

Introduction to Data Science Programming in Python

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Disclaimers

I am focusing on modern tools for data science in Python - Polars over Pandas, Plotly over Matplotlib, and Streamlit over Dash. These modern tools reflect the best of

- declarative programming (task focused programming)
- clean grammar (language abstraction that allows intuitive but complex actions)
- industry respect (all three tools are very popular for the quality and have rapid growth)

Agenda

1. Introduction and Set-up (30 minutes)
2. Polars for data munging (45 minutes)
3. Break (10 minutes)
4. Plotly for data visualization (45 minutes)
5. Streamlit for dashboards (45 minutes)

J. Hathaway

Data Scientists with ~20 years of industry experience and 8 years in Academia. Undergraduate degree in Economics (University of Utah) and a graduate degree in Statistics (BYU).



Checking our installation

1. [Python Installed](#)
2. [VS Code Installed](#)
3. [Python VS Code Extension Installed](#)
4. Python packages installed.

```
pip install polars[all] plotly streamlit
```

Introduction to Polars and Data Munging (speed)

Polars is a lightning fast DataFrame library/in-memory query engine. Its embarrassingly parallel execution, cache efficient algorithms and expressive API makes it perfect for efficient data wrangling, data pipelines, snappy APIs and so much more. Polars is about as fast as it gets, see the results in the [H2O.ai benchmark](#). [Polars Website](#)



Introduction to Polars and Data Munging (declarative API)

Polars functions (Contexts & Expressions) are human readable and they align with standard SQL methods as well as the very popular big data package [PySpark](#).

Contexts

Selection: `df.select([...])`, `df.with_columns([...])` Filtering: `df.filter()` Groupby / Aggregation: `df.groupby(...).agg([...])`

Expressions

```
new_df = df.select(
    pl.col("names").n_unique().alias("unique"),
    pl.approx_unique("names").alias("unique_approx"),
    (pl.col("nrs").sum() + 5).alias("nrs + 5"),
    pl.col("integers").cast(pl.Float32).alias("integers_as_floats"),
    pl.col("animal").str.n_chars().alias("letter_count")
)
```



Polars programming

Now let's practice using Polars with our installation of Python

1. Read data, melt data, and save as .parquet
2. Munge data for visualization

Introduction to Data Visualization

Advantages of data visualization include:

- Easily sharing information.
- Interactively explore opportunities.
- Visualize patterns and relationships.

Disadvantages include:

- Biased or inaccurate information.
- Correlation doesn't always mean causation.
- Core messages can get lost in translation.

Introduction to **Plotly** for Data Visualization

Introduction to Plotly and Data Visualization