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Using Python with Power BI

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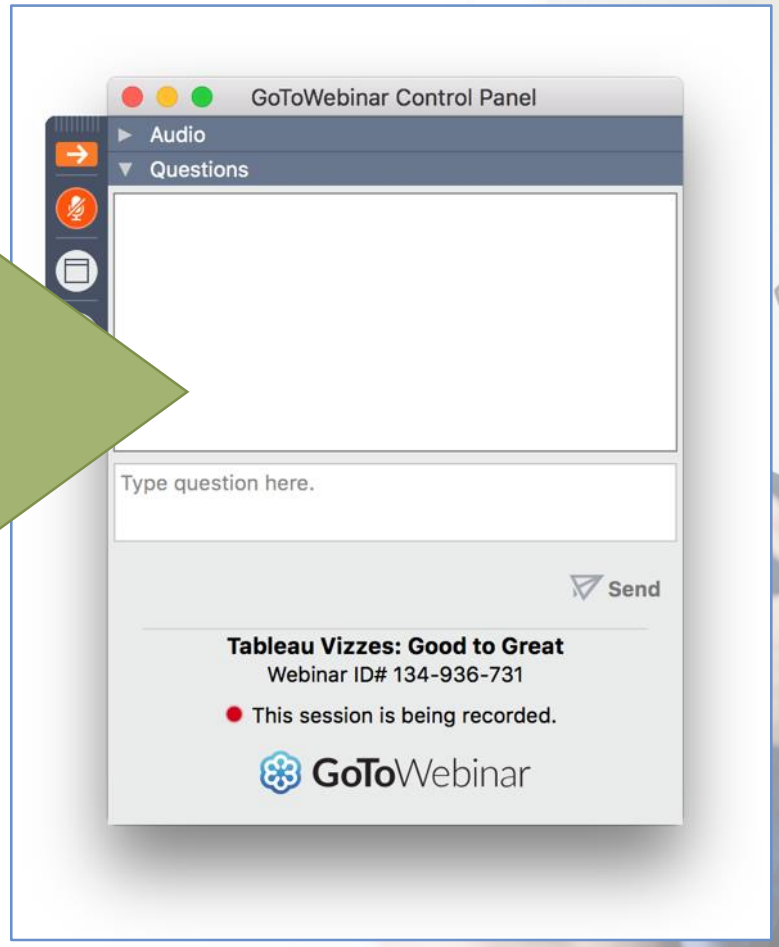

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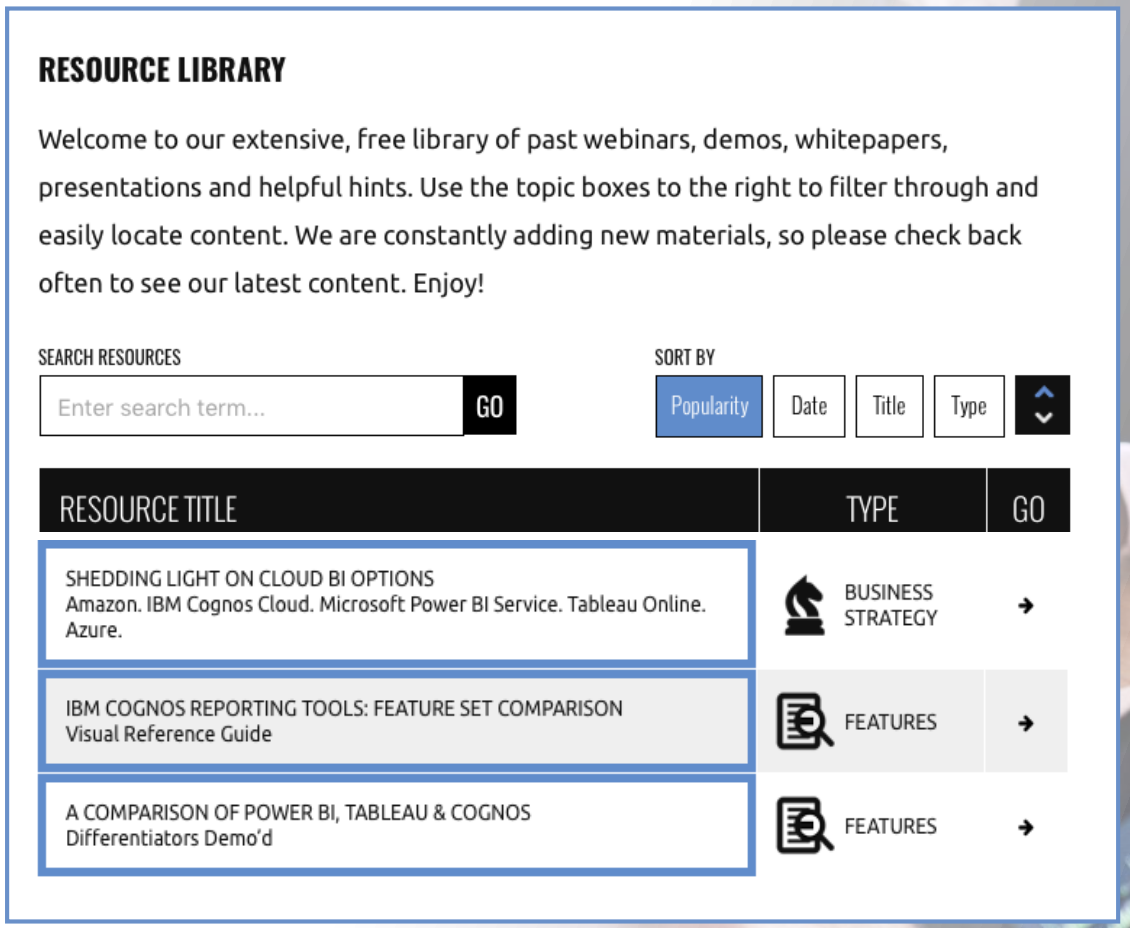

