ADVENTUREWORKS PROJECT

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Github Link (click here)

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Project Description:

This project is focused on building a comprehensive sales performance and product insights dashboard using the AdventureWorks database, a widely used sample dataset provided by Microsoft. The goal is to simulate a real-world scenario where data analysts help business teams make data-driven decisions.

AdventureWorks, a global manufacturing company, lacked centralized, interactive visibility into their product sales performance, customer distribution, and regional trends. Stakeholders were facing challenges such as identifying top-selling products, understanding customer purchse behaviour, and tracking sales trends over time.

What are stakeholders looking for?

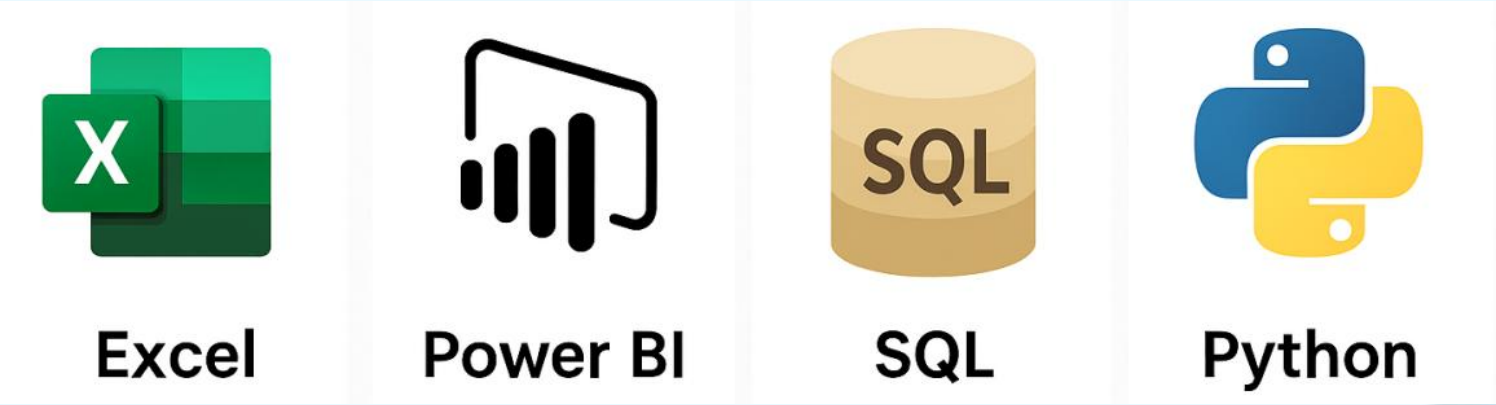
- Sales trends across products, regions and time periods
- High-performing and underperforming product categories.
- Regional performance insights.
- Customer segmentation based on purchase patterns.
- KPIs that summarize sales health and business growth.

Approach:

