# Data Flow Pipeline

**Read** → **Transform** → **Validate** → **Export**

**Read**

orders.csv

customers.csv

**Transform**
- Standardize columns
- Convert types
- Add total_ amount
- Merge DataFrames
- Normalize country
- Categoriz VIP

**Validate**
- unique key
- no nulls
- positive values
- valid email
- allowed status
- date not future
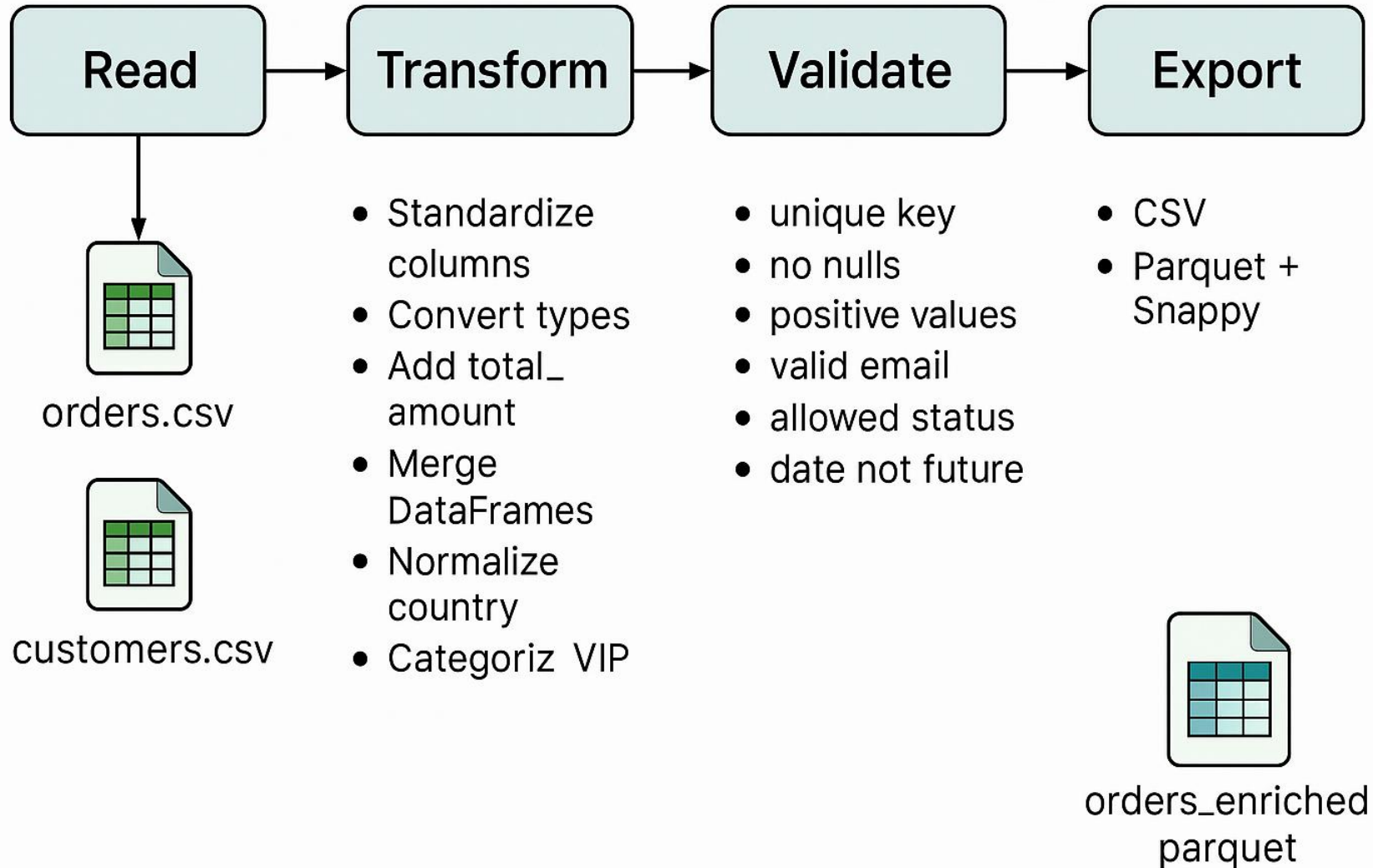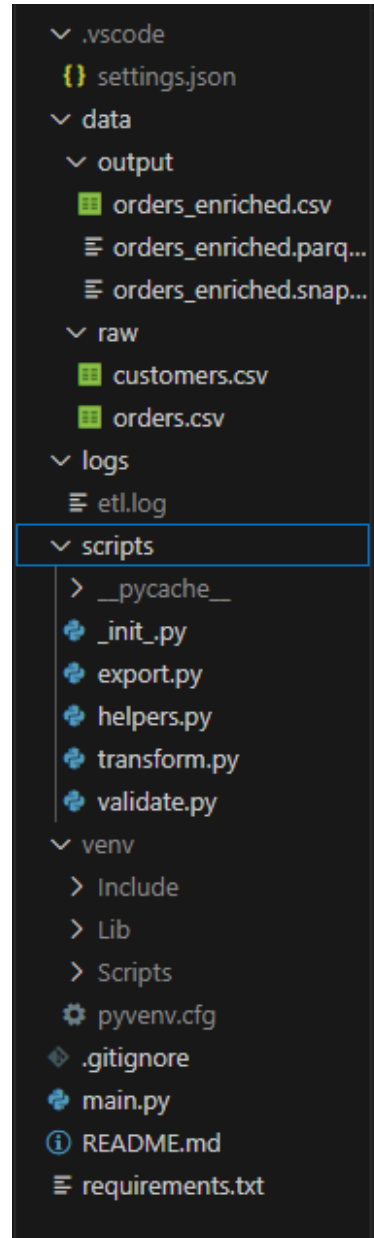
**Export**
- CSV
- Parquet + Snappy

