Understanding Complex Results

An Introduction to Visualization and pandas

Nick DeRobertis[1]

[1]University of Florida
Department of Finance, Insurance, and Real Estate

September 1, 2020

Table of Contents

Why Visualize?

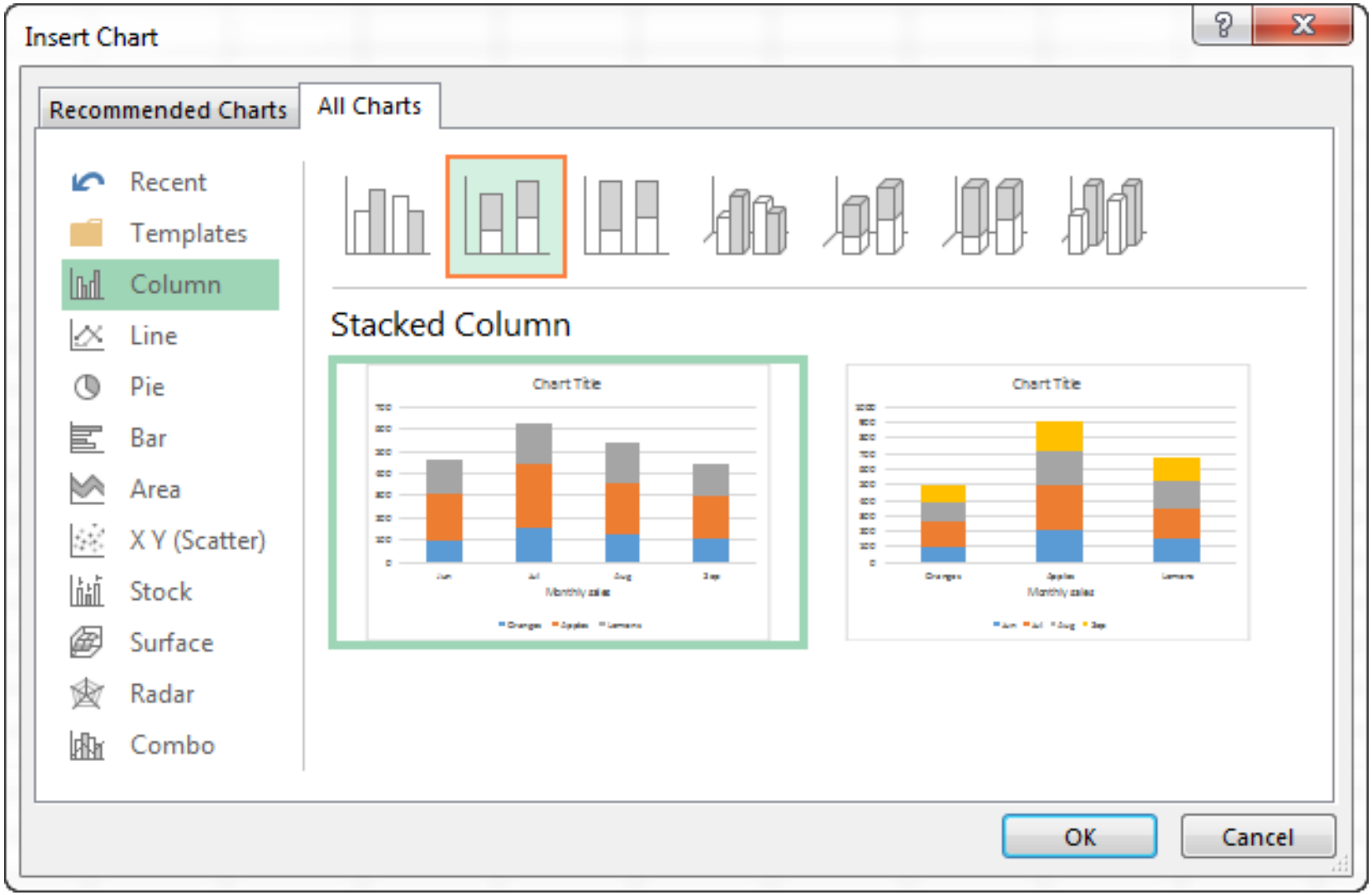
- So far we've had one main output from our model, number of years
- Salaries and wealth over time have also been outputs, but we haven't had a good way of understanding that output. It's a bunch of numbers.
- This is where visualization comes in. We have some complex result, and want to make it easily interpretable.

