README: CS-340 Dashboard Project

Project Overview

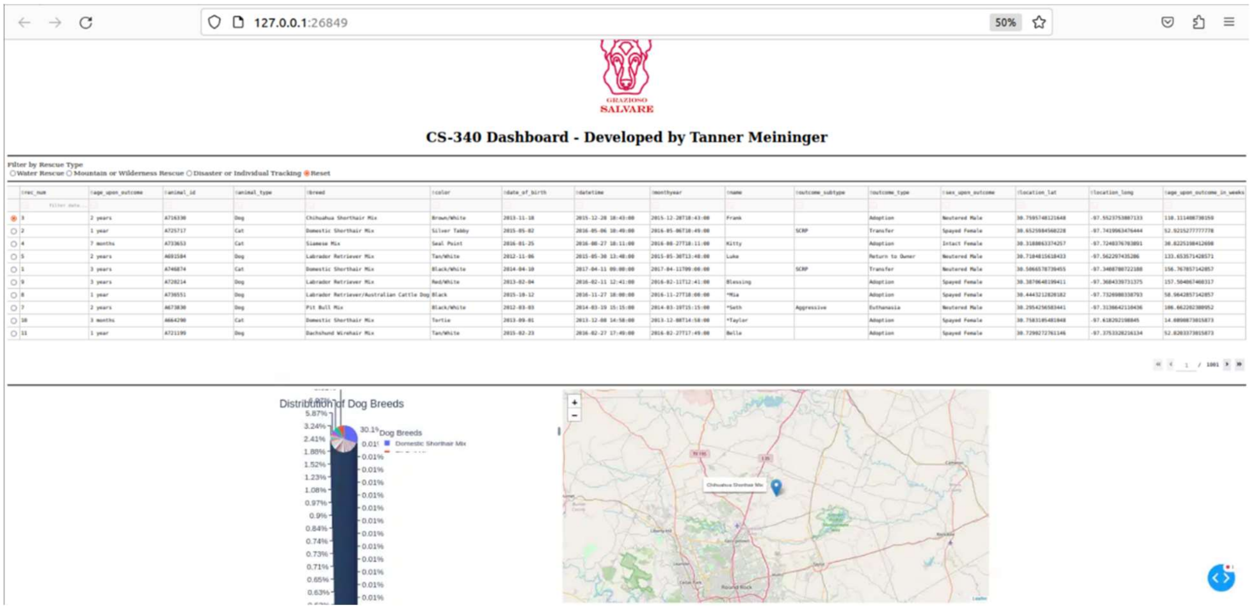
This project involves creating an interactive dashboard for Grazioso Salvare that visualizes rescue operation data for dogs. The dashboard allows the client to filter data dynamically, visualize it in a pie chart and a geolocation map, and interact with it through a responsive data table. The data is retrieved from a MongoDB database, and the web application is built using the Dash framework.

Key Functionalities

- **Interactive Filters**: Users can filter the data by rescue type (Water Rescue, Mountain or Wilderness Rescue, Disaster or Individual Tracking), and reset the filters to view all data.
- **Data Table**: A dynamic data table that updates based on the selected filter and displays the relevant records.
- **Pie Chart**: A pie chart displaying the distribution of dog breeds, dynamically updated based on the filter applied.
- **Geolocation Map**: A map displaying the geographical location of selected dogs based on the data table.

Screenshots:

- Initial state of the dashboard with **no filters (and reset filter)** applied.

