**Project Description For Interactive Chart**

1. Introduction:

* The goal of this project is to create an interactive charting application that not only visualizes data but also applies advanced algorithms and data structures to enhance the user's experience and provide valuable insights. The project will focus on the following key components.
* We will implement it as a Web Application with a Back-end and Front-end, which is implemented with a Monolithic ( divide Front-end and Back-end)

2. Data Source:

* The project will support importing data from various sources such as CSV files, APIs, and real-time data streams. Users will have the flexibility to choose the data they want to visualize.

3. User Interface:

* The user interface will be designed to be intuitive and user-friendly, allowing users to customize and interact with the chart. It will include features like zooming, panning, and selecting data points for detailed information. (Features in Chart.js and React.js)

4. Chart Types:

* The application will support a variety of chart types, including line charts, bar charts, scatter plots, and pie charts. Users can switch between chart types to find the most suitable representation for their data.

5. Algorithms:

* Several advanced algorithms will be implemented to enhance data visualization and analysis. These may include:
* Data Clustering: Implement clustering algorithms like k-means to group similar data points for better pattern recognition.
* Regression Analysis: Perform linear or polynomial regression to identify trends and make predictions.
* Time Series Analysis: Apply algorithms like moving averages and exponential smoothing for time-series data.
* Statistical Analysis: Calculate mean, median, standard deviation, and other statistical metrics for the dataset.

6. Data Structures:

* Efficient data structures will be used to store and manipulate the data. Depending on the project requirements, this might involve:
* Binary Search Trees (BST): For quick data retrieval and sorting.
* Graphs: To represent relationships and dependencies within the data.
* Hash Tables: For fast data lookup and aggregation.

7. Interactive Features:

* The interactive chart will provide the following features:
* Dynamic Filtering: Users can filter data based on specific criteria and see the updated chart in real time. (Through Form to submit new data….,)
* Annotations: Users can add annotations to highlight important data points or events.
* Customization: Users can customize chart appearance, including color schemes, axis labels, and legends.

8. Performance Optimization:

* Efforts will be made to optimize the application's performance, especially when dealing with large datasets. This may involve implementing data pagination, lazy loading, and efficient rendering techniques. ( Scale up in the future )

9. Export and Sharing: -

* Users can export the interactive chart as an image or share it with others through generated links or social media integration. ( Extra feature)

10. Technology Stack:

* The project may use a combination of technologies such as JavaScript (React or HTML-CSS) (with libraries like D3.js or Chart.js), NodeJs for backend processing, and a database system for data storage (MongoDB, MySQL, PostgreSQL…). ( Easy with Mongo but can not use it to apply for the PDM project)

11. Testing and Validation:

* Extensive testing will be conducted to ensure the accuracy of algorithms and the reliability of the application. This includes integration testing and user testing for the interface. ( jest and postman)

12. Documentation:

* Comprehensive documentation will be provided for users and developers, including how to use the application and explanations of implemented algorithms and data structures.

13. Future Enhancements:

* Consider future enhancements such as machine learning integration for predictive analytics or support for even more advanced chart types. ( OPTIONAL)

14. Conclusion:

* The Interactive Chart with Advanced Algorithms and Data Structures project aims to empower users with a powerful data analysis and visualization tool. It combines user-friendly design with cutting-edge algorithms and data structures to offer a versatile solution for various data-related tasks.

15. Benefits from the project:

* The interactive web chart is not a simple project in school, which has a business purpose and can be put in a CV in the future to apply for jobs. In addition, it also helps students learn how to apply the algorithm and data structure in real-life projects.

16. Tools for project

* Back-end: NodeJs, ExpressJs, JWT, Cors,.... ( Dễ dùng, dễ học, cộng đồng sử dụng lớn, nhưng mà khó scale up,...) ( NestJS mạnh mẽ theo đúng OOP Concept)
* Front-end: ChartJs, ReactJs,BootstrapcssCss,Css....( Dễ dùng, dễ học, cộng đồng dùng lớn, đại trà,...)
* Database: MongoDB or MySQL,.... ( tùy chọn tại cái nào cũng có cái hay riêng)
* Controller: Github, Trello, GoogleMeets