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1. Describe what data is stored in the database. (Where is the data from, and what attributes and information would be stored?)

The 'Public Transportation Service' data contains information of the public transportation system data of São Paulo and is provided by SPTrans. This data source contains 10 tables that contain information about agency names, a calendar that shows the days of operations, information about pricing, frequencies of departures, routes and their paths and shapes, names of stops and where they are located, stop times, and information about the trips.

Within the data there is lots of information on trip ids and fare ids which will be very helpful in trying to join the tables to gather further information about the trips and fares in question. There is also a service id which will be helpful in comparing the services within the table. The stopnames and startnames will also be very helpful for trying to determine what routes can be used for transfer and generally understanding where the route is going.

2. What are the basic functions of your web application? (What can users of this website do? Which simple and complex features are there?)

A basic function of our web application is to be able to find the best possible route between the user's desired start and end destination. Additionally, this function will also account for the user's desired start trip time to plan a trip that starts as close to this time as possible. With this, they will be able to see all of the general information on this route including what stop they will be at, what time the next trip will be if any transfers are needed, how much the trip will cost, and the total amount of time the trip will take.

Additionally, another basic function that will be on our web application is to allow the user to plan an 'exploration' trip based on where their desired start location is. Here, they will receive a detailed list for how to get to the 'exploration' destination, which is hopefully a place they have not been to before and gives them an opportunity to travel to a new place.

A complex feature that will exist, if possible, is a map including all routes within the São Paulo that can be filtered based on the user's desired mode of transportation. It is worth noting that for some forms of transportation, like trains, it will not be possible to accurately display the train routes as we are only given the coordinates of all stops in São Paulo.

Another complex feature that will exist on our web application is to be able to see the different costs and amount of time between different routes for a trip. We aim to display the cheapest route for the destination and we will use a weighted graph algorithm to determine this 'best' route and ranking the options from least to most expensive.

3. What would be a good creative component (function) that can improve the functionality of your application? (What is something cool that you want to include? How are you planning to achieve it?)

A good creative component could include an interactive map where the user can click on a start and end destination and see the routes associated with it. Also, we can include a drop down menu where the user can indicate their desired start time and destination and the application can provide the most convenient route. We plan to do this by using graph algorithms to find the shortest and most efficient path.

Another potential creative aspect could be an “Explore” feature where the application would provide the user with information regarding a random trip. If the user wants to, they have the option to go somewhere spontaneous and explore new places in their city. We will do this by randomly selecting a city that is a reasonable distance from the user’s start location. Then, we would provide the information as usual.

4. Project Title

Transportation Tool Kit (TTK)

5. Project Summary: It should be a 1-2 paragraph description of what your project is.

Our project features a user-friendly interface where travelers can effortlessly plan their trips, go on spontaneous adventures with a randomly generated itinerary, or compare transportation prices. The "Plan Your Trip" page enables users to easily select their starting and ending destinations, desired departure time, and receive a comprehensive list of stops, transfers, and ride details, including timings and cost. The "Explore" page offers a thrilling twist with an automatically generated trip starting from the user's selected location.

Our project also features a "Financial" page, offering an in-depth look at the cost of different trip options between destinations. This page may be a significant or minor part of the project, depending on the feasibility of implementation. Our aim is to provide the cheapest route to the destination, but this will depend on the availability of sufficient data. If feasible, we'll use weighted graph algorithms to determine the best route. At the very minimum, we'll strive to provide the most cost-effective direct routes from your location, ranking transportation options from least most expensive.

6. Description of an application of your choice. State as clearly as possible what you want to do. What problem do you want to solve, etc.?

Our application makes it convenient for a user to find an efficient route from a certain start and end location at their desired time. Our application also informs the user of the most cost efficient route. We can offer multiple options for travel and allow the user to pick the one they prefer most. The problem we want to solve is that it may be difficult for a user to find a trip route that is both short/efficient but also affordable. Our application provides information on both of these issues, and provides the best version of both for the user to choose from.

We want to allow the user to indicate their start destination and their preferred start time. Then, all the possible routes may populate on an interactive map. The application would recommend the route that is shortest and most cost-efficient, but ultimately, the user can choose whichever route they prefer. Our application will also provide information about the itinerary, describing all of the

stops on the way. It will provide the estimated trip end time, along with the total time. Along with that, it will show the total cost of the trip. There will also be an “Explore” feature where the user can find random trips available and go on something spontaneous.

