

# Introduction to ETL and ELT Pipelines

ETL AND ELT IN PYTHON



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Business Intelligence



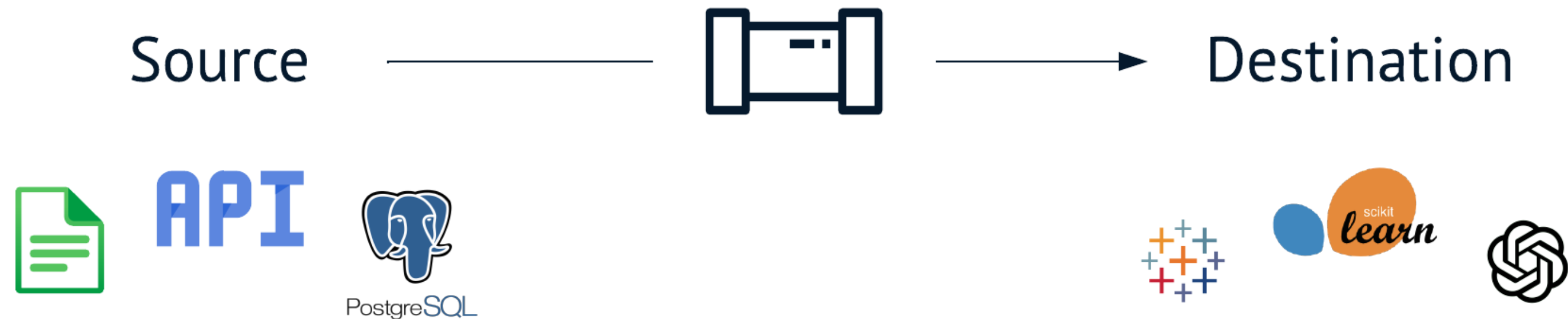
Machine Learning



Artificial Intelligence

# Data pipelines

... are responsible for moving data from a source to a destination, and transforming it somewhere along the way.



# ETL

- Extract, **transform**, load
- Traditional data pipeline design pattern
- Sources may be tabular or non-tabular
- Leverage Python with `pandas`

# ELT

- Extract, **load**, transform
- More recent pattern
- Data warehouses
- Typically tabular data

# Extract, transform, load (ETL)

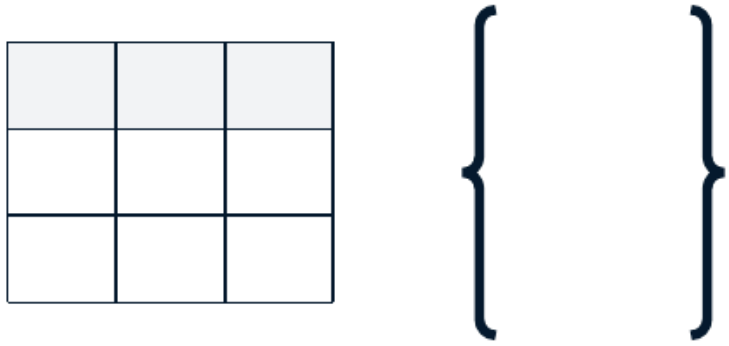
```
def load(data_frame, target_table):  
    # Some custom-built Python logic to load data to SQL  
    data_frame.to_sql(name=target_table, con=POSTGRES_CONNECTION)  
    print(f>Loading data to the {target_table} table")  
  
# Now, run the data pipeline  
extracted_data = extract(file_name="raw_data.csv")  
transformed_data = transform(data_frame=extracted_data)  
load(data_frame=transformed_data, target_table="cleaned_data")
```

```
Extracting data from raw_data.csv  
Transforming data to remove 'null' records  
Loading data to the cleaned_data table
```

# Extract, load, transform (ELT)

```
...  
def transform(source_table, target_table):  
    data_warehouse.run_sql("""  
        CREATE TABLE {target_table} AS  
        SELECT  
            <field-name>, <field-name>, ...  
        FROM {source_table};  
    """)  
  
# Similar to ETL pipelines, call the extract, load, and transform functions  
extracted_data = extract(file_name="raw_data.csv")  
load(data_frame=extracted_data, table_name="raw_data")  
transform(source_table="raw_data", target_table="cleaned_data")
```

# We'll also take a look at...



Tabular and  
non-tabular data



- Data transformation
- Writing data to disk, SQL databases



- Unit-testing
- Monitoring
- Deploying to production

# Let's practice!

ETL AND ELT IN PYTHON



# Building ETL and ELT Pipelines

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# Extract Data from a CSV File

```
import pandas as pd

# Read in the CSV file to a DataFrame
data_frame = pd.read_csv("raw_data.csv")
```

```
# Output the first few rows
data_frame.head()
```

	name	num_firms	total_income
0	Advertising	58	3892.41
1	Apparel	39	5422.69
...			
49	Trucking	35	17324.36

## read\_csv()

- Takes a file path, returns a DataFrame
- `delimiter`, `header`, `engine`

## .head()

- Outputs the first `n` number of a DataFrame

# Filtering a DataFrame

	name	num_firms	total_income
0	Advertising	58	3892.41
1	Apparel	39	5422.69
...			
49	Trucking	35	17324.36

	name	num_firms
1	Apparel	39
37	Apparel	61

# First, by rows

```
data_frame.loc[data_frame["name"] == "Apparel", :]
```

# Then, by columns

```
data_frame.loc[:, ["name", "num_firms"]]
```

**.loc**

- Filters a DataFrame
- **:** means "all"

# Write a DataFrame to a CSV File

```
# Write a DataFrame to a .csv file  
data_frame.to_csv("cleaned_data.csv")
```

## `.to_csv()`

- Takes a `path`, creates DataFrame from file stored at that `path`
- Can take other parameters to customize the output

Other options, like:

`.to_json()`, `.to_excel()`, `.to_sql()`

# Running SQL Queries

```
data_warehouse.execute( # Use Python clients or other tools to run SQL queries
    """
    CREATE TABLE total_sales AS
    SELECT
        ds,
        SUM(sales)
    FROM raw_sales_data
    GROUP BY ds;
    """
)
```

- Tools like `.execute()` to run SQL queries

# Putting it all together!

```
# Define extract(), transform(), and load() functions
...

def transform(data_frame, value):
    return data_frame.loc[data_frame["name"] == value, ["name", "num_firms"]]

# First, extract data from a .csv
extracted_data = extract(file_name="raw_data.csv")

# Then, transform the `extracted_data`
transformed_data = transform(data_frame=extracted_data, value="Apparel")

# Finally, load the `transformed_data`
load(data_frame=transformed_data, file_name="cleaned_data.csv")
```

# Let's practice!

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