Descriptive and Exploratory Data Analysis

COGS 108 Discussion Lab Week 5

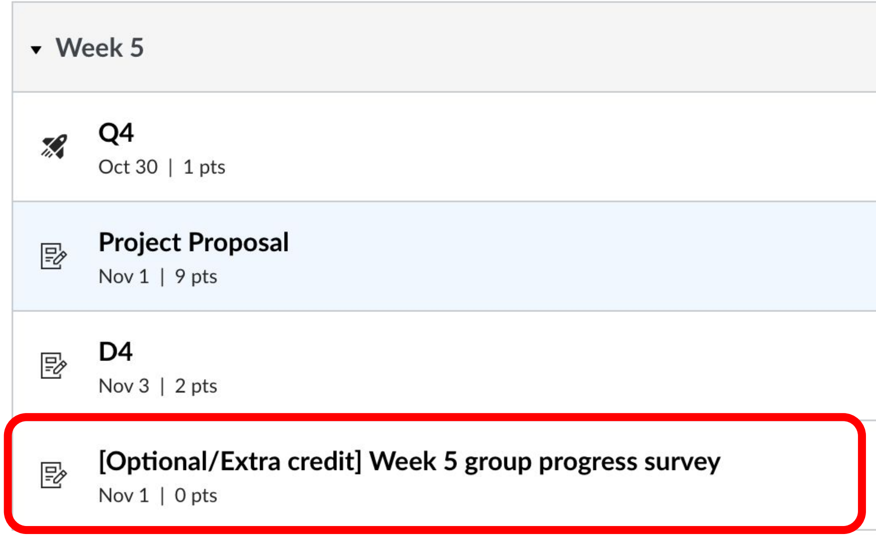
Slides adapted from Atman Patel (FA20) and Akshay N (FA22)

Due dates

- Q4: Monday (Oct. 28)
- Project Proposal: Wednesday (Oct. 30)
- D4: Friday (Nov. 1)

Project - Weekly Check-ins

- Every week you can fill out the weekly group progress survey
- If you fill them all out you get **Extra Credit!!!**
- It's a chance for you to let us know how your project is going
  - Questions?
  - Concerns about groupmates?
  - Challenges you're facing



▾ Week 5

Q4
Oct 30 | 1 pts

Project Proposal
Nov 1 | 9 pts

D4
Nov 3 | 2 pts

[Optional/Extra credit] Week 5 group progress survey
Nov 1 | 0 pts

Project Proposal

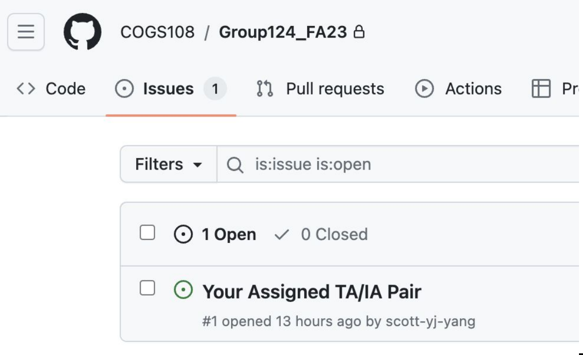
- Due: Wednesday (10/30)
- Just make sure you’ve pushed your completed Project Proposal to your github group repo by 11:59pm
    - Nothing else to submit

Project Proposal

- Work with your group to make a strong proposal
  - Practice your git/github commands and strategies
  - Use **ReviewNB** to look at changes between jupyter notebooks in Git
- Follow the instructions fully!

