# Olist ELT Implementation Technical Report

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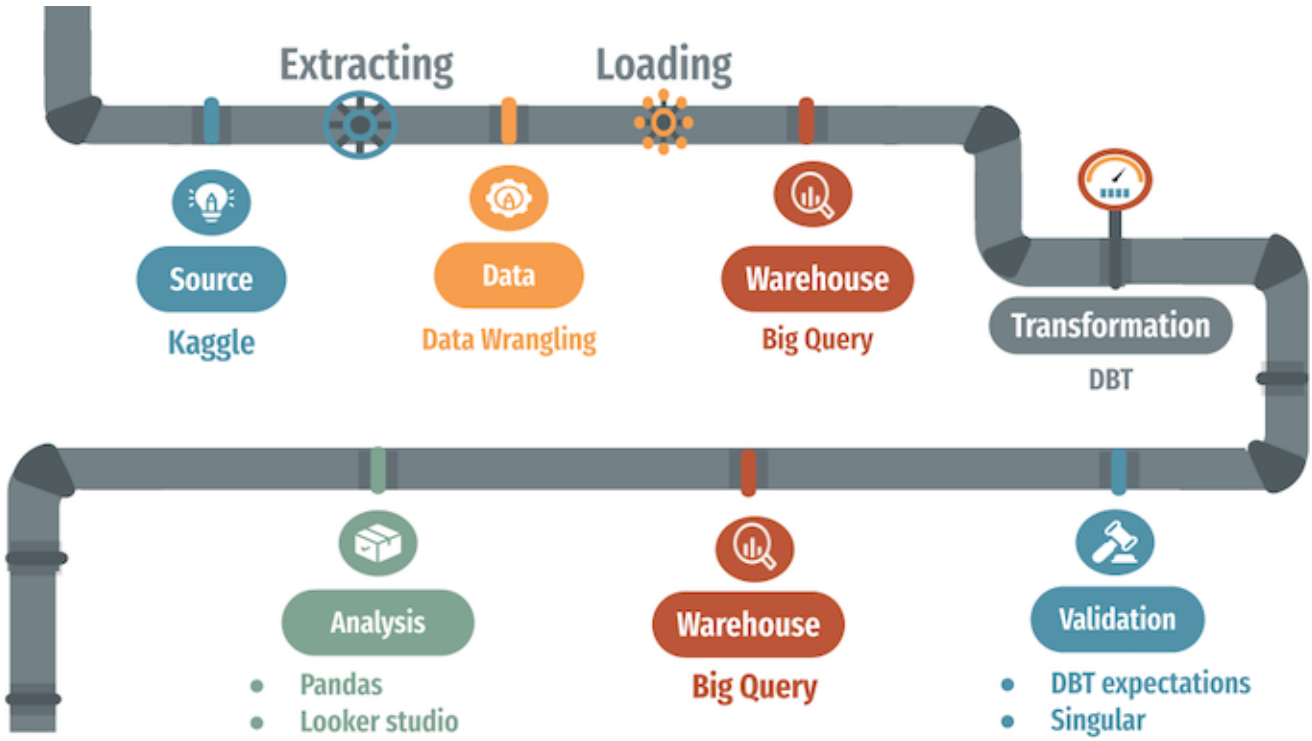
## 1. Introduction

- This document provides a technical overview of the Extract, Load, and Transform (ELT) process implemented for processing the **Kaggle Olist Dataset**.
- The pipeline is designed to automate data ingestion, cleaning, transformation, and storage using **BigQuery** as the primary data warehouse.
- **dbt** is used as the tool for data ingestion and transformation.
- Execution is automated through **GitHub Workflow**, with **GitHub Runner** handling the execution process.

## 2. Executive Summary

### 2.1 Overview of the ELT Process




- The ELT pipeline extracts data from Kaggle, cleans it, and loads it into **BigQuery** using **dbt seed** for transformation and analysis.
- **GitHub Actions** automates the workflow, ensuring scheduled execution.
- **dbt** is used for data transformation, offering a SQL-based framework for analytics engineers.

- **dbt test** is used to validate the data integrity of the transformed dataset.

### 2.2 Key Findings and Insights

- **BigQuery** is preferred over **DuckDB** due to scalability and better tooling support.
- **BigQuery** provides user-friendly tools like **Looker Studio** for non-technical users.
- **dbt seed** is simpler and more effective than **Meltano** for managing raw data.
- Using **BigQuery** allows integration with multiple source and target databases.

### 2.3 Challenges and Recommendations

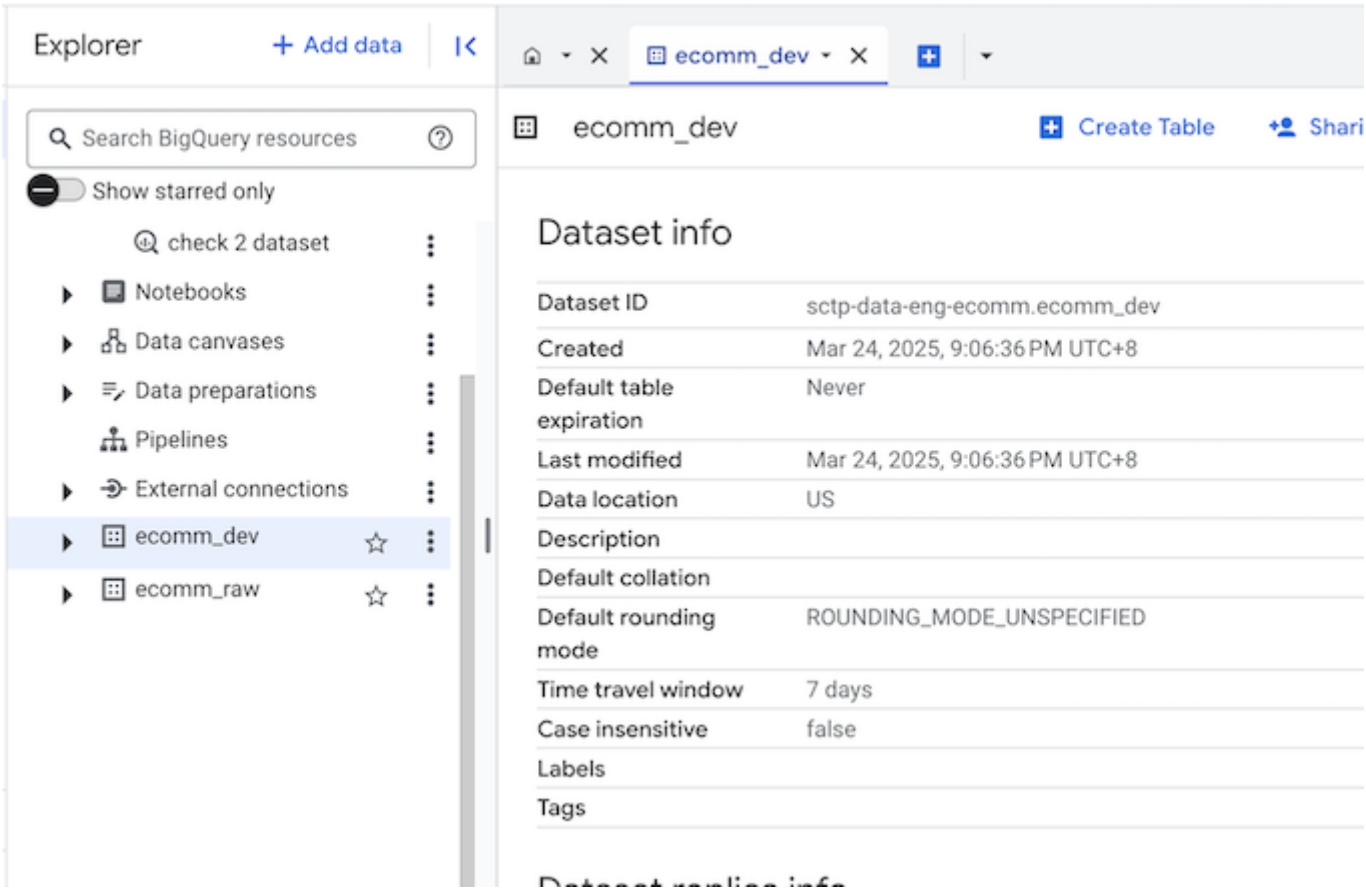
- **DuckDB file locking** is difficult to manage; **BigQuery** is a better alternative.
- **GitHub Actions' scheduling** is not guaranteed to be on time; an external scheduler such as Google Scheduler should be considered.
- Managing secret keys securely remains a challenge; using **GitHub Secrets** is recommended.
- More dbt macros and unit test should be added to improve data integrity.

## 3. Infrastructure Overview

Our ELT pipeline is designed to efficiently process and store data using **Google BigQuery** for scalable storage and **GitHub Runner** for execution.

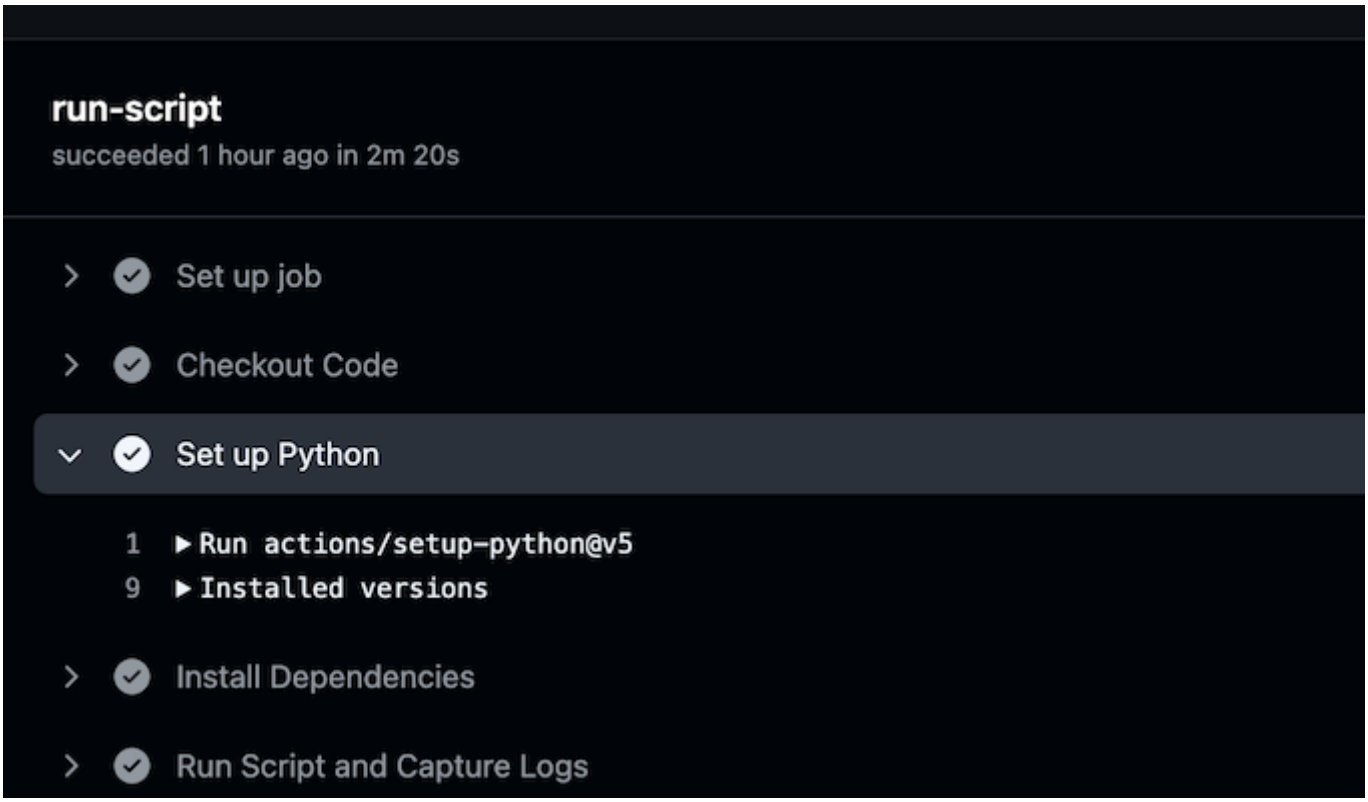
### 3.1 Storage: Google BigQuery

- Serves as the primary data warehouse.
- Optimized for analytical queries.
- Supports multiple source and target databases.



