Director of Dashboards and Data Access Performance Tasks

Hello and thank you for your time! Below I will be answering the performance task questions for the Director of Dashboards and Data Access position at NOLAPS using Python and Pandas. I am performing the analysis inside of a Jupyter Notebook because it allows me to break down my thought process step by step by including markdown text like this as well as using comments in the code to explain what I'm doing. We could answer a lot of these questions with Excel Pivot Tables (and most of the time that's perfectly ok!). However, I'm choosing to do it this way because it gives me a chance to show off my Python coding skills, and I personally think it's the most fun.

You can find this file, a PDF version, an HTML version and all associated files that I produced to answer these questions at https://github.com/antonoverby/nolaps-tryouts

Please reach out and let me know how I did! Anton Overby, antonoverby@gmail.com, 504-351-0538

Preparation

Preparing the virtual workspace

- Make directory
- Make virtual environment
- Install libraries
  - pandas
  - plotly
  - streamlit
  - geopandas
- Housekeeping
  - .gitignore

Research

- Working with geospatial data in Python
  - Geopandas:
    - https://geopandas.org/en/stable/getting_started/introduction.html
    - https://geopandas.org/en/stable/docs/user_guide/io.html

Sandboxing

- Jupyter notebooks
  - map-sandbox.ipynb

- portfolio.ipynb

File Analysis

- Key: Site Code
  - Site Code (School)- data-analysis/2023-school-performance-scores.xlsx
  - SIS Submit Site Code (Total by Site)- data-analysis/oct-2023-multi-stats-(total-by-site-and-school-system)_web.xlsx
  - Accountability Record: Site Code - data-analysis/Portfolio Data.csv

TO DO

- ☑ sandbox analysis to answer questions
  - Read in files
- ☑ visualizations
- [] data explorer streamlit app

Performance Tasks and Accompanying Code

Before we do anything we're going to import Pandas, read in the files that we'll be working with, and perform any maintenance steps necessary.

In [ ]:
```
import pandas as pd

'''Portfolio Dataframe'''

# Read files into Pandas Dataframes
portfolio = pd.read_csv("data/Portfolio Data.csv", encoding='latin-1') #

'''Stats Dataframe'''
# This Dataframe is going to take some maintenance because the file has a
stats = pd.read_excel('data/oct-2023-multi-stats-(total-by-site-and-schoo
#and skip the rows containing the picture

stats.columns = stats.iloc[0] # set column names to first row
stats = stats[1:] # drop first row which is now the headers

# stats.rename(columns={stats.columns[stats.columns.isna()][0]: '% Male'}

first_row = stats.iloc[0] # Now identify the headers which were on the se

# The next line of code I'll admit I had to ChatGPT, but what it does is
# if the header doesn't have a name then it takes the value of the cell r
# cell beneath the header then the header value stays

new_headers = [first_row[i] if not pd.isna(first_row[i]) else stats.colum
stats.columns = new_headers # Set the column names
stats = stats.iloc[3:] # Start the dataframe at the first row of actual d

'''SPS Scores Dataframe'''
# This excel sheet is mercifully easier to read in than the last

sps = pd.read_excel('data/2023-school-performance-scores.xlsx', sheet_nam
```

```
# The one thing we noticed is that there's a key in bottom rows that we d
sps = sps.iloc[0:1252]

# There's a warning below, but it does not stop the code from running.
# This is an example of technical debt which will need to be addressed in
```

```
/tmp/ipykernel_76939/3373503214.py:24: FutureWarning: Series.__getitem__ t
reating keys as positions is deprecated. In a future version, integer keys
will always be treated as labels (consistent with DataFrame behavior). To
access a value by position, use `ser.iloc[pos]`
  new_headers = [first_row[i] if not pd.isna(first_row[i]) else stats.colu
mns[i] for i in range(len(stats.columns))]
```

Analysis

1) Which Schools have a Desired Enrollment that is greater than the facility's capacity? Are any schools over capacity? Please omit private facilities from this answer.