Project Proposal

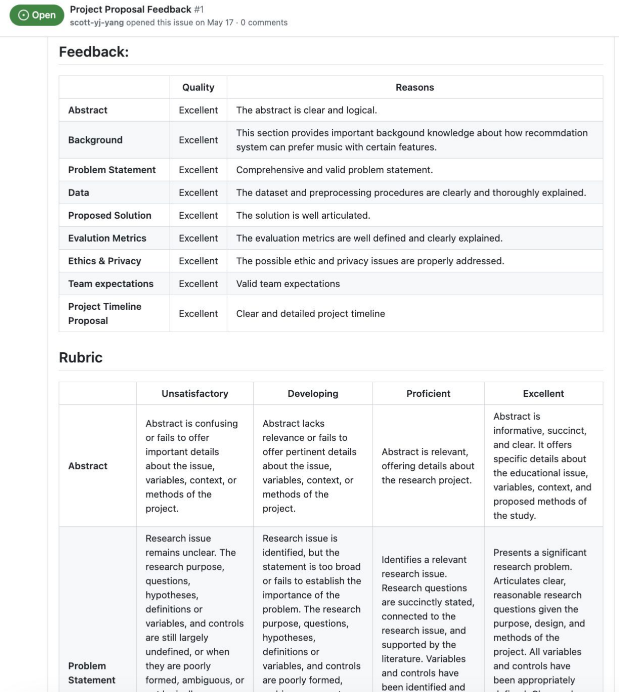
- There should be an issue in your repo with your assigned TA/IA ⇒ Reach out to them with any questions
- We will push a rubric to issues on your github group repo



COGS108 / Group124_FA23

○ 1 Open ✓ 0 Closed

□ ○ Your Assigned TA/IA Pair
#1 opened 13 hours ago by scott-yj-yang



Project Proposal Feedback #1
scott-yj-yang opened this issue on May 17 · 0 comments

Feedback:

	Quality	Reasons
Abstract	Excellent	The abstract is clear and logical.
Background	Excellent	This section provides important backgound knowledge about how recommdation system can prefer music with certain features.
Problem Statement	Excellent	Comprehensive and valid problem statement.
Data	Excellent	The dataset and preprocessing procedures are clearly and thoroughly explained.
Proposed Solution	Excellent	The solution is well articulated.
Evalution Metrics	Excellent	The evaluation metrics are well defined and clearly explained.
Ethics & Privacy	Excellent	The possible ethic and privacy issues are properly addressed.
Team expectations	Excellent	Valid team expectations
Project Timeline Proposal	Excellent	Clear and detailed project timeline

Rubric

	Unsatisfactory	Developing	Proficient	Excellent
Abstract	Abstract is confusing or fails to offer important details about the issue, variables, context, or methods of the project.	Abstract lacks relevance or fails to offer pertinent details about the issue, variables, context, or methods of the project.	Abstract is relevant, offering details about the research project.	Abstract is informative, succinct, and clear. It offers specific details about the educational issue, variables, context, and proposed methods of the study.
Problem Statement	Research issue remains unclear. The research purpose, questions, hypotheses, definitions or variables, and controls are still largely undefined, or when they are poorly formed, ambiguous, or	Research issue is identified, but the statement is too broad or fails to establish the importance of the problem. The research purpose, questions, hypotheses, definitions or variables, and controls are poorly formed,	Identifies a relevant research issue. Research questions are succinctly stated, connected to the research issue, and supported by the literature. Variables and controls have been identified and	Presents a significant research problem. Articulates clear, reasonable research questions given the purpose, design, and methods of the project. All variables and controls have been appropriately