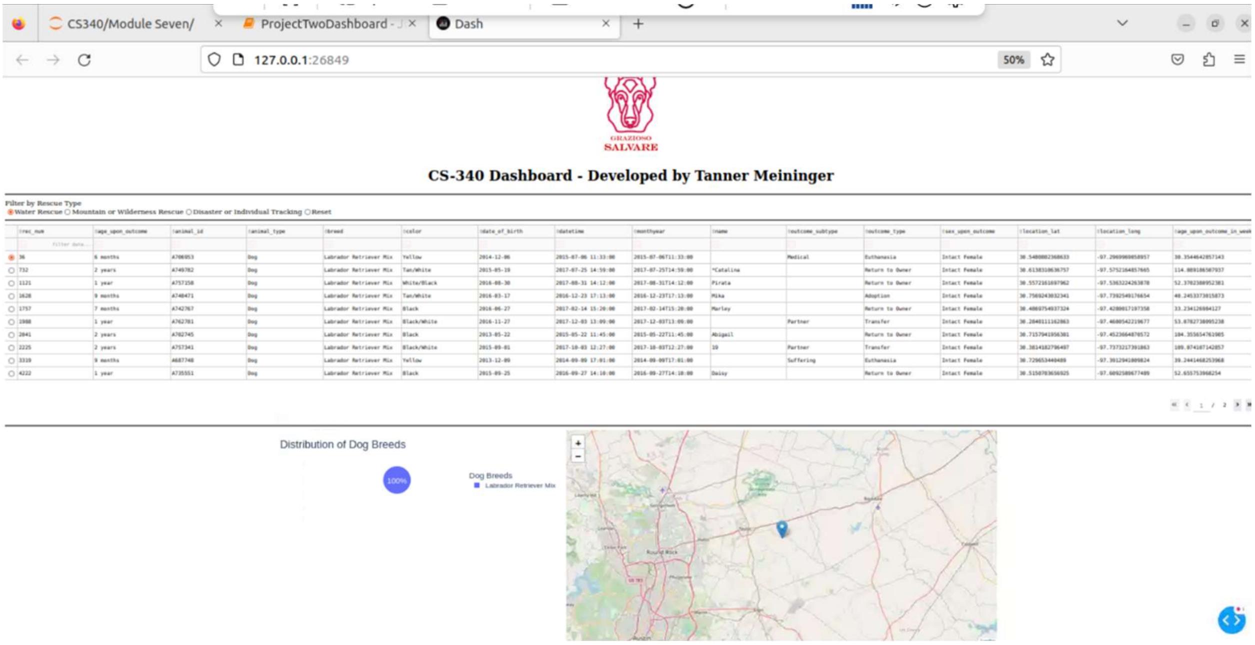


CS-340 Dashboard - Developed by Tanner Meininger

Filter by Rescue Type
○ Water Rescue ○ Mountain or Wilderness Rescue ○ Disaster or Individual Tracking ● Reset

	rec_num	age_upon_outcome	animal_id	animal_type	breed	color	date_of_birth	datetime	monthyear	name	outcome_subtype	outcome_type	sex_upon_outcome	location_lat	location_long	age_upon_outcome_in_weeks
●	3	2 years	A716330	Dog	Chihuahua Shorthair Mix	Brown/White	2013-11-18	2015-12-28 18:43:00	2015-12-28T18:43:00	Frank		Adoption	Neutered Male	30.7595748121648	-97.5523753887133	118.111408730159
○	2	1 year	A725717	Cat	Domestic Shorthair Mix	Silver Tabby	2015-05-02	2016-05-06 10:49:00	2016-05-06T10:49:00		SCRP	Transfer	Spayed Female	30.6525984560228	-97.7419963476444	52.9215277777778
○	4	7 months	A733653	Cat	Siamese Mix	Seal Point	2016-01-25	2016-08-27 18:11:00	2016-08-27T18:11:00	Kitty		Adoption	Intact Female	30.3188863374257	-97.7240376703891	30.8225198412698
○	5	2 years	A691584	Dog	Labrador Retriever Mix	Tan/White	2012-11-06	2015-05-30 13:48:00	2015-05-30T13:48:00	Luke		Return to Owner	Neutered Male	30.7104815618433	-97.562297435286	133.653571428571
○	1	3 years	A746874	Cat	Domestic Shorthair Mix	Black/White	2014-04-10	2017-04-11 09:00:00	2017-04-11T09:00:00		SCRP	Transfer	Neutered Male	30.5066578739455	-97.3408700722188	156.767857142857
○	9	3 years	A720214	Dog	Labrador Retriever Mix	Red/White	2013-02-04	2016-02-11 12:41:00	2016-02-11T12:41:00	Blessing		Adoption	Spayed Female	30.3870648199411	-97.3684339731375	157.504067460317
○	8	1 year	A736551	Dog	Labrador Retriever/Australian Cattle Dog	Black	2015-10-12	2016-11-27 18:00:00	2016-11-27T18:00:00	*Mia		Adoption	Spayed Female	30.4443212820182	-97.7326980338793	58.9642857142857
○	7	2 years	A673830	Dog	Pit Bull Mix	Black/White	2012-03-03	2014-03-19 15:15:00	2014-03-19T15:15:00	*Seth	Aggressive	Euthanasia	Neutered Male	30.2954256583441	-97.3136642110436	106.662202380952
○	10	3 months	A664290	Cat	Domestic Shorthair Mix	Tortie	2013-09-01	2013-12-08 14:58:00	2013-12-08T14:58:00	*Taylor		Adoption	Spayed Female	30.7583105481848	-97.618292198845	14.0898873015873
○	11	1 year	A721199	Dog	Dachshund Wirehair Mix	Tan/White	2015-02-23	2016-02-27 17:49:00	2016-02-27T17:49:00	Belle		Adoption	Spayed Female	30.7290272761146	-97.3753328216134	52.8203373015873