In [ ]:
```
# First we're going to define the Enrollment Dataframe which uses only th

enrollment = portfolio[['Accountability Record: Site Code', 'Accountabili

# We're then going to use the groupby function paired with an aggregate f
# Including the Site Name will allow us to identify not only the building
# Including the Site Code will allow us to group this data to other data

enrollment = enrollment.groupby(['Accountability Record: Site Code', 'Acc
    'Students': 'sum',
    'Desired Enrollment': 'sum',
    'Facility Capacity': 'first'
})

# We notice that the private facilities will have "Private" in the Facili
# We'll omit the private facilities in this next step.

enrollment = enrollment[(enrollment != 0).all(axis=1)]

# Let's now create two new columns which will tell us if Desired Enrollme
# We'll call these columns "Potential Over Capacity" and "Currently Over
# We're going to then create two new dataframe objects which only include

enrollment['Potential Over Capacity'] = enrollment.apply(lambda row: 'Yes
enrollment['Currently Over Capacity'] = enrollment.apply(lambda row: 'Yes

potential_over_capacity = enrollment[enrollment['Potential Over Capacity'
current_over_capacity = enrollment[enrollment['Currently Over Capacity']
```

Answer:

In [ ]:
```
# We see here the schools that have the potential to go over capacity bec

potential_over_capacity
```

Out[ ]:

Accountability Record: Site Code	Accountability Record: Site Name	Facility: Facility Name	Students	Desired Enrollment	Facility Capacity	Potential Over Capacity
036161	Benjamin Franklin Elem. Math and Science	Vorice Jackson Waters	431	494	363	Yes
331001	International School of Louisiana	Enrique Alferez	245	323	242	Yes
		Justice Revius Oliver Ortique Jr.	415	538	461	Yes
369003	ReNEW Dolores T. Aaron Elementary	Dolores T. Aaron	616	733	698	Yes
374001	Success @ Thurgood Marshall	Thurgood Marshall	357	479	466	Yes
395001	Martin Behrman Charter Acad of Creative Arts & Sci	Rose Mary Loving	719	810	740	Yes
399001	Samuel J. Green Charter School	Samuel J. Green	429	527	497	Yes
399002	Arthur Ashe Charter School	Arthur Ashe	691	806	722	Yes
399004	Phillis Wheatley Community School	Phillis Wheatley	647	734	673	Yes
3C2002	Edward Hynes Charter School - UNO	Jean Gordon Modulars	424	523	400	Yes
WAZ001	Audubon Charter School	Dorothy Mae Taylor	391	480	455	Yes
WBE001	The Willow School	Dr. Everett J. Williams Jr.	626	665	503	Yes
WBK001	Bricolage Academy	Elliot & Mary Jane Willard	811	895	891	Yes

Accountability Record: Site Code	Accountability Record: Site Name	Facility: Facility Name	Students	Desired Enrollment	Facility Capacity	Potential Over Capacity	C
WBT001	Audubon Charter Gentilly	Gentilly Terrace	350	453	358	Yes	
WZB001	Warren Easton Charter High School	Warren Easton	1094	1150	1128	Yes	

In [ ]:
```
# We see here the schools which are currently over capacity because their

current_over_capacity
```

Out[ ]:

Accountability Record: Site Code	Accountability Record: Site Name	Facility: Facility Name	Students	Desired Enrollment	Facility Capacity	Potential Over Capacity	C
036161	Benjamin Franklin Elem. Math and Science	Vorice Jackson Waters	431	494	363	Yes	
331001	International School of Louisiana	Enrique Alferez	245	323	242	Yes	
3C2002	Edward Hynes Charter School - UNO	Jean Gordon Modulars	424	523	400	Yes	
WBE001	The Willow School	Dr. Everett J. Williams Jr.	626	665	503	Yes	

2) Which school has the highest percent of their open seats filled (Use the Students and Desired Enrollment fields to calculate open seats)

In [ ]:
```
# For the next question we're going to use information from the Portfolio
# Here we're reading in the columns that we need to make the calculation
# We then use a groupby function similar to the groupby function in Quest

seats = portfolio[['Accountability Record: Site Code', 'Accountability Re
seats = seats.groupby(['Accountability Record: Site Code', 'Accountabilit
    'Students': 'sum',
    'Desired Enrollment': 'sum'
})
```

```
# We then add a column called "% Seats Filled" which divides the number o
# We sort this new column from high to low.
seats['% Seats Filled'] = (seats['Students']/seats['Desired Enrollment'])
seats = seats.sort_values('% Seats Filled', ascending=False)
```

Answer:

In [ ]:
```
# The result is a dataframe which shows that Opportunities Academy has th

seats
```

Out[ ]:

Accountability Record: Site Code	Accountability Record: Site Name	Students	Desired Enrollment	% Seats Filled
WC2001	**Opportunities Academy**	67	68	98.529412
WBZ001	**McDonogh 35 Senior High School**	796	819	97.191697
382002	**G W Carver High School**	730	759	96.179183
WBF001	**Eleanor McMain Secondary School**	689	719	95.827538
WBD001	**Edna Karr High School**	1094	1148	95.296167
...	**...**	...	...	...
360001	**The NET Charter High School**	107	165	64.848485
036200	**The Delores Taylor Arthur School for Young Men**	74	117	63.247863
3C3001	**Foundation Preparatory Academy**	134	220	60.909091
W18001	**Noble Minds**	77	145	53.103448
360002	**The NET 2 Charter High School**	70	136	51.470588

72 rows × 3 columns

3) Which Planning District has the most Cost Tier 1 open seats in Kindergarten? (Use Students and Facility Capacity to calculate open seats)

Note: I would ask for clarification about how we should use facility capacity to calculate open seats if the grade-level specific student count only counts for a fraction of the facility capacity. For the purpose of answering this question I will proceed without utilizing this calculation as I believe we can get the answer without it.

In [ ]:
```
# To answer this question we're going to include the usual site identific
# We're also going to add in grade level, portfolio region and cost tier.
# After reading in these columns into a new Open Seats Dataframe, we're g
```

```
open_seats = portfolio[['Accountability Record: Site Code', 'Accountabili

# open_seats['Open Seats'] = open_seats['Facility Capacity'] - open_seats
# ### This line is a commented out line where I realized that Facility Ca

# Carrying on, we're going to perform a filter to include only rows with
# We then make a column calculating Open Seats by subtracting students fr
# We then sum together the results based on Facility Planning District in

k_open_seats = open_seats[open_seats['Grade Level: Grade'] == 'K']
k_open_seats = k_open_seats[k_open_seats['Facility: Cost Tier'] == 1.0]
k_open_seats['Open Seats'] = k_open_seats['Desired Enrollment']-k_open_se
k_open_seats = k_open_seats.groupby(['Facility: Portfolio Region']).agg({
    'Students': 'sum',

}).sort_values('Students', ascending=False)
```

Answer:

In [ ]:
```
# We can see from the resulting dataframe below that Planning Districts 9

k_open_seats
```

Out[ ]:

Facility: Portfolio Region	Students
Planning Districts 9, 10, 11	389
Planning Districts 4, 5	297
Planning Districts 12, 13	256
Planning Districts 6, 7, 8	240
Planning Districts 1a, 1b, 2, 3	191

4) Among Orleans Parish high schools, which Zip Code has the most students classified as economically disadvantaged?

In [ ]:
```
# First let's take the columns that we want and filter them down to high

stats = stats[['SIS Submit Site Code', 'School System Name', 'Site Name',
stats = stats[stats['Site Category'] == 'HIGH']
stats = stats[stats['School System Name'] == 'Orleans Parish']

# We're then going to calculate number of economically disadvantaged by m
stats['Num Econ Disadv'] = stats['Total Enrollment'] * stats['% Economica
stats['Num Econ Disadv'] = stats['Num Econ Disadv'].round()

# We're going to now pull in data Site Code, Site Name and Zip Code data
# We're going to call it x since it's immediately being used in the join

x = portfolio.groupby(['Accountability Record: Site Code','Accountability
x = x[['Accountability Record: Site Code','Accountability Record: Site Na

# We join the two dataframes using the respective site code columns

stats_w_zip = pd.merge(stats,
         x[['Accountability Record: Site Code', 'Facility: Zip/Postal Cod
```

```
        left_on='SIS Submit Site Code',
        right_on='Accountability Record: Site Code',
        how='inner')

# Now we'll group by the zip code and sum the results

stats_w_zip = stats_w_zip.groupby('Facility: Zip/Postal Code', as_index=F
```

Answer:

In [ ]:
```
# The resulting dataframe shows us that 70122 is the Zip Code with the mo

stats_w_zip
```

Out[ ]:

	Facility: Zip/Postal Code	Num Econ Disadv
6	70122	1659.0
8	70126	1286.0
7	70125	1218.0
12	70131	934.0
5	70119	913.0
3	70115	837.0
9	70127	616.0
4	70117	586.0
0	70112	477.0
2	70114	472
10	70128	362.0
11	70129	347.0
1	70113	217.0

5) How many students in each Zip Code attend either a D or F-rated school? (Use 2023 Letter Grade)