DISCUSSION LAB 4

Descriptive AND Exploratory Data Analysis

Web scraping tools

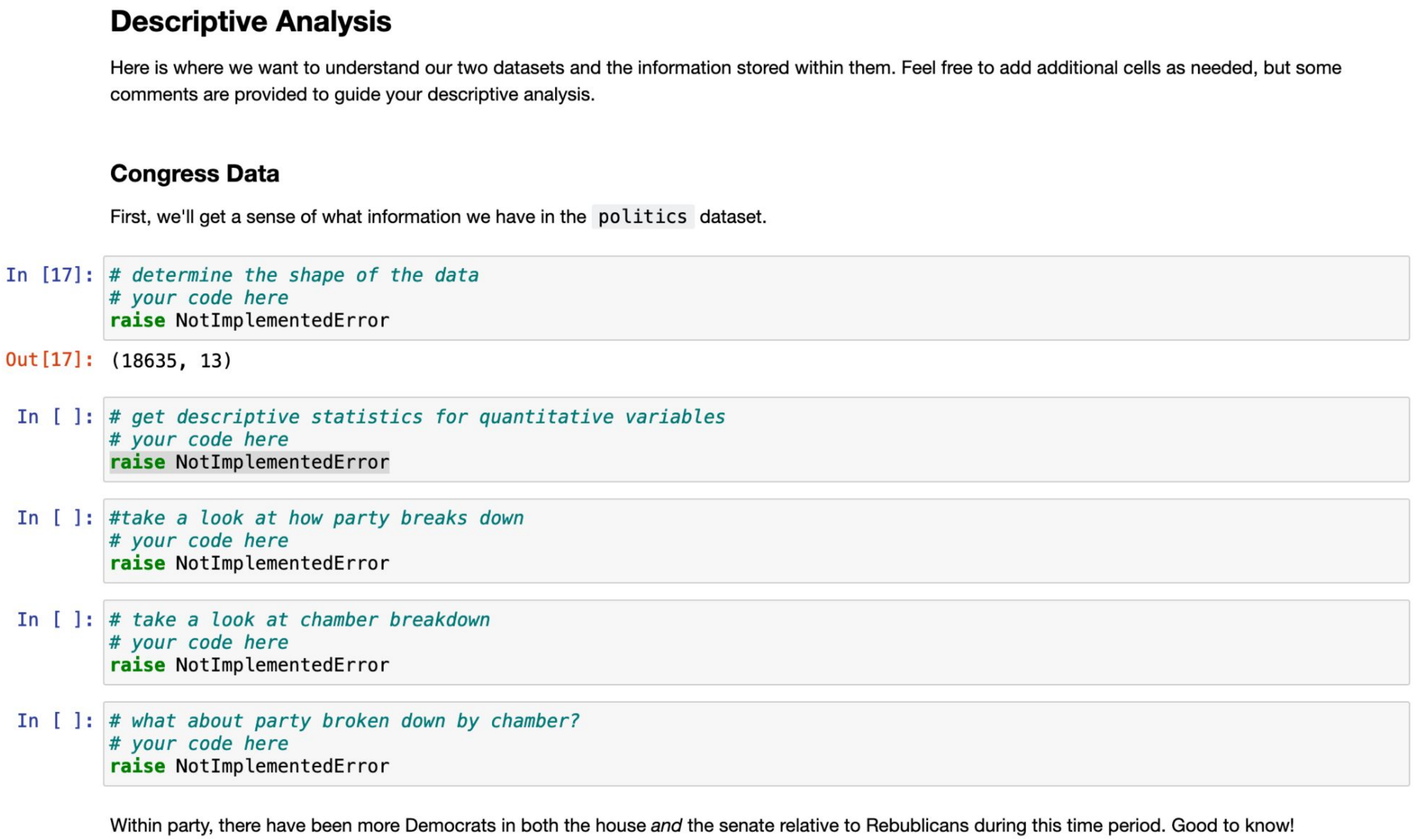
```
# packages helpful for webscraping
import requests
```

The requests library is the de facto standard for making HTTP requests in Python. It abstracts the complexities of making requests behind a beautiful, simple API so that you can focus on interacting with services and consuming data in your application.

```
import bs4
from bs4 import BeautifulSoup
```

Beautiful Soup is a Python library for pulling data out of HTML and XML files.

https://realpython.com/beautiful-soup-web-scraper-python/



Descriptive Analysis

Here is where we want to understand our two datasets and the information stored within them. Feel free to add additional cells as needed, but some comments are provided to guide your descriptive analysis.