Agenda

- Introductions
- Discussion of Python & Power BI
- Demos
- Additional resources & Senturus Overview
- Q&A

Topics

- Python basics
- Configuring Power BI Desktop
- Using Python for data
- Python visualizations
- Transforming data

Introductions

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Poll #1

What is your preferred scripting language?

- Python
- R
- Other
- Don’t use a scripting language

Poll #2

Do you create your own advanced queries with M?

- Yes
- No

What is Python?

- An interpreted, interactive, object-oriented programming language
- Combines power with a straight-forward, easy to understand syntax
- Is portable to Windows, Linux, and MacOS
- Is fully extensible with C or C++
- Named after Monty Python's Flying Circus

Why Python with Power BI?

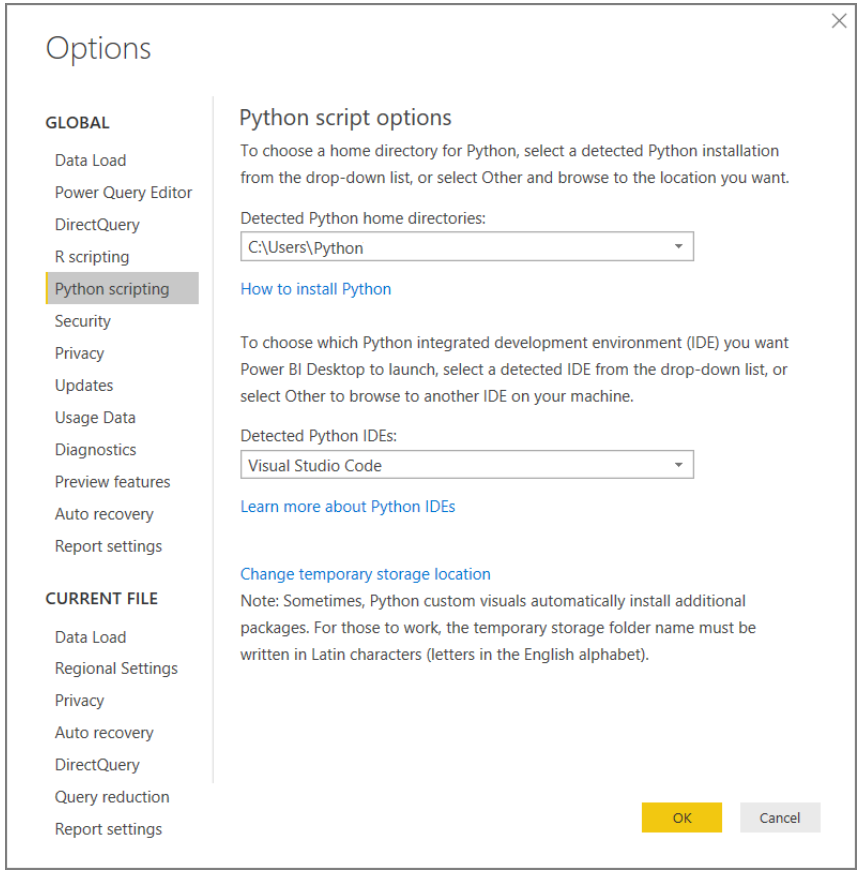
- Can help with automation, creating visuals, and even creating machine learning modules
- Using Python allows access to additional visualizations libraries
- When combined with Power Query, Python can be used for data cleansing, advanced data shaping, and even predictions and clustering

Installing Python

- A base installation of Python is required
- Requires two Python packages before scripts can be used:
  - **Pandas**
    - A software library for data manipulation and analysis. It offers data structures and operations for manipulating numerical tables and time series
  - **Matplotlib**
    - A plotting library for Python and its numerical mathematics extension NumPy
    - Provide an object-oriented API for embedding plots into applications using general-purpose GUI toolkits – e.g. Tkinter, wxPython, Qt, or GTK+

