Project Report: Amazon Product Sales and Sentiment Analysis

1. Project Overview

The objective of this project is to analyze the performance of Amazon products across various categories to identify key drivers of customer satisfaction and pricing strategies. By leveraging a multi-tool approach (Python, SQL, and Power BI), the project transforms raw e-commerce data into actionable business intelligence, specifically focusing on the relationship between discounts, ratings, and product popularity.

2. Dataset Summary

The dataset consists of detailed information on various Amazon products. Key attributes included for analysis are:

- **Product Identification:** product_id and product_name.

- **Categorization:** category (and the derived main_category and product_type).

- **Pricing Metrics:** actual_price, discounted_price, and discount_percentage.

- **Customer Feedback:** rating and rating_count (used as a proxy for sales volume).

3. Exploratory Data Analysis Using Python

The initial data processing was performed in a Jupyter Notebook (.ipynb) to clean and prepare the data for database ingestion.

	product_id	product_name	category	discounted_price	actual_price	discount_percentage	rating	rating_count	about_produc
0	B07JW9H4J1	Wayona Nylon Braided USB to Lightning Fast Cha...	Computers&Accessories|Accessories&Peripherals|...	₹399	₹1,099	64%	4.2	24,269	Hig Compatibility Compatibl With iPhon 12.
1	B098NS6PVG	Ambrane Unbreakable 60W / 3A Fast Charging 1.5...	Computers&Accessories|Accessories&Peripherals|...	₹199	₹349	43%	4.0	43,994	Compatibl with all Type enable devices, be.
2	B096MSW6CT	Sounce Fast Phone Charging Cable & Data Sync U...	Computers&Accessories|Accessories&Peripherals|...	₹199	₹1,899	90%	3.9	7,928	【 Fas Charger& Dat Sync】-Wit built-in safet.
3	B08HDJ86NZ	boAt Deuce USB 300 2 in 1 Type-C & Micro USB S...	Computers&Accessories|Accessories&Peripherals|...	₹329	₹699	53%	4.2	94,363	The boA Deuce USB 30 2 in 1 cable i compati.
4	B08CF3B7N1	Portronics Konnect L 1.2M Fast Charging 3A 8 P...	Computers&Accessories|Accessories&Peripherals|...	₹154	₹399	61%	4.2	16,905	[CHARGE & SYN FUNCTION] This cabl comes wit.

- **Data Cleaning:** Handled missing values and corrected data types for pricing and rating columns to ensure numerical consistency.

```
product_id            0          product_id            0
product_name          0          product_name          0
category              0          category              0
discounted_price      0          discounted_price      0
actual_price          0          actual_price          0
discount_percentage   0          discount_percentage   0
rating                0          rating                0
rating_count          2          rating_count          0
about_product         0          about_product         0
user_id               0          user_id               0
user_name             0          user_name             0
review_id             0          review_id             0
review_title          0          review_title          0
review_content        0          review_content        0
img_link              0          img_link              0
product_link          0          product_link          0
main_category         0          main_category         0
product_type          0          product_type          0
dtype: int64                     dtype: int64
```

- **Data Type Correction:** Converted pricing and rating columns from strings to numeric formats, handling special characters (like currency symbols) to allow for mathematical operations.

	product_id	product_name	category	discounted_price	actual_price	discount_percentage	rating	rating_count
0	B07JW9H4J1	Wayona Nylon Braided USB to Lightning Fast Cha...	Computers&Accessories|Accessories&Peripherals|...	399.0	1099.0	64%	4.2	24269.0
1	B098NS6PVG	Ambrane Unbreakable 60W / 3A Fast Charging 1.5...	Computers&Accessories|Accessories&Peripherals|...	199.0	349.0	43%	4.0	43994.0
2	B096MSW6CT	Sounce Fast Phone Charging Cable & Data Sync U...	Computers&Accessories|Accessories&Peripherals|...	199.0	1899.0	90%	3.9	7928.0
3	B08HDJ86NZ	boAt Deuce USB 300 2 in 1 Type-C & Micro USB S...	Computers&Accessories|Accessories&Peripherals|...	329.0	699.0	53%	4.2	94363.0
4	B08CF3B7N1	Portronics Konnect L 1.2M Fast Charging 3A 8 P...	Computers&Accessories|Accessories&Peripherals|...	154.0	399.0	61%	4.2	16905.0

- **Categorical Mapping:** Extracted the `main_category` and `product_type` from hierarchical category strings to simplify high-level analysis across the dataset.

