Investigate a Dataset

REVIEW | HISTORY

Meets Specifications

Dear student,
You have done a good job with this investigation task using pandas.
I really love the notebook, it is outstanding and covers beyond what is required, well done

Useful Resources:

- I would like to share this website with your where you can learn about how to deal with missing data. This will be an interesting read:
  https://stefvanbuuren.name/fimd/sec-MCAR.html
- Also, here is an awesome Pandas cheatsheet with you:
  https://pandas.pydata.org/Pandas_Cheat_Sheet.pdf
- This will help you in choosing the right Pandas methods when you do wrangling and exploration.
  This is also a very useful guide on which plot type to use for a specific analysis scenarios.
  http://www.mymarketresearchmethods.com/wp-content/uploads/2013/01/Chart-types.jpg

Code Functionality

✓

- **All code is functional and produces no errors when run.**
- **The code given is sufficient to reproduce the results described.**

Awesome job meeting requirement here

✔Code is run all the lines of the python code without any errors
✔The code produces what is required

Markdown in Jupiter

Try adding markdown as it is an excellent way to have a clear notebook in Jupiter, I use it a lot at work as it reminds me of the business requirement or logic I used especially for issues I run once a year or quarter: https://towardsdatascience.com/jupyter-and-markdown-cbc1f0ea6406

Useful Links

- Most used Pandas functions: https://medium.com/analytics-vidhya/top-20-pandas-functions-which-are-commonly-used-for-exploratory-data-analysis-3cb817a60f46
- Python: https://towardsdatascience.com/tips-and-tricks-for-fast-data-analysis-in-python-f108ad32fa90
- Here is an excellent guide for markdown: https://medium.com/analytics-vidhya/the-ultimate-markdown-guide-for-jupyter-notebook-d5e5abf728fd

✓

- **The project uses NumPy arrays and Pandas Series and DataFrames where appropriate rather than Python lists and dictionaries.**
- **Where possible, vectorized operations and built-in functions are used instead of loops.**

Awesome job using the below and vectors instead of lists and dictionaries

- Pandas
- Numpy
- Matplotlib

Why Vectors instead of loops

Vectors and built in functions makes data investigation and analysis fast and accurate, here is a nice article: https://medium.com/analytics-vidhya/understanding-vectorization-in-numpy-and-pandas-188b6ebc5398

Useful Links

Some important Pandas built-in functions:

- Value-Counts
- Indexing and Selecting data
- Group-by

✓

- **The code makes use of at least 1 function to avoid repetitive code.**

- The code contains good comments and meaningful variable names, making it easy to read.

Awesome job defining and implementing a function that can be used repetitively:

Suggestion

When writing a function, it is recommended that you explain what the function does not with comments preceding the function definition but with what we call 'docstrings' which are multi-line comments we usually add after the function header.
Check here the importance of commenting your code: https://realpython.com/lessons/importance-writing-good-code-comments/

```
def remove_sign(stri):
    if stri.endswith('%'):
        return stri.replace('%', '')
    else:
        i=float(stri)*100
        return str(i)
```

Quality of Analysis

✓ The project clearly states one or more questions, then addresses those questions in the rest of the analysis.

Awesome job done here adding more than is required in clear and explanatory questions:

Suggested links

I will suggest you check the below article showing how to develop analytical questions:
https://www.datapine.com/blog/data-analysis-questions/

> Questions to Answer:
>
> 1. Does Population estimates in States correlate with total gun registration and purchases?
> 2. Is there relation between total gun registration and purchases and the percentage of various races in the given states?
> 3. Which States had the highest growth in gun registration and purchases?
> 4. What is the overall trend of gun purchases?

Data Wrangling Phase

✓ The project documents any changes that were made to clean the data, such as merging multiple files, handling missing values, etc.

✓Well done justifying the reason for certain data cleaning choices using markdown cells explaining the rationale

behind those cleaning decisions.
✔Good work in implementing a Data Wrangling Phase!
✔You captured the issues in this dataset and also explained every step and cleaning! Good job!

Useful Links

- As you have learned, missing data is one of the major issues data analysts encounter when they start the exploration. I really recommend you check out this website to learn more details about the different types of missing data and how to deal with each one: https://stefvanbuuren.name/fimd/sec-MCAR.html
- Real Python gives a good overview of examining and cleaning your data

Here's the link to a nice article to read: The hardest thing about Data Science is asking the right question