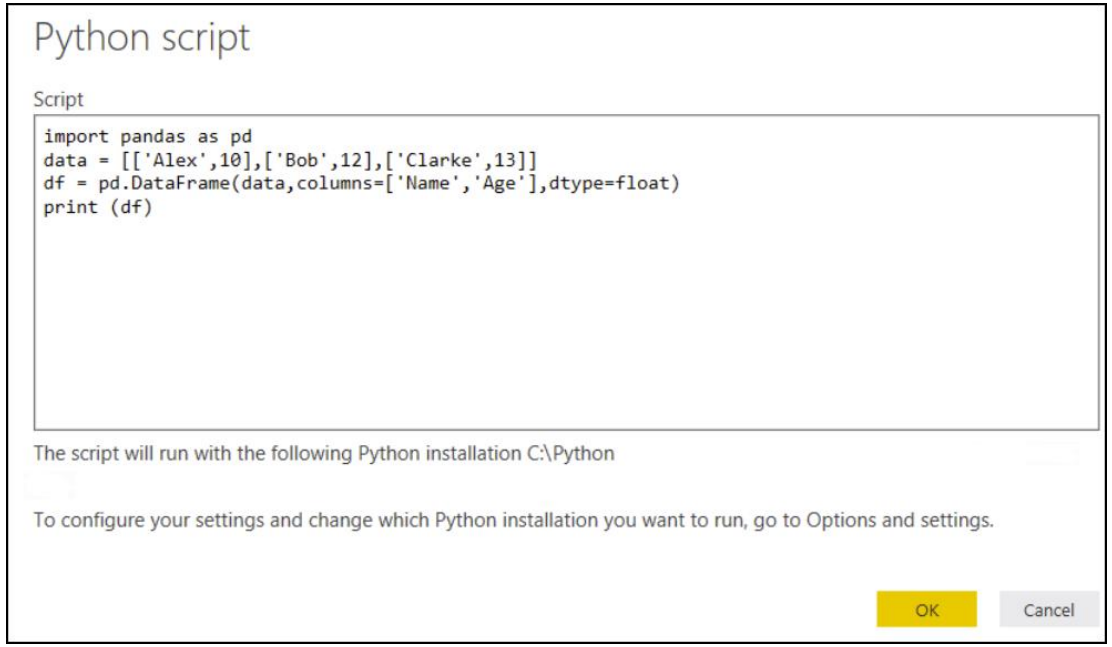
Configuring Python for Power BI

- Once Python and associated libraries are installed, configure Power BI



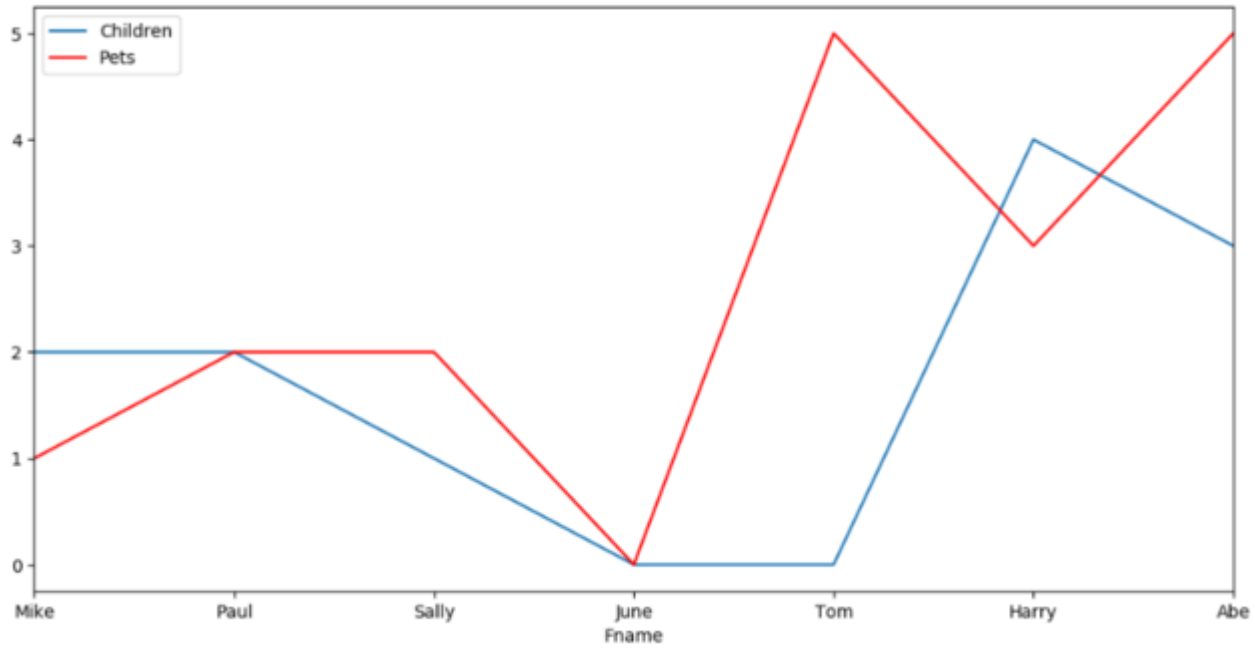
Data Creation

- Python scripts can be used to either hard code data frames or a connection script can be created to use existing data sources