What we Have so Far

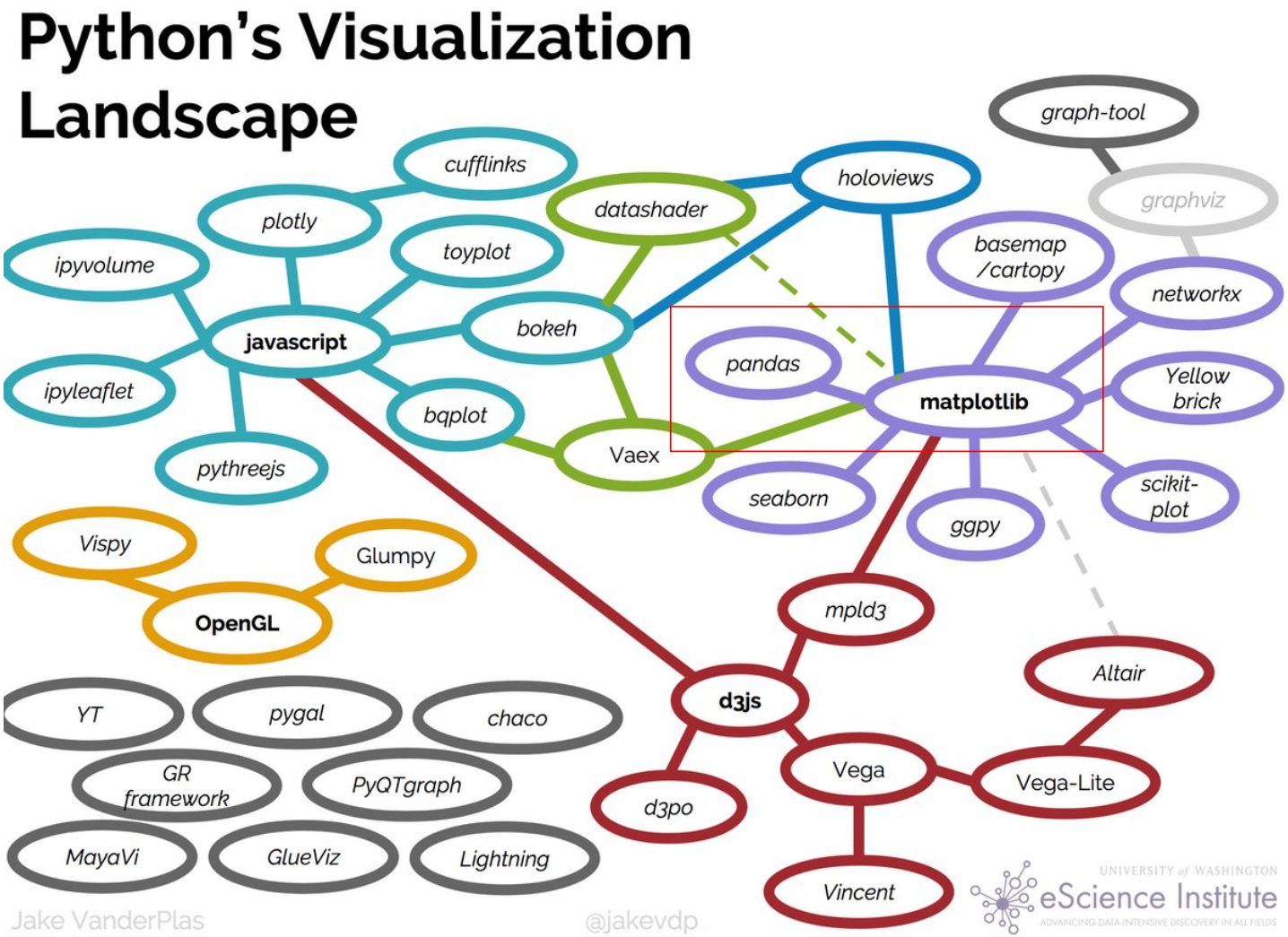
Retirement Info

Time	Salaries	Wealths
1	61,200	31,050
2	62,424	48,208
3	63,672	66,537
4	64,946	86,100
5	76,182	109,451
6	77,705	134,350
7	79,259	160,882
8	80,844	189,137
9	82,461	219,209
10	96,727	254,352
11	98,662	291,735
12	100,635	331,480

Visualization in Excel



An Overwhelming Number of Options in Python



Explaining Python Visualization in This Class

- Ultimately, we will be creating graphs using `matplotlib` but we won't use it directly.
- Instead, we will use `pandas`
- `pandas` is actually creating its graphs using `matplotlib` for us, but it is simpler to use.