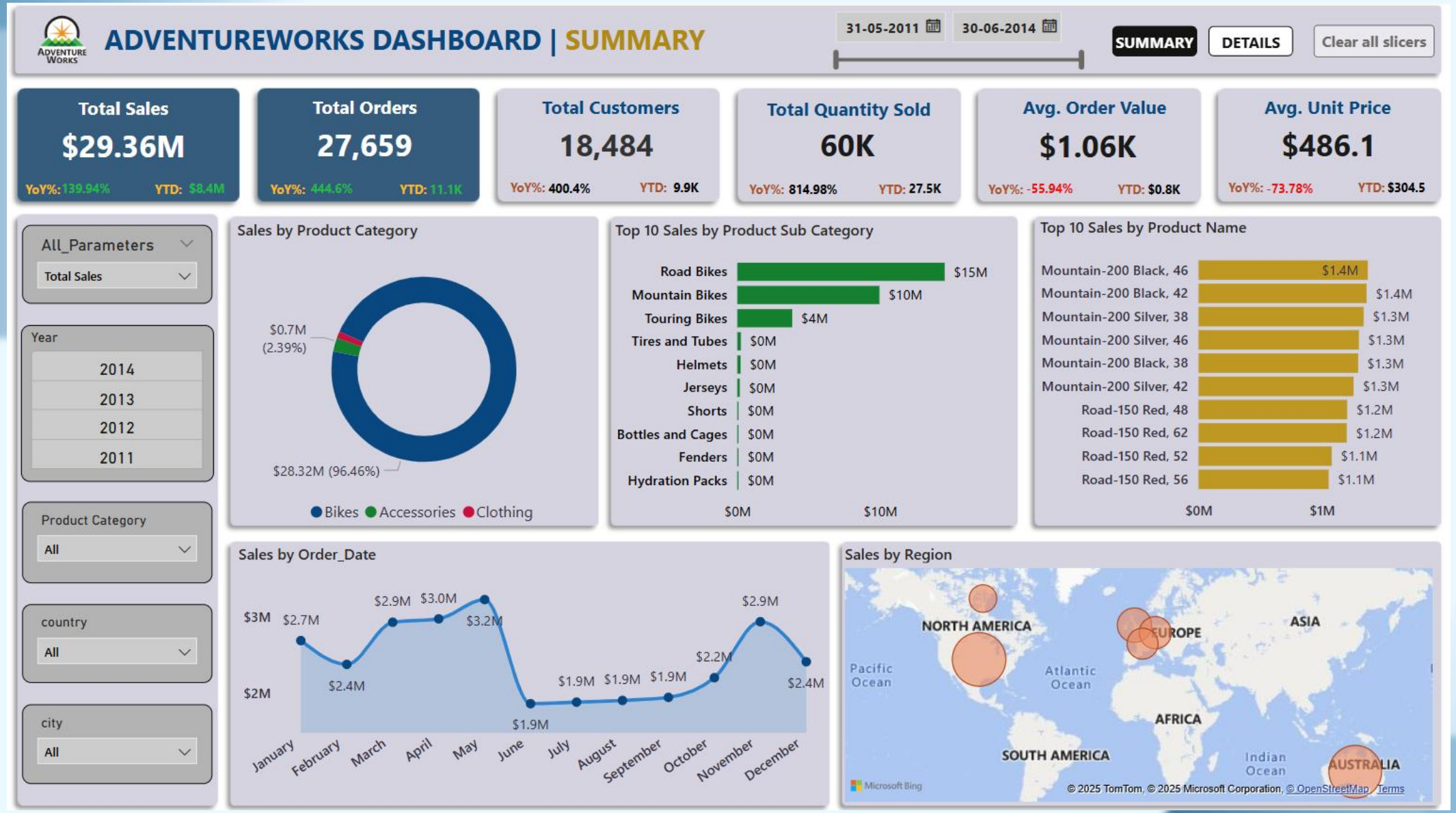
- Downloaded and restored the original AdventureWorks .bak file into SQL Server.
- Analyzed the database schema and selected relevant columns from multiple tables.
- Created and saved cleaned tables (customers, orders, products) using SQL Queries.
- Exported results into Excel and converted to .csv files for Jupyter processing.
- Performed further data cleaning and exploratory data analysis (EDA) in Python.
- Pushed cleaned tables back into SQL Server under adventureworks_cleaned database.
- Connected SQL Server to Power BI, performed data modelling and relationships.
- Built a custom date table inside Power BI for time intelligence.
- Designed a multi-page Power BI dashboard with KPIs, visuals and slicers.
- Used DAX to calculate key business metrics and drive interactivity.
- Finally, validated dashboard results of Power BI in SQL Server by running SQL Queries.

Tech-Stack Used:

- **SQL Server Management Studio:** Used of Data Extraction, Transformation and Schema Analysis.
- **Excel:** Used for temporary data storage and export to CSV.
- **Python (Jupyter Notebook):** Used for Data Cleaning, Manipulation and pushing data to SQL Server.
- **Pandas, NumPy and other Libraries:** Used for EDA and preprocessing.
- **PowerBI:** Used for Dashboard Development, DAX Modelling and for creating interactive visuals.



Dashboard:


ADVENTUREWORKS DASHBOARD | SUMMARY
31-05-2011
30-06-2014
SUMMARY
DETAILS
Clear all slicers
Total Sales
$29.36M
YoY%: 139.94%
YTD: $8.4M
Total Orders
27,659
YoY%: 444.6%
YTD: 11.1K
Total Customers
18,484
YoY%: 400.4%
YTD: 9.9K
Total Quantity Sold
60K
YoY%: 814.98%
YTD: 27.5K
Avg. Order Value
$1.06K
YoY%: -55.94%
YTD: $0.8K
Avg. Unit Price
$486.1
YoY%: -73.78%
YTD: $304.5
All_Parameters
Total Sales
Year
2014
2013
2012
2011
Product Category
All
country
All
city
All
Sales by Product Category
$0.7M
(2.39%)
$28.32M (96.46%)
Bikes
Accessories
Clothing
Top 10 Sales by Product Sub Category
Road Bikes $15M
Mountain Bikes $10M
Touring Bikes $4M
Tires and Tubes $0M
Helmets $0M
Jerseys $0M
Shorts $0M
Bottles and Cages $0M
Fenders $0M
Hydration Packs $0M
$0M
$10M
Top 10 Sales by Product Name
Mountain-200 Black, 46 $1.4M
Mountain-200 Black, 42 $1.4M
Mountain-200 Silver, 38 $1.3M
Mountain-200 Silver, 46 $1.3M
Mountain-200 Black, 38 $1.3M
Mountain-200 Silver, 42 $1.3M
Road-150 Red, 48 $1.2M
Road-150 Red, 62 $1.2M
Road-150 Red, 52 $1.1M
Road-150 Red, 56 $1.1M
$0M
$1M
Sales by Order_Date
$3M
$2M
$2.7M
$2.4M
$2.9M
$3.0M
$3.2M
$1.9M
$1.9M
$1.9M
$1.9M
$2.2M
$2.9M
$2.4M
January
February
March
April
May
June
July
August
September
October
November
December
Sales by Region
NORTH AMERICA
EUROPE
ASIA
Pacific Ocean
Atlantic Ocean
AFRICA
SOUTH AMERICA
Indian Ocean
AUSTRALIA
Microsoft Bing
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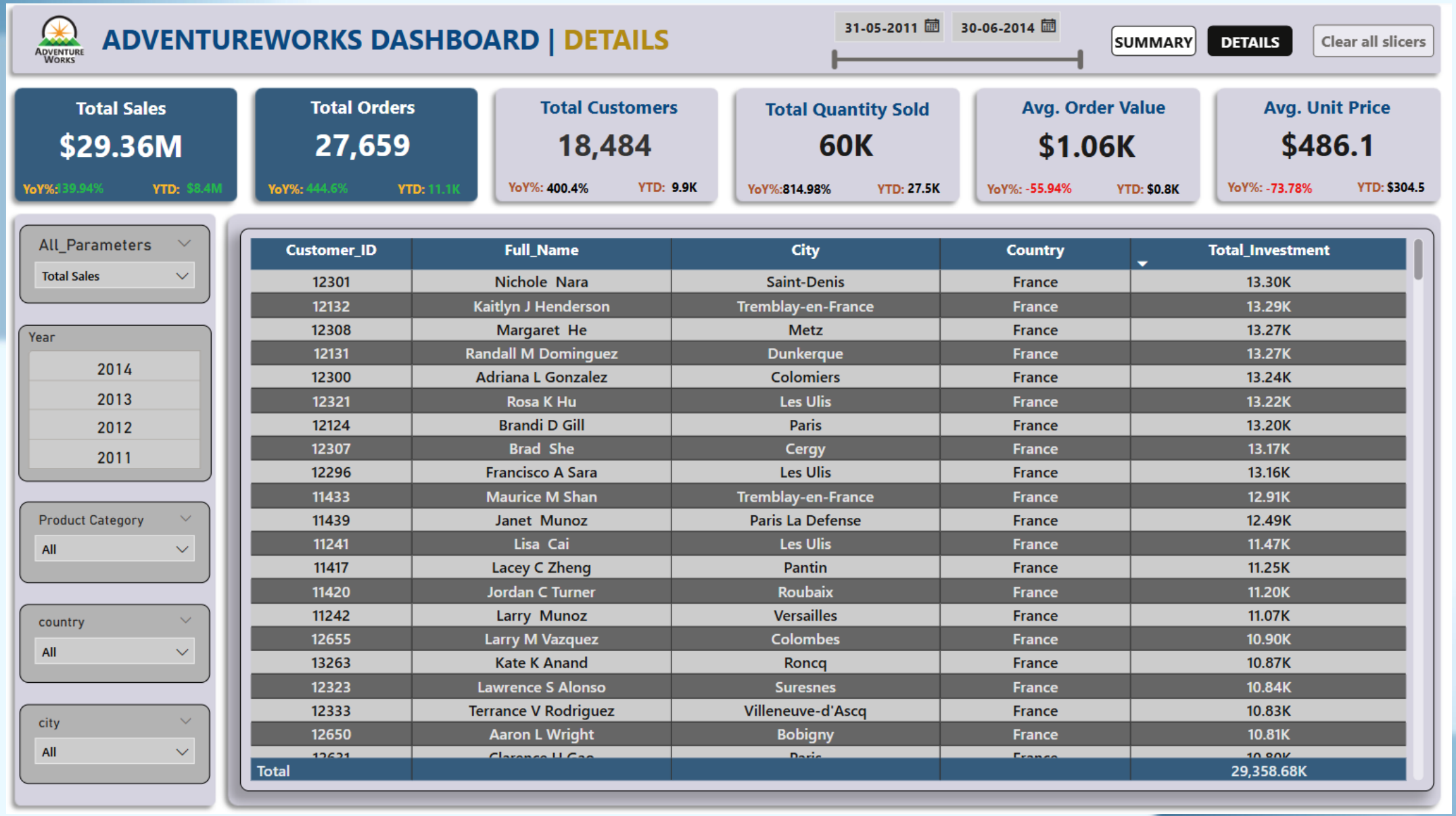
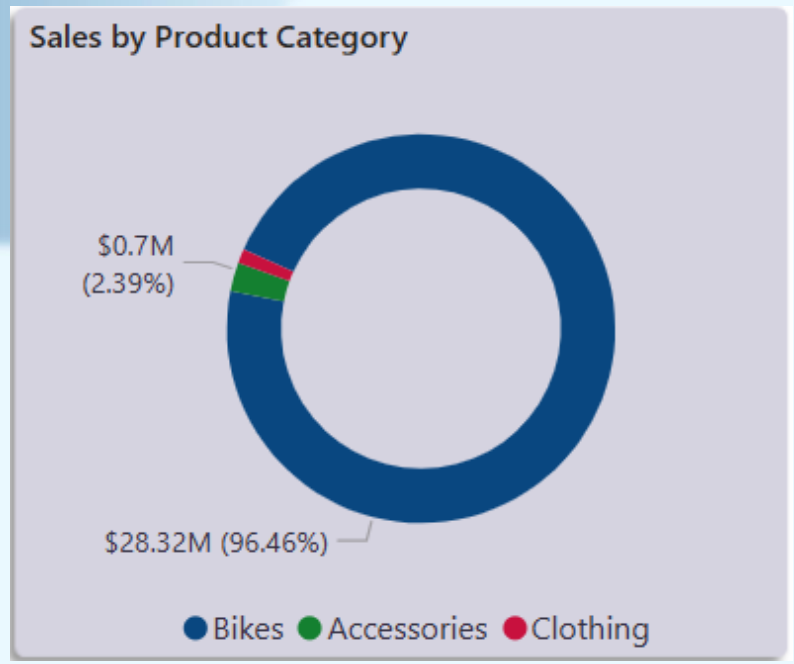
Dashboard:

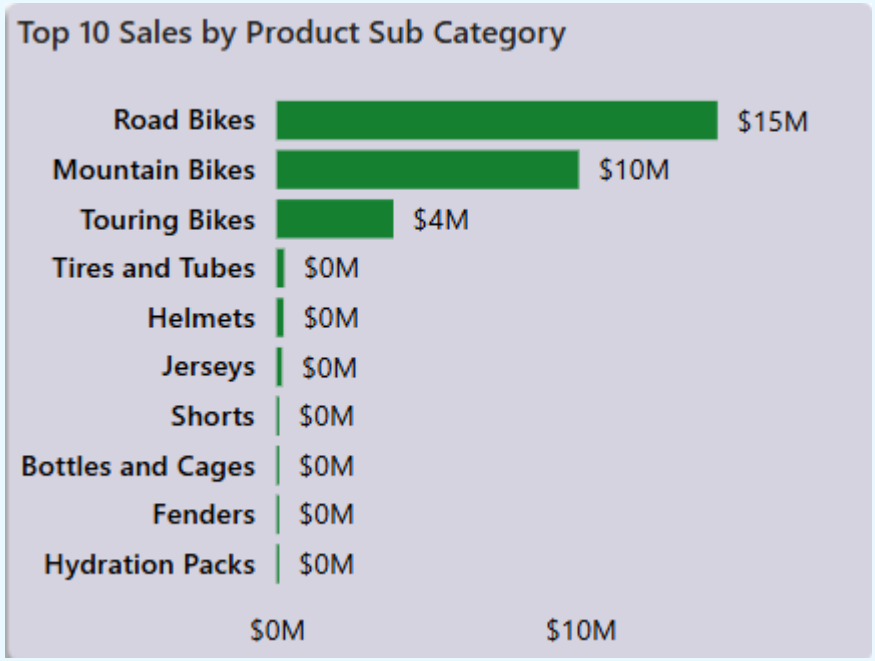


Customer_ID	Full_Name	City	Country	Total_Investment
12301	Nichole Nara	Saint-Denis	France	13.30K
12132	Kaitlyn J Henderson	Tremblay-en-France	France	13.29K
12308	Margaret He	Metz	France	13.27K
12131	Randall M Dominguez	Dunkerque	France	13.27K
12300	Adriana L Gonzalez	Colomiers	France	13.24K
12321	Rosa K Hu	Les Ulis	France	13.22K
12124	Brandi D Gill	Paris	France	13.20K
12307	Brad She	Cergy	France	13.17K
12296	Francisco A Sara	Les Ulis	France	13.16K
11433	Maurice M Shan	Tremblay-en-France	France	12.91K
11439	Janet Munoz	Paris La Defense	France	12.49K
11241	Lisa Cai	Les Ulis	France	11.47K
11417	Lacey C Zheng	Pantin	France	11.25K
11420	Jordan C Turner	Roubaix	France	11.20K
11242	Larry Munoz	Versailles	France	11.07K
12655	Larry M Vazquez	Colombes	France	10.90K
13263	Kate K Anand	Roncq	France	10.87K
12323	Lawrence S Alonso	Suresnes	France	10.84K
12333	Terrance V Rodriguez	Villeneuve-d'Ascq	France	10.83K
12650	Aaron L Wright	Bobigny	France	10.81K
Total				29,358.68K

Business Problems:

- What are the top performing product categories and subcategories?