Exploration Phase

✓

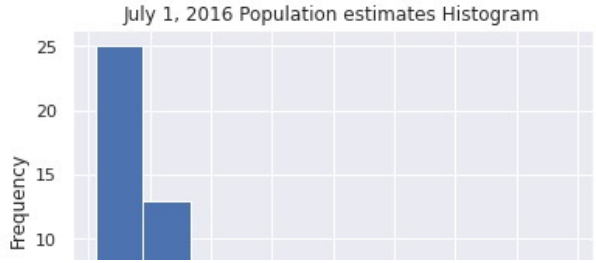
- **The project investigates the stated question(s) from multiple angles.**
- **The project explores at least three variables in relation to the primary question. This can be an exploratory relationship between three variables of interest, or looking at how two independent variables relate to a single dependent variable of interest.**
- **The project performs both single-variable (1d) and multiple-variable (2d) explorations.**

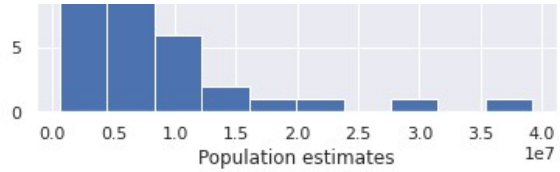
Awesome job here.

✔ The questions were thoroughly investigated from various angles
✔Used both 1d and 2d explorations were used for several variables investigated..!! Well done..!!
✔Awesome job exploring at least three variables in relation to the primary question

Excellent 1d exploration

```
:
#plot a histogram to showcase the distribution of population estimates
plt.hist(data=df_census2, x='Population estimates, July 1, 2016,  (V2016)');
plt.title('July 1, 2016 Population estimates Histogram')
plt.xlabel('Population estimates')
plt.ylabel('Frequency');
```





Here are the differences between bivariate and univariate data:

Summary: Differences between univariate and bivariate data.

Univariate Data	Bivariate Data
• involving a **single variable**	• involving **two variables**
• does not deal with causes or relationships	• deals with causes or relationships
• the major purpose of univariate analysis is to describe	• the major purpose of bivariate analysis is to explain
• central tendency - mean, mode, median • dispersion - range, variance, max, min, quartiles, standard deviation. • frequency distributions • bar graph, histogram, pie chart, line graph, box-and-whisker plot	• analysis of two variables simultaneously • correlations • comparisons, relationships, causes, explanations • tables where one variable is contingent on the values of the other variable. • independent and dependent variables
Sample question: How many of the students in the freshman class are female?	**Sample question:** Is there a relationship between the number of females in Computer Programming and their scores in Mathematics?

Suggested Reads

Useful link on how to best choose the plot types: https://udacity-reviews-uploads.s3.us-west-2.amazonaws.com/_attachments/83662/1588660779/How-to-Visualize-your-Data-with-Charts-and-Graphs.jpg

✓

- The project's visualizations are varied and show multiple comparisons and trends.
- At least two kinds of plots should be created as part of the explorations.
- Relevant statistics are computed throughout the analysis when an inference is made about the data.

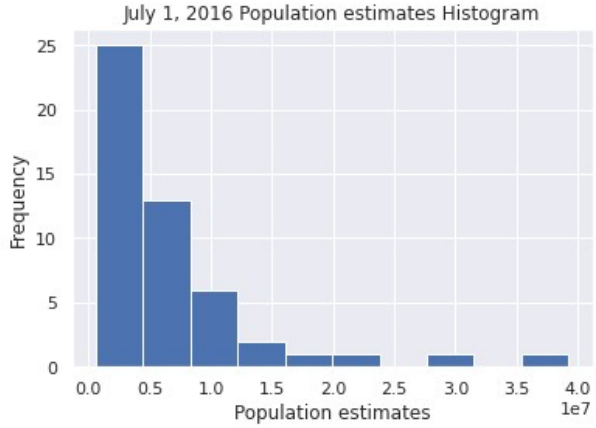
Well done meeting requirement here for using more than one plot type!

✔ You successfully used histograms
✔ Well implemented bar plots and scatter plots
✔ Well done having more than 2 plots to answer questions

Outstanding

I love that you used all the attributes of the .plot() function in Matplotlib:

```
#plot a histogram to showcase the distribution of population estimates
plt.hist(data=df_census2, x='Population estimates, July 1, 2016,  (V2016)');
plt.title('July 1, 2016 Population estimates Histogram')
plt.xlabel('Population estimates')
plt.ylabel('Frequency');
```



Suggested Galleries

- The Python Graph Gallery contains a gallery of different visualisation and template code you can use for your visualisations.
- Another gallery I'd recommend you is the seaborn gallery