- Dashboard after applying each of the following filters:
    - **Water Rescue**



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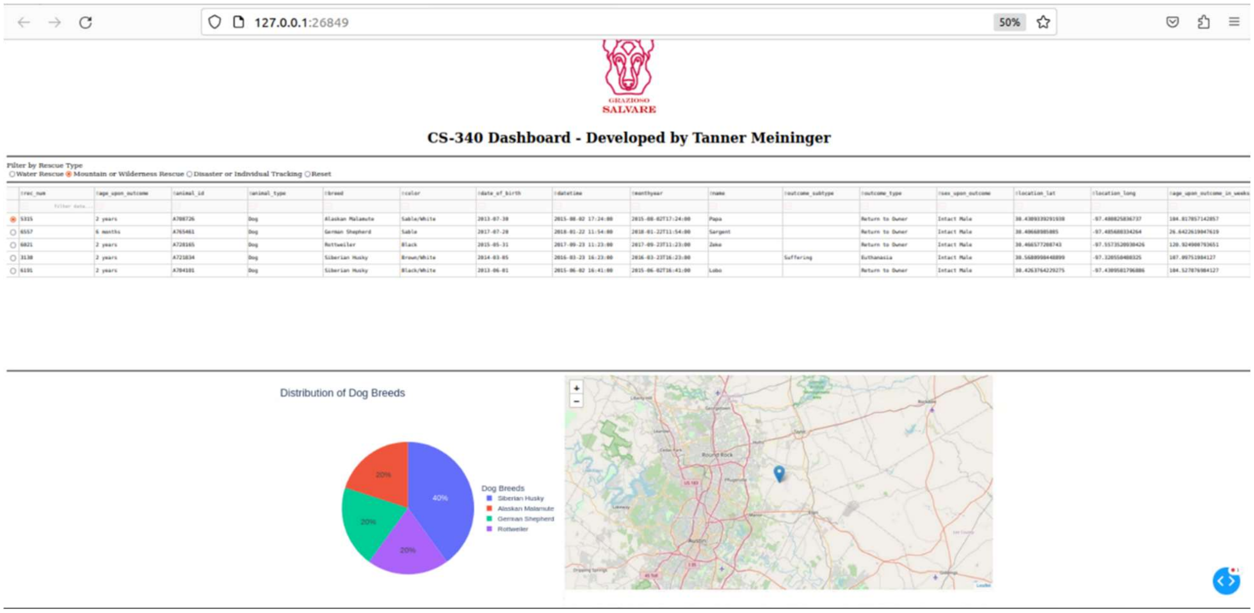
Filter by Rescue Type
● Water Rescue ○ Mountain or Wilderness Rescue ○ Disaster or Individual Tracking ○ Reset

