7 TIPS FOR SUCCESS:

DATA WRANGLING W/ PYTHON

James Wilson

Download Anaconda

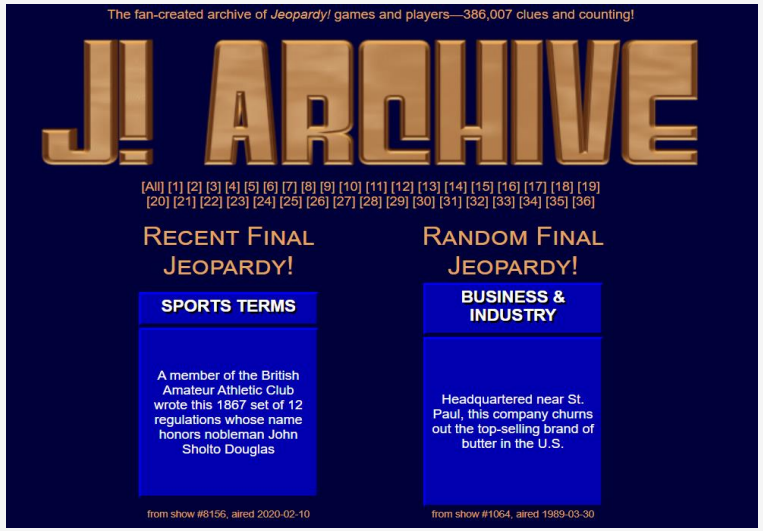
- Download version 3.7 from https://www.anaconda.com/distribution/
- Once downloaded, please open Jupyter Notebooks

Libraries

- **Pandas**
  - A fast, powerful, flexible and easy to use open-source data analysis and manipulation tool.
- **Numpy**
  - Tool to support working with large, multi-dimensional arrays and matrices, along with a large collection of high-level mathematical functions to operate on these arrays
- **Plotly**
  - Provides online graphing, analytics, and statistics tools for individuals and collaboration

The Data: Jeopardy Player Details

Jeopardy Archive



@CoolJeopardyStories Twitter Account

Creating the Data: Archive

Show #8032 - Tuesday, July 9, 2019

Contestants

Kevin Paquette, a math teacher from Charlottesville, Virginia
Hannah Safford, an engineering Ph.D. student from Davis, California
Ryan Bilger, a student from Macungie, Pennsylvania (whose 3-day cash winnings total $96,650)

- Can extract the show date, player names, occupations, hometowns, final scores, and other details.

Final scores:

Ryan	Hannah	Kevin
$10,399	**$8,800**	**$7,199**
4-day champion: $107,049	2nd place: $2,000	3rd place: $1,000

Creating the Data:

Twitter

- Can extract fun facts and the show date the players shared them.
- We can also deduce who said which fact!

Python Tips!

- Tip #1 – Evaluate column names and types
- Tip #2 – Detect NA's & duplicates; why are they there?
- Tip #3 - String cleaning & variable creation
- Tip #4 - Join and reshape data
- Tip #5 - Numeric summaries and outlier detection
- Tip #6 - Evaluating categorical variables with frequency tables
- Tip #7 - Build graphics to explore ideas

Tip #1:

Evaluate column names and types

- Consistent names are easier to read
- Lower case is the best case
- Remove special characters and spaces
- Make your life simpler!

<u>Code:</u>

- df.shape
- df.info()
- df.dtypes()
- df.columns

Tip #1:

Evaluate column names and types

- Consistent names are easier to read
- Lower case is the best case
- Remove special characters and spaces
- Make your life simpler!

Returns dimensions of the DataFrame (df)

<u>Code:</u>

- df.shape
- df.info()
- df.dtypes()
- df.columns

Tip #1:

Evaluate column names and types

- Consistent names are easier to read
- Lower case is the best case
- Remove special characters and spaces
- Make your life simpler!