Visualization in Excel

Adding Graphs to the Dynamic Salary Retirement Excel Model

- I will now go back to the "Dynamic Salary Retirement Model.xlsx" Excel model to add visualization. If you do not have it already, it is in Examples > Intro > Excel.
- I have also uploaded the completed workbook from this exercise in Examples > Visualization > Excel > Dynamic Salary Retirement Model Visualized.xlsx
- Follow along as I go through the example.

Table of Contents

Some Setup Before we can Visualize in Python

- `pandas` does **a lot** more than just graphing. We will use it throughout the rest of the class.
- Previously we've worked with lists, numbers, strings, and even our custom types (our model dataclasses)
- `pandas` provides the `DataFrame` as a new type that we can use.
- Before we can get to graphing, we must learn how to use the `DataFrame`.

What is a `DataFrame`?

A `DataFrame` is essentially a table. It has rows and columns, just like in Excel.

Some Features of the `DataFrame`

- Add or remove columns or rows
- Group by and aggregate
- Load in and output data from/to Excel and many other formats
- Merge and join data sets
- Reshape and pivot data
- Time-series functionality
- Slice and query your data
- Handle duplicates and missing data

A Basic DataFrame Example

```
>>> import pandas as pd
>>> df = pd.DataFrame()
>>> df['Sales'] = [1052, 212, 346]
>>> df['Category'] = ['Aprons', 'Apples', 'Bowties']
df
```

	Sales	Category
0	1052	Aprons
1	212	Apples
2	346	Bowties

Introduction to Pandas

Creating and Using Pandas DataFrames

- I will now go through the notebook in Examples > Visualization > Python > Intro to Pandas and Table Visualization.ipynb
- Follow along as I go through the example.
- We will complete everything up until DataFrame Styling

Getting Started with Pandas, Level 1

Intro to Pandas Exercises, Level 1

1. Find the lab exercises in Labs > Visualization > Pandas and Visualization Labs.ipynb
2. Complete the lab exercises in the first section entitled "Pandas"

Styling Pandas DataFrames

- It is possible to add styling to our displayed tabular data by styling the `DataFrame`
- The styling is very flexible and essentially allows you to do anything
- Out of the box, it is easy to change colors, size, and positioning of text, add a caption, do conditional formatting, and draw a bar graph over the cells.

Introduction to Pandas

Creating and Using Pandas DataFrames

- I will now go through the next section in Examples > Visualization > Python > Intro to Pandas and Table Visualization.ipynb
- Follow along as I go through the example.
- This time we are covering the remainder of the notebook starting from "DataFrame Styling"