	rec_num	age_upon_outcome	animal_id	animal_type	breed	color	date_of_birth	datetime	monthyear	name	outcome_subtype	outcome_type	sex_upon_outcome	location_lat	location_long	age_upon_outcome_in_weeks
	filter data...															
●	36	6 months	A706953	Dog	Labrador Retriever Mix	Yellow	2014-12-06	2015-07-06 11:33:00	2015-07-06T11:33:00		Medical	Euthanasia	Intact Female	30.5480802368633	-97.2969969858957	30.3544642857143
○	732	2 years	A749782	Dog	Labrador Retriever Mix	Tan/White	2015-05-19	2017-07-25 14:59:00	2017-07-25T14:59:00	*Catalina		Return to Owner	Intact Female	30.6138310636757	-97.5752164857665	114.889186507937
○	1121	1 year	A757158	Dog	Labrador Retriever Mix	White/Black	2016-08-30	2017-08-31 14:12:00	2017-08-31T14:12:00	Pirata		Return to Owner	Intact Female	30.5572161697962	-97.5363224263878	52.3702380952381
○	1628	9 months	A740471	Dog	Labrador Retriever Mix	Tan/White	2016-03-17	2016-12-23 17:13:00	2016-12-23T17:13:00	Mika		Adoption	Intact Female	30.7569243032341	-97.7392549176654	40.2453373015873
○	1757	7 months	A742767	Dog	Labrador Retriever Mix	Black	2016-06-27	2017-02-14 15:20:00	2017-02-14T15:20:00	Marley		Return to Owner	Intact Female	30.4069754937324	-97.4280017197358	33.234126984127
○	1988	1 year	A762781	Dog	Labrador Retriever Mix	Black/White	2016-11-27	2017-12-03 13:09:00	2017-12-03T13:09:00		Partner	Transfer	Intact Female	30.2840111162863	-97.4600542219677	53.0782738095238
○	2041	2 years	A702745	Dog	Labrador Retriever Mix	Black	2013-05-22	2015-05-22 11:45:00	2015-05-22T11:45:00	Abigail		Return to Owner	Intact Female	30.7157941956381	-97.4523664870572	104.355654761905
○	2225	2 years	A757341	Dog	Labrador Retriever Mix	Black/White	2015-09-01	2017-10-03 12:27:00	2017-10-03T12:27:00	19	Partner	Transfer	Intact Female	30.3814182796497	-97.7373217391863	109.074107142857
○	3319	9 months	A687748	Dog	Labrador Retriever Mix	Yellow	2013-12-09	2014-09-09 17:01:00	2014-09-09T17:01:00		Suffering	Euthanasia	Intact Female	30.729653440489	-97.3912941809824	39.2441468253968
○	4222	1 year	A735551	Dog	Labrador Retriever Mix	Black	2015-09-25	2016-09-27 14:10:00	2016-09-27T14:10:00	Daisy		Return to Owner	Intact Female	30.5150703656925	-97.6092580677489	52.655753968254