review_id	review_title	review_content	img_link	product_link	main_category	product_type
QJGUP6P86,R1K...	Satisfied,Charging is really fast,Value for mo...	Looks durable Charging is fine tooNo complains...	https://m.media-amazon.com/images/W/WEBP_40237...	https://www.amazon.in/Wayona-Braided-WN3LG1-Sy...	Computers&Accessories	USBCables
IWL29GWDE,RY...	A Good Braided Cable for Your Type C Device,Go...	I ordered this cable to connect my phone to An...	https://m.media-amazon.com/images/W/WEBP_40237...	https://www.amazon.in/Ambrane-Unbreakable-Char...	Computers&Accessories	USBCables
79XKQ6I1QF,R2...	Good speed for earlier versions,Good Product,W...	Not quite durable and sturdy,https://m.media-a...	https://m.media-amazon.com/images/W/WEBP_40237...	https://www.amazon.in/Sounce-iPhone-Charging-C...	Computers&Accessories	USBCables
CAZ7AMPQC,R1...	Good product,Good one,Nice,Really nice product...	Good product,long wire,Charges good,Nice,I bou...	https://m.media-amazon.com/images/I/41V5FtEWPk...	https://www.amazon.in/Deuce-300-Resistant-Tang...	Computers&Accessories	USBCables
PDB81N66T4P,R...	As good as original,Decent,Good one for second...	Bought this instead of original apple, does th...	https://m.media-amazon.com/images/W/WEBP_40237...	https://www.amazon.in/Portronics-Konnect-POR-1...	Computers&Accessories	USBCables

- **Segmenting Discount Tiers:** Created a custom logic to bin products into "High," "Medium," and "Low" discount brackets, enabling the study of how aggressive pricing affects visibility.

img_link	product_link	main_category	product_type	discount_bucket
https://m.media-amazon.com/images/W/WEBP_40237...	https://www.amazon.in/Wayona-Braided-WN3LG1-Sy...	Computers&Accessories	USBCables	High
https://m.media-amazon.com/images/W/WEBP_40237...	https://www.amazon.in/Ambrane-Unbreakable-Char...	Computers&Accessories	USBCables	Medium
https://m.media-amazon.com/images/W/WEBP_40237...	https://www.amazon.in/Sounce-iPhone-Charging-C...	Computers&Accessories	USBCables	High
https://m.media-amazon.com/images/I/41V5FtEWPk...	https://www.amazon.in/Deuce-300-Resistant-Tang...	Computers&Accessories	USBCables	High
https://m.media-amazon.com/images/W/WEBP_40237...	https://www.amazon.in/Portronics-Konnect-POR-1...	Computers&Accessories	USBCables	High

- **Database Ingestion:** Established a secure connection using SQLAlchemy and PyMySQL to migrate the refined data into a relational database for SQL-based querying.

4. Data Analysis using SQL

Once the data was structured in MySQL, several complex queries were executed to extract specific business insights:

- **Inventory Distribution:** Calculated the total count of products per category to identify the most stocked departments.

main_category	count
Computers&Accessories	453
Electronics	526
MusicalInstruments	2
OfficeProducts	31
Home&Kitchen	448
HomeImprovement	2
Toys&Games	1
Car&Motorbike	1
Health&PersonalCare	1

- **High-Value Identification:** Queried for "Best Value" products—those with a rating above 4.0 and a discount greater than 50%.

product_name	main_category	rating	discount_percentage	discounted_price
REDTECH USB-C to Lightning Cable 3.3FT, [App...	Computers&Accessories	5.0	75	249
Instant Pot Air Fryer, Vortex 2QT, Touch Contr...	Home&Kitchen	4.8	75	4995
Spigen EZ Fit Tempered Glass Screen Protector ...	Electronics	4.7	66	999
Campfire Spring Chef Prolix Instant Portable W...	Home&Kitchen	4.7	57	1499
FIGMENT Handheld Milk Frother Rechargeable, ...	Home&Kitchen	4.7	56	699
Multifunctional 2 in 1 Electric Egg Boiling Steame...	Home&Kitchen	4.7	56	699
Aquadpure Copper + Mineral RO+UV+UF 10 to ...	Home&Kitchen	4.6	80	4999
Spigen EZ Fit Tempered Glass Screen Protector ...	Electronics	4.6	66	999
Spigen EZ Fit Tempered Glass Screen Protector ...	Electronics	4.6	66	999
10k 8k 4k HDMI Cable, Certified 48Gbps 1ms Ult...	Electronics	4.6	58	999

- **Performance Benchmarking:** Used GROUP BY and AVG functions to rank categories based on their average customer rating.

main_category	avg_rating
OfficeProducts	4.31
Toys&Games	4.3
HomeImprovement	4.25
Computers&Accessories	4.15
Electronics	4.08
Home&Kitchen	4.03
Health&PersonalCare	4
MusicalInstruments	3.9
Car&Motorbike	3.8

- **Engagement Analysis:** Aggregated the rating_count to determine which product types generate the most consumer interaction.

main_category	total_reviews
Electronics	15778848
Computers&Accessories	7739047
Home&Kitchen	2991069
OfficeProducts	149675
MusicalInstruments	88882
Toys&Games	15867
HomeImprovement	8566
Health&PersonalCare	3663
Car&Motorbike	1118

- **Discount Distribution:** Calculated the total discount percent per category to identify the most discounted departments.

main_category	avg_discount
HomeImprovement	57.5
Computers&Accessories	54.02
Health&PersonalCare	53
Electronics	50.83
MusicalInstruments	46
Car&Motorbike	42
Home&Kitchen	40.12
OfficeProducts	12.35
Toys&Games	0

5. Dashboard in Power BI