Getting Started with Pandas, Level 1

Intro to Pandas Exercises, Level 1

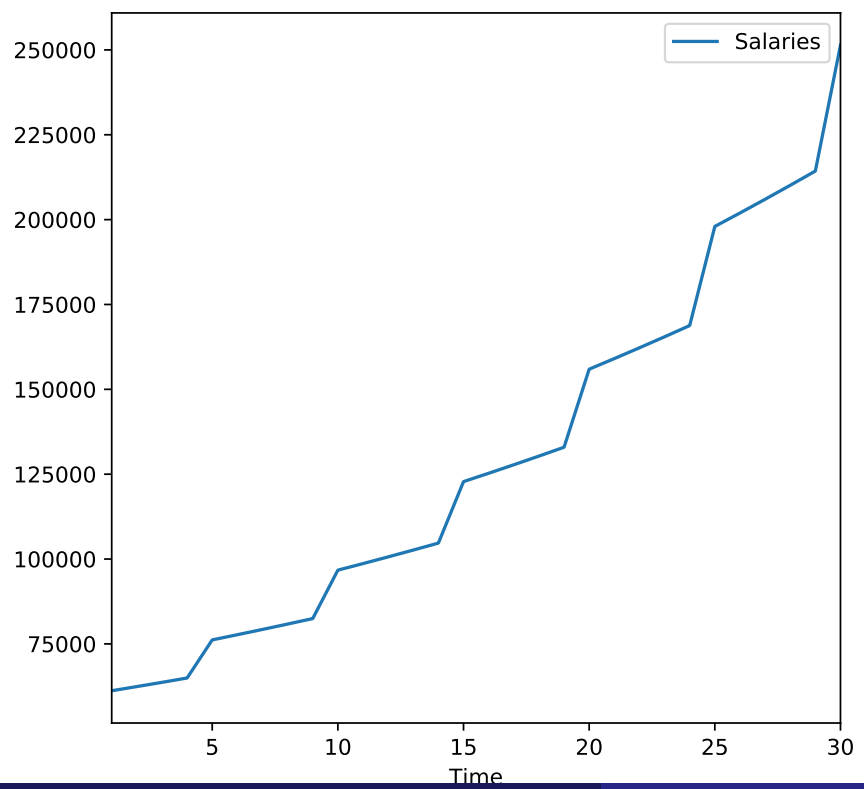
1. Keep working with the same lab Jupyter Notebook
2. Complete the lab exercises in the second section entitled "Pandas Styling"

Table of Contents

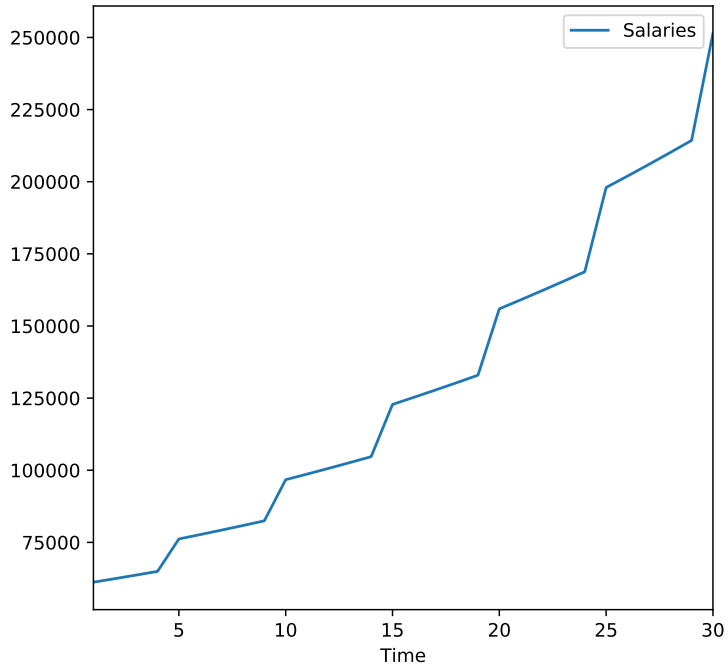
A Minimal Plotting Example

Line Graphs using pandas

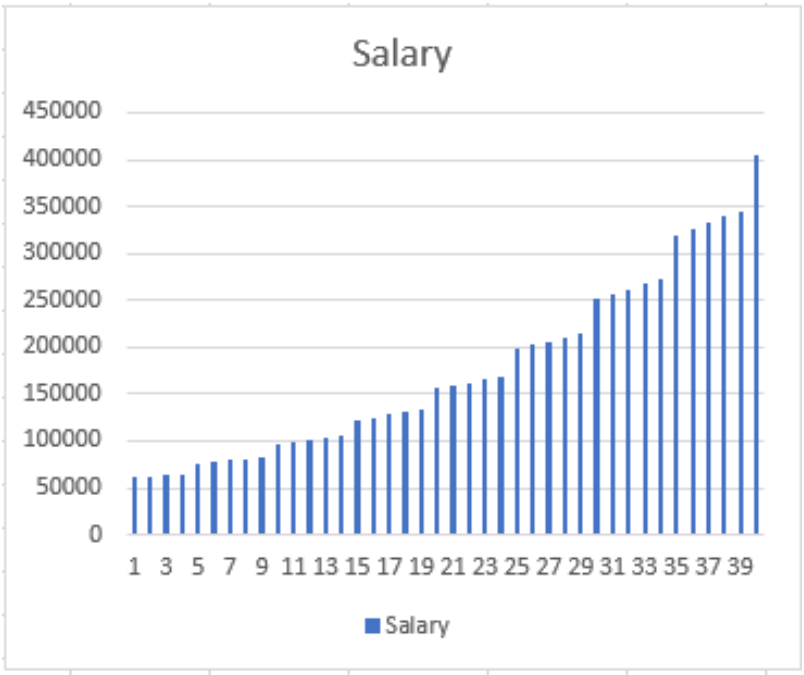
```
>>> %matplotlib inline
>>> ret_df.plot.line(x='Time', y='Salaries')
```