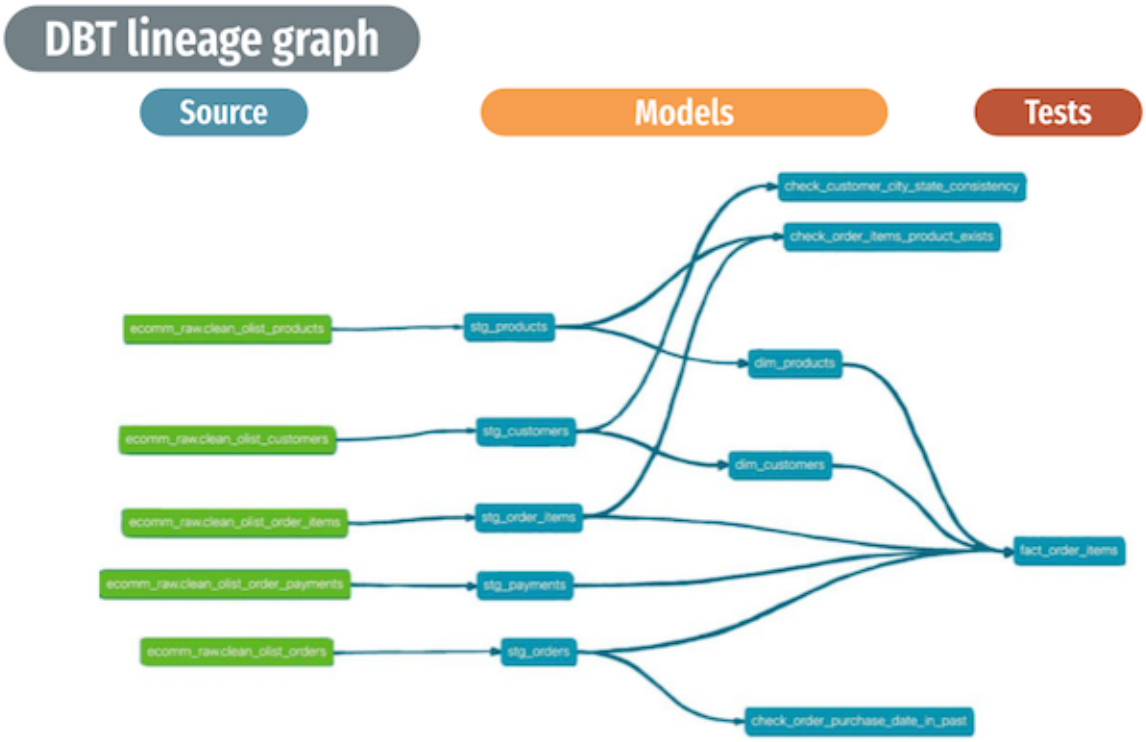
### 3.2 Execution: GitHub Runner

- Automates pipeline execution.
- Ensures reproducibility across environments.
- Handles error logging and notifications.



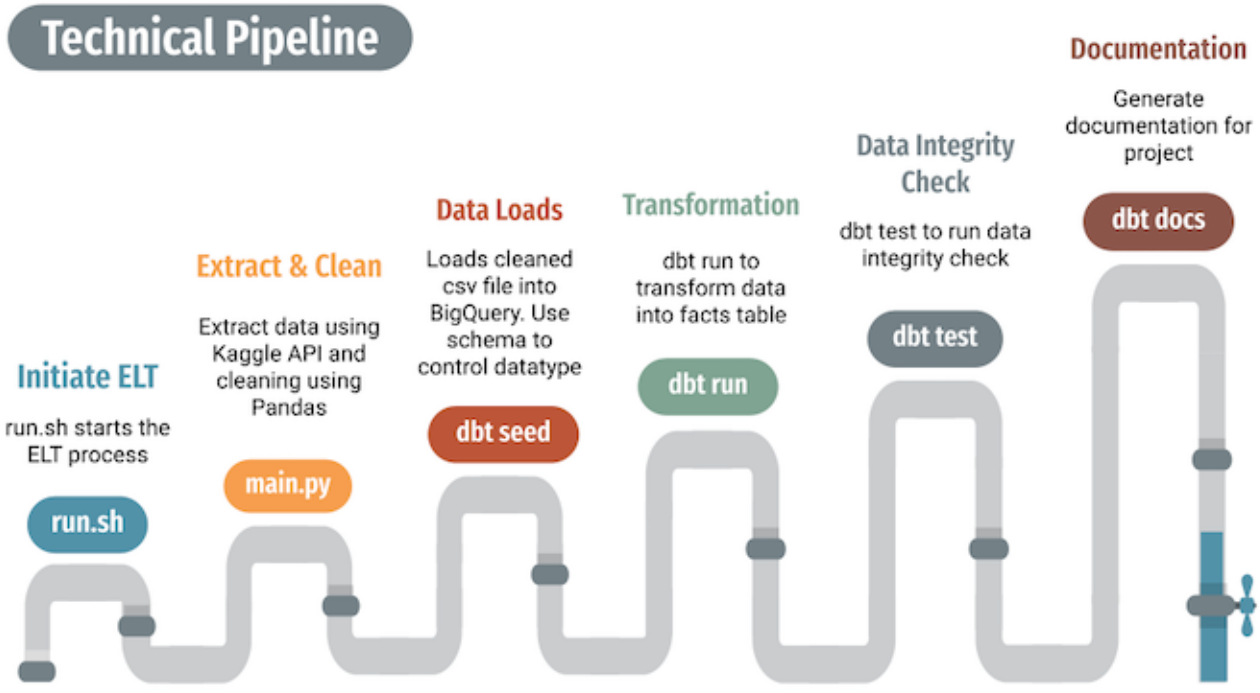

## 4. Data Warehouse Design

- **Star Schema**: We use star schema to define the dimension table and the facts table
- **Staging Models**: Clean and prepare raw data for downstream transformations.
- **Dimensional Models**: Create analytics-ready tables such as `dim_customers` and `dim_products`.
- **Fact Models**: Aggregate transactional data for reporting and analysis.
- **Testing**: Ensure data quality using dbt's built-in testing framework and additional packages.




## 5. ELT Process

The following diagram show the technical flow of the ELT process:




The following shell script (`run.sh`) initiates the ELT process:

```
echo '!!! Starting e-commerce ELT Process !!!'

echo '!!! Starting data download and data cleaning'
python main.py
```

```
echo '!!! Starting dbt transformation and validation process'
cd dbt_ecomm

echo '!!! Cleaning dbt environment before transformation'
dbt clean

echo '!!! Checking dependencies'
dbt deps

echo '!!! Running dbt seed'
dbt seed --target raw

echo '!!! Running dbt run'
dbt run

echo 'Running dbt test'
dbt test

echo '!!! Cleaning dbt environment after transformation'
dbt clean

echo '!!! ELT Process COMPLETED !!!'
```

### 5.1 Extract (E) - Data Download & Cleaning

- **Data Source**: The ELT process uses the **Kaggle Olist Dataset**, which contains Brazilian e-commerce transaction data, including orders, customers, products, payments, and seller information. The data source file is in **CSV** format and downloaded via **Kaggle API**.
- **Data Cleaning**: Performed using Python (Pandas, YAML for configuration).

The shell script (`run.sh`) start by running `main.py` for data extraction and cleaning:

```
# Run main.py for data extraction and cleaning
python main.py
```

The Python script (`main.py`) performs the following extraction process:

- **Loading configurations** : The `config.yaml` file specifies data paths.
- **Dataset Download**: The script `load_kaggle_dataset()` fetches the dataset from Kaggle
- **Storage**: The raw data is stored locally in folder (`./data`)before further processing.
- **Data Cleaning**: Cleaning multiple datasets (customers, orders, products, payments, etc.)

**Python Code Partial Reference (main.py):**

```
# Load Data Source from Kaggle
logging.info("Loading data from Kaggle")
load_kaggle_dataset(config["kaggle_source"])
 ...
```

```
# Initialize and run data preparation
logging.info("Data Cleaning")

# Cleaning customers file
...
clean_customers_files(source_folder, customers_file_name,
seed_destination, cleaned_customers_file_name)

# Cleaning order items file
...
clean_order_items(source_folder, order_items_file_name, seed_destination,
cleaned_order_items_file_name)
...
```

### 5.2 Load (L) - Database Preparation

- **Cleaned data is stored in the dbt seed folder** before loading into BigQuery.
- **dbt seed** transfers the cleaned CSV files into BigQuery.
- We use the file `properties.yml` to define our intended schema for ingestion.

Before transformation, the database environment is set up using dbt:

```
cd dbt_ecomm
dbt clean  # Cleaning dbt environment
dbt deps   # Checking dependencies
dbt seed --target raw  # Loading initial data
```

- The `dbt deps` command ensures that all dependencies are installed before transformation.
- The `dbt seed` command loads reference data into the database. The target refers to different database profile which is only accessible by the data engineering team.
- The following is the schema, we use to control the ingestion process.

```
version: 2

seeds:
  - name: clean_olist_orders
    config:
      column_types:
        order_purchase_timestamp: datetime
        order_approved_at: datetime
        order_delivered_carrier_date: datetime
        order_delivered_customer_date: datetime
        order_estimated_delivery_date: datetime
  - name: clean_olist_products
    config:
      column_types:
        product_weight_g: float
```

```
        product_length_cm: float
        product_height_cm: float
        product_width_cm: float
```

### 5.3 Transform (T) - Data Processing with dbt

- **dbt run** applies transformation logic.

The following is our dbt model design:

- **Staging Models**: Clean and prepare raw data for downstream transformations.
- **Dimensional Models**: Create analytics-ready tables such as `dim_customers` and `dim_products`.
- **Fact Models**: Aggregate transactional data for reporting and analysis.

Once the data is ingested, transformation is carried out using dbt:

```
dbt run   # Running transformations
```

- The `dbt run` command applies transformation logic to raw data tables.

