**CS-340 Project Two (Grazioso Salvare) Dashboard’s README File**

**Project Description**

This project aims to create a web-based dashboard that displays data visualization and allows for interactive dataset exploration. The dashboard is built using the Dash framework in Python, and the data is stored in a MongoDB database.

**Required Functionality**

The required functionality of the project includes:

*Data loading*: The dashboard should load data from a MongoDB database and perform necessary pre-processing steps.

***Data visualization*:** The dashboard should display data visualizations, such as scatter plots, line charts, and bar charts, which allow users to explore the data.

***Interactivity*:** The dashboard should allow users to interact with the data by selecting different variables, filtering data, and zooming in on specific visualization parts.

***Deployment*:** The dashboard will be able to be deployed to a web server so that it can be accessed by users.

**Screenshots/Screencast**

Screenshots of the dashboard.

Interactive Filter Options and Interactive Data Table

Table

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Charts (Pie Chart and Geolocation Chart Next to it)

Map

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The Web Application Dashboard with Interactive Data Table

Diagram

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**Tools Used**

*Python:* We used Python as the main programming language for this project, including data pre-processing, data visualization, and web application development.

*Dash framework****:*** We used the Dash framework to build the web application, which provides a simple and flexible way to create web-based data visualizations and dashboards.

*Plotly:* We used the Plotly library to create interactive data visualizations, which provides a powerful and flexible way to create customizable data visualizations.

*MongoDB****:*** We use MongoDB as the database to store the data, which provides a scalable and flexible way to store and retrieve data.

**MongoDB**

MongoDB is a popular NoSQL database that is known for its flexibility, scalability, and ease of use. It was chosen as the model component for the project for several reasons:

***Flexibility:*** MongoDB's document-based data model makes it easy to store and retrieve complex data structures. This is particularly useful for web applications that require a high degree of flexibility in their data models.

***Scalability:*** MongoDB is designed to scale horizontally, which means that it can handle large volumes of data and high levels of traffic without sacrificing performance.

***Ease of use:*** MongoDB's simple query language and intuitive API make it easy to work with, even for developers who are new to NoSQL databases.

In terms of interfacing with Python, MongoDB provides several useful features and capabilities:

**Python driver:** MongoDB provides an official Python driver (PyMongo) that makes it easy to connect to a MongoDB database and perform CRUD (create, read, update, delete) operations.

Here is a screenshot of the CRUD operation.

Text

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**BSON:** MongoDB uses BSON (Binary JSON) to represent data in a binary format, which is more efficient than using traditional JSON. This makes it faster and more efficient to read and write data from Python.

**Aggregation framework:** MongoDB's aggregation framework provides a powerful set of tools for querying and analyzing data. This is particularly useful for applications that require complex data analysis or reporting.

Overall, MongoDB's flexibility, scalability, and ease of use, combined with its strong support for Python, make it an excellent choice for the model component of web applications.

**Steps Taken**

1. Import animal shelter data into a MongoDB database.
2. Create/use a CRUD module to connect to the database using Python.
3. Build a frontend dashboard using Dash to display documents from the database.

**Challenges**

I encountered several challenges during data processing, database installation and deployment process. For example, making sure the database is up and running, validating dependencies and modules, and making sure that data were processed correctly. To overcome these challenges, I used online resources, including documentation and forums, and consulted with other students and academic support.

**Resources and Software Applications:**

**Software**

*Anaconda:* Anaconda is a distribution of the Python and R programming languages for scientific computing, which aims to simplify package management and deployment.

*Jupyter Notebook:* The Jupyter Notebook is the original web application for creating and sharing computational documents. It offers a simple, streamlined, document-centric experience.

**Resources**

<https://docs.mongodb.com/>

<https://dash.plotly.com/introduction>

<https://pandas.pydata.org/docs/>

<https://docs.python.org/3/>

<https://www.w3schools.com/css/default.asp>

<https://www.w3schools.com/python/pandas/default.asp>

Austin Animal Center Outcomes Spreadsheet csv dataset – Reference: Austin Animal Center. (2020). Austin Animal Center Outcomes [Data set]. City of Austin, Texas Open Data Portal. <https://doi.org/10.26000/025.000001>

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