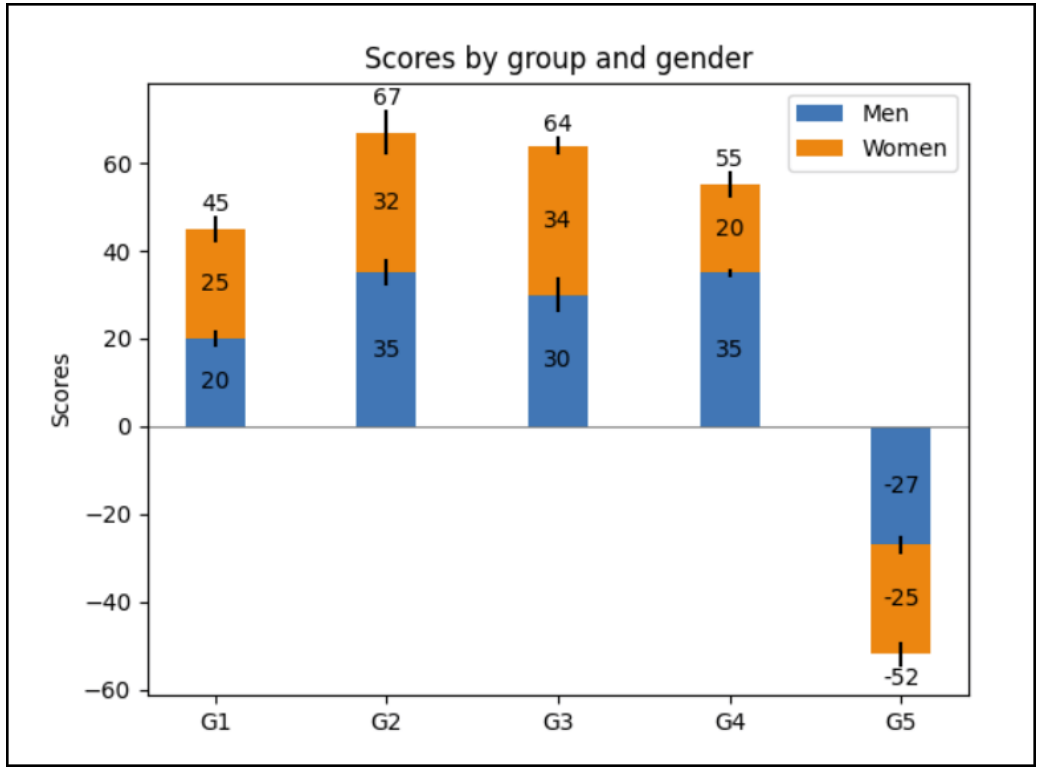
Python Visualizations

- To create visuals with Python, we leverage pandas and matplotlib



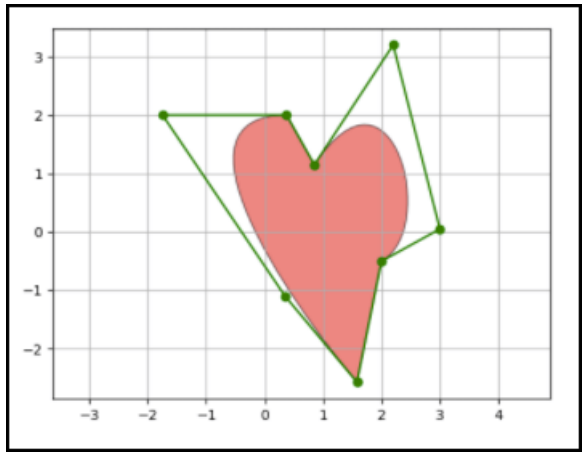
MATPLOTLIB

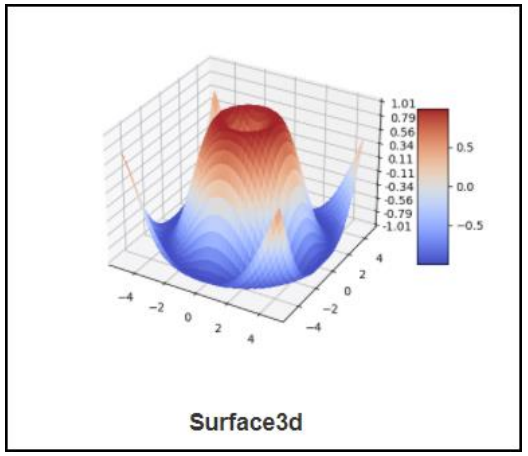
An open source library that allows users to create static, animated, and even interactive visualizations with Python