Code:

- df.shape
- df.info()
- df.dtypes()
- df.columns

Returns summary of the DataFrame (df)

Tip #1:

Evaluate column names and types

- Consistent names are easier to read
- Lower case is the best case
- Remove special characters and spaces
- Make your life simpler!

<u>Code:</u>

- df.shape
- df.info()
- df.dtypes()
- df.columns

Returns the data type (dtype) of each column in the given dataframe

Tip #1:

Evaluate column names and types

- Consistent names are easier to read
- Lower case is the best case
- Remove special characters and spaces
- Make your life simpler!

<u>Code:</u>

- df.shape
- df.info()
- df.dtypes()
- df.columns

Returns the column names contains in the data frame

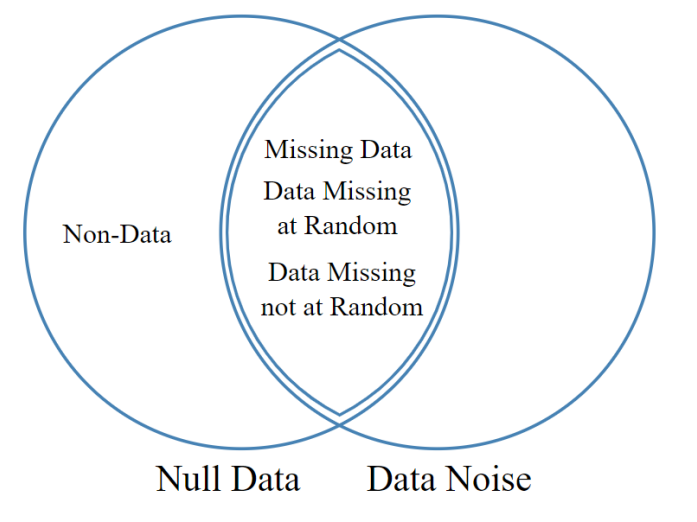
Tip #2:

Detect NA's & Duplicates; why are they there?

- Need to understand what data is present
- Are you missing important information?
- What will you be able to work with?

<u>Code:</u>

- df.isnull() / df.isna()
- df.fillna()
- df.duplicated()
- df.drop_duplicates()



Tip #2:

Detect NA's & Duplicates; why are they there?

- Need to understand what data is present
- Are you missing important information ?
- What will you be able to work with?

Detect Null values in the DF

<u>Code:</u>

- df.isnull() / df.isna()
- df.fillna()
- df.duplicated()
- df.drop_duplicates()

Tip #2:

Detect NA's & Duplicates; why are they there?

- Need to understand what data is present
- Are you missing important information ?
- What will you be able to work with?

<u>Code:</u>

- df.isnull() / df.isna()
- df.fillna()
- df.duplicated()
- df.drop_duplicates()

Fill Missing Values in Date Frame

Tip #2:

Detect NA's & Duplicates; why are they there?

- Need to understand what data is present
- Are you missing important information ?
- What will you be able to work with?

<u>Code:</u>

- df.isnull() / df.isna()
- df.fillna()
- df.duplicated()
- df.drop_duplicates()

Detect duplicated rows

Tip #2:

Detect NA's & Duplicates; why are they there?

- Need to understand what data is present
- Are you missing important information ?
- What will you be able to work with?

<u>Code:</u>

- df.isnull() / df.isna()
- df.fillna()
- df.duplicated()
- df.drop_duplicates()

Drop duplicated rows

Tip #3:

String cleaning & variable creation

- Cleaning variables early is essential for later success
- Allows you to quality control the data as you go
- Creating features and more granular variables will make for more detailed analytics

Code:

- df.['x'].str.replace()
- df.['x'].astype()
- df.['x'].split()
- df.['x'].strip()
- And more!

Tip #3:

String cleaning & variable creation

- Cleaning variables early is essential for later success
- Allows you to quality control the data as you go
- Creating features and more granular variables will make for more detailed analytics

Replace specified characters in string

<u>Code</u>:

- df.['x'].str.replace()
- df.['x'].astype()
- df.['x'].split()
- df.['x'].strip()
- And more!