Sample sql scripts:

```
-- models/staging/stg_customers.sql
SELECT
    customer_id,
    customer_unique_id,
    customer_zip_code_prefix,
    customer_city,
    customer_state
FROM
    {{ source('ecomm_raw', 'clean_olist_customers') }}
```

Sample dimension models:

```
-- models/dimensions/dim_customers.sql
SELECT
    customer_id,
    customer_unique_id,
    customer_city,
    customer_state,
    customer_zip_code_prefix
FROM {{ ref('stg_customers') }}
```

Fact table:

```
-- models/facts/fact_order_items.sql
{{
    config(
        materialized='table'
    )
}}
SELECT
    oi.order_id,
    oi.order_item_id,
    oi.product_id,
    oi.seller_id,
    oi.shipping_limit_date,
    oi.price,
    oi.freight_value,
    o.customer_id,
    o.order_status,
    o.order_purchase_timestamp,
    o.order_approved_at,
    o.order_delivered_carrier_date,
    o.order_delivered_customer_date,
    o.order_estimated_delivery_date,
    c.customer_unique_id,
    c.customer_city AS customer_city,
    c.customer_state AS customer_state,
    p.payment_type,
    p.payment_installments,
    p.payment_value,
    pr.product_category_name,
FROM
    {{ ref('stg_order_items') }} oi
LEFT JOIN
    {{ ref('stg_orders') }} o ON oi.order_id = o.order_id
LEFT JOIN
    {{ ref('dim_customers') }} c ON o.customer_id = c.customer_id
LEFT JOIN
    {{ ref('stg_payments') }} p ON o.order_id = p.order_id  -- Corrected
join
LEFT JOIN
    {{ ref('dim_products') }} pr ON oi.product_id = pr.product_id
```

### 5.4 Data Validation - Data Integrity Test with dbt

- **dbt test** validates data integrity.
- **Singular test**: Additional test are written and placed under the tests folder to test business logic.

Once the data is transformed, data integrity test is carried out using dbt:

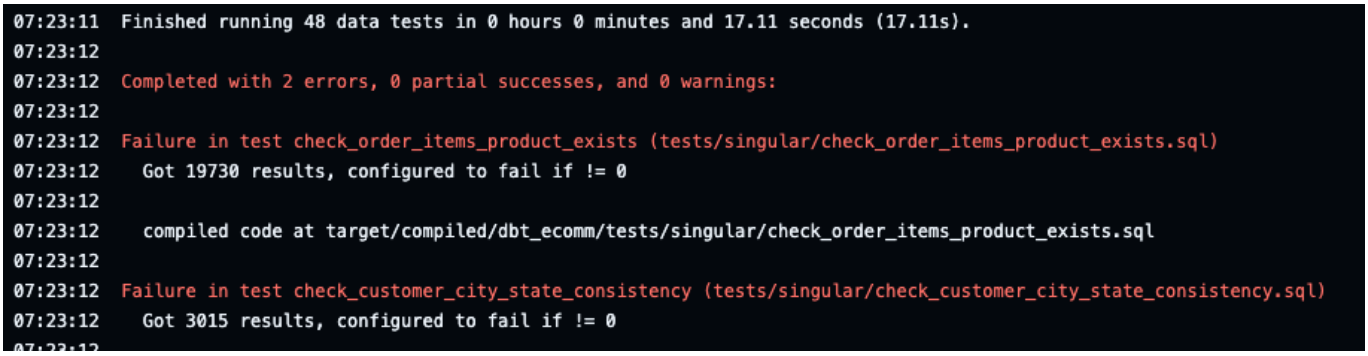
```
dbt test  # Running tests to validate data integrity
dbt clean  # Final cleanup
```

- The `dbt test` command ensures data integrity by checking constraints and relationships.
- The final cleanup removes temporary files and ensures a clean working environment.

**Successful Singular Test**

```sql
-- Check that order purchase timestamps are in the past
select
    order_id,
    order_purchase_timestamp
from {{ ref('stg_orders') }}
where order_purchase_timestamp > CAST(current_timestamp() AS DATETIME)
```

**Singular Test Required Further Investigation**




```sql
-- Check that all product_ids in order_items table exist in products table
select
    oi.product_id
from {{ ref('stg_order_items') }} oi
left join {{ ref('stg_products') }} p on oi.product_id = p.product_id
where p.product_id is null
```

```sql
-- Check if customer city and state combinations are consistent
select
    customer_city,
    customer_state,
    count(*) as count
from {{ ref('stg_customers') }}
group by 1, 2
having count(*) > 1
```

Partial test schema:

```yaml
      - name: order_purchase_timestamp
        description: Timestamp when the order was purchased.
        tests:
```

```
          - not_null
          - dbt_expectations.expect_column_values_to_be_of_type:  #
dbt_expectations test
              column_type: DATETIME
      - name: order_approved_at
        description: Timestamp when the order was approved.
        tests:
          - dbt_expectations.expect_column_values_to_be_of_type:  #
dbt_expectations test
              column_type: DATETIME
      - name: order_delivered_carrier_date
        description: Timestamp when the order was delivered to the
carrier.
        tests:
          - dbt_expectations.expect_column_values_to_be_of_type:  #
dbt_expectations test
              column_type: DATETIME
      - name: order_delivered_customer_date
        description: Timestamp when the order was delivered to the
customer.
        tests:
          - dbt_expectations.expect_column_values_to_be_of_type: #
dbt_expectations test
              column_type: DATETIME
```

## 6. Data Analysis

Data analysis can be performed using python and pandas code:

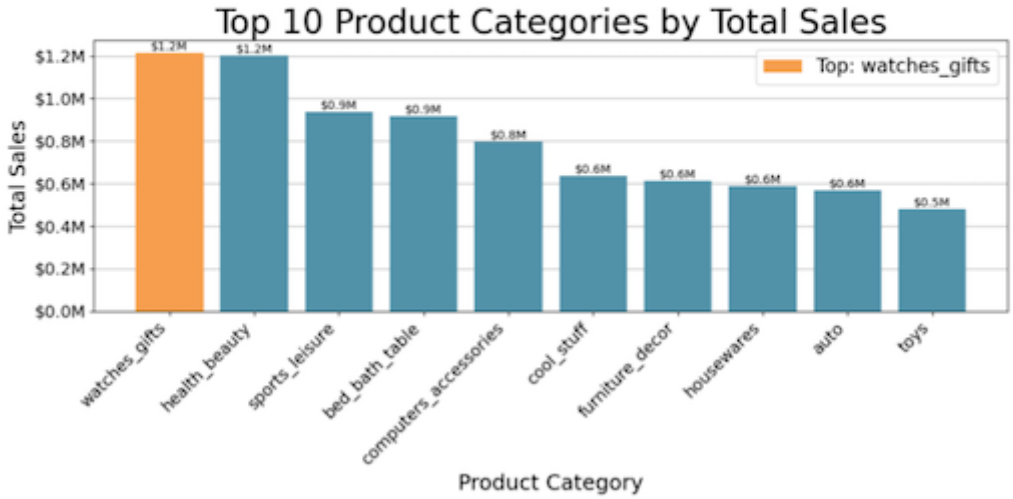
Sample code:

```
from google.cloud import bigquery
from google.oauth2 import service_account
credentials = service_account.Credentials.from_service_account_file(
'../.keys/keys.json')

project_id = 'project-name-in-bigquery'
client = bigquery.Client(credentials= credentials,project=project_id)


# Query: Average Installments per Payment Type
query3 = """
SELECT
  payment_type,
  AVG(payment_installments) AS avg_installments
FROM `sctp-data-eng-ecomm.ecomm_dev.fact_order_items`
WHERE payment_installments IS NOT NULL
GROUP BY payment_type
"""
df3 = client.query(query3).to_dataframe()
```

The following are our analysis:

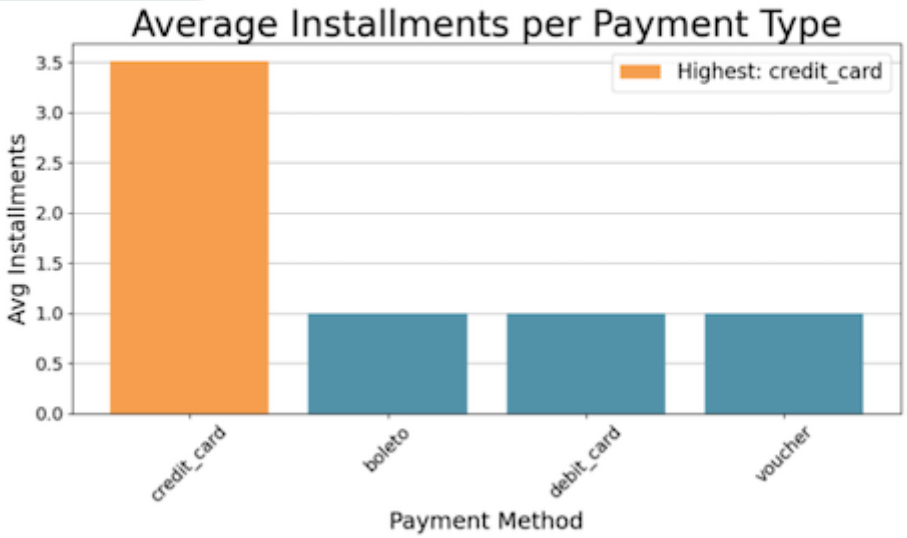
### Top 10 Product Categories by Total Sales