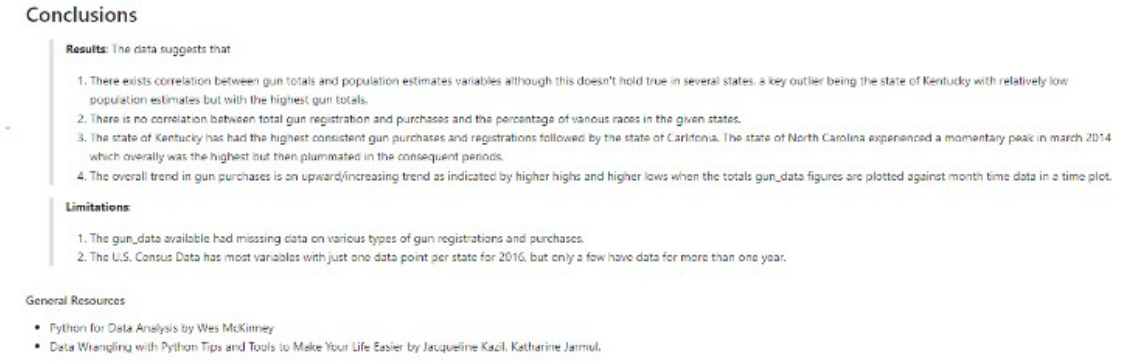
Conclusions Phase

- The Conclusions have reflected on the steps taken during the data exploration.
- The Conclusions have summarized the main findings in relation to the question(s) provided at the beginning of the analysis accurately.
- The project has pointed out where additional research can be done or where additional information could be useful.
- The conclusion should have at least 1 limitation explained clearly.
- The analysis does not state or imply that one change causes another based solely on a correlation

- The analysis does not state or imply that one change causes another based solely on a correlation.

Awesome

✔ You have taken your time in thinking and presenting a brief but very clear conclusion about your findings. This is a very important part of the report since many readers have the practice of going through the conclusion before reading the analysis section that lead to it.
✔Excellent listing of clear limitations in the dataset



Conclusions

Results: The data suggests that

1. There exists correlation between gun totals and population estimates variables although this doesn't hold true in several states. a key outlier being the state of Kentucky with relatively low population estimates but with the highest gun totals.
2. There is no correlation between total gun registration and purchases and the percentage of various races in the given states.
3. The state of Kentucky has had the highest consistent gun purchases and registrations followed by the state of Carlifonia. The state of North Carolina experienced a momentary peak in march 2014 which overally was the highest but then plummated in the consequent periods.
4. The overall trend in gun purchases is an upward/increasing trend as indicated by higher highs and higher lows when the totals gun_data figures are plotted against month time data in a time plot.

Limitations:

1. The gun_data available had missing data on various types of gun registrations and purchases.
2. The U.S. Census Data has most variables with just one data point per state for 2016, but only a few have data for more than one year.

General Resources

- Python for Data Analysis by Wes McKinney
- Data Wrangling with Python Tips and Tools to Make Your Life Easier by Jacqueline Kazil, Katharine Jarmul.

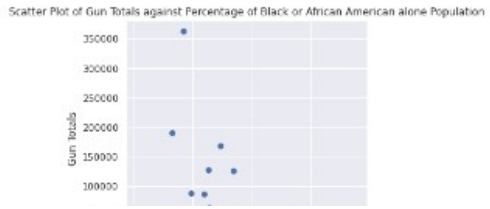
Communication

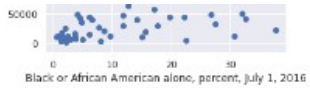
✓

- **The code should have ideally the following sections: Introduction; Questions; Data Wrangling; Exploratory Data Analysis; Conclusions, Limitation.**
- **Reasoning is provided for each analysis decision, plot, and statistical summary.**
- **Interpretation of plots and application of statistical tests should be correct and without error.**
- **Comments are used within the code cells.**
- **Documented the flow of analysis in the mark-down cells.**

Awesome job organizing your EDA notebook properly.

✔Reasoning is provided for each analysis decision, plot, and statistical summary.
✔Comments are used within the code cells.
✔Documented the flow of analysis in the mark-down cells.





- The Scatter Plot of Gun Totals against Percentage of Black or African American alone Population depicts that there's no correlation between the gun totals and the population percentage of Black or African American alone variables.

Useful Links

Here is an excellent guide for markdown: https://medium.com/analytics-vidhya/the-ultimate-markdown-guide-for-jupyter-notebook-d5e5abf728fd

✓ **Visualizations made in the project depict the data in an appropriate manner (i.e., has appropriate labels, scale, legends, and plot type) that allows plots to be readily interpreted.**

Excellent job having:
✔Clear abbreviations labels on all plots
✔Plot titles
✔Legends visible

Outstanding

In each plot you have all components (label, title and legends) as shown below:

```
plt.ylabel('Gun totals')
plt.xlabel('Time Change')
plt.title('Line plot depicting the overall trend of Gun purchases', size=20)
plt.show();
```

Useful Links

Here is a nice document on the importance of labels: https://teach.files.bbci.co.uk/skillswise/ma37grap-e3-f-using-clear-labels-on-your-chart-or-diagram.pdf

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