User Scenario

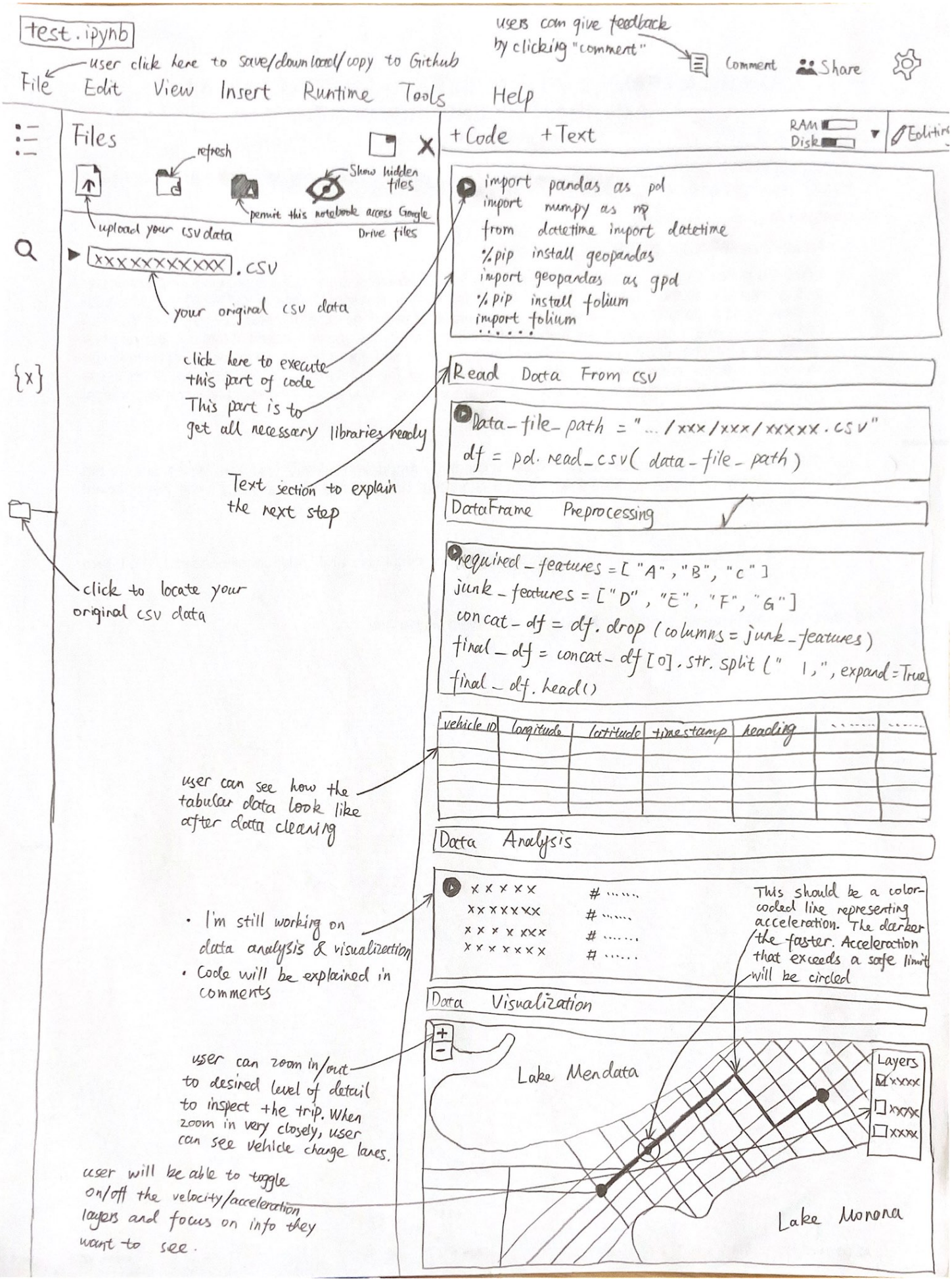
Tom is a data scientist in an insurance company. He needs to perform the car insurance price analysis based on the driver's driving behavior. Tom has no GIS background, but uses Jupyter Notebook and Python a lot on a daily basis. Before he can estimate the car insurance price, he needs to do some trip data exploratory analysis. He wants to see where the vehicle turns, speeds up, stop, change lanes, etc. I use GIS-related libraries like geopandas and folium to integrate a mapping component in a Jupyter Notebook, so Tom will be able to see the trips on the basemap.

Scenario 1: To check if a vehicle changes lanes too frequently
Tom toggle off the acceleration layer, just keep the velocity layer. Tom clicks the “+” button and zoom in to the maximum level of detail (level 19). He sees 4 lanes. He finds the vehicle switches from lane A to lane B. He clicks the point of location where the vehicle changes lanes. A label pop up and says “The latitude is 43.071 and longitude is -89.388; The time is 21:36:47 on 2013 Jun 24”. So Tom knows exactly when and where this lane change takes place.

Scenario 2: To check speeding/hard brake
Tom toggle off the velocity layer and just keep the acceleration layer. Tom zooms in to a trip he is interested in and sees a blue-red diverging color-coded trip. The reder the higher the acceleration, the bluer the higher the deceleration. He sees a red circle on the trip. He clicks the red circle and sees “The acceleration is 70 mile/hr > the speed limit 30 mile/hr”. Tom know the vehicle is speeding at this location.

Mock-up Summary

As this interactive map is one of the components hosted in Jupyter Notebook, it aims to help data scientists understand the pattern and behavior of the vehicle. When using this notebook, the user needs to import the csv trajectory data, and then import related libraries. Next, follow a data retrieving-data cleaning-data analysis-data visualization workflow to use this notebook. The user can move around the code snippets to improve this notebook. The integrated mapping component has several functions like zoom in/out, pan around, filter layers, pop-up label. These functions are believed to bring better user interaction experience to the user.


test.ipynb
user click here to save/download/copy to Github
File Edit View Insert Runtime Tools Help
users can give feedback by clicking "comment"
Comment
Share
Files
refresh
Show hidden files
upload your csv data
permit this notebook access Google Drive files
xxxxxxxxxxx.csv
your original csv data
+Code +Text
RAM
Disk
import pandas as pd
import numpy as np
from datetime import datetime
%pip install geopandas
import geopandas as gpd
%pip install folium
import folium
click here to execute this part of code
This part is to get all necessary libraries ready
Read Data From csv
Data_file_path = ".../xxx/xxx/xxxxx.csv"
df = pd.read_csv(data_file_path)
Text section to explain the next step
DataFrame Preprocessing
required_features = ["A","B","C"]
junk_features = ["D","E","F","G"]
concat_df = df.drop(columns=junk_features)
final_df = concat_df[0].str.split(" ",expand=True
final_df.head()
click to locate your original csv data
vehicle ID
longitude
latitude
timestamp
heading
user can see how the tabular data look like after data cleaning
Data Analysis
xxxxx #.....
xxxxxxx #.....
xxxxxxx #.....
xxxxxxx #.....
This should be a color-coded line representing acceleration. The darker the faster. Acceleration that exceeds a safe limit will be circled
• I'm still working on data analysis & visualization
• Code will be explained in comments
Data Visualization
user can zoom in/out to desired level of detail to inspect the trip. When zoom in very closely, user can see vehicle change lanes.
Lake Mendata
Layers
xxxx
xxxx
xxxx
Lake Monona
user will be able to toggle on/off the velocity/acceleration layers and focus on info they want to see.