    - **Mountain or Wilderness Rescue**



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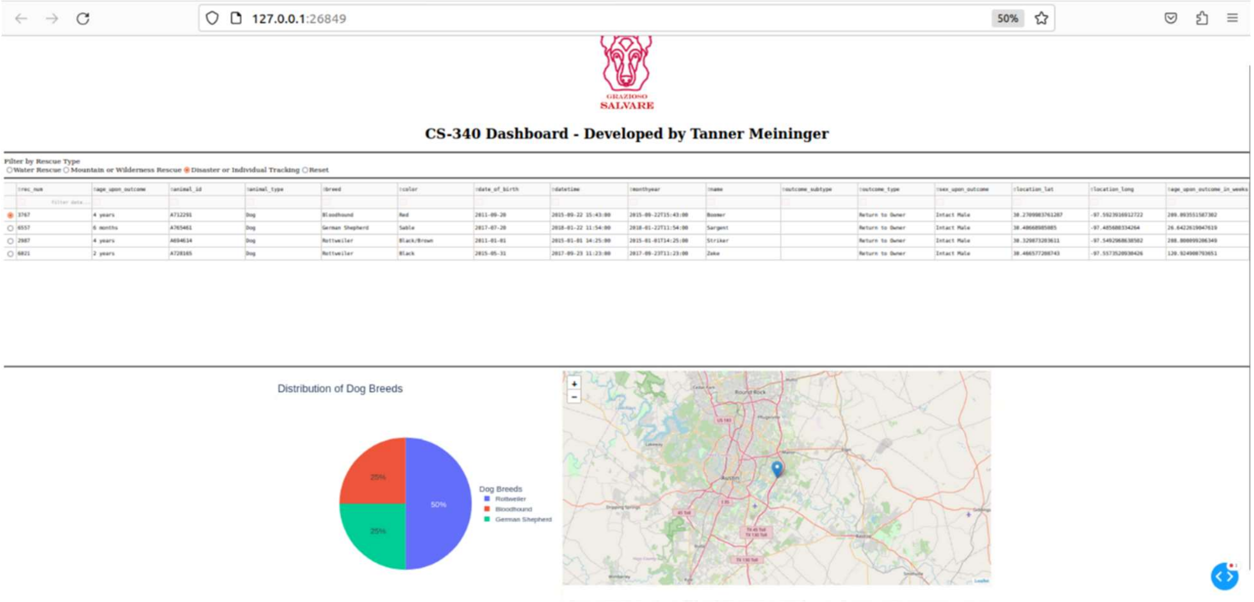
Filter by Rescue Type
○ Water Rescue ● Mountain or Wilderness Rescue ○ Disaster or Individual Tracking ○ Reset

	rec_num	age_upon_outcome	animal_id	animal_type	breed	color	date_of_birth	datetime	monthyear	name	outcome_subtype	outcome_type	sex_upon_outcome	location_lat	location_long	age_upon_outcome_in_weeks
	filter data...															
●	5315	2 years	A708726	Dog	Alaskan Malamute	Sable/White	2013-07-30	2015-08-02 17:24:00	2015-08-02T17:24:00	Papa		Return to Owner	Intact Male	30.4309339291938	-97.488825836737	104.817857142857
○	6557	6 months	A765461	Dog	German Shepherd	Sable	2017-07-20	2018-01-22 11:54:00	2018-01-22T11:54:00	Sargent		Return to Owner	Intact Male	30.40668985085	-97.485680334264	26.6422619047619
○	6021	2 years	A728165	Dog	Rottweiler	Black	2015-05-31	2017-09-23 11:23:00	2017-09-23T11:23:00	Zeke		Return to Owner	Intact Male	30.466577208743	-97.5573520030426	120.924900793651
○	3138	2 years	A721834	Dog	Siberian Husky	Brown/White	2014-03-05	2016-03-23 16:23:00	2016-03-23T16:23:00		Suffering	Euthanasia	Intact Male	30.5680998448899	-97.320550480325	107.09751984127
○	6191	2 years	A704181	Dog	Siberian Husky	Black/White	2013-06-01	2015-06-02 16:41:00	2015-06-02T16:41:00	Lobo		Return to Owner	Intact Male	30.4263764229275	-97.4309581796886	104.527876984127

- ○ **Disaster or Individual Tracking**



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Filter by Rescue Type
○ Water Rescue ○ Mountain or Wilderness Rescue ● Disaster or Individual Tracking ○ Reset