Congress Data

First, we'll get a sense of what information we have in the `politics` dataset.

```
In [17]: # determine the shape of the data
         # your code here
         raise NotImplementedError

Out[17]: (18635, 13)
```

```
In [ ]: # get descriptive statistics for quantitative variables
        # your code here
        raise NotImplementedError
```

```
In [ ]: #take a look at how party breaks down
        # your code here
        raise NotImplementedError
```

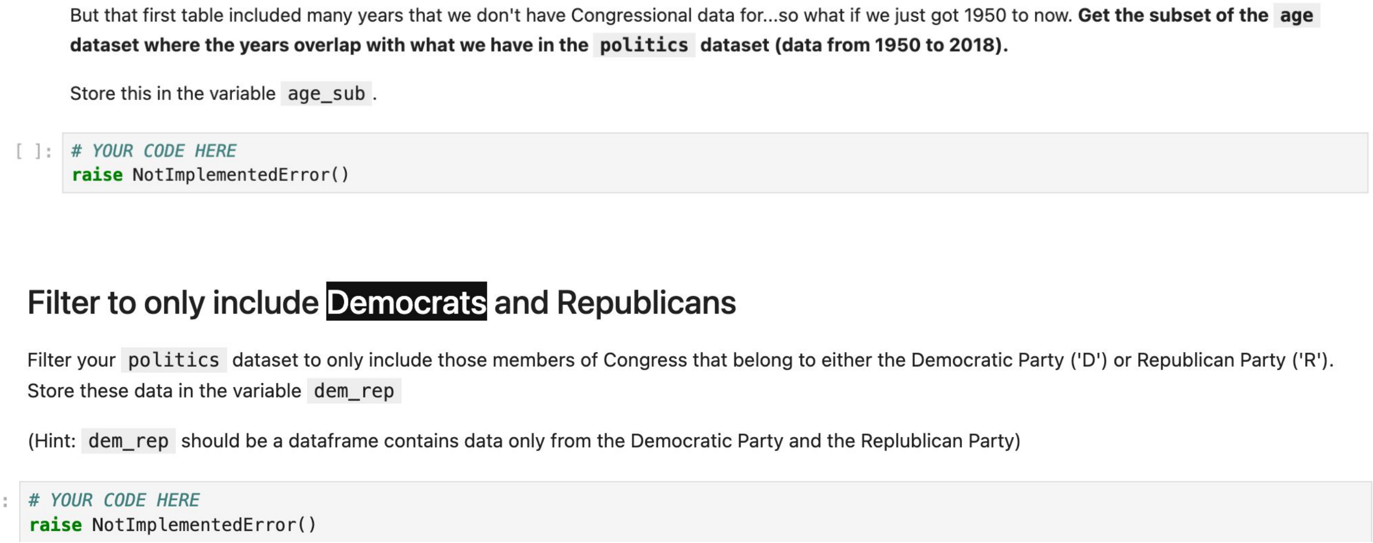
```
In [ ]: # take a look at chamber breakdown
        # your code here
        raise NotImplementedError
```

```
In [ ]: # what about party broken down by chamber?
        # your code here
        raise NotImplementedError
```

Within party, there have been more Democrats in both the house *and* the senate relative to Rebublicans during this time period. Good to know!

PART II: DESCRIPTIVE ANALYSIS

- Determine the shape of the data: shape
- Get descriptive statistics for quantitative variables: describe()
- Take a look at how party breaks down : politics.party.value_counts()
- Take a look at chamber breakdown: politics.chamber.value_counts()
- What about party broken down by chamber?
    - DataFrame.groupby(‘_1_’)[‘_2_’].value_counts()
    - 1: what column are you “breaking down” by?
    - 2: what column are you interested in looking at?