orders_enriched parquet

# Folders Structure

# Data Raw (orders.csv)

```
data > raw > 📊 orders.csv > 🗋 data
  1    order_id,customer_id,order_date,quantity,unit_price,status
  2    101,1,2023-07-10,3,150,completed
  3    102,2,2023-07-11,1,1200,pending
  4    103,3,2023-07-12,5,200,cancelled
  5    104,4,2023-07-13,2,750,completed
  6    105,5,2023-07-14,10,80,pending
  7    106,6,2023-07-15,4,300,completed
  8    107,7,2023-07-16,6,180,pending
  9    108,8,2023-07-17,3,950,cancelled
 10    109,9,2023-07-18,8,110,completed
 11    110,10,2023-07-19,2,1000,pending
 12    111,11,2023-07-20,1,2200,completed
 13    112,12,2023-07-21,7,140,completed
 14    113,13,2023-07-22,5,210,pending
 15    114,14,2023-07-23,2,1300,cancelled
 16    115,15,2023-07-24,9,95,completed
 17    116,16,2023-07-25,3,400,completed
 18    117,17,2023-07-26,4,275,pending
 19    118,18,2023-07-27,1,850,cancelled
 20    119,19,2023-07-28,6,160,completed
 21    120,20,2023-07-29,2,1250,pending
 22    121,21,2023-07-30,10,70,cancelled
 23    122,22,2023-07-31,3,300,completed
 24    123,23,2023-08-01,2,1450,pending
 25    124,24,2023-08-02,4,220,cancelled
 26    125,25,2023-08-03,5,195,completed
 27    126,26,2023-08-04,3,180,pending
 28    127,27,2023-08-05,6,250,completed
 29    128,28,2023-08-06,1,999,completed
 30    129,29,2023-08-07,2,600,cancelled
 31    130,30,2023-08-08,3,1100,pending
 32
```

