**Introduction**

The United States COVID-19 Vaccination Tracker is a web-based application that visualizes and tracks the progress of COVID-19 vaccinations across different states in the United States. The project aims to provide valuable insights and facilitate the understanding of vaccination rates and trends.

**Objectives**

The main objectives of the project are as follows:

Create an ETL (Extract, Transform, Load) pipeline to get the vaccination data into a PostgreSQL database.

Develop a Flask API server to retrieve the data from the database and serve it to the frontend.

Implement interactive visualizations using Plotly.js to present the vaccination data in a user-friendly manner.

Enable users to explore and analyze the data to answer specific questions regarding COVID-19 vaccination rates.

**Technologies Used**

The project utilizes the following technologies:

Python: for data extraction, transformation, and loading using pandas and SQLAlchemy.

PostgreSQL: as the database management system to store the vaccination data.

Flask: to create the API server for data retrieval.

Plotly.js: for generating interactive visualizations, including line charts, bar charts, and choropleth maps.

HTML/CSS: for designing and structuring the web application frontend.

**Project Steps**

The project will be implemented in the following steps:

ETL - Data Ingestion:

Extract the COVID-19 vaccination data from a CSV file using pandas.

Clean and preprocess the data, removing any unnecessary columns or rows.

Load the processed data into a PostgreSQL database using SQLAlchemy.

Flask API Server:

Set up a Flask application to serve as the API server.

Configure the Flask application to connect to the PostgreSQL database.

Define the necessary routes to retrieve the vaccination data from the database.

Implement the DailyValue model to map to the daily\_values table in the database.

Create an endpoint to provide the vaccination data in JSON format.

Frontend Visualization:

Develop an interactive web interface using HTML, CSS, and JavaScript.

Use Plotly.js library to generate three types of visualizations:

Line Chart: Display the total vaccinations over time.

Bar Chart: Show the daily vaccinations by state.

Choropleth Map: Visualize the vaccination rates by state.

Implement event listeners to fetch data from the Flask API server and update the visualizations accordingly.

**Potential Questions Addressed by the Visualizations**

The visualizations provided by the United States COVID-19 Vaccination Tracker can help answer various questions related to vaccination rates. Here are some examples:

Line Chart (Total Vaccinations Over Time):

How have total vaccinations changed over time in the United States?

Bar Chart (Daily Vaccinations by State):

Which states have the highest daily vaccination rates?

Are there any states that experienced significant fluctuations in daily vaccinations?

Choropleth Map (Vaccination Rates by State):

How does the vaccination rate vary across different states?

Which states have the highest and lowest vaccination rates?

How does the vaccination progress in one state compare to another?

How does the vaccination rate in a specific state compare to the national average?

**Conclusion**

The United States COVID-19 Vaccination Tracker project aims to deliver an informative and user-friendly web application to track and visualize COVID-19 vaccination rates across states. By providing interactive visualizations, users can explore the data, identify trends, and gain insights into the vaccination progress.