In [ ]:
```
# We know that the SPS Dataframe has 2023 SPS scores, so let's start by g

sps = sps[['Site Code', '2023 Letter Grade ']]
# Fun fact bonus that I'll leave in here -- notice that '2023 Letter Grad

# We're going to take data from the Portfolio Dataframe which we'll join

zips = portfolio[['Accountability Record: Site Code', 'Students', 'Facili
zips = zips.groupby(['Accountability Record: Site Code', 'Facility: Zip/P

# Join the two dataframes into a new dataframe
ltr_grd = pd.merge(zips,
                   sps[['Site Code', '2023 Letter Grade ']],
                   left_on='Accountability Record: Site Code',
                   right_on='Site Code',
                   how='inner'
                   )
```

```
# Filter for only D's and F's and sum the rows containing the same Zip Co

ltr_grd = ltr_grd[ltr_grd['2023 Letter Grade '].isin(['D', 'F'])]
ltr_grd = ltr_grd.groupby('Facility: Zip/Postal Code', as_index=False)['S
```

Answer:

In [ ]:
```
# We can see in the resulting Letter Grade Dataframe how many students ar

ltr_grd
```

Out[ ]:

	Facility: Zip/Postal Code	Students
0	70114	2668
1	70117	660
2	70118	688
3	70119	1006
4	70122	615
5	70125	500
6	70126	244
7	70127	279
8	70128	846
9	70129	826
10	70130	363
11	70131	319

Visualization

6) The Board would like to know how many high school students in each Zip Code are classified as economically disadvantaged. Using your data from #4, put together a visualization to be presented at the next OPSB board meeting. You may include additional data in your visualization if you think it helps to add depth. There are limits to how accurately you can respond to this request. Briefly describe any limits that you identify and how you would convey those in your summary

Limits:

- Zip Codes are huge, smaller groupings would lend more nuanced data
- The percentage of economically disadvantaged students is high overall, so the map will basically follow population density
- Two zip codes are missing when you have only high schools?
- School enrollment isn't constricted by Zip Code
- Knowing the limits is the type of thing I feel like would come with knowing the data a lot better

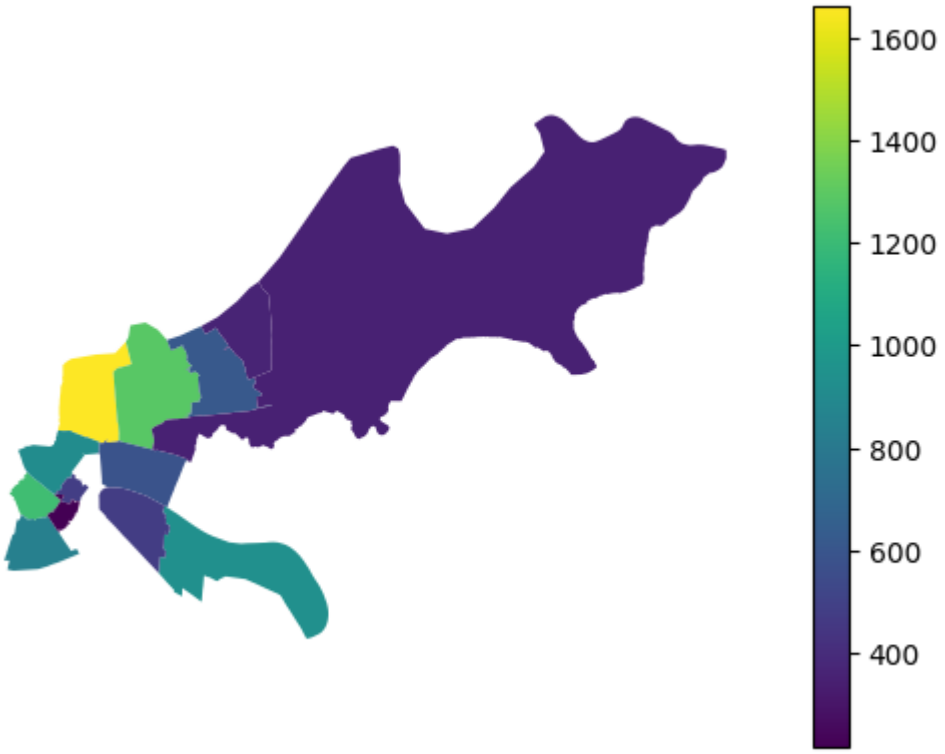
Note: I chose to make a choropleth map in this instance, but this data could be

presented in a number of ways. I would use Plotly to make other visualizations, I really just wanted to try out Geopandas since I just learned about it!