Analysis

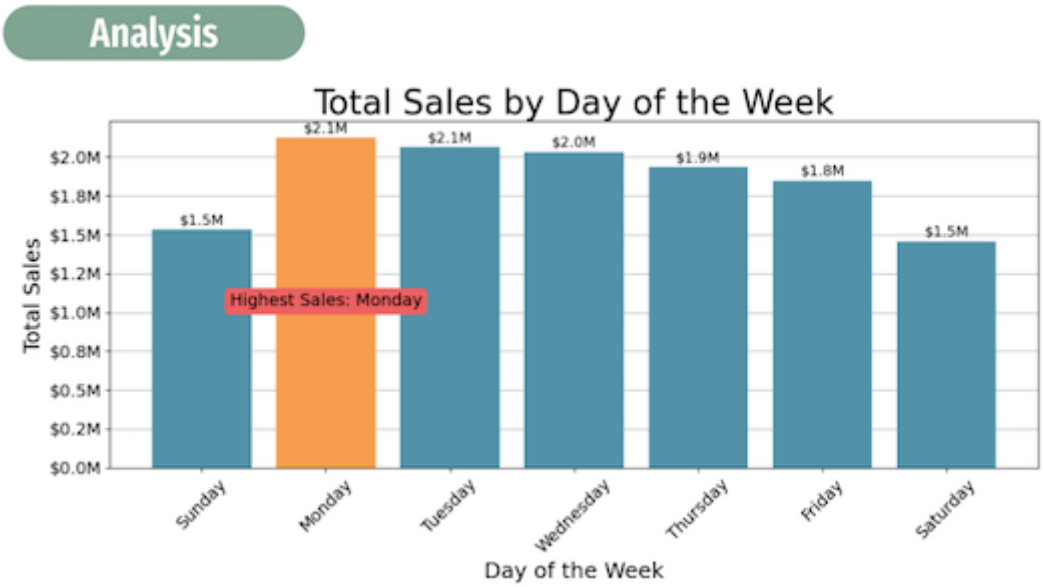



### Average Installments per Payment Type

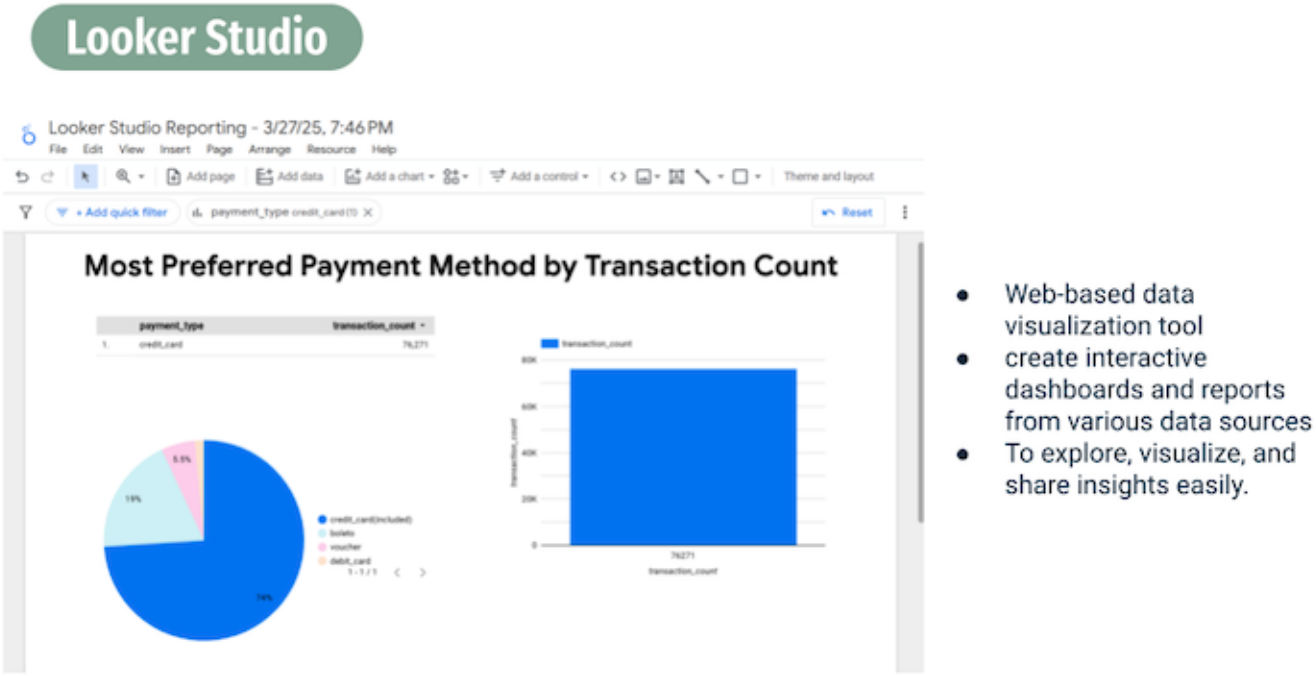
Analysis



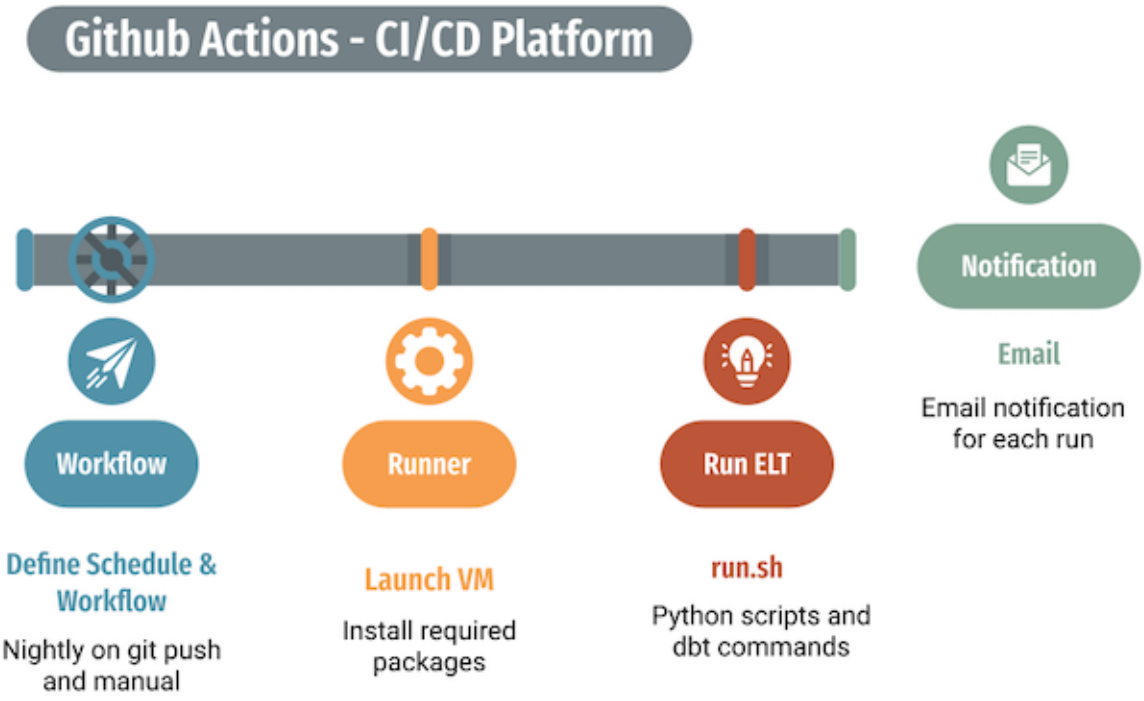

### Total Sales by Day of the Week




Non technical user can make use of Looker Studio for some light weight analysis:




## 7. GitHub Workflow for Automation




### 5.1 Workflow Execution Steps

- **push**: Runs the process when there is a git push to the main branch. Only for production stage.
- **Manual Trigger**: Developers can manually start the workflow via GitHub UI.
- **Scheduled Execution**: Runs daily at 3:00 PM UTC (11:00 PM Singapore Time) using a `cron` schedule.
- **GitHub Runner** is responsible for executing the scheduled jobs.
- **Steps**:
  - Checkout Code
  - Install Dependencies
  - Run ELT Script
  - Capture Logs
  - Send Email Notification

```yaml
name: Run ELT Process on Schedule

on:
  # push: # use in production stage
  #   branches:
  #     - main  # Adjust if you want to trigger on different branches
  workflow_dispatch:  # Enables manual triggering from GitHub UI
  schedule:
    - cron: '0 15 * * *'  # Runs every day at 3pm UTC 11pm SG time

jobs:
  run-script:
    runs-on: ubuntu-latest
    steps:
      - name: Checkout Code
        uses: actions/checkout@v4
```

```
      - name: Set up Python
        uses: actions/setup-python@v5
        with:
          python-version: '3.10'

      - name: Install Dependencies
        run: |
          python -m pip install --upgrade pip
          if [ -f requirements.txt ]; then pip install -r
requirements.txt; fi

      - name: Run Script and Capture Logs
        run: ./run.sh 2>&1 | tee workflow.log

      - name: Read Log File into Environment Variable
        run: echo "LOG_CONTENT<<EOF" >> $GITHUB_ENV && cat workflow.log >>
$GITHUB_ENV && echo "EOF" >> $GITHUB_ENV

      - name: Send Email Notification with Logs
        if: always()
        uses: dawidd6/action-send-mail@v3
        with:
          server_address: smtp.gmail.com
          server_port: 587
          username: ${{ secrets.MAIL_USERNAME }}
          password: ${{ secrets.MAIL_PASSWORD }}
          subject: "GitHub Actions Workflow Run - ${{ job.status }}"
          body: |
            Job Status: ${{ job.status }}

            Logs:
            ${{ env.LOG_CONTENT }}

            Check full logs here: ${{ github.server_url }}/${{
github.repository }}/actions/runs/${{ github.run_id }}
          to: ${{ secrets.COLLABORATORS_EMAILS }}
          from: "GitHub Actions <no-reply@example.com>"
```

# 8. Performance Analysis

## 8.1 Execution Time & Success Rate

- The pipeline executes in **under 3 minutes**.
- dbt test took **less than 1 minute**.
- GitHub Actions' scheduler **may not be precise**; Google Cloud Scheduler is recommended for critical processes.

## 8.2 Data Quality & Integrity Checks

- **dbt test** ensures data consistency and integrity.
- Data deduplication is handled in the cleaning phase.

# 9. Challenges and Recommendations

## 9.1 Identified Bottlenecks

- **Managing service key files** securely.
- **GitHub Actions' scheduling limitations**.

## 9.2 Suggested Improvements

- Store **service key files** in **GitHub Secrets**.
- Use an **external scheduler** for better job execution reliability.
- To include dbt unit test and macros to improve data quality

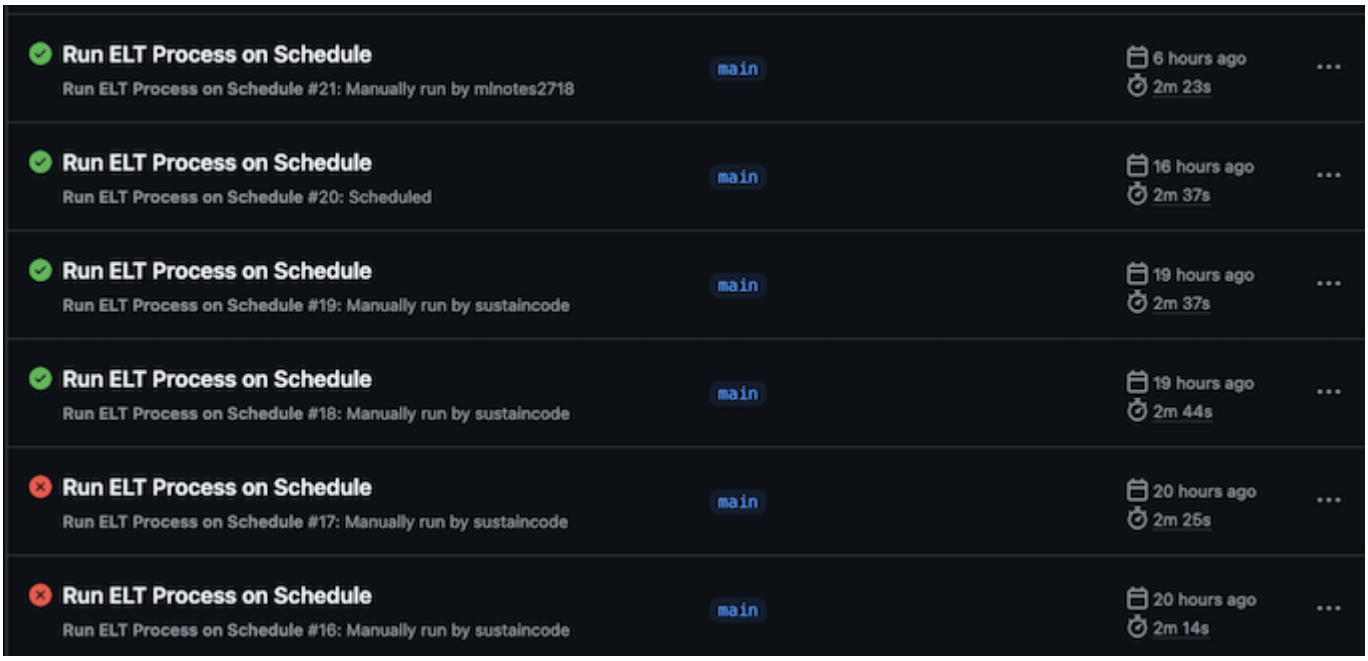
# 10. Conclusion

- The ELT pipeline efficiently processes e-commerce transaction data.
- **BigQuery** offers scalability and analytical advantages.
- **GitHub Actions** ensures automation but requires external scheduling for reliability.
- Future enhancements include optimizing resource utilization and testing alternative schedulers.