But that first table included many years that we don't have Congressional data for...so what if we just got 1950 to now. **Get the subset of the `age` dataset where the years overlap with what we have in the `politics` dataset (data from 1950 to 2018).**

Store this in the variable `age_sub`.

```
# YOUR CODE HERE
raise NotImplementedError()
```

Filter to only include Democrats and Republicans

Filter your `politics` dataset to only include those members of Congress that belong to either the Democratic Party ('D') or Republican Party ('R'). Store these data in the variable `dem_rep`

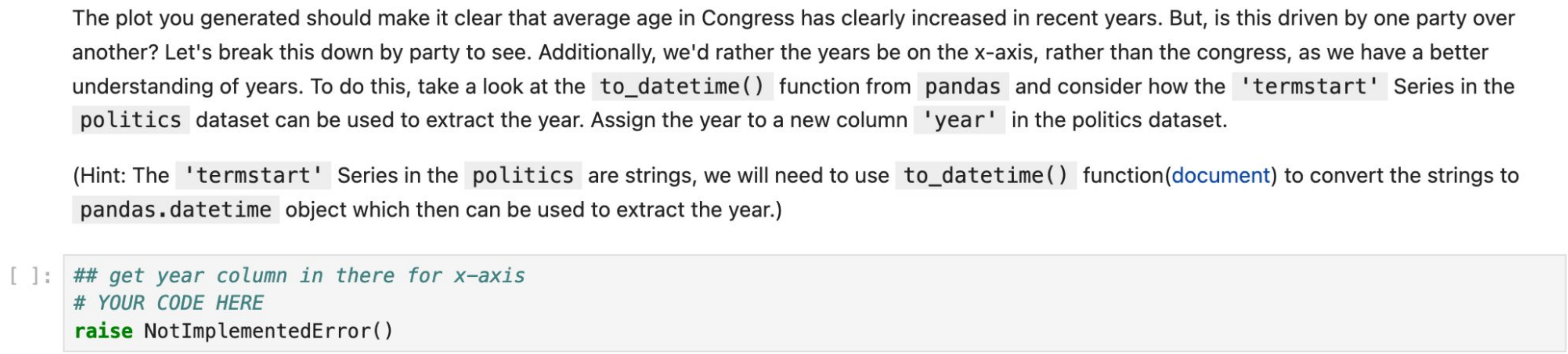
(Hint: `dem_rep` should be a dataframe contains data only from the Democratic Party and the Replublican Party)

```
# YOUR CODE HERE
raise NotImplementedError()
```

PART II: DESCRIPTIVE ANALYSIS

- How do we get the age data after 1950?
  - Remember “iloc”
  - age.iloc[start_row_index:end_row_index,]
  - Look at age[‘*boolean condition*’]
  - *Boolean condition* ⇒ age[‘year’] == 1950

- How do we get just democrats and republicans?
  - Remember the boolean condition
  - Note: In Pandas, we use “|” as an “or”
  - Ex: DataFrame[(DataFrame[‘column1’] == value) | (DataFrame[‘column2’] == value2)]
  - Ex: DataFrame[(DataFrame[‘party’] == ‘Democrat”)]



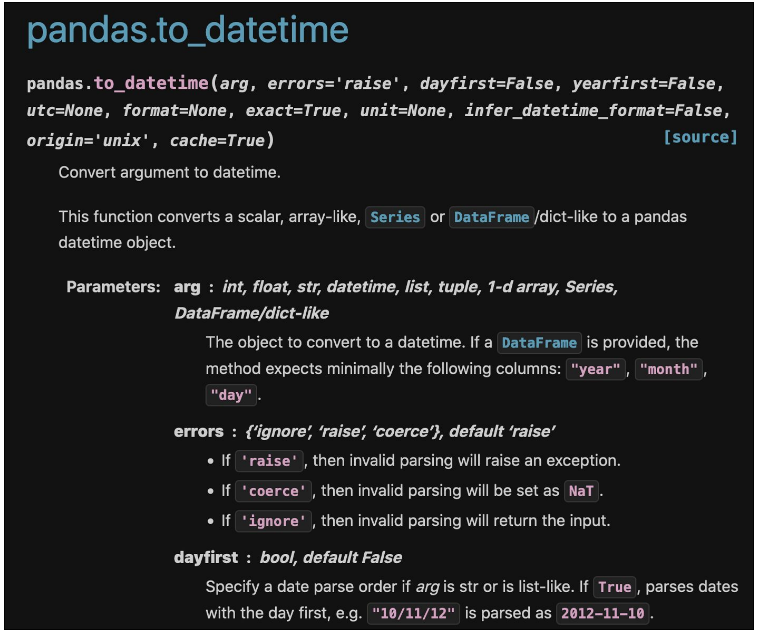
The plot you generated should make it clear that average age in Congress has clearly increased in recent years. But, is this driven by one party over another? Let's break this down by party to see. Additionally, we'd rather the years be on the x-axis, rather than the congress, as we have a better understanding of years. To do this, take a look at the `to_datetime()` function from `pandas` and consider how the `'termstart'` Series in the `politics` dataset can be used to extract the year. Assign the year to a new column `'year'` in the politics dataset.

