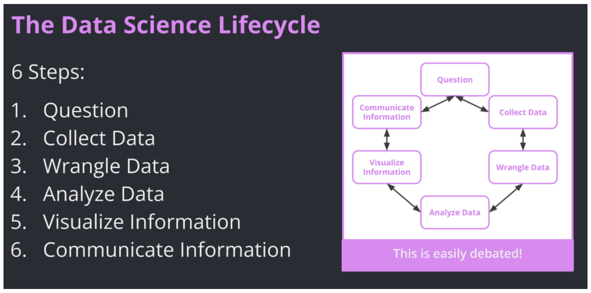
8/21/23 notes

What Is Data Science?

- Using advanced analytics to extract and interpret data for business
- Is used in almost all areas of business



The Data Science Lifecycle

6 Steps:

1. Question
2. Collect Data
3. Wrangle Data
4. Analyze Data
5. Visualize Information
6. Communicate Information

This is easily debated!

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Python Fundamentals

- Datasets - collection of data
  - List - **ordered** and **changeable** with duplicates **allowed**
  - Dictionary **- ordered** and **changeable** with duplicates **not allowed**
  - Set - **unordered** and **unchangeable** with duplicates **not allowed**
  - Tuple **- unordered** and **unchangeable** with duplicates **allowed**
- Representing the data
  - Column-oriented - grouping my features, or column
    - Each column has values associated with the first row of that column
  - Row-oriented - grouping by observation, or row
    - Each row has the values associated with the first column of that row
- Indexing
  - List - **name[index]**
    - Index must be whole number, starts at 0 and counts up by 1
  - Dictionary **name[key]**
    - Keys can be any valad data type within used language, keys must be unique within dictionary
  - Set - **for *value* in *set***
  - Tuple - **name[index]**
- Iteration
  - While loop
    - Runs as long as condition is true
  - For loop
    - Runs through all values in a collection

- Useful functions
    - Dictionaries:
        - values()
        - items()
        - keys()
    - Lists:
        - len()
        - append()
        - sort()
    - Other:
        - range()
        - print()
        - split()
        - type()
        - int()
        - str()

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Central Tendancy

- An attempt to use statistical measures to describe the behavbior of the collection of data
    - Mean
        - Takes the sum of all data points and divides by the number of datapoints
        - “Expected” values for data
        - Best for symmetrical data with a normal distribution
        - Can be misleading if there are outliers
    - Median
        - The middle value of the data when arranged smallest to largest
        - Works for all distributions of data, resistant to outliers
    - Mode
        - The value that shows up the most in a set of data
        - Multimodal data - Data with more than one significant modes
- Skewed data
    - Result of outliers - skews the way of the outlier(right or left)
    - Median and mode dont really change, but mean is pulled the way of the outlier

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Pandas

- A Python library that makes it easier to analize data
- Dataframes
  - An object that stores a dataset
  - Information is organized into rows and columns
  - Simplify common operations, like sorting data and doing math
    - .mean(), .median(), and .mode() for example
  - Can turn dictionaries into datraframes where the keys become the columns
- Series
  - Used to create a dataframe
  - A one-dimentional list of data, one column of the dataframe
- Indexing
  - .loc[] - name.loc[row_label , col_label]
    - Takes in the name of the row and column
  - .iloc[] - name.iloc[row_index , col_index]
    - Takes in the index of the row and column
- Selsection - the process of accessing a subset of a dataframe
  - Uses .loc[] and .iloc[]
  - Can specify a range of rows
    - Ex: df.loc[0:2, ["A","B"]]
      - Grabs the first 3 rows of columns "A" and "B"
- Filtering - select parts of data that meet a given condition
  - Evens = df[df.iloc[:,:] % 2 == 0]
    - Checks all rows and columns and adds value to Evens if the values is an even number
- Combining datasets
  - Concatenate - naively combines along an axis
  - Merge - combine through shared column
  - Join - combine using shared indices
    - Inner join - only keeps shared data, anything else is deleted
    - Left Outer join - keeps shared data and extra values in the left, deletes excess in the right
    - Right outer join - does the same as left but for the right
    - Full outer join - keeps everything