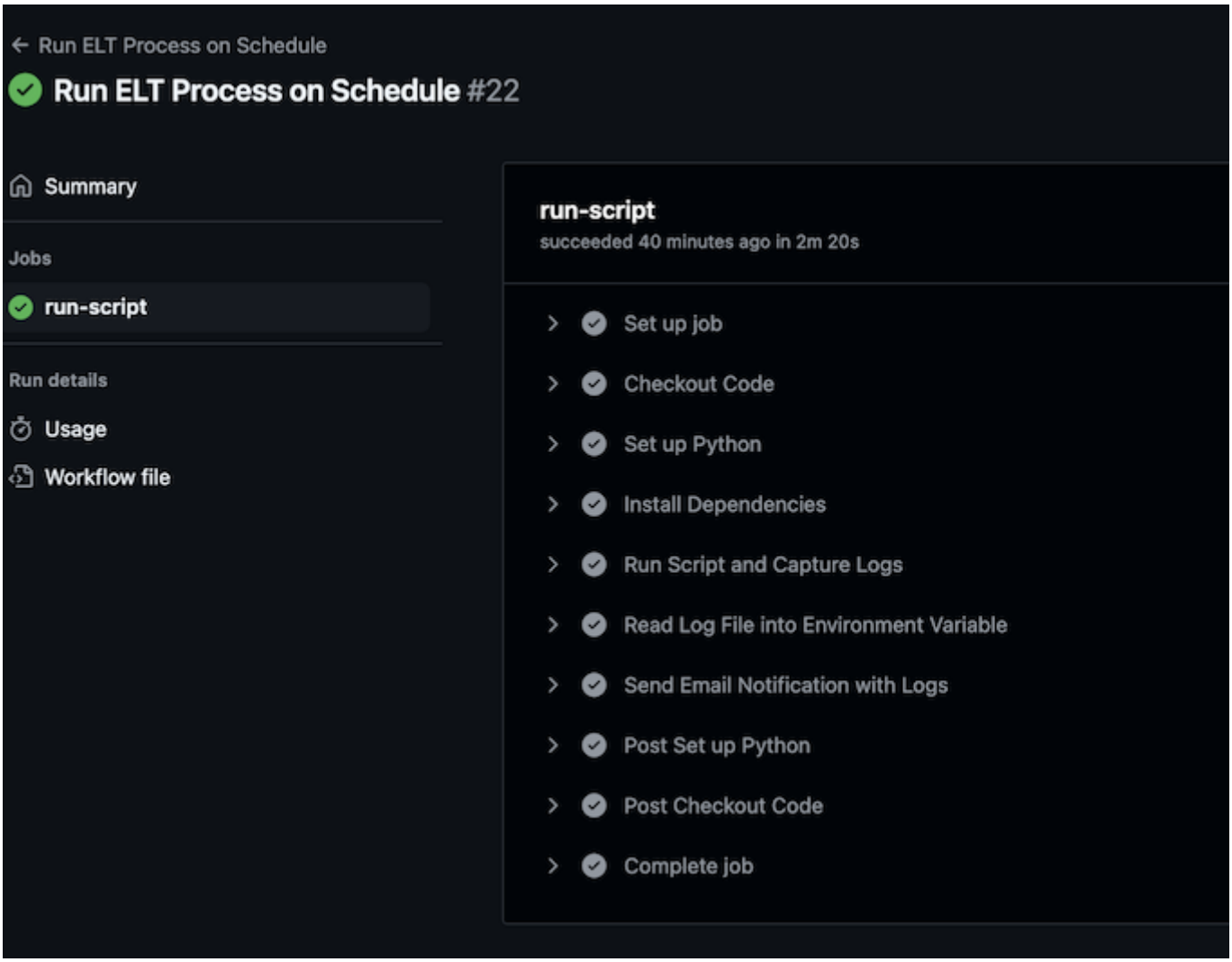
# 11. Appendix

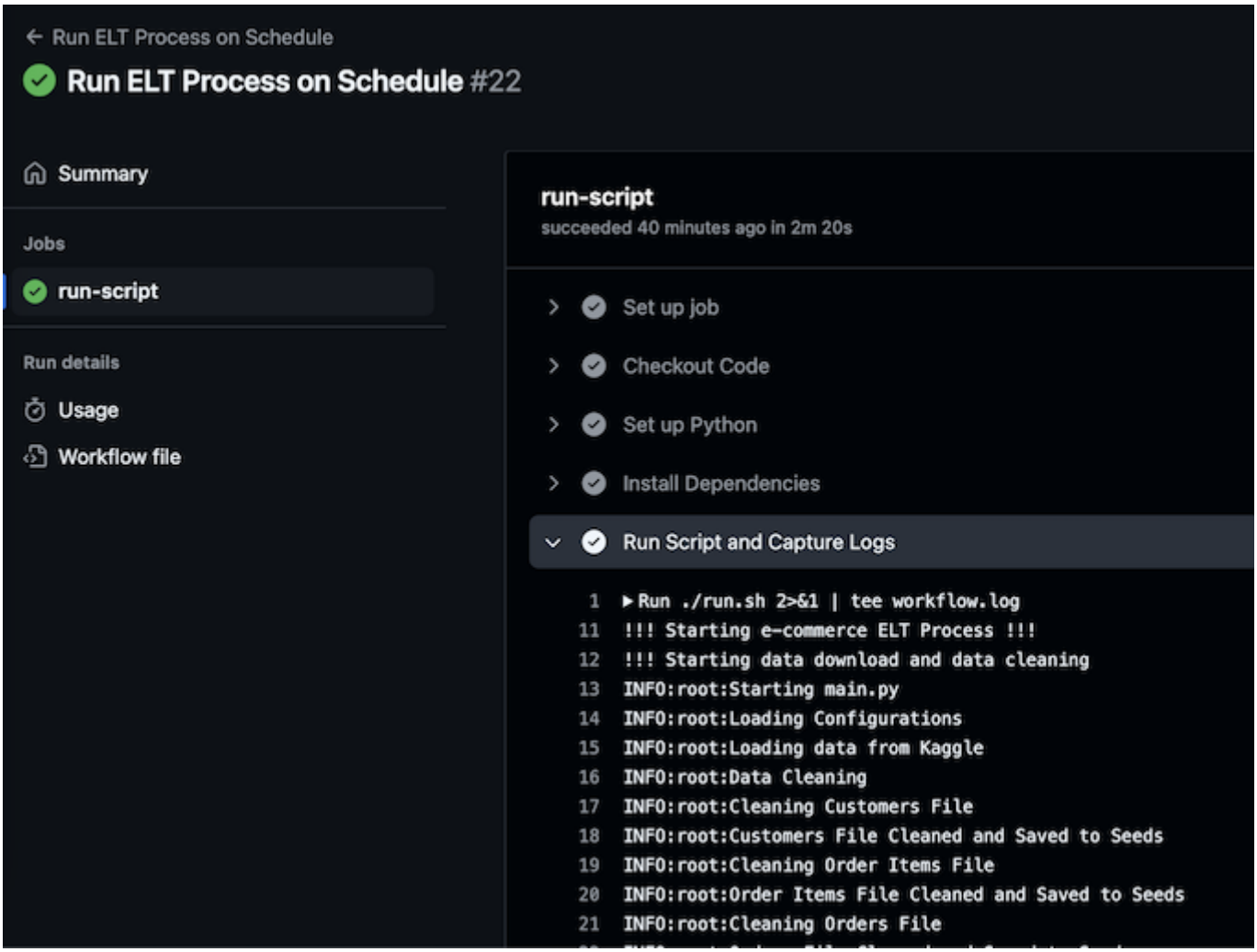
## 11.1 Github Actions Screenshots

### Github Actions Runs




### Github Actions Runs Log


Run ELT Process on Schedule
Run ELT Process on Schedule #22
Summary
Jobs
run-script
Run details
Usage
Workflow file
run-script
succeeded 40 minutes ago in 2m 20s
Set up job
Checkout Code
Set up Python
Install Dependencies
Run Script and Capture Logs
Read Log File into Environment Variable
Send Email Notification with Logs
Post Set up Python
Post Checkout Code
Complete job




**Github Actions - Email Notification**

GitHub Actions Workflow Run - success

Logs:
!!! Starting e-commerce ELT Process !!!
!!! Starting data download and data cleaning
INFO:root:Starting main.py
INFO:root:Loading Configurations
INFO:root:Loading data from Kaggle
INFO:root:Data Cleaning
INFO:root:Cleaning Customers File
INFO:root:Customers File Cleaned and Saved to Seeds
INFO:root:Cleaning Order Items File
INFO:root:Order Items File Cleaned and Saved to Seeds
INFO:root:Cleaning Orders File
INFO:root:Orders File Cleaned and Saved to Seeds
INFO:root:Cleaning Order Payments File
INFO:root:Order Payments File Cleaned and Saved to Seeds
INFO:root:End of Python script.
INFO:root:End of data download and data cleaning
Dataset URL: https://www.kaggle.com/datasets/olistbr/brazilian-ecommerce
!!! Starting dbt transformation and validation process
!!! Cleaning dbt environment before transformation
[0m07:22:01 Running with dbt=1.9.3

## 11.2 **SQL queries and scripts used in dbt**

**dbt seed schema**

```yaml
version: 2

seeds:
  - name: clean_olist_orders
    config:
      column_types:
        order_purchase_timestamp: datetime
        order_approved_at: datetime
        order_delivered_carrier_date: datetime
        order_delivered_customer_date: datetime
        order_estimated_delivery_date: datetime
  - name: clean_olist_products
    config:
      column_types:
        product_weight_g: float
        product_length_cm: float
        product_height_cm: float
        product_width_cm: float
```

