CHALLENGE

There was an error in your submission. Please review the form below and try again. ✖

Warning: We suggest you use Chrome(https://www.google.com/chrome/) as your browser (possibly using Incognito Mode) if you experience any errors.

Please answer as many questions as you can. We do not expect you to answer them all, but **you *must* answer at least one for each section.** Answering more questions correctly will help you and answering them incorrectly will not hurt you. (*) denotes a required field. Due to the volume of requests, we will only accept submissions via this form. The basic ground rules are:

- **Answer the questions yourself without asking others for assistance**. This is a test of your ability to answer realistic questions. You will be asked questions of similar difficulty during the phone interview so cheating will not help.
- **Do not share the questions or your answers with anyone.** This includes posting the questions or your solutions publicly on services like quora, stackoverflow, or github. Doing so gives others an unfair advantage and may also disqualify you from this or future fellowships.
- **Save often.**If you have filled out parts of the form but you are not ready to submit yet, we highly recommend that you save your solutions often by clicking the “Save” button below in order to avoid loosing work due to any browser issues.
- **Submit when finished.**Be sure to press submit when you are *completely finished* with the challenge. This lets us know that you are done with your solutions so we can begin to review them. You will not be able to work further on the challenge after submitting your work.

▶ A few helpful hints (click to expand):

Section 1:

The New York City Department of Buildings maintains a database of applications for building jobs within the city. The dataset can be downloaded here. (https://data.cityofnewyork.us/api/views/ic3t-wcy2/rows.csv?accessType=DOWNLOAD) Specific information about the dataset can be found here. (https://data.cityofnewyork.us/api/views/ic3t-wcy2/files/9bb3688e-1bf8-4f8f-9541-ce936f1d00f4?download=true&filename=DD_DOB%20Job%20Application%20Filings_2019-06-19.xlsx) Unless stated otherwise, you should only consider applications with a "Pre- Filing Date" in the years 2013-2018.

Some DOB Job applications appear in this dataset more than once, where new entries denote different documents or updates to applications. Only consider entries with "Doc #" equal to 1. Then, use the column "DOBRunDate" to obtain only the most recent entry for each Job #. You will use this filtered data for the rest of the questions, as well. Lastly, report the number of unique DOB job applications with a "Pre- Filing Date" in 2018.

84777

Consider all DOB job applications in Manhattan. What proportion of the job applications pertain to buildings with residential existing occupancy types? Note that more information on occupancy types can be found in this document(https://www1.nyc.gov/assets/buildings/pdf/pw1_userguide.pdf).

0.35

Consider only job applications with a pre-filing date between 2013-2018. Do different boroughs have different success rates for obtaining job permits? Perform a chi-squared test to see if there is a difference in proportions between Queens and The Bronx and report the test statistic.

1.0

For each borough in New York City, compute the proportion of unique DOB job applications pertaining to buildings owned by corporations or partnerships. What is the ratio of the highest to the second-highest value of these proportions?

1.44

Obtain the area in square miles for each borough in New York City. For each borough, and for entries with a pre- filing date in 2018, compute the number of job applications for constructing new buildings per square mile. The Job Type column contains information regarding which jobs are for new buildings. Report the ratio between the highest and second highest of these values.

1.0

Consider all DOB job applications with residential 'Existing Occupancy' types and with job type A1. For this subset, what proportion of job applications involve an increase from the number of existing dwelling units to the number of proposed dwelling units? Ignore entries with missing values.

1.0

Compute the number of days it takes to obtain a permit for each DOB application in Brooklyn from 2013 to 2018. Perform a linear regression on these differences against the applications' pre-filing years, then report the R^2 value. Ignore missing values, i.e. applications that have not been approved.

1.0

The column GIS_NTA_NAME provides the Neighborhood Tabulation Area for each entry. We can use the job application locations to estimate the areas of each neighborhood tabulation area. Represent each as an ellipse with semi-axes given by a single standard deviation of the longitude and latitude. What is the average area in square kilometers of a neighborhood in Manhattan? Note that some NTA names denote multiple neighborhoods, such as 'Hudson Yards-Chelsea-Flatiron-Union Square', and ignore entries whose GIS_NTA_NAME corresponds to Manhattan's parks and cemeteries.

1.0

In what language is the script written?

Python

Please provide the script used to compute your response (max 10000 characters).

Section 2:

The Tower of Hanoi is a game in which disks of different sizes are moved among several rods, always keeping the disks in sorted order on each rod, so that no disk sits upon a disk smaller than itself. The game begins with all disks stacked in order on the first rod (rod 0). Given a current state, find the minimum number of moves required to restore the disks to their starting position.

The game state is described by a number of rods R and an N-length array representing the positions of N disks. The i-th number in the array labels which rod the i-th largest disk is on (the largest disk is first in the array). The target state (all disks on the starting rod) is an array of all zeros.

$R = 4$, starting state $[0, 1, 1, 0]$ (*i.e.* largest disk on the first rod, next largest on the second rod, next largest on the second rod, and smallest on the first rod)

1

$R = 3$, starting state $[1, 2, 0, 1, 1, 0, 2, 2, 1, 1]$

1

$R = 4$, starting state $[1, 2, 0, 1, 1, 0, 2, 2, 1, 1]$

1

$R = 3$, starting state $[1, 2, 0, 1, 1, 0, 2, 2, 1, 1, 2, 1, 1, 0, 2]$

1

$R = 4$, **starting state** $[1, 2, 0, 1, 3, 0, 3, 2, 1, 1, 0, 3, 2]$

1

$R = 4$, **starting state** $[1, 2, 0, 1, 3, 0, 3, 2, 1, 1, 0, 3, 2, 2]$

1

In what language is the script written?

Python

Please provide the script used to compute your response (max 10000 characters).

How many hours did it take you to complete this challenge? This will not be considered in your application, and is only used for future challenge design.

99

SAVE SUBMIT