HONR 39900 – Homework 2

Justin A. Gould
gould29@purdue.edu

May 18, 2021

DUE DATE: 2021/09/06 23:59 EDT

Homework Instructions
To receive credit for the assignment, do the following:

1. Create a `.py` file, and name it: `purduealias_honr39900_homework_number.py` (e.g., `gould29_honr39900_homework_1.py`)

2. Create a function for each problem, accepting the input and providing the desired output (both of which will be defined in the homework assignment). (e.g., `def problem_1()` for Problem #1)

3. Submit the `.py` file to Brightspace by the due date.

4. This homework assignment will have a non-code question (question 3). To receive credit for this question, please follow the question's instructions and submit a PDF of the requirements to Brightspace by the due date.

For grading, I will leverage unit tests, to ensure you aren't hard-coding your work. These unit tests are hidden. To test your code, I suggest using a Jupyter Notebook to ensure you're following directions. An example `.py` file is on our Brightspace and GitHub.

Problem 1

Calculating Distances: Cartesian Distance – 4 points
Write a function to calculate the cartesian distance between 2 coordinates on a 2D plane.

Input: Two Python sets, each containing coordinates in degrees. Please use the following format:

```
(longitude, latitude)
```

Desired Output: A float representing the cartesian distance between $coordinate_1$ and $coordinate_2$.

Problem 2

Calculating Distances: Spherical Distance – 10 points
Write a function to calculate the haversine distance between 2 coordinates.

Input: Two Python sets, each containing coordinates in degrees. Please use the following format:

```
(longitude, latitude)
```

Desired Output: A float representing the haversine distance between $coordinate_1$ and $coordinate_2$.

NOTE: For problem 3, please use the following information:

The United States Postal Service (USPS) is a massive, complex logistics operation. In an effort to improve customer service, the organization would like to provide customers with real-time information on processing and current location of each shipped item. To do this, the USPS must leverage an organization-wide data entry and retrieval system (database). The USPS is asking for your help to create the database that will store these critical data for the feature.

Database Requirements: The database must store the following information about shipped items.

1. Shipped items can be characterized by item number (**unique**), weight, dimensions, insurance amount, destination, and final delivery date.
2. Shipped items are received into the USPS system at a single retail center. Retail centers are characterized by their type, `uniqueID`, and address.
3. Shipped items make their way to their destination via one or more standard USPS transportation events (e.g., flights, truck deliveries, etc.). These transportation events are characterized by a **unique** `scheduleNumber`, a type (e.g., flight, truck, etc.), and a `deliveryRoute`.

Please create an entity relationship diagram that captures this information about the USPS item-tracking system.

Problem 3

Create a Spatial Database Schema (a) – 36 points
Use the aforementioned scenario and requirements to create a spatial database schema (entity relationship diagram)

Input: N/A

Desired Output: A PDF of an entity relationship diagram fulfilling the requirements outlined above.

Grading Criteria:

- You will receive 20 points for correctly identifying entities.
- You will receive 8 points for correctly identifying primary/foreign keys and entity relationships.
- You will receive 8 points for correctly identifying attributes (columns).