**Staging Models**

```sql
-- models/staging/stg_customers.sql
SELECT
    customer_id,
    customer_unique_id,
    customer_zip_code_prefix,
    customer_city,
    customer_state
FROM
    {{ source('ecomm_raw', 'clean_olist_customers') }}
```

```sql
-- models/staging/stg_order_items.sql
SELECT
    order_id,
    order_item_id,
    product_id,
    seller_id,
    shipping_limit_date,
    price,
    freight_value
FROM
    {{ source('ecomm_raw', 'clean_olist_order_items') }}
```

```sql
-- models/staging/stg_orders.sql
SELECT
```

```
    order_id,
    customer_id,
    order_status,
    order_purchase_timestamp,
    order_approved_at,
    order_delivered_carrier_date,
    order_delivered_customer_date,
    order_estimated_delivery_date
FROM
    {{ source('ecomm_raw', 'clean_olist_orders') }}
```

```
-- models/staging/stg_payments.sql
SELECT
    order_id,
    payment_sequential,
    payment_type,
    payment_installments,
    payment_value
FROM
    {{ source('ecomm_raw', 'clean_olist_order_payments') }}
```

```
-- models/staging/stg_products.sql
SELECT
    product_id,
    product_category_name,
    product_weight_g,
    product_length_cm,
    product_height_cm,
    product_width_cm
FROM
    {{ source('ecomm_raw', 'clean_olist_products') }}
```

**Dimension Model**

```
-- models/dimensions/dim_customers.sql
SELECT
    customer_id,
    customer_unique_id,
    customer_city,
    customer_state,
    customer_zip_code_prefix
FROM {{ ref('stg_customers') }}
```

```
-- models/dimensions/dim_products.sql
SELECT
    product_id,
    product_category_name,
    product_weight_g,
    product_length_cm,
    product_height_cm,
    product_width_cm
FROM {{ ref('stg_products') }}
```

**Fact Table**

```
-- models/facts/fact_order_items.sql
{{
    config(
        materialized='table'
    )
}}
SELECT
    oi.order_id,
    oi.order_item_id,
    oi.product_id,
    oi.seller_id,
    oi.shipping_limit_date,
    oi.price,
    oi.freight_value,
    o.customer_id,
    o.order_status,
    o.order_purchase_timestamp,
    o.order_approved_at,
    o.order_delivered_carrier_date,
    o.order_delivered_customer_date,
    o.order_estimated_delivery_date,
    c.customer_unique_id,
    c.customer_city AS customer_city,
    c.customer_state AS customer_state,
    p.payment_type,
    p.payment_installments,
    p.payment_value,
    pr.product_category_name,
FROM
    {{ ref('stg_order_items') }} oi
LEFT JOIN
    {{ ref('stg_orders') }} o ON oi.order_id = o.order_id
LEFT JOIN
    {{ ref('dim_customers') }} c ON o.customer_id = c.customer_id
LEFT JOIN
    {{ ref('stg_payments') }} p ON o.order_id = p.order_id  -- Corrected
join
```

```
LEFT JOIN
    {{ ref('dim_products') }} pr ON oi.product_id = pr.product_id
```

**Test Schema**

```
version: 2

models:
  - name: stg_customers
    description: Staged customer data from the raw source.
    columns:
      - name: customer_id
        description: Unique identifier for a customer.
        tests:
          - unique
          - not_null
      - name: customer_unique_id
        description: Unique identifier for a customer across all orders.
        tests:
          - not_null
      - name: customer_zip_code_prefix
        description: First 5 digits of the customer's zip code.
        tests:
          - dbt_expectations.expect_column_values_to_be_of_type:  #
dbt_expectations test
              column_type: int64
      - name: customer_city
        description: Customer's city.
        tests:
          - not_null
      - name: customer_state
        description: Customer's state.
        tests:
          - not_null
          - accepted_values: #Built-in test
              values: ["AC", "AL", "AM", "AP", "BA", "CE", "DF", "ES",
"GO", "MA", "MG", "MS", "MT", "PA", "PB", "PE", "PI", "PR", "RJ", "RN",
"RO", "RR", "RS", "SC", "SE", "SP", "TO"]

  - name: stg_orders
    description: Staged order data from the raw source.
    columns:
      - name: order_id
        description: Unique identifier for an order.
        tests:
          - unique
          - not_null
      - name: customer_id
        description: Foreign key to the customers table.
        tests:
          - not_null
```

```
      - name: order_status
        description: Status of the order.
        tests:
          - not_null
          - accepted_values:
              values: ["delivered", "shipped", "canceled", "unavailable",
"invoiced", "processing", "created", "approved"]
      - name: order_purchase_timestamp
        description: Timestamp when the order was purchased.
        tests:
          - not_null
          - dbt_expectations.expect_column_values_to_be_of_type:  #
dbt_expectations test
              column_type: DATETIME
      - name: order_approved_at
        description: Timestamp when the order was approved.
        tests:
          - dbt_expectations.expect_column_values_to_be_of_type:  #
dbt_expectations test
              column_type: DATETIME
      - name: order_delivered_carrier_date
        description: Timestamp when the order was delivered to the
carrier.
        tests:
          - dbt_expectations.expect_column_values_to_be_of_type:  #
dbt_expectations test
              column_type: DATETIME
      - name: order_delivered_customer_date
        description: Timestamp when the order was delivered to the
customer.
        tests:
          - dbt_expectations.expect_column_values_to_be_of_type: #
dbt_expectations test
              column_type: DATETIME
      - name: order_estimated_delivery_date
        description: Timestamp of the estimated delivery date.
        tests:
          - not_null
          - dbt_expectations.expect_column_values_to_be_of_type:
              column_type: DATETIME


  - name: stg_order_items
    description: Staged order item data from the raw source.
    columns:
      - name: order_id
        description: Foreign key to the orders table.
        tests:
          - not_null

      - name: order_item_id
        description: Unique identifier for an item within an order.
        tests:
```

```
          - not_null
      - name: price
        description: Price of the item.
        tests:
          - not_null

          - dbt_expectations.expect_column_values_to_be_between:
              min_value: 0
      - name: freight_value
        description: Freight value of the item.
        tests:
          - not_null

          - dbt_expectations.expect_column_values_to_be_between:
              min_value: 0

  - name: stg_products
    description: Staged product data from the raw source.
    columns:
      - name: product_id
        description: Unique identifier for a product.
        tests:
          - unique
          - not_null
      - name: product_category_name
        description: Name of the product category.
        tests:
          - not_null
      - name: product_weight_g
        description: Weight of the product in grams.
        tests:
          - not_null

          - dbt_expectations.expect_column_values_to_be_of_type:
              column_type: float64
      - name: product_length_cm
        description: Length of the product in centimeters.
        tests:
          - not_null

          - dbt_expectations.expect_column_values_to_be_of_type:
              column_type: float64
      - name: product_height_cm
        description: Height of the product in centimeters.
        tests:
          - not_null

          - dbt_expectations.expect_column_values_to_be_of_type:
              column_type: float64
      - name: product_width_cm
        description: Width of the product in centimeters.
        tests:
          - not_null
```

```
          - dbt_expectations.expect_column_values_to_be_of_type:
              column_type: float64

  - name: stg_payments
    description: Staged payment data from the raw source.
    columns:
      - name: order_id
        description: Foreign key to the orders table.
        tests:
          - not_null

      - name: payment_sequential
        description: Sequential number of the payment.
        tests:
          - not_null
          - dbt_expectations.expect_column_values_to_be_of_type:
              column_type: int64
      - name: payment_type
        description: Type of payment.
        tests:
          - not_null
          - accepted_values:
              values: ["credit_card", "boleto", "voucher", "debit_card",
"not_defined"]
      - name: payment_installments
        description: Number of installments for the payment.
        tests:
          - not_null

          - dbt_expectations.expect_column_values_to_be_of_type:
              column_type: int64
      - name: payment_value
        description: Value of the payment.
        tests:
          - not_null

          - dbt_expectations.expect_column_values_to_be_between:
              min_value: 0
```

**Singular Test**

```
-- Check that order purchase timestamps are in the past
select
    order_id,
    order_purchase_timestamp
from {{ ref('stg_orders') }}
where order_purchase_timestamp > CAST(current_timestamp() AS DATETIME)
```

```
-- Check that all product_ids in order_items table exist in products table
select
    oi.product_id
from {{ ref('stg_order_items') }} oi
left join {{ ref('stg_products') }} p on oi.product_id = p.product_id
where p.product_id is null
```

```
-- Check if customer city and state combinations are consistent
select
    customer_city,
    customer_state,
    count(*) as count
from {{ ref('stg_customers') }}
group by 1, 2
having count(*) > 1
```