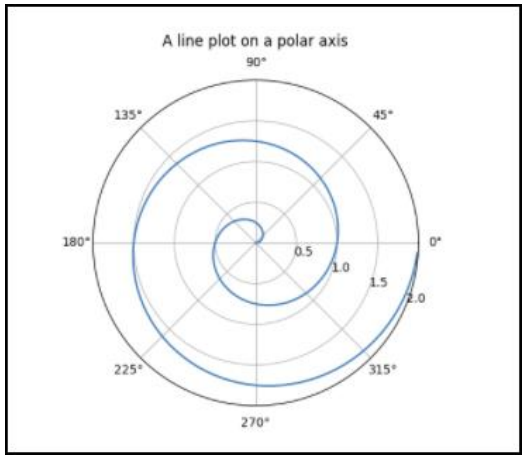


Additional Visualizations

- With MATPLOTLIB, access visualizations not currently available in Power BI







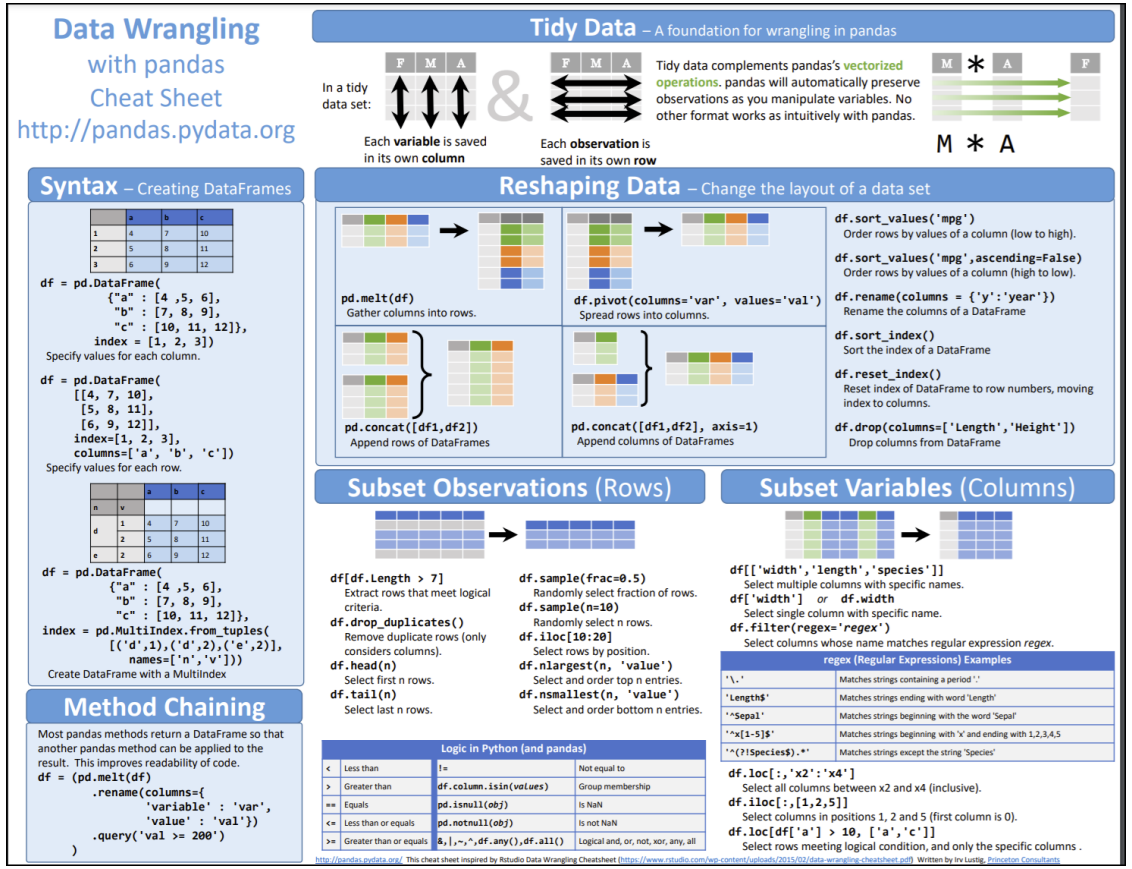
Data Manipulation

- Scripts can be used in Power Query Editor
- Data can be shaped in multiple ways:
  - Completion of missing data
  - Pivoting data
  - Column and row removal
  - Predictions
  - Clustering

PANDAS quick reference

- Print this *Data Wrangling with pandas Cheat Sheet*

  https://pandas.pydata.org/Pandas_Cheat_Sheet.pdf



Data Wrangling with pandas Cheat Sheet http://pandas.pydata.org

Tidy Data – A foundation for wrangling in pandas

In a tidy data set: Each **variable** is saved in its own **column**. Each **observation** is saved in its own **row**.