# Data Raw (customers.csv)

```
data > raw > ▦ customers.csv > 🗋 data
  1   customer_id,name,email,country
  2   1,Lucas Pereira,lucas.pereira@mail.com,Brazil
  3   2,Emma Torres,emma.torres@mail.com,Argentina
  4   3,Noah Jiménez,noah.jimenez@mail.com,Mexico
  5   4,Sofía Rivas,sofia.rivas@mail.com,Colombia
  6   5,Mateo Duarte,mateo.duarte@mail.com,Chile
  7   6,Valentina Álvarez,valentina.alvarez@mail.com,Peru
  8   7,Thiago Guzmán,thiago.guzman@mail.com,Brazil
  9   8,Camila Herrera,camila.herrera@mail.com,Argentina
 10   9,Benjamín Vega,benjamin.vega@mail.com,Chile
 11   10,Isabella Cruz,isabella.cruz@mail.com,Mexico
 12   11,Martín Paredes,martin.paredes@mail.com,Colombia
 13   12,Antonella Mora,antonella.mora@mail.com,Peru
 14   13,Joaquín Ramírez,joaquin.ramirez@mail.com,Brazil
 15   14,Abril Navarro,abril.navarro@mail.com,Argentina
 16   15,Santiago León,santiago.leon@mail.com,Mexico
 17   16,Aitana Cordero,aitana.cordero@mail.com,Chile
 18   17,Emilio Vargas,emilio.vargas@mail.com,Colombia
 19   18,Josefina Peña,josefina.pena@mail.com,Peru
 20   19,Facundo Bravo,facundo.bravo@mail.com,Argentina
 21   20,Regina Campos,regina.campos@mail.com,Mexico
 22   21,Iker Castillo,iker.castillo@mail.com,Colombia
 23   22,Zoe Medina,zoe.medina@mail.com,Chile
 24   23,Bruno Salinas,bruno.salinas@mail.com,Peru
 25   24,Renata Cabrera,renata.cabrera@mail.com,Brazil
 26   25,Luciano Torres,luciano.torres@mail.com,Argentina
 27   26,Mía Aguirre,mia.aguirre@mail.com,Mexico
 28   27,Gaspar Molina,gaspar.molina@mail.com,Chile
 29   28,Catalina Ríos,catalina.rios@mail.com,Colombia
 30   29,Elías Blanco,elias.blanco@mail.com,Peru
 31   30,Julieta Silva,julieta.silva@mail.com,Brazil
 32   |
```

# requirements.txt

```
requirements.txt
1    pandas==2.2.2
2    boto3==1.34.124
3    python-dateutil==2.9.0
4    pyarrow==15.0.2
5
```

# transform.py

```python
scripts > transform.py > ...
1    import pandas as pd
2
3    def standardize_column_names(df: pd.DataFrame) -> pd.DataFrame:
4        df.columns = df.columns.str.strip().str.lower().str.replace(" ", "_")
5        return df
6
7    def convert_types(df: pd.DataFrame) -> pd.DataFrame:
8        df["order_date"] = pd.to_datetime(df["order_date"], errors="coerce")
9        df["quantity"] = pd.to_numeric(df["quantity"], errors="coerce")
10       df["unit_price"] = pd.to_numeric(df["unit_price"], errors="coerce")
11       return df
12
13   def add_total_amount(df: pd.DataFrame) -> pd.DataFrame:
14       df["total_amount"] = df["quantity"] * df["unit_price"]
15       return df
16
17   def merge_orders_customers(df_orders: pd.DataFrame, df_customers: pd.DataFrame) -> pd.DataFrame:
18       return df_orders.merge(df_customers, on="customer_id", how="left")
19
20   def normalize_country(df: pd.DataFrame) -> pd.DataFrame:
21       df["country"] = df["country"].str.strip().str.upper()
22       return df
23
24   def categorize_vip(df: pd.DataFrame) -> pd.DataFrame:
25       df["vip"] = df["total_amount"] > 1000
26       return df
27
```

# validate.py

```python
scripts > 🐍 validate.py > ...
  1  import re
  2  import pandas as pd
  3
  4  def unique_key(df: pd.DataFrame, column: str):
  5      if not df[column].is_unique:
  6          raise ValueError(f"La columna {column} tiene valores duplicados.")
  7
  8  def no_nulls(df: pd.DataFrame, columns: list):
  9      for col in columns:
 10          if df[col].isnull().any():
 11              raise ValueError(f"La columna {col} tiene valores nulos.")
 12
 13  def positive_values(df: pd.DataFrame, columns: list):
 14      for col in columns:
 15          if (df[col] <= 0).any():
 16              raise ValueError(f"La columna {col} tiene valores menores o iguales a 0.")
 17
 18  def valid_email(df: pd.DataFrame):
 19      pattern = r"[^@]+@[^@]+\.[^@]+"
 20      if not df["email"].apply(lambda x: bool(re.match(pattern, str(x)))).all():
 21          raise ValueError("Hay emails inválidos en la columna 'email'.")
 22
 23  def allowed_status(df: pd.DataFrame):
 24      allowed = {"completed", "pending", "cancelled"}
 25      if not df["status"].isin(allowed).all():
 26          raise ValueError("Hay valores no permitidos en la columna 'status'.")
 27
 28  def date_not_future(df: pd.DataFrame, column: str):
 29      if (df[column] > pd.Timestamp.today()).any():
 30          raise ValueError(f"Hay fechas futuras en la columna {column}.")
 31
```