Tip #3:

String cleaning & variable creation

- Cleaning variables early is essential for later success
- Allows you to quality control the data as you go
- Creating features and more granular variables will make for more detailed analytics

Code:

- df.['x'].str.replace()
- df.['x'].astype()
- df.['x'].split()
- df.['x'].strip()
- And more!

Change the data type of a variable

Tip #3:

String cleaning & variable creation

- Cleaning variables early is essential for later success
- Allows you to quality control the data as you go
- Creating features and more granular variables will make for more detailed analytics

<u>Code</u>:

- df.['x'].str.replace()
- df.['x'].astype()
- df.['x'].split()
- df.['x'].strip()
- And more!

Split a variable at a specified delimeter

Tip #3:

String cleaning & variable creation

- Cleaning variables early is essential for later success
- Allows you to quality control the data as you go
- Creating features and more granular variables will make for more detailed analytics

<u>Code</u>:

- df.['x'].str.replace()
- df.['x'].astype()
- df.['x'].split()
- df.['x'].strip()
- And more!

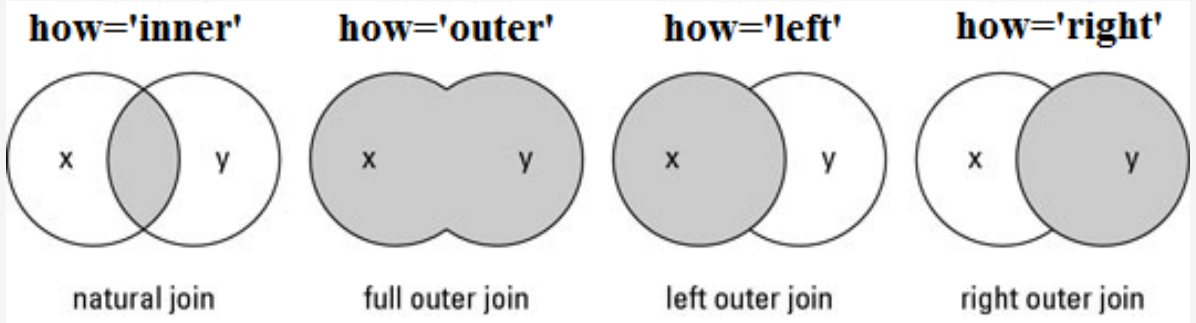
String a variable of white space

Tip #4:

Join and reshape data

Merge

- Combine datasets to have a full picture of the data
- Make sure not to lose any data in the process



Code:

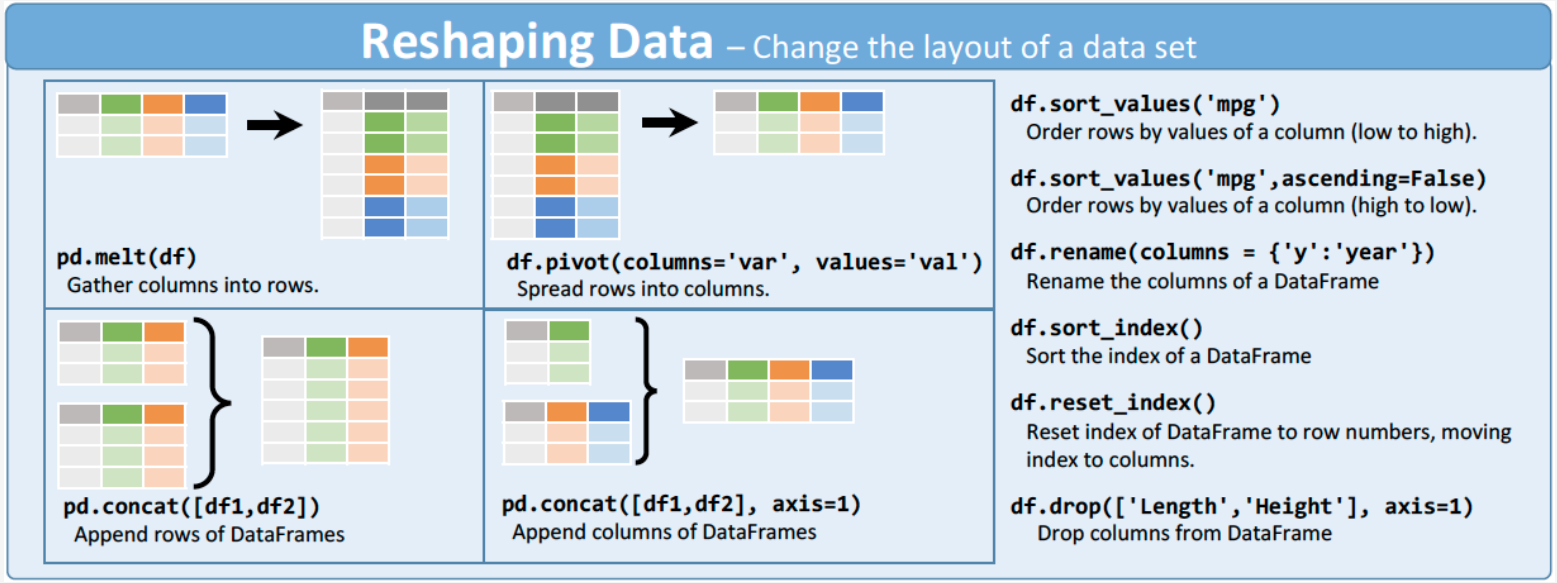
- pd.merge()

Combine data sets on specified keys

Tip #4:

Join and reshape data

Melt



<u>Code</u>:

- pd.melt()

Massage dataframe into a format where one or more columns are identifiers, where all other columns are considered unpivoted, measured variables

Tip #5:

Numeric summaries and outlier detection

- Evaluate the spread and shape of the numerical fields
- Search for outliers that may indicate problems with data collection – will be an issue for model building

Code:

- df[‘x’] > y
- df[‘x’].sum()
- df[‘x’].describe()
- df[‘x’].transform(‘function’)
- np.where(x, a, b)

Tip #5:

Numeric summaries and outlier detection

- Evaluate the spread and shape of the numerical fields
- Search for outliers that may indicate problems with data collection – will be an issue for model building

Subset data frame on conditional

Code:

- df[‘x’] > y
- df[‘x’].sum()
- df[‘x’].describe()
- df[‘x’].transform(‘function’)
- np.where(x, a, b)

Tip #5:

Numeric summaries and outlier detection

- Evaluate the spread and shape of the numerical fields
- Search for outliers that may indicate problems with data collection – will be an issue for model building

Code:

- df['x'] > y
- df['x'].sum()
- df['x'].describe()
- df['x'].transform('function')
- np.where(x, a, b)

Create summary stats on specified variable (e.g. sum)

Tip #5:

Numeric summaries and outlier detection

- Evaluate the spread and shape of the numerical fields
- Search for outliers that may indicate problems with data collection – will be an issue for model building

Code:

- df['x'] > y
- df['x'].sum()
- df['x'].describe()
- df['x'].transform('function')
- np.where(x, a, b)

Generate ALL summary statistics for specified variable

Tip #5:

Numeric summaries and outlier detection

- Evaluate the spread and shape of the numerical fields
- Search for outliers that may indicate problems with data collection – will be an issue for model building

Code:

- df['x'] > y
- df['x'].sum()
- df['x'].describe()
- df['x'].transform('function')
- np.where(x, a, b)

Create a new variable based on transformation of a variable

Tip #5:

Numeric summaries and outlier detection

- Evaluate the spread and shape of the numerical fields
- Search for outliers that may indicate problems with data collection – will be an issue for model building