	rec_num	age_upon_outcome	animal_id	animal_type	breed	color	date_of_birth	datetime	monthyear	name	outcome_subtype	outcome_type	sex_upon_outcome	location_lat	location_long	age_upon_outcome_in_weeks
	filter data...															
●	3767	4 years	A712291	Dog	Bloodhound	Red	2011-09-20	2015-09-22 15:43:00	2015-09-22T15:43:00	Boomer		Return to Owner	Intact Male	30.2709983761287	-97.5923916812722	209.893551587302
○	6557	6 months	A765461	Dog	German Shepherd	Sable	2017-07-20	2018-01-22 11:54:00	2018-01-22T11:54:00	Sargent		Return to Owner	Intact Male	30.4866898585085	-97.4856080334264	26.6422619047619
○	2987	4 years	A694614	Dog	Rottweiler	Black/Brown	2011-01-01	2015-01-01 14:25:00	2015-01-01T14:25:00	Striker		Return to Owner	Intact Male	30.329873203611	-97.549296863858	208.800099206349
○	6021	2 years	A728165	Dog	Rottweiler	Black	2015-05-31	2017-09-23 11:23:00	2017-09-23T11:23:00	Zeke		Return to Owner	Intact Male	30.466577208743	-97.5573520938426	120.924900793651

Distribution of Dog Breeds

Tools and Technologies Used

MongoDB

- **Purpose**: MongoDB was used as the model component of the project to store and manage the rescue operation data.
- **Why MongoDB?**:
  - Scalability: MongoDB is a NoSQL database that excels at handling large datasets and provides flexibility in data structure.
  - Ease of Use with Python: MongoDB provides an excellent interface for Python using the pymongo library, which allows for easy CRUD (Create, Read, Update, Delete) operations.
  - Document-Oriented: Its document-oriented nature is ideal for storing semi-structured data like rescue records that may include complex relationships or varying attributes.

Dash Framework

- **Purpose**: Dash is a Python framework used for building web applications with an interactive user interface (UI). It provides both the view and controller structure for the project.
- **Why Dash?**

  - Python Integration: Dash allows seamless integration with Python, making it ideal for data-driven applications where Python is used for data manipulation and visualization.
  - Interactive Components: Dash provides various UI components such as graphs, data tables, and filters that automatically update when new data is passed to them.
  - Plotly for Visualizations: Dash integrates with Plotly to create dynamic and interactive charts, which was essential for the pie chart and map used in this project.

Other Tools:

- **Dash Leaflet**: Used for the geolocation map visualization.
- **Plotly**: Used for creating the interactive pie chart that visualizes dog breeds.
- **JupyterDash**: A version of Dash that allows for running Dash applications within Jupyter Notebooks.
- **Jupyter Notebooks**

Steps to Reproduce the Project

Set Up MongoDB

- Install MongoDB and load the rescue data into the database.
- Configure a MongoDB user account (e.g., aacuser) with the necessary permissions.
- Ensure the MongoDB instance is running and accessible from your application.

Create the CRUD Python Module

- Develop the CRUD class to handle interactions with MongoDB (insert, read, update, and delete operations).
- Test the CRUD operations to ensure data is correctly retrieved from the database.

Develop the Dashboard Application

- Use the Dash framework to build the user interface, including the data table, pie chart, and map.
- Use Plotly for creating a dynamic pie chart visualizing dog breed distribution.
- Use Dash Leaflet to render the geolocation map that shows where each dog was rescued.
- Set up filters (radio buttons) to allow users to filter data based on rescue type.

Run the Application

- Use JupyterDash to run the Dash application in a Jupyter Notebook or as a standalone web app.
- Test the application to ensure the filters, charts, and maps are responsive and update dynamically based on user input.

Test and Capture Screenshots

- Ensure all functionality is working as expected (filters, chart updates, data table, map).
- Capture screenshots or screencast for the project documentation.

Challenges and Solutions

Challenge 1: MongoDB Authentication and Connection

- **Issue**: There were initial difficulties in connecting to MongoDB due to authentication issues.
- **Solution**: The problem was resolved by ensuring that the correct MongoDB URI was used, with proper encoding for special characters in the username and password.

Challenge 2: Plotly Legend Overlapping the Chart

- **Issue**: The legend in the pie chart was overlapping the chart itself, making it difficult to read.
- **Solution**: The legend was moved to the right of the pie chart and resized for better readability.

Challenge 3: Data Filtering

- **Issue**: Ensuring the correct filtering logic was applied based on rescue type.
- **Solution**: Applied MongoDB queries that filter the data by breed, age, and sex to match the rescue type criteria.