(Hint: The `'termstart'` Series in the `politics` are strings, we will need to use `to_datetime()` function(document) to convert the strings to `pandas.datetime` object which then can be used to extract the year.)

```
[ ]: ## get year column in there for x-axis
     # YOUR CODE HERE
     raise NotImplementedError()
```

EDA - date and time

pd.to_datetime(politics['termstart']).dt.year



pandas.to_datetime

`pandas.to_datetime(arg, errors='raise', dayfirst=False, yearfirst=False, utc=None, format=None, exact=True, unit=None, infer_datetime_format=False, origin='unix', cache=True)` [source]

Convert argument to datetime.

This function converts a scalar, array-like, `Series` or `DataFrame`/dict-like to a pandas datetime object.

Parameters: **arg** : *int, float, str, datetime, list, tuple, 1-d array, Series, DataFrame/dict-like*

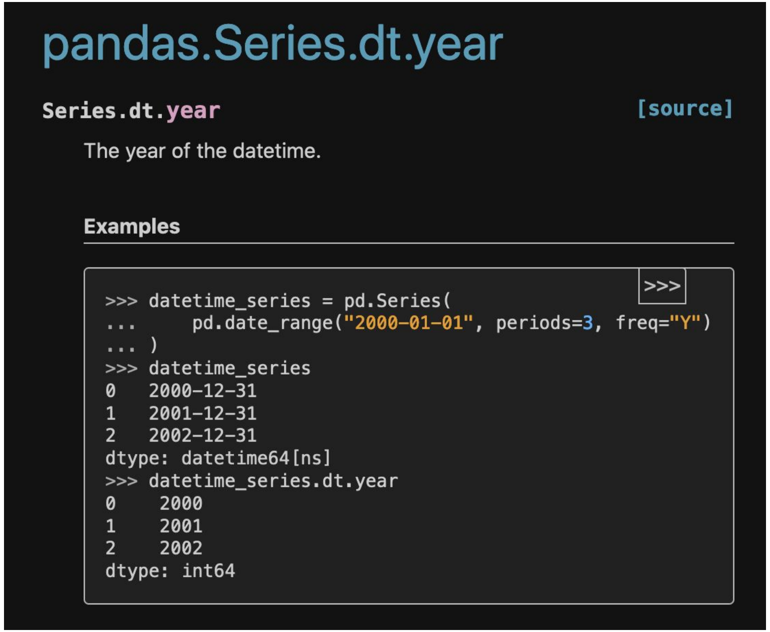
The object to convert to a datetime. If a `DataFrame` is provided, the method expects minimally the following columns: `"year"`, `"month"`, `"day"`.

errors : *{'ignore', 'raise', 'coerce'}, default 'raise'*

- If `'raise'`, then invalid parsing will raise an exception.
- If `'coerce'`, then invalid parsing will be set as `NaT`.
- If `'ignore'`, then invalid parsing will return the input.

dayfirst : *bool, default False*

Specify a date parse order if *arg* is str or is list-like. If `True`, parses dates with the day first, e.g. `"10/11/12"` is parsed as `2012-11-10`.



pandas.Series.dt.year

`Series.dt.year` [source]