### 11.3 **Detailed logs**

```
GitHub Actions Workflow Run - success
GitHub Actions<email_address>

reducted (email address)

Job Status: success

Logs:
!!! Starting e-commerce ELT Process !!!
!!! Starting data download and data cleaning
INFO:root:Starting main.py
INFO:root:Loading Configurations
INFO:root:Loading data from Kaggle
INFO:root:Data Cleaning
INFO:root:Cleaning Customers File
INFO:root:Customers File Cleaned and Saved to Seeds
INFO:root:Cleaning Order Items File
INFO:root:Order Items File Cleaned and Saved to Seeds
INFO:root:Cleaning Orders File
INFO:root:Orders File Cleaned and Saved to Seeds
INFO:root:Cleaning Order Payments File
INFO:root:Order Payments File Cleaned and Saved to Seeds
INFO:root:End of Python script.
INFO:root:End of data download and data cleaning
Dataset URL: https://www.kaggle.com/datasets/olistbr/brazilian-ecommerce
!!! Starting dbt transformation and validation process
!!! Cleaning dbt environment before transformation
 [0m15:21:34  Running with dbt=1.9.3
 [0m15:21:34  Checking /home/runner/work/module2-project/module2-
```

```
project/dbt_ecomm/target/*
 [0m15:21:34  Cleaned /home/runner/work/module2-project/module2-
project/dbt_ecomm/target/*
 [0m15:21:34  Checking /home/runner/work/module2-project/module2-
project/dbt_ecomm/dbt_packages/*
 [0m15:21:34  Cleaned /home/runner/work/module2-project/module2-
project/dbt_ecomm/dbt_packages/*
 [0m15:21:34  Finished cleaning all paths.
!!! Checking dependencies
 [0m15:21:36  Running with dbt=1.9.3
 [0m15:21:37  Installing dbt-labs/dbt_utils
 [0m15:21:37  Installed from version 1.3.0
 [0m15:21:37  Up to date!
 [0m15:21:37  Installing metaplane/dbt_expectations
 [0m15:21:37  Installed from version 0.10.8
 [0m15:21:37  Up to date!
 [0m15:21:37  Installing godatadriven/dbt_date
 [0m15:21:37  Installed from version 0.11.0
 [0m15:21:37  Up to date!
!!! Running dbt seed
 [0m15:21:39  Running with dbt=1.9.3
 [0m15:21:41  Registered adapter: bigquery=1.9.1
 [0m15:21:41  Unable to do partial parsing because saved manifest not
found. Starting full parse.
 [0m15:21:44  Found 8 models, 48 data tests, 5 seeds, 5 sources, 874 macros
 [0m15:21:44
 [0m15:21:44  Concurrency: 3 threads (target='raw')
 [0m15:21:44
 [0m15:21:45  1 of 5 START seed file ecomm_raw.clean_olist_customers
.......................... [RUN]
 [0m15:21:45  2 of 5 START seed file ecomm_raw.clean_olist_order_items
........................ [RUN]
 [0m15:21:45  3 of 5 START seed file ecomm_raw.clean_olist_order_payments
...................... [RUN]
 [0m15:21:56  1 of 5 OK loaded seed file ecomm_raw.clean_olist_customers
...................... [ [32mINSERT 96096 [0m in 11.09s]
 [0m15:21:56  4 of 5 START seed file ecomm_raw.clean_olist_orders
............................. [RUN]
 [0m15:21:57  3 of 5 OK loaded seed file
ecomm_raw.clean_olist_order_payments ................. [ [32mINSERT
103886 [0m in 11.97s]
 [0m15:21:57  5 of 5 START seed file ecomm_raw.clean_olist_products
............................ [RUN]
 [0m15:22:01  5 of 5 OK loaded seed file ecomm_raw.clean_olist_products
....................... [ [32mINSERT 31666 [0m in 4.09s]
 [0m15:22:01  2 of 5 OK loaded seed file ecomm_raw.clean_olist_order_items
..................... [ [32mINSERT 98666 [0m in 16.17s]
 [0m15:22:03  4 of 5 OK loaded seed file ecomm_raw.clean_olist_orders
........................ [ [32mINSERT 99433 [0m in 7.17s]
 [0m15:22:03
 [0m15:22:03  Finished running 5 seeds in 0 hours 0 minutes and 19.02
seconds (19.02s).
 [0m15:22:03
 [0m15:22:03   [32mCompleted successfully [0m
```

```
 [0m15:22:03
 [0m15:22:03  Done. PASS=5 WARN=0 ERROR=0 SKIP=0 TOTAL=5
!!! Running dbt run
 [0m15:22:06  Running with dbt=1.9.3
 [0m15:22:07  Registered adapter: bigquery=1.9.1
 [0m15:22:08  Unable to do partial parsing because config vars, config
profile, or config target have changed
 [0m15:22:08  Unable to do partial parsing because profile has changed
 [0m15:22:11  Found 8 models, 48 data tests, 5 seeds, 5 sources, 874 macros
 [0m15:22:11
 [0m15:22:11  Concurrency: 3 threads (target='dev')
 [0m15:22:11
 [0m15:22:12  1 of 8 START sql table model ecomm_dev.stg_customers
..... [RUN]
 [0m15:22:12  2 of 8 START sql table model ecomm_dev.stg_order_items
..... [RUN]
 [0m15:22:12  3 of 8 START sql table model ecomm_dev.stg_orders
..... [RUN]
 [0m15:22:15  2 of 8 OK created sql table model ecomm_dev.stg_order_items
..... [ [32mCREATE TABLE (98.7k rows, 12.6 MiB
processed) [0m in 3.59s]
 [0m15:22:15  4 of 8 START sql table model ecomm_dev.stg_payments
..... [RUN]
 [0m15:22:15  1 of 8 OK created sql table model ecomm_dev.stg_customers
..... [ [32mCREATE TABLE (96.1k rows, 8.5 MiB
processed) [0m in 3.77s]
 [0m15:22:15  5 of 8 START sql table model ecomm_dev.stg_products
..... [RUN]
 [0m15:22:15  3 of 8 OK created sql table model ecomm_dev.stg_orders
..... [ [32mCREATE TABLE (99.4k rows, 11.2 MiB
processed) [0m in 3.92s]
 [0m15:22:15  6 of 8 START sql view model ecomm_dev.dim_customers
..... [RUN]
 [0m15:22:16  6 of 8 OK created sql view model ecomm_dev.dim_customers
..... [ [32mCREATE VIEW (0 processed) [0m in 0.82s]
 [0m15:22:18  5 of 8 OK created sql table model ecomm_dev.stg_products
..... [ [32mCREATE TABLE (31.7k rows, 2.4 MiB
processed) [0m in 3.04s]
 [0m15:22:18  7 of 8 START sql view model ecomm_dev.dim_products
..... [RUN]
 [0m15:22:19  4 of 8 OK created sql table model ecomm_dev.stg_payments
..... [ [32mCREATE TABLE (103.9k rows, 6.9 MiB
processed) [0m in 3.83s]
 [0m15:22:19  7 of 8 OK created sql view model ecomm_dev.dim_products
..... [ [32mCREATE VIEW (0 processed) [0m in 1.15s]
 [0m15:22:19  8 of 8 START sql table model ecomm_dev.fact_order_items
..... [RUN]
 [0m15:22:26  8 of 8 OK created sql table model ecomm_dev.fact_order_items
..... [ [32mCREATE TABLE (103.1k rows, 39.2 MiB
processed) [0m in 6.03s]
 [0m15:22:26
 [0m15:22:26  Finished running 6 table models, 2 view models in 0 hours 0
minutes and 14.63 seconds (14.63s).
 [0m15:22:26
```

```
 [0m15:22:26   [32mCompleted successfully [0m
 [0m15:22:26
 [0m15:22:26  Done. PASS=8 WARN=0 ERROR=0 SKIP=0 TOTAL=8
Running dbt test
 [0m15:22:28  Running with dbt=1.9.3
 [0m15:22:29  Registered adapter: bigquery=1.9.1
 [0m15:22:30  Found 8 models, 48 data tests, 5 seeds, 5 sources, 874 macros
 [0m15:22:30
 [0m15:22:30  Concurrency: 3 threads (target='dev')
 [0m15:22:30
 [0m15:22:30  1 of 48 START test
accepted_values_stg_customers_customer_state__AC__AL__AM__AP__BA__CE__DF__
ES__GO__MA__MG__MS__MT__PA__PB__PE__PI__PR__RJ__RN__RO__RR__RS__SC__SE__SP
__TO  [RUN]
 [0m15:22:30  2 of 48 START test
accepted_values_stg_orders_order_status__delivered__shipped__canceled__una
vailable__invoiced__processing__created__approved  [RUN]
 [0m15:22:30  3 of 48 START test
accepted_values_stg_payments_payment_type__credit_card__boleto__voucher__d
ebit_card__not_defined  [RUN]
 [0m15:22:32  1 of 48 PASS
accepted_values_stg_customers_customer_state__AC__AL__AM__AP__BA__CE__DF__
ES__GO__MA__MG__MS__MT__PA__PB__PE__PI__PR__RJ__RN__RO__RR__RS__SC__SE__SP
__TO  [ [32mPASS [0m in 1.44s]
 [0m15:22:32  4 of 48 START test check_customer_city_state_consistency
..... [RUN]
 [0m15:22:32  2 of 48 PASS
accepted_values_stg_orders_order_status__delivered__shipped__canceled__una
vailable__invoiced__processing__created__approved  [ [32mPASS [0m in 1.49s]
 [0m15:22:32  5 of 48 START test check_order_items_product_exists
..... [RUN]
 [0m15:22:32  3 of 48 PASS
accepted_values_stg_payments_payment_type__credit_card__boleto__voucher__d
ebit_card__not_defined  [ [32mPASS [0m in 1.62s]
 [0m15:22:32  6 of 48 START test check_order_purchase_date_in_past
..... [RUN]
 [0m15:22:33  4 of 48 FAIL 3015 check_customer_city_state_consistency
..... [ [31mFAIL 3015 [0m in 1.27s]
 [0m15:22:33  7 of 48 START test
dbt_expectations_expect_column_values_to_be_between_stg_order_items_freigh
t_value__0  [RUN]
 [0m15:22:33  6 of 48 PASS check_order_purchase_date_in_past
..... [ [32mPASS [0m in 1.11s]
 [0m15:22:33  8 of 48 START test
dbt_expectations_expect_column_values_to_be_between_stg_order_items_price_
_0  [RUN]
 [0m15:22:33  5 of 48 FAIL 3736 check_order_items_product_exists
..... [ [31mFAIL 3736 [0m in 1.38s]
 [0m15:22:33  9 of 48 START test
dbt_expectations_expect_column_values_to_be_between_stg_payments_payment_v
alue__0  [RUN]
 [0m15:22:34  7 of 48 PASS
dbt_expectations_expect_column_values_to_be_between_stg_order_items_freigh
t_value__0  [ [32mPASS [0m in 1.15s]
```

```
 [0m15:22:34  10 of 48 START test
dbt_expectations_expect_column_values_to_be_of_type_stg_customers_customer
_zip_code_prefix__int64  [RUN]
 [0m15:22:34  8 of 48 PASS
dbt_expectations_expect_column_values_to_be_between_stg_order_items_price_
_0  [ [32mPASS [0m in 1.16s]
 [0m15:22:34  11 of 48 START test
dbt_expectations_expect_column_values_to_be_of_type_stg_orders_order_appro
ved_at__DATETIME  [RUN]
 [0m15:22:35  9 of 48 PASS
dbt_expectations_expect_column_values_to_be_between_stg_payments_payment_v
alue__0  [ [32mPASS [0m in 1.46s]
 [0m15:22:35  12 of 48 START test
dbt_expectations_expect_column_values_to_be_of_type_stg_orders_order_deliv
ered_carrier_date__DATETIME  [RUN]
 [0m15:22:35  11 of 48 PASS
dbt_expectations_expect_column_values_to_be_of_type_stg_orders_order_appro
ved_at__DATETIME  [ [32mPASS [0m in 1.11s]
 [0m15:22:35  13 of 48 START test
dbt_expectations_expect_column_values_to_be_of_type_stg_orders_order_deliv
ered_customer_date__DATETIME  [RUN]
 [0m15:22:35  10 of 48 PASS
dbt_expectations_expect_column_values_to_be_of_type_stg_customers_customer
_zip_code_prefix__int64  [ [32mPASS [0m in 1.16s]
 [0m15:22:35  14 of 48 START test
dbt_expectations_expect_column_values_to_be_of_type_stg_orders_order_estim
ated_delivery_date__DATETIME  [RUN]
 [0m15:22:36  12 of 48 PASS
dbt_expectations_expect_column_values_to_be_of_type_stg_orders_order_deliv
ered_carrier_date__DATETIME  [ [32mPASS [0m in 1.01s]
 [0m15:22:36  15 of 48 START test
dbt_expectations_expect_column_values_to_be_of_type_stg_orders_order_purch
ase_timestamp__DATETIME  [RUN]
 [0m15:22:36  14 of 48 PASS
dbt_expectations_expect_column_values_to_be_of_type_stg_orders_order_estim