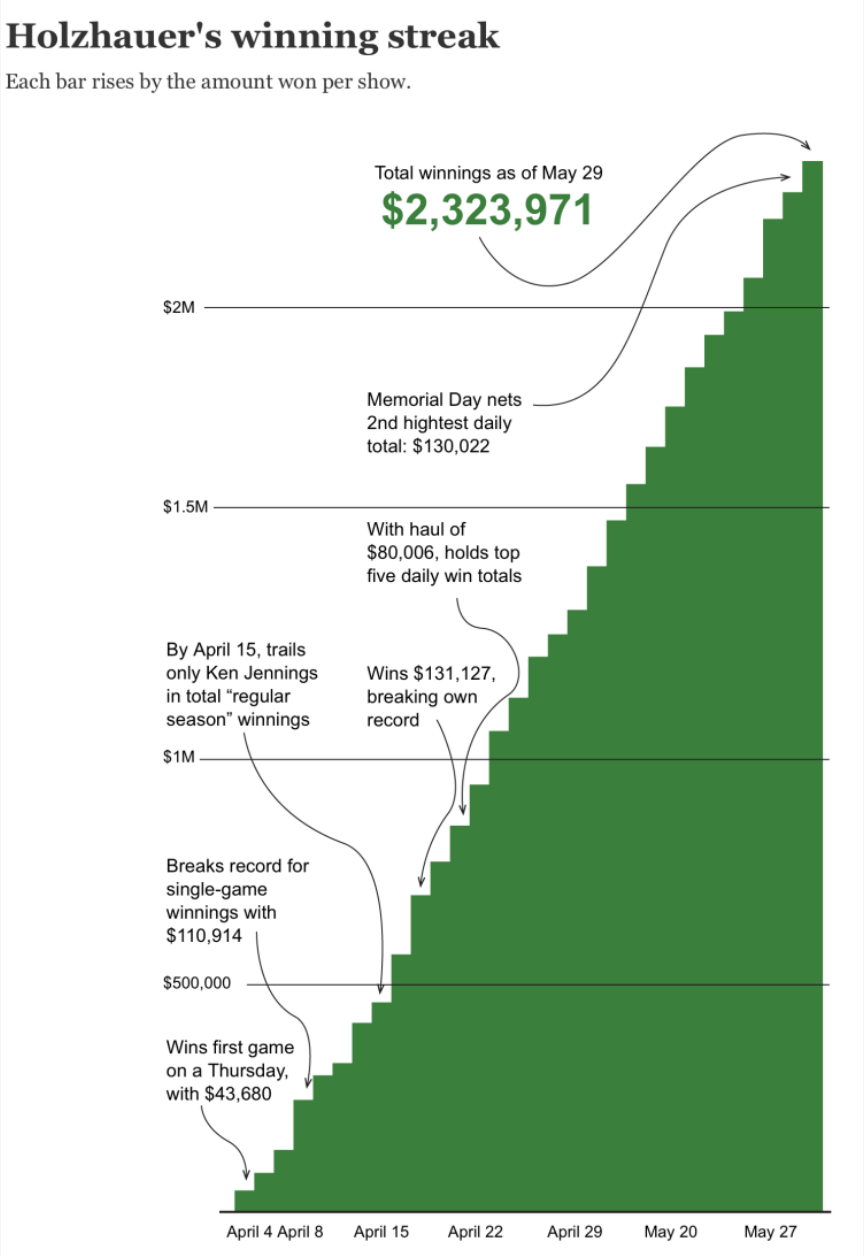
Code:

- df['x'] > y
- df['x'].sum()
- df['x'].describe()
- df['x'].transform('function')
- np.where(x, a, b)

Subset an array on a specific condition

Outlier!

James Holzhauer



Tip 6:

Evaluating categorical variables

- Determine the scope of variables at your disposal
- What unique groupings are there?
- Any relevant frequency counts?
- What story can be told ?

