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CS 195: Introduction to Database Systems
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CS 195: Climate Change Database User Interface

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NOTE TO GRADER: This document gives a general description of the program, with underlines sections highlighting the five specific coding requirements of the program. Directly below in “Information for Testing the Program”, contains any information you would need to test any part of the program.

Information for Testing the Program:

To access the program, the grader can either enter the login credentials for the admin (Username: test1, Password: test2), or they can enter the login credentials for another user (Username: JosieSmith572, Password: greenPearFour35?) to view how the admin-input-page is not accessible from the home page without authentication. To search values with specific “WHERE” function calls, the admin can either use the “Search” function in admin input or can search for the particular year ranges on the home page. The admin can also Add, Modify, and Remove values from the database directly from the admin input page. The “JOIN” function is represented in the home page’s heat graphs, which Joins together each selected graph by the foreign variable “Year”. Statistical methods can also be selected in the home page graphing functions for the First Graph. Finally, the data is visualized as a scatter plot and a heat graph from the home page, as well as in a table format for admin input.

Purpose of the Program:

This program allows the user to find the relationship between glacial density/elevation, surface temperature average, and sea level change over six countries between the years 1901 to 2021. With greenhouse gases (accumulated from climate change) increasing the global temperature, this User Interface allows users to see how these three different variables are correlated, creating graphs for the users to visualize the relationships between each location’s climate change statistics.

This program has four main sections: login screen, home screen, admin input screen, and petition input screen. Additionally, there is the CSV_to_Database Python file, which performs data cleaning by reformatting the names of the different variables, changing the date variables to create a foreign key, and

The Login Screen accesses the “USERS” database to verify the user’s login information. Reading through the tuples in the “USERS” table, the admin’s username and password as determined before the user is logged in. If the user logs into the program with the admin’s username and password, then an authorization value is recorded in the program and the user proceeds to the home page. Otherwise, if the user’s information was validated, they are redirected to the home page without admin authorization.

The Home screen accesses the data tables for each country (Canada, Chile, Greenland, Iceland, Pakistan, and the USA) and data type (Glacial Density which is determined by the decrease in glacier elevation, Surface Temperature Average, and Sea Level Rise). The user has four options from this page: choose a pre-made example to view the data, create a petition for a new country to be added, alter or search within the data if the user is “admin-authorized”, and graph some selected data.

If the user chooses to either choose a pre-made example or create their own graphed data by entering location and variable data, as well as a yearly time range, the user will be presented with two scatterplot graphs showing the change of each variable over the course of the yearly range. This satisfied a “WHERE” condition that the user can specifically query against, without admin permissions. There is also additional information in the program as to different ways that graphs can be made. Additionally, there is a heat-map correlation graph of the two chosen variable-location pairs to show the relationship between each. If a line can be visualized in the graph, then the user can determine a relationship from the data. Finally, the user can select a statistical method such as maximum, minimum, mean, count, or sum to discover details about the data.

The admin input page allows the admin to directly add, remove, or modify existing or new values for the database by each table. If the user enters an invalid input, they can reference the input page directions above the input sections of the page. They can also search for specific values based on the column name selected and the value the user is searching for. When the user submits a search request on the “/admin_input” page, they are prompted with a table of each of the values in the selected data table which satisfy the condition “ColumnName == (Entered Data Value)”.

Finally, the petition page of the program allows a given user to enter a country that they want to be added to the database, as well as the reason that they want that country to be entered into the database. If the user leaves either of these fields blank, then the user is prompted to add valid values.

Finally, the input and petition pages are described in the last two sections of the “/home_page” section. Each contains input validation for the different user inputs, with the user being notified on the admin input page when their change is successful or fails, as well as when the input is invalid for the petition page.