- 7. Usefulness. Explain as clearly as possible why your chosen application is useful. Make sure to answer the following questions: Are there any similar websites/applications out there? If so, what are they, and how is yours different?**

Our application is useful because it makes it convenient for a user to find an efficient route from a certain start and end location at their desired time that is also cost-efficient. A similar website/application could be Google/Apple maps. Our application is different since it is meant for a specific region. Also, it allows users to plan their trips ahead since the bus times are standard and won't change.

The website also shows what the fares may be for the trips and compares all the options available for travel, and recommends the best trip option to the user. It will compare rates from all different types of transportation available. For example, if there are two metros going to a similar location, the application will recommend the cheaper one (even though it may require a few extra minutes of walking; we will be sure to include all of these details)

- 8. Realness. Describe what your data is and where you will get it.**

Our data is from the Public Transportation Service dataset. The data includes a calendar that shows hours of operations, information about pricing, frequencies of departures, different routes and their paths/shapes, the stop times, where the stops are, and information about the trips. We will make use of all of this data, but most specifically, we will focus on the routes, stop times/locations, and the information on fares.

We may also gather basic information online to understand the city where this app is located and see how the train systems may actually work so we have a better understanding to create our website. This way it will be more realistic and usable.

- 9. Description of the functionality that your website offers. This is where you talk about what the website delivers. Talk about how a user would interact with the application (i.e., things that one could create, delete, update, or search for). Read the requirements for stages 4 and 5 to see what other functionalities you want to provide to the users. You should include:**

Our website will include a friendly interface where the user can choose to create their journey, create a randomly generated journey, and to be able to compare the costs of different types of transportation based on where they are in São Paulo.

Our ‘create a journey’ functionality includes steps to easily find routes based on time and expense. It will include a detailed list including what stop they need to be at and what time. Additionally, it will display the total amount of money their trip will cost as well as the total amount of time it takes to commute to their final destination. This functionality will create a table with only the needed information, and the table will be deleted and a new table will be created with the needed information as needed.

Our 'explore' functionality will be relatively similar to the 'create a journey' functionality but it will create a randomly generated trip based on the user's desired start location. It will also include the same information such as what stop they still be at and what stop they need to be at based on what time. With this, a table will be stored with all of the needed information to later display on the screen. When a new journey is created, this table will be deleted and a new table will be created and the new information will be added as needed.

Our 'compare the costs' functionality will allow the user to input the location they are closest to and what amount of distance they consider a 'walking distance.' From this, we will create a table that contains all potential forms of transportations and stops they could go to. This table will be searchable as the user will need entries that match the description of their desired form of transportation. Additionally, if they need to update their location, this table will be updated with the corresponding information and if they want to filter the types of transportation and stops based on price or by service ID, then the unneeded rows will be deleted from the table.

Essentially on a high level, whenever a user first starts the program a table will be created and a search will be conducted. Whenever the user wants to perform any sort of filtering to their table then this will result in rows being deleted. Whenever the user wants to change their location or their radius then an update will occur to the table.

A. A low-fidelity UI mockup:

Bus icon | Plan a Trip | Explore | Contact Us

Start Destination | End Destination | Start of Trip | ✓

Start Destination @ Closest Start Time

⋮
⋮ } any stops/transferring needed
⋮
⋮

End Destination

Total Time of Travel: _____

Total Price: _____

Bus icon | Plan a Trip | Explore | Contact Us

Start Destination | End Destination | Start of Trip | ✓

Map showing best route
on map w/ any stops/transferred
needed

Look @ trip itinerary ->

B. Project work distribution:

Aadya: Will create an interactive map where it can display the various stops, paths, and modes of transportation. With this, it will be color coded to show what the different modes of transportation are. To create the map, we can use the coordinates stored within the data to display the stops and can easily draw the routes for each trip that is created.

Emily: To create the 'Explore' functionality page. This page will include a trip based on the user's desired starting point and will create a route for them to explore somewhere

new. The user will be able to see all of the stops they need to go to at a certain time, total travel cost, and total travel time. Here, a map will also be used to display their randomly generated trip.

Matt: Will use a weighted graph algorithm to find the shortest and most cost-efficient route. This will also take into account the total travel cost and will be easily displayed for the user to see where it will be sorted in a display showing total cost and total time.