In [ ]:
```
# Here we're going to use Geopandas to read in the New Orleans geospatial
# We'll then merge it with the earlier Economically Disadvantaged by Zip

import geopandas

geofile = 'data/Orleans_ZCTA_2010.zip'
nola = geopandas.read_file(geofile)
nola['ZCTA5CE10'] = nola['ZCTA5CE10'].astype(int)

nola_econ_dis = pd.merge(nola, stats_w_zip, how='right', left_on='ZCTA5CE
nola_econ_dis['Num Econ Disadv'] = nola_econ_dis['Num Econ Disadv'].astyp
```

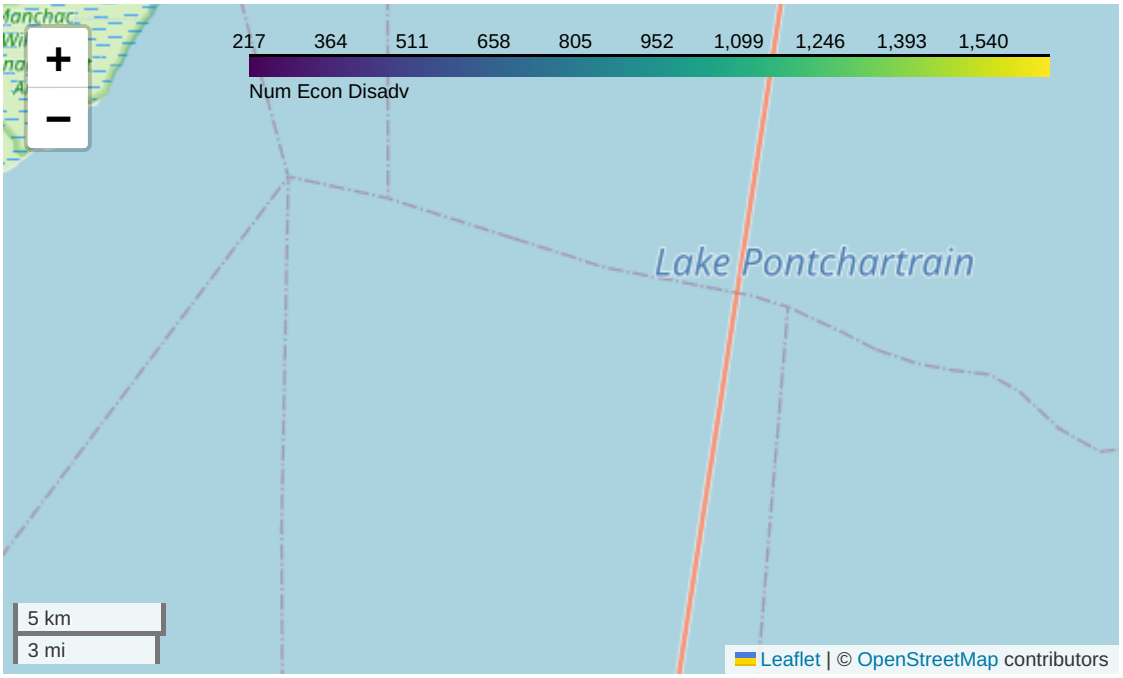
The Vizzes:

In [ ]:
```
# Here's a choropleth of the data. I would put this on a slide with a Tit

nola_econ_dis.plot(column='Num Econ Disadv',
                   legend=True
                   ).set_axis_off()
```



In [ ]:
```
# This map is interactive if you're using a browser to view the HTML file
# (it may look weird on PDF version, just wanted to include it because I

nola_econ_dis.explore(column="Num Econ Disadv")
```

Out[ ]:



Data Systems

7) Assume the files are tables in a database. The table naming conventions are up to you. Write a SQL query to retrieve the number of available seats across all facilities in Cost Tier 1 and 2 except for those contained in Planning Districts 12, 13

This would be the SQL query if "planning_district" field only contains the numbers of the planning districts

SELECT SUM(available_seats) FROM enrollment WHERE (cost_tier IN (1,2) AND planning_district NOT IN (12,13))

This would be the SQL query if "planning_district" field contains the words "Planning Districts 12, 13" SELECT SUM(available_seats) FROM enrollment WHERE (cost_tier IN (1,2) AND planning_district NOT LIKE "Planning Districts 12, 13")

8) If you were to create tables for the data contained in these files, what keys would you use or create to make the data more manageable?

I would of course use the Site Code as a primary key since it is the most unique thing identifying each site. I would also make a key out of the concatenation of site code and grade level to be able to access data at the grade level.

THANK YOU FOR YOUR TIME! :)

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