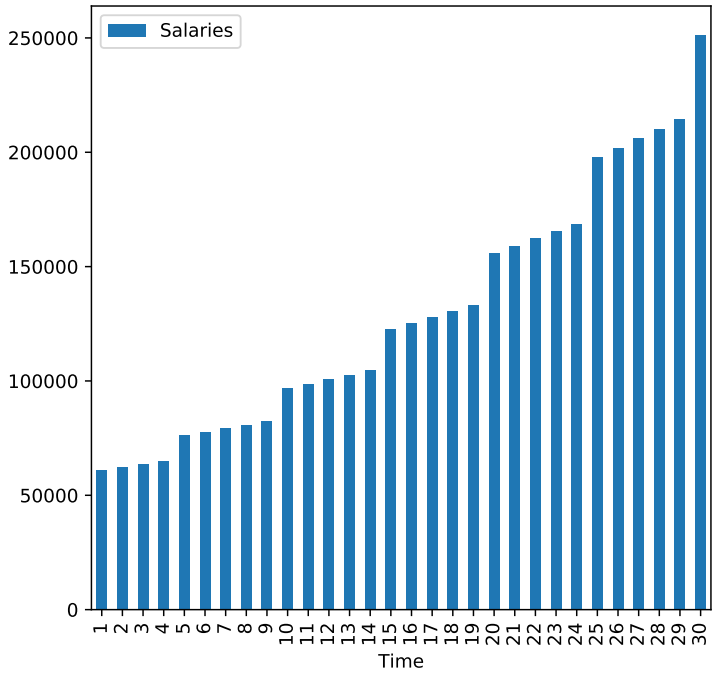


Basic Graph Types: Line Graphs

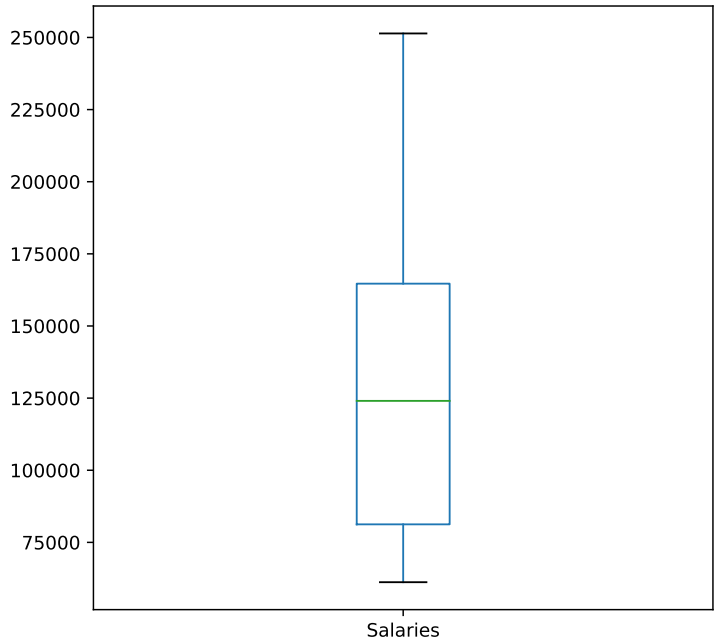


Basic Graph Types: Bar Graphs





Basic Graph Types: Box and Whisker Plots



Introduction to Graphing

Graphing Using Pandas

- I will now go through Examples > Visualization > Python > Intro to Graphics.ipynb
- Follow along as I go through the entire example notebook.

Getting Started with Visualization, Level 1

Intro to Graphing with Pandas, Level 1

1. Keep working with the same lab Jupyter Notebook
2. Complete the lab exercises in the final section entitled "Graphics"