<u>Code</u>:

- df['x'].nunique()
- df['x'].apply(function)
- df['x'].groupby()
- df['x'].agg(['count'])
- df['x'].sort_values()

Tip 6:

Evaluating categorical variables

- Determine the scope of variables at your disposal
- What unique groupings are there?
- Any relevant frequency counts?
- What story can be told ?

Calculate number of unique groups in a variable

<u>Code</u>:

- df['x'].nunique()
- df['x'].apply(function)
- df['x'].groupby()
- df['x'].agg(['count'])
- df['x'].sort_values()

Tip 6:

Evaluating categorical variables

- Determine the scope of variables at your disposal
- What unique groupings are there?
- Any relevant frequency counts?
- What story can be told ?

<u>Code</u>:

- df['x'].nunique()
- df['x'].apply(function)
- df['x'].groupby()
- df['x'].agg(['count'])
- df['x'].sort_values()

Apply a function to a specified variable

Tip 6:

Evaluating categorical variables

- Determine the scope of variables at your disposal
- What unique groupings are there?
- Any relevant frequency counts?
- What story can be told ?

<u>Code</u>:

- df['x'].nunique()
- df['x'].apply(function)
- df['x'].groupby()
- df['x'].agg(['count'])
- df['x'].sort_values()

Group by a specified variable

Tip 6:

Evaluating categorical variables

- Determine the scope of variables at your disposal
- What unique groupings are there?
- Any relevant frequency counts?
- What story can be told ?

<u>Code</u>:

- df['x'].nunique()
- df['x'].apply(function)
- df['x'].groupby()
- df['x'].agg(['count'])
- df['x'].sort_values()

Create a summary table breakout

Tip 6:

Evaluating categorical variables

- Determine the scope of variables at your disposal
- What unique groupings are there?
- Any relevant frequency counts?
- What story can be told ?

<u>Code</u>:

- df['x'].nunique()
- df['x'].apply(function)
- df['x'].groupby()
- df['x'].agg(['count'])
- df['x'].sort_values()

Sort a table

Tip #7:

Build graphics to explore ideas

- Visualize and communicate your results
- Simple and to the point
- Clearly label you axes and titles!

Code:

- px.bar()
- px.line()
- plt.box()
- plt.scatter()
- chloropleth()

Tip #7:

Build graphics to explore ideas

- Visualize and communicate your results
- Simple and to the point
- Clearly label you axes and titles!

Create a barplot

Code:

- px.bar()
- px.line()
- plt.box()
- plt.scatter()
- chloropleth()

Tip #7:

Build graphics to explore ideas

- Visualize and communicate your results
- Simple and to the point
- Clearly label you axes and titles!

Code:

- px.bar()
- px.line()
- plt.box()
- plt.scatter()
- chloropleth()

Create a line plot

Tip #7:

Build graphics to explore ideas

- Visualize and communicate your results
- Simple and to the point
- Clearly label you axes and titles!

<u>Code</u>:

- px.bar()
- px.line()
- plt.box()
- plt.scatter()
- chloropleth()

Create a boxplot

Tip #7:

Build graphics to explore ideas

- Visualize and communicate your results
- Simple and to the point
- Clearly label you axes and titles!

Code:

- px.bar()
- px.line()
- plt.box()
- plt.scatter()
- chloropleth()

Create a scatter plot

Tip #7:

Build graphics to explore ideas

- Visualize and communicate your results
- Simple and to the point
- Clearly label you axes and titles!

Code:

- px.bar()
- px.line()
- plt.box()
- plt.scatter()
- chloropleth()

Create a map

Additional Resources

- Reticulate Package (use Python in R!)
  - https://rstudio.github.io/reticulate/index.html
- Install Packages in Anaconda
  - https://www.geeksforgeeks.org/python-add-packages-to-anaconda-environment/
  - When in doubt, try using *conda forge* command
- Attributes vs methods in Python
  - https://stackoverflow.com/questions/28798781/differences-between-data-attributes-and-method-attributes

THANK YOU