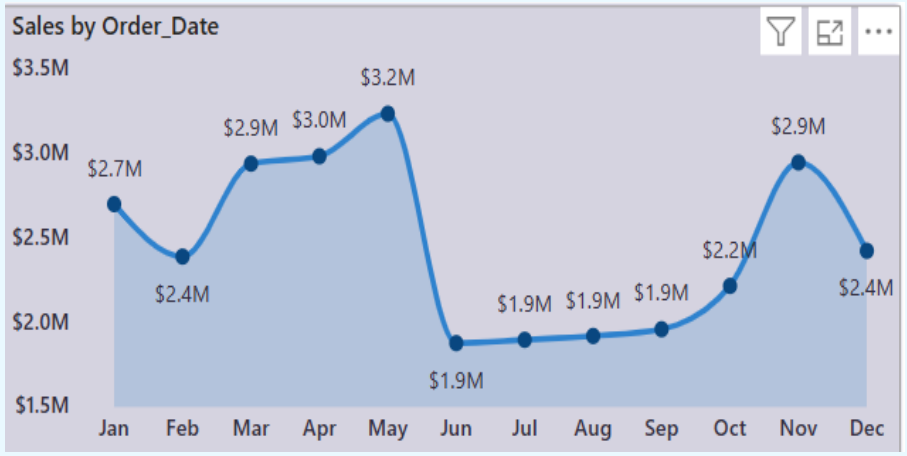


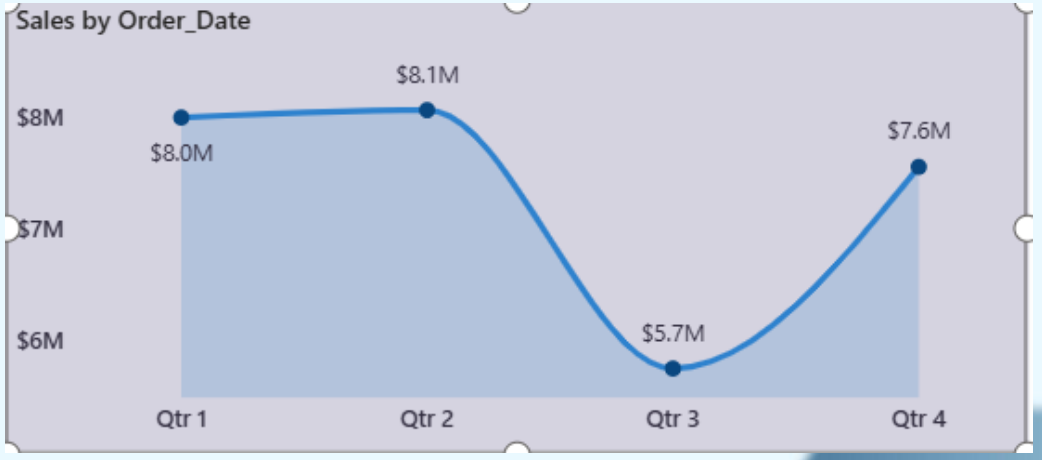


- Which city or country is generating the most revenue?

country	total_sales
United States	9.39M
Australia	9.06M
United Kingdom	3.39M
Germany	2.89M
France	2.64M
Canada	1.98M

- What is the trend of sales over time (monthly/quarterly)?





- Who are the top customers based on sales?

Customer_ID	Full_Name	City	Country	Total_Investment
12301	Nichole Nara	Saint-Denis	France	13.30K
12132	Kaitlyn J Henderson	Tremblay-en-France	France	13.29K
12308	Margaret He	Metz	France	13.27K
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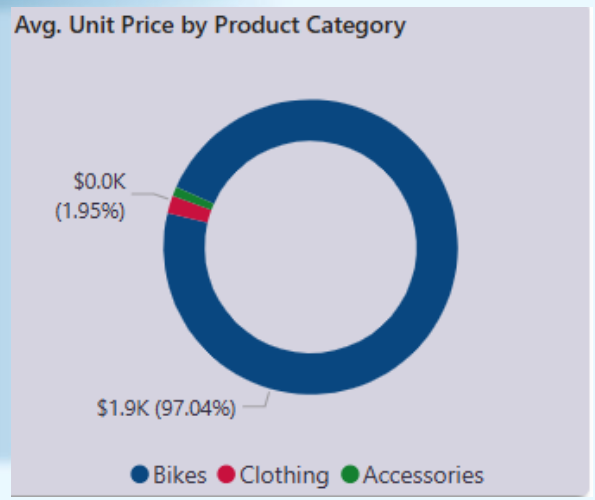
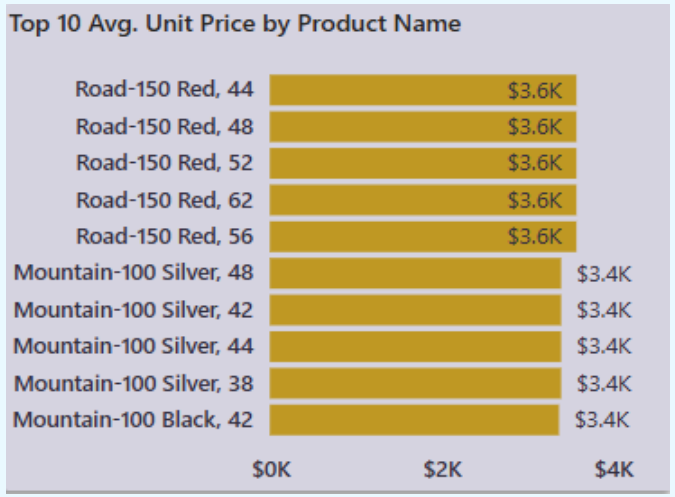
12333	Terrance V Rodriguez	Villeneuve-d'Ascq	France	10.83K
12650	Aaron L Wright	Bobigny	France	10.81K
12631	Clarence H Cao	Paris	France	10.80K
Total				29,358.68K

- What is the average unit price per product or per category?



