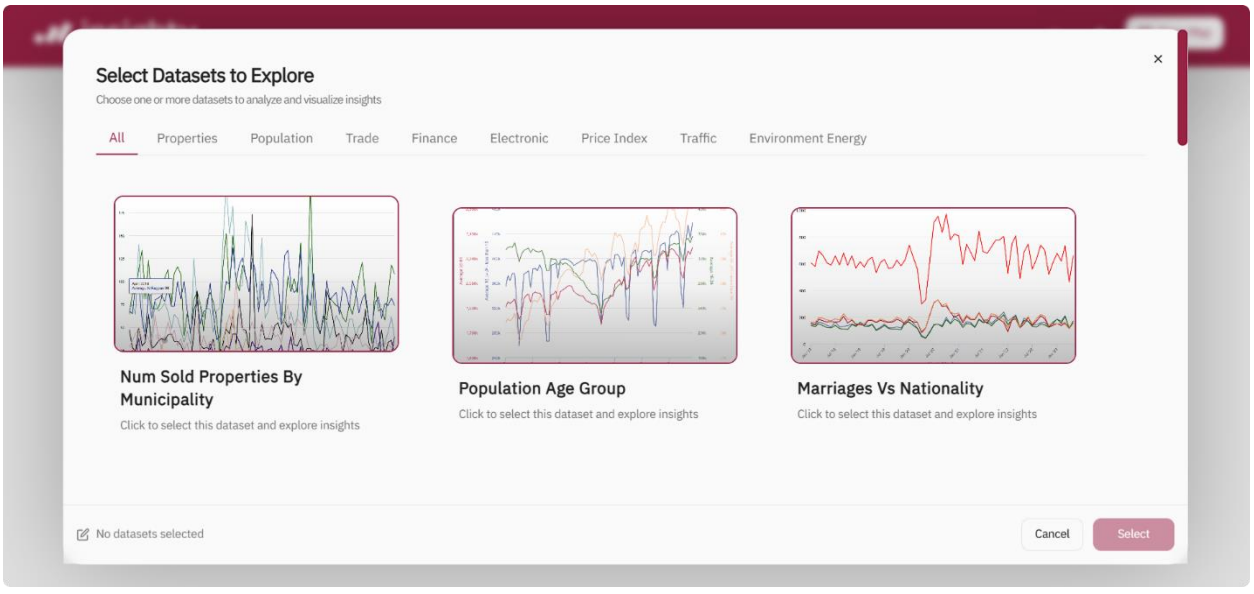
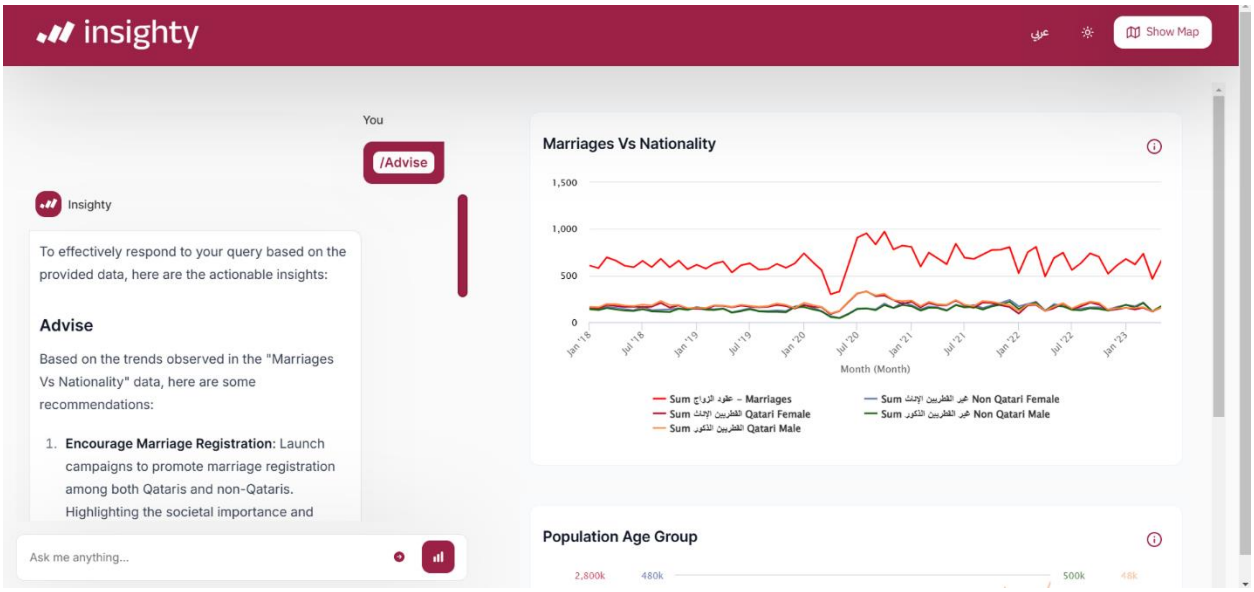


Description: The right side of the interface displays a map with Qatar regions-specific data visualization. It highlights different areas with varying shades of color to represent data intensity. When a region is selected, a pop-up provides key statistics, such as deaths, injuries, and severity scores, offering insights based on the dataset.



Description: a Pop-up for selecting datasets to analyze. It offers multiple options, allowing users to customize their data visualization and insights.



Description: The right side displays **data visualizations and analytics** that the user chooses from the datasets, and the AI agent provides insights based on them.

Challenges & Future Directions

Challenges:

- **Unstructured Data:** Most of NPC data is structured for human comprehension rather than AI systems, requiring rearranging the data and/or using **Advanced Retrieval Methods**.
- **AI Interpretation Accuracy:** Ensuring the chatbot provided **reliable insights** without misleading users.
- **User Experience:** Designing a **seamless interface** that blends AI interactions with data visualizations.

Future Enhancements:

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- **Expanded Data Access:** We plan to integrate more datasets, including real-time feeds and external databases, to enhance data quality and depth.
- **Enhanced Heatmap Functionality:** The heatmap will be expanded to include environmental, financial, and demographic data with interactive filters and predictive modeling.
- **AI Model Improvement:** The AI chatbot will be refined with advanced NLP techniques and adaptive learning to improve response accuracy and contextual understanding.
- **Broadening User Accessibility:** We aim to develop a more user-friendly, multilingual, and cross-platform experience to accommodate diverse users in Qatar.

Conclusion

Our AI-powered platform transforms complex data into actionable insights, enabling better decision-making across traffic, urban planning, economy, environment, and smart city initiatives. By integrating AI analytics with interactive visualizations, we help policymakers, businesses, and researchers identify trends, optimize resources, and drive sustainable growth. This solution supports Qatar's Vision 2030 by enhancing data-driven governance, improving efficiency, and fostering innovation across multiple sectors.