# main.py (parte 1)

```python
main.py > ...
  1   import argparse
  2   import pandas as pd
  3   from pathlib import Path
  4   import logging
  5
  6   # Importar funciones desde los scripts
  7   from scripts.transform import (
  8       standardize_column_names,
  9       convert_types,
 10       add_total_amount,
 11       merge_orders_customers,
 12       normalize_country,
 13       categorize_vip
 14   )
 15   from scripts.validate import (
 16       unique_key,
 17       no_nulls,
 18       positive_values,
 19       valid_email,
 20       allowed_status,
 21       date_not_future
 22   )
 23   from scripts.export import export_df
 24
 25   # Configurar logging
 26   logging.basicConfig(
 27       filename="logs/etl.log",
 28       level=logging.INFO,
 29       format="%(asctime)s - %(levelname)s - %(message)s"
 30   )
 31
 32   def main(orders_path, customers_path, output_path, output_format):
 33       try:
 34           logging.info("Proceso ETL iniciado.")
 35
 36           # Leer datos
 37           df_orders = pd.read_csv(orders_path)
 38           df_customers = pd.read_csv(customers_path)
 39
 40           # Transformaciones
 41           df_orders = standardize_column_names(df_orders)
 42           df_customers = standardize_column_names(df_customers)
 43
 44           df_orders = convert_types(df_orders)
 45           df_orders = add_total_amount(df_orders)
 46
```

# main.py (parte 2)

```python
            df = merge_orders_customers(df_orders, df_customers)
            df = normalize_country(df)
            df = categorize_vip(df)

            # Validaciones
            unique_key(df, "order_id")
            no_nulls(df, ["order_id", "order_date", "customer_id", "email"])
            positive_values(df, ["quantity", "unit_price", "total_amount"])
            valid_email(df)
            allowed_status(df)
            date_not_future(df, "order_date")

            # Exportar en tres formatos
            output_path = Path(output_path)

            # Exportar CSV
            export_df(df, output_path.with_suffix(".csv"), "csv")

            # Exportar Parquet sin compresión
            export_df(df, output_path.with_suffix(".parquet"), "parquet")

            # Exportar Parquet con compresión Snappy
            export_df(df, output_path.with_name(output_path.stem + ".snappy.parquet"), "parquet", compression="snappy")

            logging.info("Proceso ETL finalizado exitosamente.")
            print("✅ Proceso completado. Archivos exportados en tres formatos.")

    except Exception as e:
        logging.error(f"Error en el proceso ETL: {e}")
        print("❌ Error durante la ejecución:", e)

if __name__ == "__main__":
    parser = argparse.ArgumentParser(description="Script ETL")
    parser.add_argument("--orders", required=True, help="Ruta del archivo de pedidos")
    parser.add_argument("--customers", required=True, help="Ruta del archivo de clientes")
    parser.add_argument("--output", required=True, help="Ruta de salida del archivo transformado")
    parser.add_argument("--format", required=False, default="csv", choices=["csv", "parquet"], help="Formato de salida")

    args = parser.parse_args()

    main(args.orders, args.customers, args.output, args.format)
```

# export.py

```python
scripts > export.py > ...
1    import pandas as pd
2    from pathlib import Path
3
4    def export_df(df, output_path, output_format="csv", compression=None):
5        if output_format == "csv":
6            df.to_csv(output_path, index=False)
7        elif output_format == "parquet":
8            df.to_parquet(output_path, index=False, compression=compression)
9        else:
10           raise ValueError("Formato de exportación no soportado.")
11
```

