

# Python Polars

Guide Complete - Comprehensive Guide

Chapter 1: Getting Started with Polars

What will you learn?	Working with DataFrames and Series
	Lazy evaluation and optimization
	Filtering and selecting data
	Method chaining
	Processing large files

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# 1. Introduction to Polars

Polars is a modern and extremely fast Python library for data processing. It serves as an excellent alternative to Pandas, with significantly improved performance.

## Advantages of Polars:

- Speed - Up to 10-100 times faster than Pandas
- Efficient memory utilization - Smart use of RAM
- Parallel processing - Utilizes all CPU cores
- Lazy Evaluation - Automatic query optimization
- Clean and intuitive syntax
- Type Safety - Strong type checking

## Installation:

```
pip install polars
```

## 2. DataFrame - Basic Data Structure

A DataFrame is a two-dimensional data structure (table) containing rows and columns. Each column contains data of the same type, and each row represents a single record.

### Creating a DataFrame:

```
import polars as pl

df = pl.DataFrame({
    'nums': [1, 2, 3, 4, 5],
    'letters': ['a', 'b', 'c', 'd', 'e']
})
```

### Reading from CSV file:

```
df = pl.read_csv('data.csv')
```

### Important DataFrame properties:

Property	Description	Example
schema	Table structure (columns + types)	df.schema
columns	List of column names	df.columns
dtypes	List of data types	df.dtypes
shape	Dimensions (rows, cols)	df.shape
height	Number of rows	df.height
width	Number of columns	df.width

### 3. Series - Single Column

A Series is a one-dimensional data structure representing a single column from a table. It contains values of the same type and is optimized for fast vectorized operations.

#### Creating a Series:

```
series = pl.Series('my_series', [1, 2, 3, 4, 5])
```

#### Accessing Series from DataFrame:

```
age_series = df['Age']
```

#### Common operations on Series:

- `mean()` - Average
- `sum()` - Sum
- `min()` / `max()` - Minimum / Maximum
- `median()` - Median
- `std()` - Standard deviation
- `n_unique()` - Unique values
- `null_count()` - Missing values

## 4. LazyFrame - Lazy Evaluation

LazyFrame is a 'lazy' version of DataFrame where operations are not executed immediately. Polars builds an optimal execution plan and only executes when calling `.collect()`.

### Advantages of LazyFrame:

- Automatic optimization - Polars optimizes the query
- Better performance - Parallel and efficient execution
- Memory savings - Processes only what's needed
- Predicate Pushdown - Early filtering of data
- Projection Pushdown - Reads only required columns

### Example usage:

```
result = (  
    df.lazy()  
    .filter(pl.col('Age') > 30)  
    .select(['Name', 'Age', 'Fare'])  
    .sort('Fare', descending=True)  
    .collect() # Execute here  
)
```

## 5. Selecting Columns and Filtering Data

One of the most common uses when working with data is selecting specific columns and filtering rows.

### Selecting columns:

```
# Single column
df.select('Name')

# Multiple columns
df.select(['Name', 'Age', 'Fare'])

# Using pl.col() with transformations
df.select(pl.col('Name'), (pl.col('Age') * 12).alias('Age_in_months'))
```

### Filtering rows:

```
# Simple filter
df.filter(pl.col('Age') > 30)

# Multiple conditions with AND (&)
df.filter((pl.col('Age') > 30) & (pl.col('Sex') == 'female'))

# Conditions with OR (|)
df.filter((pl.col('Age') > 70) | (pl.col('Age') < 5))
```

## 10. Summary and Resources

What did we learn in this chapter?

Topic	Key Concepts
DataFrame	Two-dimensional table, schema, columns, dtypes
Series	Single column, statistical operations
LazyFrame	Lazy evaluation, optimization, <code>.collect()</code>
Selecting	<code>.select()</code> , <code>pl.col()</code> , column transformations
Filtering	<code>.filter()</code> , conditions with <code>&amp;</code> and <code> </code>
Modifying	<code>.with_columns()</code> , <code>.drop()</code> , <code>.rename()</code>
Chaining	Connecting multiple operations
Large Files	<code>scan_csv()</code> , streaming, batches

### Additional Resources:

- Official Polars Docs: <https://pola-rs.github.io/polars/>
- User Guide: <https://pola-rs.github.io/polars-book/>
- API Reference: <https://pola-rs.github.io/polars/py-polars/html/reference/>
- Discord Community: <https://discord.gg/4UfP5cfBE7>
- GitHub: <https://github.com/pola-rs/polars>

Good luck with Polars! Python Polars - Fast, efficient, and modern!