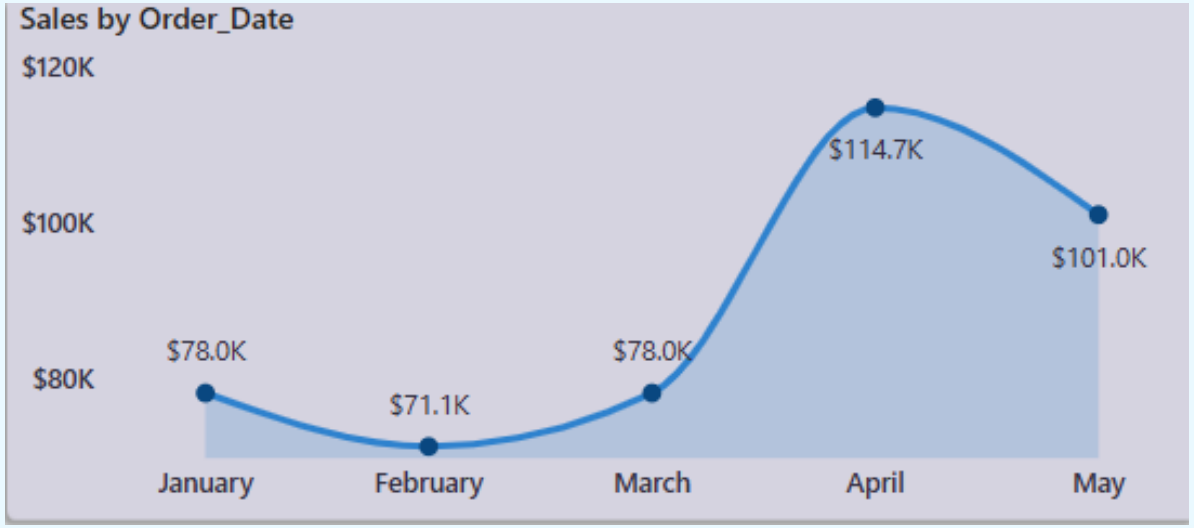


- Which products are underperforming?

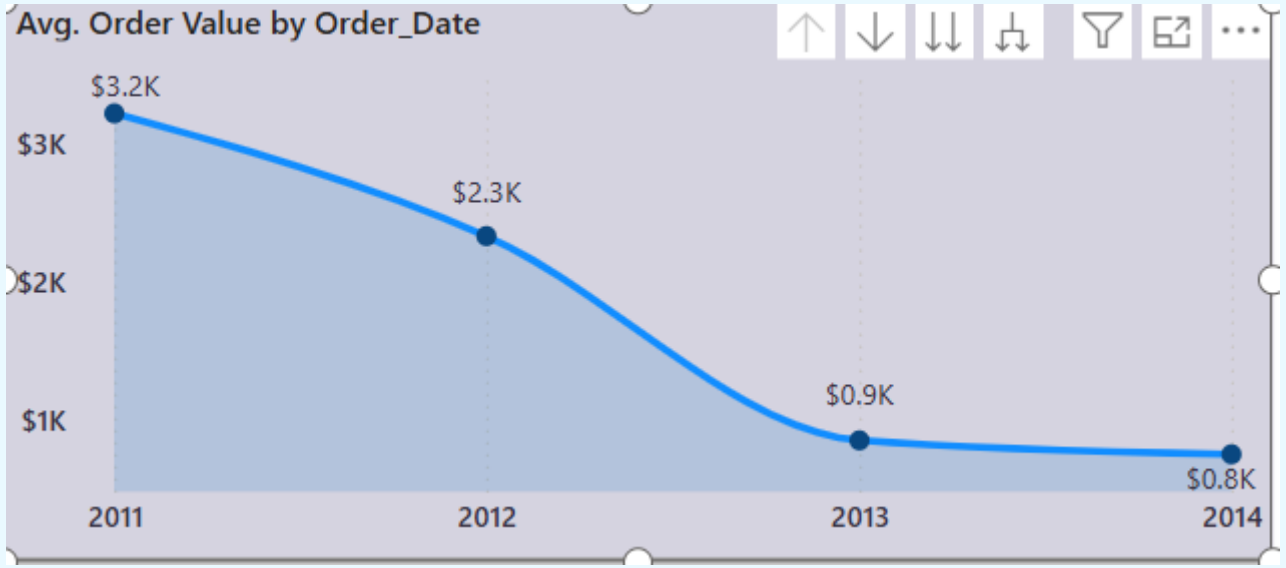
	productname	total_sales
1	Racing Socks, L	2427.30
2	Racing Socks, M	2679.02
3	Bike Wash - Dissolver	7218.60
4	Patch Kit/8 Patches	7307.39
5	Touring Tire Tube	7425.12
6	Road Tire Tube	9480.24
7	Classic Vest, S	10668.00
8	Half-Finger Gloves, L	10849.07
9	Half-Finger Gloves, S	11951.12
10	Half-Finger Gloves, M	12220.51

- Are high-value products being ordered frequently?