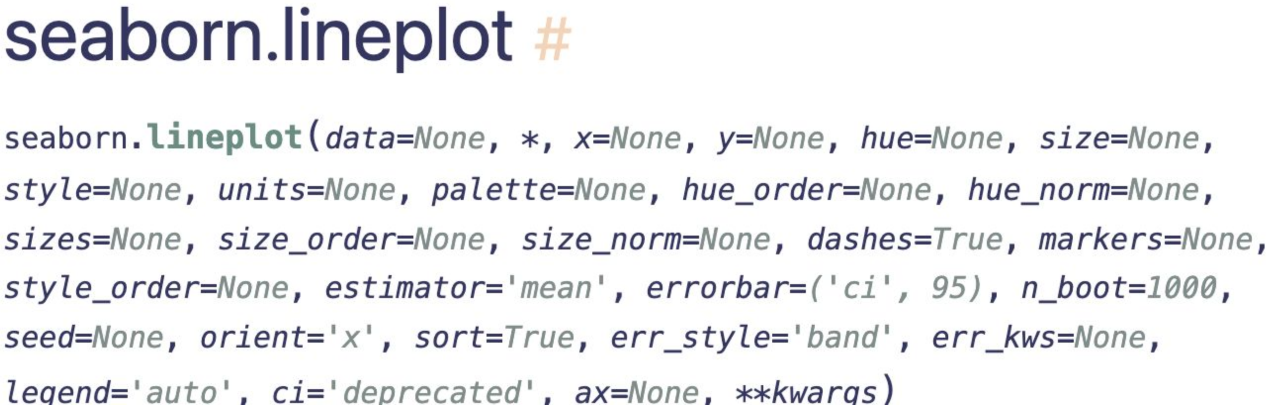
The year of the datetime.

Examples

```
>>> datetime_series = pd.Series(
...     pd.date_range("2000-01-01", periods=3, freq="Y")
... )
>>> datetime_series
0   2000-12-31
1   2001-12-31
2   2002-12-31
dtype: datetime64[ns]
>>> datetime_series.dt.year
0    2000
1    2001
2    2002
dtype: int64
```

Ref: https://www.geeksforgeeks.org/countplot-using-seaborn-in-python/

EDA - Plot the ages in Congress broken down by party.

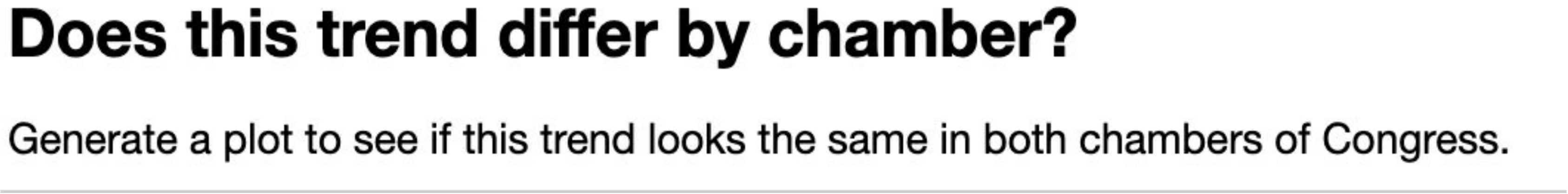


seaborn.lineplot

```
seaborn.lineplot(data=None, *, x=None, y=None, hue=None, size=None,
style=None, units=None, palette=None, hue_order=None, hue_norm=None,
sizes=None, size_order=None, size_norm=None, dashes=True, markers=None,
style_order=None, estimator='mean', errorbar=('ci', 95), n_boot=1000,
seed=None, orient='x', sort=True, err_style='band', err_kws=None,
legend='auto', ci='deprecated', ax=None, **kwargs)
```

sns.lineplot(x=..., y=..., hue=x, data=...);
x: the column name you are breaking the data down by.