# etl.log

```
logs >  ≡ etl.log
  1    2025-07-18 09:29:22,118 - INFO - Proceso ETL iniciado.
  2    2025-07-18 09:29:22,158 - ERROR - Error en el proceso ETL: 'status'
  3    2025-07-18 09:29:40,628 - INFO - Proceso ETL iniciado.
  4    2025-07-18 09:29:40,644 - ERROR - Error en el proceso ETL: 'status'
  5    2025-07-18 09:35:17,654 - INFO - Proceso ETL iniciado.
  6    2025-07-18 09:35:17,670 - ERROR - Error en el proceso ETL: 'order_date'
  7    2025-07-18 09:37:18,052 - INFO - Proceso ETL iniciado.
  8    2025-07-18 09:37:18,068 - ERROR - Error en el proceso ETL: 'unit_price'
  9    2025-07-18 09:37:40,560 - INFO - Proceso ETL iniciado.
 10    2025-07-18 09:37:40,994 - INFO - Proceso ETL finalizado exitosamente.
 11    2025-07-18 09:40:40,682 - INFO - Proceso ETL iniciado.
 12    2025-07-18 09:40:40,714 - INFO - Proceso ETL finalizado exitosamente.
 13    2025-07-18 10:26:51,302 - INFO - Proceso ETL iniciado.
 14    2025-07-18 10:26:51,535 - ERROR - Error en el proceso ETL: export_df() got an unexpected keyword argument 'compression'
 15    2025-07-18 10:58:45,307 - INFO - Proceso ETL iniciado.
 16    2025-07-18 10:58:45,308 - ERROR - Error en el proceso ETL: [Errno 2] No such file or directory: 'data/orders.csv'
 17    2025-07-18 10:59:01,759 - INFO - Proceso ETL iniciado.
 18    2025-07-18 10:59:01,759 - ERROR - Error en el proceso ETL: [Errno 2] No such file or directory: 'data/orders.csv'
 19    2025-07-18 11:06:16,117 - INFO - Proceso ETL iniciado.
 20    2025-07-18 11:06:16,150 - INFO - Proceso ETL finalizado exitosamente.
 21
```

# Data Output (.csv)

```
data > output > orders_enriched.csv > data
  1   order_id,customer_id,order_date,quantity,unit_price,status,total_amount,name,email,country,vip
  2   101,1,2023-07-10,3,150,completed,450,Lucas Pereira,lucas.pereira@mail.com,BRAZIL,False
  3   102,2,2023-07-11,1,1200,pending,1200,Emma Torres,emma.torres@mail.com,ARGENTINA,True
  4   103,3,2023-07-12,5,200,cancelled,1000,Noah Jiménez,noah.jimenez@mail.com,MEXICO,False
  5   104,4,2023-07-13,2,750,completed,1500,Sofía Rivas,sofia.rivas@mail.com,COLOMBIA,True
  6   105,5,2023-07-14,10,80,pending,800,Mateo Duarte,mateo.duarte@mail.com,CHILE,False
  7   106,6,2023-07-15,4,300,completed,1200,Valentina Álvarez,valentina.alvarez@mail.com,PERU,True
  8   107,7,2023-07-16,6,180,pending,1080,Thiago Guzmán,thiago.guzman@mail.com,BRAZIL,True
  9   108,8,2023-07-17,3,950,cancelled,2850,Camila Herrera,camila.herrera@mail.com,ARGENTINA,True
 10   109,9,2023-07-18,8,110,completed,880,Benjamín Vega,benjamin.vega@mail.com,CHILE,False
 11   110,10,2023-07-19,2,1000,pending,2000,Isabella Cruz,isabella.cruz@mail.com,MEXICO,True
 12   111,11,2023-07-20,1,2200,completed,2200,Martín Paredes,martin.paredes@mail.com,COLOMBIA,True
 13   112,12,2023-07-21,7,140,completed,980,Antonella Mora,antonella.mora@mail.com,PERU,False
 14   113,13,2023-07-22,5,210,pending,1050,Joaquín Ramírez,joaquin.ramirez@mail.com,BRAZIL,True
 15   114,14,2023-07-23,2,1300,cancelled,2600,Abril Navarro,abril.navarro@mail.com,ARGENTINA,True
 16   115,15,2023-07-24,9,95,completed,855,Santiago León,santiago.leon@mail.com,MEXICO,False
 17   116,16,2023-07-25,3,400,completed,1200,Aitana Cordero,aitana.cordero@mail.com,CHILE,True
 18   117,17,2023-07-26,4,275,pending,1100,Emilio Vargas,emilio.vargas@mail.com,COLOMBIA,True
 19   118,18,2023-07-27,1,850,cancelled,850,Josefina Peña,josefina.pena@mail.com,PERU,False
 20   119,19,2023-07-28,6,160,completed,960,Facundo Bravo,facundo.bravo@mail.com,ARGENTINA,False
 21   120,20,2023-07-29,2,1250,pending,2500,Regina Campos,regina.campos@mail.com,MEXICO,True
 22   121,21,2023-07-30,10,70,cancelled,700,Iker Castillo,iker.castillo@mail.com,COLOMBIA,False
 23   122,22,2023-07-31,3,300,completed,900,Zoe Medina,zoe.medina@mail.com,CHILE,False
 24   123,23,2023-08-01,2,1450,pending,2900,Bruno Salinas,bruno.salinas@mail.com,PERU,True
 25   124,24,2023-08-02,4,220,cancelled,880,Renata Cabrera,renata.cabrera@mail.com,BRAZIL,False
 26   125,25,2023-08-03,5,195,completed,975,Luciano Torres,luciano.torres@mail.com,ARGENTINA,False
 27   126,26,2023-08-04,3,180,pending,540,Mía Aguirre,mia.aguirre@mail.com,MEXICO,False
 28   127,27,2023-08-05,6,250,completed,1500,Gaspar Molina,gaspar.molina@mail.com,CHILE,True
 29   128,28,2023-08-06,1,999,completed,999,Catalina Ríos,catalina.rios@mail.com,COLOMBIA,False
 30   129,29,2023-08-07,2,600,cancelled,1200,Elías Blanco,elias.blanco@mail.com,PERU,True
 31   130,30,2023-08-08,3,1100,pending,3300,Julieta Silva,julieta.silva@mail.com,BRAZIL,True
 32
```