Tidy data complements pandas's vectorized operations. pandas will automatically preserve observations as you manipulate variables. No other format works as intuitively with pandas.

M * A

Syntax – Creating DataFrames

```
df = pd.DataFrame(
        {"a" : [4 ,5, 6],
         "b" : [7, 8, 9],
         "c" : [10, 11, 12]},
       index = [1, 2, 3])
```
Specify values for each column.

```
df = pd.DataFrame(
    [[4, 7, 10],
     [5, 8, 11],
     [6, 9, 12]],
    index=[1, 2, 3],
    columns=['a', 'b', 'c'])
```
Specify values for each row.

```
df = pd.DataFrame(
        {"a" : [4 ,5, 6],
         "b" : [7, 8, 9],
         "c" : [10, 11, 12]},
index = pd.MultiIndex.from_tuples(
        [('d',1),('d',2),('e',2)],
         names=['n','v']))
```
Create DataFrame with a MultiIndex

Method Chaining

Most pandas methods return a DataFrame so that another pandas method can be applied to the result. This improves readability of code.

```
df = (pd.melt(df)
        .rename(columns={
                'variable' : 'var',
                'value' : 'val'})
        .query('val >= 200')
    )
```

Reshaping Data – Change the layout of a data set

`pd.melt(df)` Gather columns into rows.

`df.pivot(columns='var', values='val')` Spread rows into columns.

`pd.concat([df1,df2])` Append rows of DataFrames

`pd.concat([df1,df2], axis=1)` Append columns of DataFrames

`df.sort_values('mpg')` Order rows by values of a column (low to high).

`df.sort_values('mpg',ascending=False)` Order rows by values of a column (high to low).

`df.rename(columns = {'y':'year'})` Rename the columns of a DataFrame

`df.sort_index()` Sort the index of a DataFrame

`df.reset_index()` Reset index of DataFrame to row numbers, moving index to columns.

`df.drop(columns=['Length','Height'])` Drop columns from DataFrame

Subset Observations (Rows)

`df[df.Length > 7]` Extract rows that meet logical criteria.

`df.drop_duplicates()` Remove duplicate rows (only considers columns).

`df.head(n)` Select first n rows.

`df.tail(n)` Select last n rows.

`df.sample(frac=0.5)` Randomly select fraction of rows.

`df.sample(n=10)` Randomly select n rows.

`df.iloc[10:20]` Select rows by position.

`df.nlargest(n, 'value')` Select and order top n entries.

`df.nsmallest(n, 'value')` Select and order bottom n entries.

Logic in Python (and pandas)

<	Less than	!=	Not equal to
>	Greater than	`df.column.isin(values)`	Group membership
==	Equals	`pd.isnull(obj)`	Is NaN
<=	Less than or equals	`pd.notnull(obj)`	Is not NaN
>=	Greater than or equals	&,|,~,^,df.any(),df.all()	Logical and, or, not, xor, any, all

Subset Variables (Columns)

`df[['width','length','species']]` Select multiple columns with specific names.

`df['width']` or `df.width` Select single column with specific name.

`df.filter(regex='regex')` Select columns whose name matches regular expression *regex*.

regex (Regular Expressions) Examples

`'\.'`	Matches strings containing a period '.'
`'Length$'`	Matches strings ending with word 'Length'
`'^Sepal'`	Matches strings beginning with the word 'Sepal'
`'^x[1-5]$'`	Matches strings beginning with 'x' and ending with 1,2,3,4,5
`'^(?!Species$).*'`	Matches strings except the string 'Species'

`df.loc[:,'x2':'x4']` Select all columns between x2 and x4 (inclusive).

`df.iloc[:,[1,2,5]]` Select columns in positions 1, 2 and 5 (first column is 0).

`df.loc[df['a'] > 10, ['a','c']]` Select rows meeting logical condition, and only the specific columns .

http://pandas.pydata.org/ This cheat sheet inspired by Rstudio Data Wrangling Cheatsheet (https://www.rstudio.com/wp-content/uploads/2015/02/data-wrangling-cheatsheet.pdf) Written by Irv Lustig, Princeton Consultants

Power BI demos

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Demos

Creating an enterprise workbook

- Configuring Power BI and libraries
- Creating data
- Building a visualization
- Transforming data

Python & Power BI Benefits

- Power BI & Python together gives you:
  - Access to re-using existing code
  - More visualizations than currently available in Power BI
  - Greater flexibility in retrieving data from tricky sources
  - A potential replacement for cumbersome M scripts
  - Access to pre-existing scripts to leverage in your workbooks