ated_delivery_date__DATETIME  [ [32mPASS [0m in 1.09s]
 [0m15:22:36  16 of 48 START test
dbt_expectations_expect_column_values_to_be_of_type_stg_payments_payment_i
nstallments__int64  [RUN]
 [0m15:22:36  13 of 48 PASS
dbt_expectations_expect_column_values_to_be_of_type_stg_orders_order_deliv
ered_customer_date__DATETIME  [ [32mPASS [0m in 1.14s]
 [0m15:22:36  17 of 48 START test
dbt_expectations_expect_column_values_to_be_of_type_stg_payments_payment_s
equential__int64  [RUN]
 [0m15:22:37  15 of 48 PASS
dbt_expectations_expect_column_values_to_be_of_type_stg_orders_order_purch
ase_timestamp__DATETIME  [ [32mPASS [0m in 0.96s]
 [0m15:22:37  18 of 48 START test
dbt_expectations_expect_column_values_to_be_of_type_stg_products_product_h
eight_cm__float64  [RUN]
 [0m15:22:37  17 of 48 PASS
dbt_expectations_expect_column_values_to_be_of_type_stg_payments_payment_s
equential__int64  [ [32mPASS [0m in 0.99s]
```

```
 [0m15:22:38  19 of 48 START test
dbt_expectations_expect_column_values_to_be_of_type_stg_products_product_l
ength_cm__float64  [RUN]
 [0m15:22:38  16 of 48 PASS
dbt_expectations_expect_column_values_to_be_of_type_stg_payments_payment_i
nstallments__int64  [ [32mPASS [0m in 1.38s]
 [0m15:22:38  20 of 48 START test
dbt_expectations_expect_column_values_to_be_of_type_stg_products_product_w
eight_g__float64  [RUN]
 [0m15:22:38  18 of 48 PASS
dbt_expectations_expect_column_values_to_be_of_type_stg_products_product_h
eight_cm__float64  [ [32mPASS [0m in 1.24s]
 [0m15:22:38  21 of 48 START test
dbt_expectations_expect_column_values_to_be_of_type_stg_products_product_w
idth_cm__float64  [RUN]
 [0m15:22:38  19 of 48 PASS
dbt_expectations_expect_column_values_to_be_of_type_stg_products_product_l
ength_cm__float64  [ [32mPASS [0m in 0.94s]
 [0m15:22:38  22 of 48 START test not_null_stg_customers_customer_city
..................... [RUN]
 [0m15:22:39  20 of 48 PASS
dbt_expectations_expect_column_values_to_be_of_type_stg_products_product_w
eight_g__float64  [ [32mPASS [0m in 1.16s]
 [0m15:22:39  23 of 48 START test not_null_stg_customers_customer_id
..................... [RUN]
 [0m15:22:39  21 of 48 PASS
dbt_expectations_expect_column_values_to_be_of_type_stg_products_product_w
idth_cm__float64  [ [32mPASS [0m in 1.17s]
 [0m15:22:39  24 of 48 START test not_null_stg_customers_customer_state
..................... [RUN]
 [0m15:22:39  22 of 48 PASS not_null_stg_customers_customer_city
..................... [ [32mPASS [0m in 1.01s]
 [0m15:22:39  25 of 48 START test not_null_stg_customers_customer_unique_id
..................... [RUN]
 [0m15:22:40  24 of 48 PASS not_null_stg_customers_customer_state
..................... [ [32mPASS [0m in 1.07s]
 [0m15:22:40  26 of 48 START test not_null_stg_order_items_freight_value
..................... [RUN]
 [0m15:22:40  23 of 48 PASS not_null_stg_customers_customer_id
..................... [ [32mPASS [0m in 1.17s]
 [0m15:22:40  27 of 48 START test not_null_stg_order_items_order_id
..................... [RUN]
 [0m15:22:41  25 of 48 PASS not_null_stg_customers_customer_unique_id
..................... [ [32mPASS [0m in 1.31s]
 [0m15:22:41  28 of 48 START test not_null_stg_order_items_order_item_id
..................... [RUN]
 [0m15:22:41  27 of 48 PASS not_null_stg_order_items_order_id
..................... [ [32mPASS [0m in 1.09s]
 [0m15:22:41  29 of 48 START test not_null_stg_order_items_price
..................... [RUN]
 [0m15:22:42  26 of 48 PASS not_null_stg_order_items_freight_value
..................... [ [32mPASS [0m in 1.53s]
 [0m15:22:42  30 of 48 START test not_null_stg_orders_customer_id
..................... [RUN]
```

```
 [0m15:22:42  28 of 48 PASS not_null_stg_order_items_order_item_id
..... [ [32mPASS [0m in 1.07s]
 [0m15:22:42  31 of 48 START test
not_null_stg_orders_order_estimated_delivery_date ..... [RUN]
 [0m15:22:42  29 of 48 PASS not_null_stg_order_items_price
..... [ [32mPASS [0m in 1.05s]
 [0m15:22:42  32 of 48 START test not_null_stg_orders_order_id
..... [RUN]
 [0m15:22:43  31 of 48 PASS
not_null_stg_orders_order_estimated_delivery_date .....
[ [32mPASS [0m in 1.04s]
 [0m15:22:43  33 of 48 START test
not_null_stg_orders_order_purchase_timestamp ..... [RUN]
 [0m15:22:43  30 of 48 PASS not_null_stg_orders_customer_id
..... [ [32mPASS [0m in 1.28s]
 [0m15:22:43  34 of 48 START test not_null_stg_orders_order_status
..... [RUN]
 [0m15:22:43  32 of 48 PASS not_null_stg_orders_order_id
..... [ [32mPASS [0m in 1.11s]
 [0m15:22:43  35 of 48 START test not_null_stg_payments_order_id
..... [RUN]
 [0m15:22:44  33 of 48 PASS not_null_stg_orders_order_purchase_timestamp
..... [ [32mPASS [0m in 1.01s]
 [0m15:22:44  36 of 48 START test
not_null_stg_payments_payment_installments ..... [RUN]
 [0m15:22:44  34 of 48 PASS not_null_stg_orders_order_status
..... [ [32mPASS [0m in 1.27s]
 [0m15:22:44  37 of 48 START test not_null_stg_payments_payment_sequential
..... [RUN]
 [0m15:22:45  35 of 48 PASS not_null_stg_payments_order_id
..... [ [32mPASS [0m in 1.23s]
 [0m15:22:45  38 of 48 START test not_null_stg_payments_payment_type
..... [RUN]
 [0m15:22:45  36 of 48 PASS not_null_stg_payments_payment_installments
..... [ [32mPASS [0m in 1.20s]
 [0m15:22:45  39 of 48 START test not_null_stg_payments_payment_value
..... [RUN]
 [0m15:22:45  37 of 48 PASS not_null_stg_payments_payment_sequential
..... [ [32mPASS [0m in 1.23s]
 [0m15:22:45  40 of 48 START test
not_null_stg_products_product_category_name ..... [RUN]
 [0m15:22:46  38 of 48 PASS not_null_stg_payments_payment_type
..... [ [32mPASS [0m in 1.08s]
 [0m15:22:46  41 of 48 START test not_null_stg_products_product_height_cm
..... [RUN]
 [0m15:22:46  39 of 48 PASS not_null_stg_payments_payment_value
..... [ [32mPASS [0m in 1.07s]
 [0m15:22:46  42 of 48 START test not_null_stg_products_product_id
..... [RUN]
 [0m15:22:47  40 of 48 PASS not_null_stg_products_product_category_name
..... [ [32mPASS [0m in 1.19s]
 [0m15:22:47  43 of 48 START test not_null_stg_products_product_length_cm
..... [RUN]
 [0m15:22:47  41 of 48 PASS not_null_stg_products_product_height_cm
```

```
.......................... [ [32mPASS [0m in 1.14s]
 [0m15:22:47  44 of 48 START test not_null_stg_products_product_weight_g
...................... [RUN]
 [0m15:22:47  42 of 48 PASS not_null_stg_products_product_id
................................... [ [32mPASS [0m in 1.03s]
 [0m15:22:47  45 of 48 START test not_null_stg_products_product_width_cm
...................... [RUN]
 [0m15:22:48  44 of 48 PASS not_null_stg_products_product_weight_g
.......................... [ [32mPASS [0m in 1.03s]
 [0m15:22:48  46 of 48 START test unique_stg_customers_customer_id
.......................... [RUN]
 [0m15:22:48  43 of 48 PASS not_null_stg_products_product_length_cm
.......................... [ [32mPASS [0m in 1.49s]
 [0m15:22:48  47 of 48 START test unique_stg_orders_order_id
................................... [RUN]
 [0m15:22:48  45 of 48 PASS not_null_stg_products_product_width_cm
.......................... [ [32mPASS [0m in 1.08s]
 [0m15:22:48  48 of 48 START test unique_stg_products_product_id
.............................. [RUN]
 [0m15:22:49  46 of 48 PASS unique_stg_customers_customer_id
................................ [ [32mPASS [0m in 1.34s]
 [0m15:22:49  47 of 48 PASS unique_stg_orders_order_id
...................................... [ [32mPASS [0m in 1.29s]
 [0m15:22:50  48 of 48 PASS unique_stg_products_product_id
................................... [ [32mPASS [0m in 1.48s]
 [0m15:22:50
 [0m15:22:50  Finished running 48 data tests in 0 hours 0 minutes and 19.80
seconds (19.80s).
 [0m15:22:50
 [0m15:22:50   [31mCompleted with 2 errors, 0 partial successes, and 0
warnings: [0m
 [0m15:22:50
 [0m15:22:50   [31mFailure in test check_customer_city_state_consistency
(tests/singular/check_customer_city_state_consistency.sql) [0m
 [0m15:22:50    Got 3015 results, configured to fail if != 0
 [0m15:22:50
 [0m15:22:50    compiled code at
target/compiled/dbt_ecomm/tests/singular/check_customer_city_state_consist
ency.sql
 [0m15:22:50
 [0m15:22:50   [31mFailure in test check_order_items_product_exists
(tests/singular/check_order_items_product_exists.sql) [0m
 [0m15:22:50    Got 3736 results, configured to fail if != 0
 [0m15:22:50
 [0m15:22:50    compiled code at
target/compiled/dbt_ecomm/tests/singular/check_order_items_product_exists.
sql
 [0m15:22:50
 [0m15:22:50  Done. PASS=46 WARN=0 ERROR=2 SKIP=0 TOTAL=48
!!! Cleaning dbt environment after transformation
 [0m15:22:52  Running with dbt=1.9.3
 [0m15:22:52  Checking /home/runner/work/module2-project/module2-
project/dbt_ecomm/dbt_packages/*
 [0m15:22:52  Cleaned /home/runner/work/module2-project/module2-
```

```
project/dbt_ecomm/dbt_packages/*
 [0m15:22:52  Checking /home/runner/work/module2-project/module2-
project/dbt_ecomm/target/*
 [0m15:22:52  Cleaned /home/runner/work/module2-project/module2-
project/dbt_ecomm/target/*
 [0m15:22:52  Finished cleaning all paths.
!!! ELT Process COMPLETED !!!

Check full logs here: https://github.com/sustaincode/module2-
project/actions/runs/14132224388
```

## 11.4 **References**

### Kaggle

- https://www.kaggle.com/datasets/olistbr/brazilian-ecommerce?select=olist_customers_dataset.csv
- https://drlee.io/unlock-the-power-of-kaggle-how-to-call-datasets-directly-with-python-and-rule-the-data-science-2303cbae4e8a

### BigQuery

- https://www.rudderstack.com/guides/how-to-access-and-query-your-bigquery-data-using-python-and-r/
- https://cloud.google.com/iam/docs/keys-create-delete#creating

### dbt

- https://docs.getdbt.com/docs/core/connect-data-platform/duckdb-setup
- https://docs.getdbt.com/docs/core/connect-data-platform/bigquery-setup
- https://docs.getdbt.com/guides/bigquery?step=1
- https://mbvyn.medium.com/understanding-dbt-seeds-and-sources-c5611be17d32
- https://docs.getdbt.com/reference/seed-configs

### Github Actions

- https://docs.github.com/en/actions/writing-workflows/quickstart
- https://docs.github.com/en/actions/security-for-github-actions/security-guides/using-secrets-in-github-actions
- https://chatgpt.com/share/67e4e54f-b340-8000-8d01-fce47c0f4870

### Slides

- https://slidesgo.com/