# Data Output (.parquet)

```
1   {"order_id":101,"customer_id":1,"order_date":1688947200000,"quantity":3,"unit_price":150,"status":"completed","total_amount":450,"name":"Lucas Pereira","email":"lucas.pereira@mail.com","country"
2   {"order_id":102,"customer_id":2,"order_date":1689033600000,"quantity":1,"unit_price":1200,"status":"pending","total_amount":1200,"name":"Emma Torres","email":"emma.torres@mail.com","country":"A
3   {"order_id":103,"customer_id":3,"order_date":1689120000000,"quantity":5,"unit_price":200,"status":"cancelled","total_amount":1000,"name":"Noah Jiménez","email":"noah.jimenez@mail.com","country"
4   {"order_id":104,"customer_id":4,"order_date":1689206400000,"quantity":2,"unit_price":750,"status":"completed","total_amount":1500,"name":"Sofía Rivas","email":"sofia.rivas@mail.com","country":"
5   {"order_id":105,"customer_id":5,"order_date":1689292800000,"quantity":10,"unit_price":80,"status":"completed","total_amount":800,"name":"Mateo Duarte","email":"mateo.duarte@mail.com","country":"C
6   {"order_id":106,"customer_id":6,"order_date":1689379200000,"quantity":4,"unit_price":300,"status":"completed","total_amount":1200,"name":"Valentina Álvarez","email":"valentina.alvarez@mail.com"
7   {"order_id":107,"customer_id":7,"order_date":1689465600000,"quantity":6,"unit_price":180,"status":"pending","total_amount":1080,"name":"Thiago Guzmán","email":"thiago.guzman@mail.com","country"
8   {"order_id":108,"customer_id":8,"order_date":1689552000000,"quantity":3,"unit_price":950,"status":"cancelled","total_amount":2850,"name":"Camila Herrera","email":"camila.herrera@mail.com","coun
9   {"order_id":109,"customer_id":9,"order_date":1689638400000,"quantity":8,"unit_price":110,"status":"completed","total_amount":880,"name":"Benjamín Vega","email":"benjamin.vega@mail.com","country
10  {"order_id":110,"customer_id":10,"order_date":1689724800000,"quantity":2,"unit_price":1000,"status":"pending","total_amount":2000,"name":"Isabella Cruz","email":"isabella.cruz@mail.com","countr
11  {"order_id":111,"customer_id":11,"order_date":1689811200000,"quantity":1,"unit_price":2200,"status":"completed","total_amount":2200,"name":"Martín Paredes","email":"martin.paredes@mail.com","co
12  {"order_id":112,"customer_id":12,"order_date":1689897600000,"quantity":7,"unit_price":140,"status":"completed","total_amount":980,"name":"Antonella Mora","email":"antonella.mora@mail.com","coun
13  {"order_id":113,"customer_id":13,"order_date":1689984000000,"quantity":5,"unit_price":210,"status":"pending","total_amount":1050,"name":"Joaquín Ramírez","email":"joaquin.ramirez@mail.com","cou
14  {"order_id":114,"customer_id":14,"order_date":1690070400000,"quantity":2,"unit_price":1300,"status":"cancelled","total_amount":2600,"name":"Abril Navarro","email":"abril.navarro@mail.com","coun
15  {"order_id":115,"customer_id":15,"order_date":1690156800000,"quantity":9,"unit_price":95,"status":"completed","total_amount":855,"name":"Santiago León","email":"santiago.leon@mail.com","country