EDA - trend differ by chamber

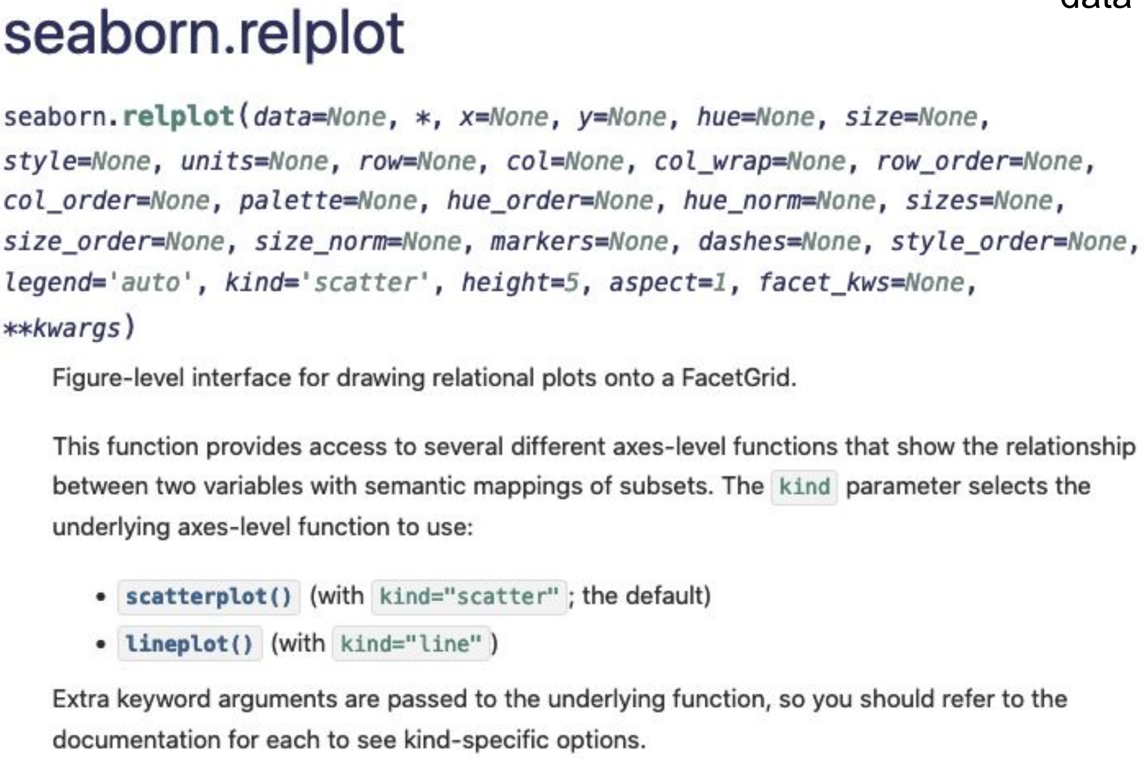


Does this trend differ by chamber?

Generate a plot to see if this trend looks the same in both chambers of Congress.

```
sns.relplot(x = …,
            y = …,
            hue = …,
            col = 'chamber',
            kind = "line",
            data = …);
```

Relational Plots



seaborn.relplot

```
seaborn.relplot(data=None, *, x=None, y=None, hue=None, size=None,
style=None, units=None, row=None, col=None, col_wrap=None, row_order=None,
col_order=None, palette=None, hue_order=None, hue_norm=None, sizes=None,
size_order=None, size_norm=None, markers=None, dashes=None, style_order=None,
legend='auto', kind='scatter', height=5, aspect=1, facet_kws=None,
**kwargs)
```

Figure-level interface for drawing relational plots onto a FacetGrid.

This function provides access to several different axes-level functions that show the relationship between two variables with semantic mappings of subsets. The `kind` parameter selects the underlying axes-level function to use:

- `scatterplot()` (with `kind="scatter"`; the default)
- `lineplot()` (with `kind="line"`)

Extra keyword arguments are passed to the underlying function, so you should refer to the documentation for each to see kind-specific options.