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Overview:

The project has its main goal to design a system for investment firms which can handle the requests of its clients and according to their preference the firm can buy or suggest investment portfolios for them. On the basis of investment firms' portfolios, a cluster is needed to be created. Also the proportion of difference of investor's profile and his investment is needed to be marked. Overall, the project requires exclusive implementation of various classes to achieve the functionality of managing investing firms data and investors data as well and further to get logical conclusions from them.

Core Entities and Relationships:

- Financial Advisors and Investment Firms: These kinds of people guide the investors where to invest their money based on their profile and choices and current market scenarios.
- Investor Profiles: Individuals are categorized into profiles such as conservative, moderate, or aggressive investors, which dictate their investment strategies and stock mix based on sectors.
- Stock Classifications: Stocks are classified based on the sectors that particular company serves. The investor's profile gets distributed into various sections based in these classifications.
- Dividend Reinvestment: Investors get dividends at various phases after their investment. Investment firms handle that dividend either to reinvest into new stock or return that amount to the investor.

Project Objectives:

- Creation of an InvestmentFirm class to encapsulate the management of investor portfolios, including data persistence across program executions.
- Ability to define and manage investment sectors, assigning stocks to sectors and adjusting portfolios accordingly.
- Creation and management of investor profiles specifying sectorial investment percentages.
- Mechanism for reinvesting dividends, dealing with fractional shares, and tracking individual investor holdings within the firm's internal system.

Queries and Analytics:

- Sector Holdings Analysis: To determine the amount invested or can invest in each sector stock.
- Advisor Comparison: Creating cluster of financial advisor for getting to know about similar investment portfolios.
- Profile Alignment: To identify the risk whether a investors stock holding would deviate from stated profiles.
- Stock Recommendations: Recommend the firm to adjust stocks based on the investors profile.

Solution Strategy:

- Modular Design: Breaking down the system into cohesive classes beyond InvestmentFirm, such as separate classes for handling stocks, sectors, profiles, and dividends, to simplify management and enhance maintainability.
- Robust Data Structures: Leveraging appropriate data structures for efficient data storage, retrieval, and manipulation. For example, using hash maps for quick lookups and arrays or linked lists for ordered data.
- Algorithmic Analysis: Implementing algorithms for financial analysis, including sector distribution comparison, portfolio similarity measures, and dividend reinvestment strategies.
- User Interaction and Validation: Ensuring user inputs are validated, especially for operations involving financial transactions or profile adjustments.

Probable Data base design: I can create the following entities that can be used to handle the database:

1. Investors
2. Financial Advisors
3. Investment Profiles
4. Investor Profiles
5. Sectors
6. Stocks
7. Account Transactions
8. Investment Accounts

In the above schema fields, I can create strong and weak entity relationship by using primary and foreign key wherever required.