Mountain-200 Black, 46 is making most sales among all the products.
I've taken 2014 year from January to May (only these months are available) to check the frequency of sales.



- What is the average order value, and is it improving?



Note: As this is a PDF version of AdventureWorks Project, I am unable to present all the charts in this PDF, besides, the insights are generated directly from SQL Server and Power BI dashboard which are shown in the next page.

Insights:

- The Bikes category contributes 96.46% of total sales, while Accessories (2.39%) and Clothing (minimal) are significantly behind. The business is heavily reliant on a single category, creating risk. A sudden drop in bike sales could impact revenue drastically. I would recommend to diversify marketing efforts and product development into Accessories and Clothing to broaden the revenue base.
- The top 3 subcategories (Road, Mountain, Touring Bikes) alone account for the majority of revenue (>$29M). This shows strong demand concentration, but could also signal limited consumer exploration of other products. I would recommend to bundle related accessories with bike purchases to cross-sell items like helmets, shorts, and jerseys.
- United States ($9.39M) and Australia ($9.06M) are top revenue regions, followed by the UK, Germany, and France. US and Australia are current strengths, but France, Canada, and Germany show emerging potential. It is better to launch targeted campaigns and optimize logistics in France and Canada to convert them into primary markets.

Insights:

- Upon aggregating customer sales, France-based customers rank highest in total purchases. There's a high engagement from French buyers; this might indicate brand loyalty or purchasing power. Establishing localized marketing strategies and retaining these customers with loyalty programs would be beneficial to business.
- Bikes have the highest average unit price, followed by Clothing and then Accessories. While price contributes to high bike revenue, Accessories may be underpriced or undervalued. I would recommend to explore pricing elasticity and promotions on accessories to increase their perceived value.
- Top 10 products by average unit price are all from Road-150 Red and Mountain-100 Black lines. These models are premium-priced and likely top earners, but there's limited product variety at the high end. I would recommend to introduce new variants or colors in these premium lines to extend customer interest.
- Products like Racing Socks, Bike Wash, and Patch Kit have negligible sales. These SKUs are underutilizing shelf space and may drain marketing budgets. Evaluating whether to discontinue or rebrand these items or bundle them with higher-performing products is necessary.

Insights:

- AOV dropped significantly from $3.2K in 2011 to $0.8K in 2014. This suggests a shift in consumer buying behavior i.e., possibly more budget-conscious or buying fewer premium items. Consider volume-based discounts or product bundles to lift order values back up.
- KPIs like YoY growth in Orders (444.6%), Customers (400.4%), and Quantity Sold (814.98%) show aggressive market expansion. However, YoY drop in AOV (-55.94%) and Unit Price (-73.78%) indicate lower ticket sizes. The business is growing fast but becoming price-sensitive. I would recommend to introduce tiered product offerings to serve both premium and economy segments while maintaining margins.
- Sales peaked in certain quarters but showed fluctuating patterns in recent months. Potential seasonal patterns or marketing lapses need investigation. It is better to perform time-series analysis and align campaigns with peak seasons to optimize results.

Results:

- Restored and explored the AdventureWorks .bak file in SQL Server.
- Understood the structure of a large relational database and identified required tables.
- Wrote SQL queries to extract and shape fact and dimension tables.
- Exported SQL query outputs to CSV format for analysis.
- Performed data cleaning and transformation using Pandas in Jupyter Notebook.
- Conducted exploratory data analysis (EDA) using Python libraries like Matplotlib and Seaborn.
- Visualized trends, outliers, and distributions to understand customer and sales behavior.
- Connected Python to SQL Server using SQLAlchemy and PyODBC.
- Pushed cleaned dataframes into a new SQL Server database for Power BI use.
- Connected Power BI to SQL Server and imported cleaned data.
- Created a custom Date table and designed an optimized star schema data model.
- Cleaned data further using Power Query editor in Power BI.
- Created dynamic KPIs and measures using DAX (e.g., Total Sales, YTD Sales, YoY Growth).
- Built interactive dashboards with slicers, tooltips, and drillthrough features.
- Identified top-selling categories, underperforming products, and regional sales gaps.
- Recommended actionable insights based on visual analysis of business data.
- Developed a storytelling approach to presenting dashboards for stakeholder clarity.
- Improved hands-on skills with SQL, Python, Excel, Power BI, and DAX.
- Strengthened business thinking by asking meaningful questions and solving real use cases.

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