New self-paced class

Power BI & Python

https://senturus.com/product/power-bi-python/

Complete BI training

Power BI

tableau

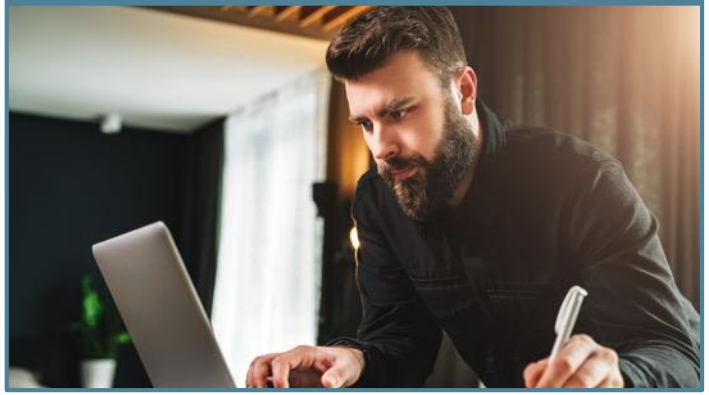
IBM Cognos Analytics

Tailored group sessions

Mentoring

Instructor-led online courses

Self-paced learning



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Additional resources

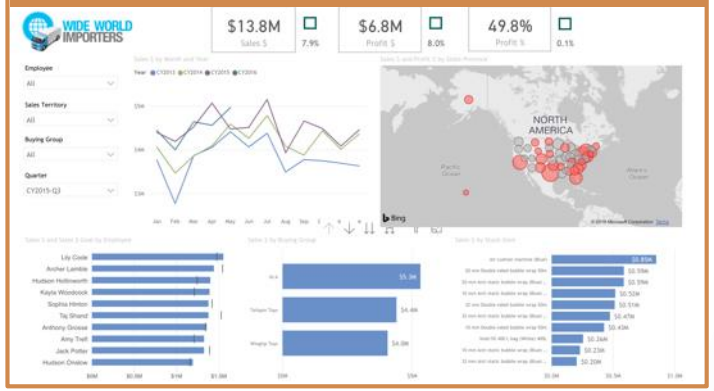
Unbiased product reviews

Technical tips

Insider viewpoints

More on this subject

Product demos



Upcoming events

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Upcoming event

What's New in Cognos 11.2.1

With IBM's Rachel Su

Thursday, Oct 28, 11am PT/2pm ET

Register: https://senturus.com/events/whats-new-in-cognos-11-2-1/

Easily Connect Power BI & Tableau to Cognos Data

Senturus Analytics Connector demo

Thursday, Nov 14, 2021, 11am PT/2pm ET

Your path to modern BI

Accelerating self-service analytics for the enterprise

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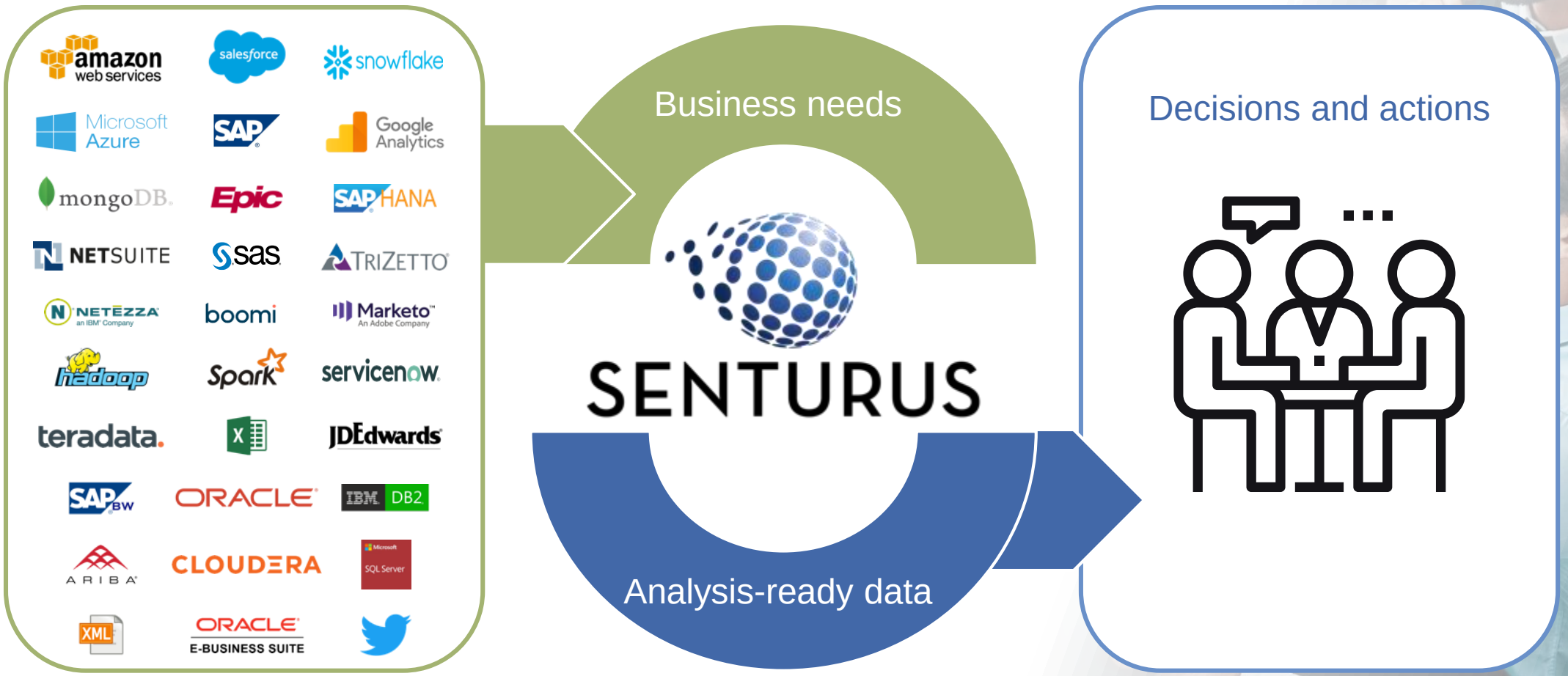
Bridging the gap