16  {"order_id":116,"customer_id":16,"order_date":1690243200000,"quantity":3,"unit_price":400,"status":"completed","total_amount":1200,"name":"Aitana Cordero","email":"aitana.cordero@mail.com","cou
17  {"order_id":117,"customer_id":17,"order_date":1690329600000,"quantity":4,"unit_price":275,"status":"pending","total_amount":1100,"name":"Emilio Vargas","email":"emilio.vargas@mail.com","country
18  {"order_id":118,"customer_id":18,"order_date":1690416000000,"quantity":1,"unit_price":850,"status":"cancelled","total_amount":850,"name":"Josefina Peña","email":"josefina.pena@mail.com","countr
19  {"order_id":119,"customer_id":19,"order_date":1690502400000,"quantity":6,"unit_price":160,"status":"completed","total_amount":960,"name":"Facundo Bravo","email":"facundo.bravo@mail.com","countr
20  {"order_id":120,"customer_id":20,"order_date":1690588800000,"quantity":2,"unit_price":1250,"status":"pending","total_amount":2500,"name":"Regina Campos","email":"regina.campos@mail.com","countr
21  {"order_id":121,"customer_id":21,"order_date":1690675200000,"quantity":10,"unit_price":70,"status":"cancelled","total_amount":700,"name":"Iker Castillo","email":"iker.castillo@mail.com","countr
22  {"order_id":122,"customer_id":22,"order_date":1690761600000,"quantity":3,"unit_price":300,"status":"completed","total_amount":900,"name":"Zoe Medina","email":"zoe.medina@mail.com","country":"CH
23  {"order_id":123,"customer_id":23,"order_date":1690848000000,"quantity":2,"unit_price":1450,"status":"pending","total_amount":2900,"name":"Bruno Salinas","email":"bruno.salinas@mail.com","countr
24  {"order_id":124,"customer_id":24,"order_date":1690934400000,"quantity":4,"unit_price":220,"status":"cancelled","total_amount":880,"name":"Renata Cabrera","email":"renata.cabrera@mail.com","coun
25  {"order_id":125,"customer_id":25,"order_date":1691020800000,"quantity":5,"unit_price":195,"status":"completed","total_amount":975,"name":"Luciano Torres","email":"luciano.torres@mail.com","coun
26  {"order_id":126,"customer_id":26,"order_date":1691107200000,"quantity":3,"unit_price":180,"status":"pending","total_amount":540,"name":"Mía Aguirre","email":"mia.aguirre@mail.com","country":"ME
27  {"order_id":127,"customer_id":27,"order_date":1691193600000,"quantity":6,"unit_price":250,"status":"completed","total_amount":1500,"name":"Gaspar Molina","email":"gaspar.molina@mail.com","count
28  {"order_id":128,"customer_id":28,"order_date":1691280000000,"quantity":1,"unit_price":999,"status":"completed","total_amount":999,"name":"Catalina Ríos","email":"catalina.rios@mail.com","countr
29  {"order_id":129,"customer_id":29,"order_date":1691366400000,"quantity":2,"unit_price":600,"status":"cancelled","total_amount":1200,"name":"Elías Blanco","email":"elias.blanco@mail.com","country
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# Data Output (.snappy)

orders_enriched.snappy.parquet.as.json

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8   {"order_id":108,"customer_id":8,"order_date":1689552000000,"quantity":3,"unit_price":950,"status":"cancelled","total_amount":2850,"name":"Camila Herrera","email":"camila.herrera@mail.com","coun
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