Full spectrum of BI services

- Data preparation and modern data warehousing
- Dashboards, reporting and visualizations in Power BI, Cognos and Tableau
- Hybrid BI environments (migrations, security, etc.)
- Software to accelerate bimodal BI and migrations
- BI services and support retainer (expertise on demand)
- Training and mentoring

A long, strong history of success

20+ years

1350+ clients

3000+ projects

Join the Senturus team

We're hiring talented and experienced professionals

- Senior Microsoft BI Architect
- Senior Azure Architect
- Modern Analytics Solution Architect
- ETL Developer
- And more

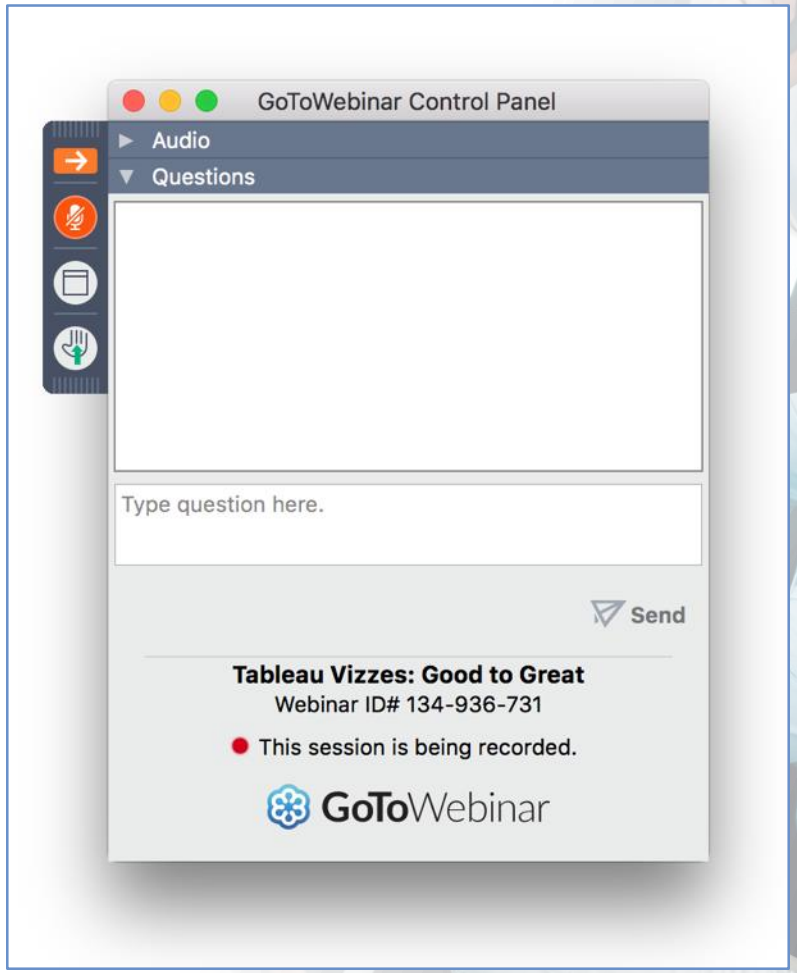
See job descriptions: https://senturus.com/why-senturus/careers/
Send your resume to jobs@senturus.com

Q & A

If your question or issue is broader than what we are able to answer today, contact us at:

info@senturus.com

and we will set up a free consultation.



Thank You

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