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MOBILE DEVICE USAGE AND USER BEHAVIOUR ANALYSIS

MSDS-2024-131
WEEKEND

Problem Definition:

The project aims to analyze mobile device usage patterns and classify user behavior into one of five predefined classes (1 to 5) using a dataset containing various metrics such as app usage time, screen-on time, battery drain, and data consumption.



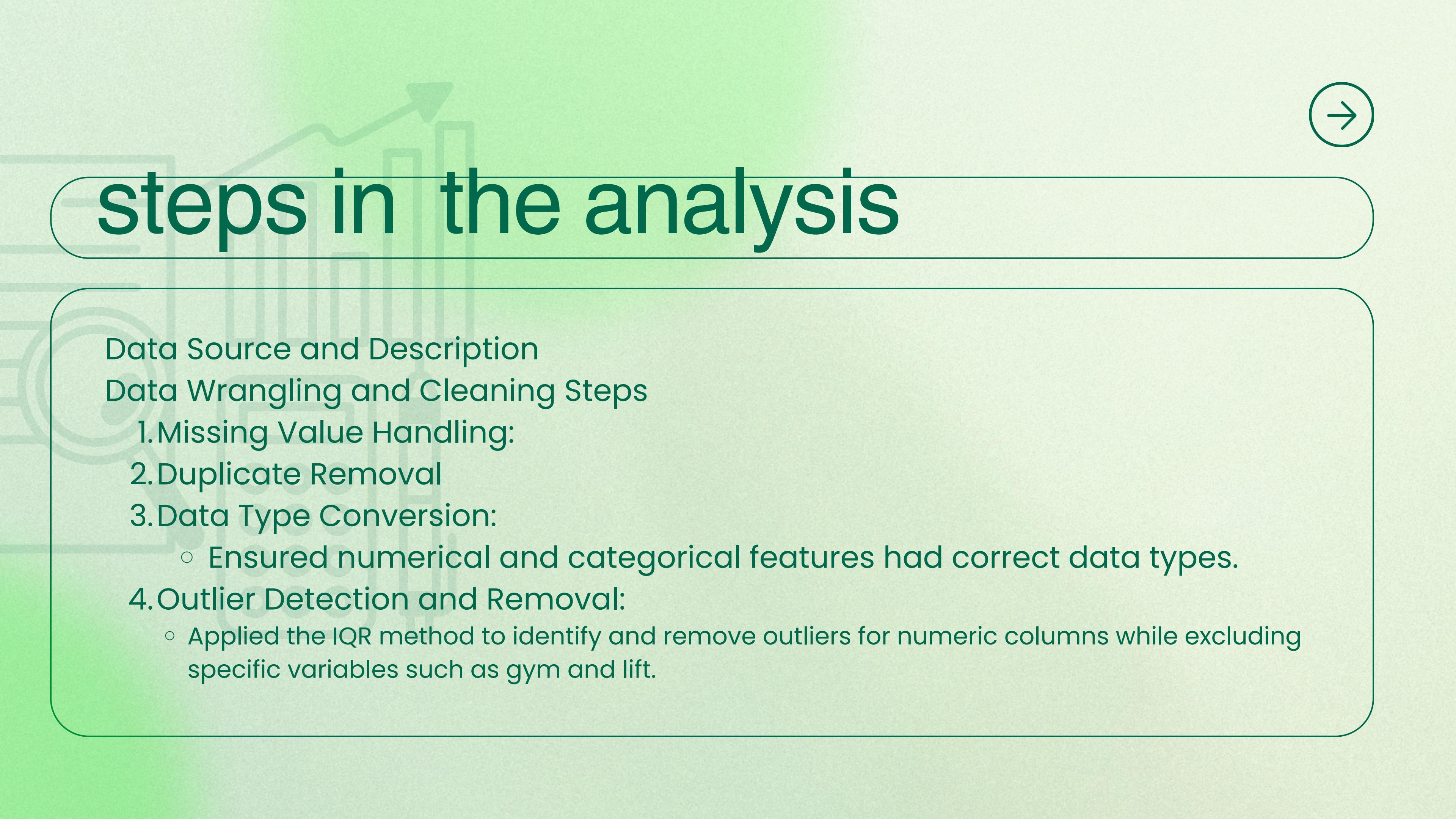
Objectives:

- Predict or classify mobile user behavior into five distinct categories based on usage patterns.
- Identify significant factors influencing user behavior classes.
- Explore relationships between app usage, screen-on time, and other metrics.
- Provide actionable insights for developers to optimize user experiences and improve mobile resource efficiency.

Questions

1. What are the most significant factors influencing user behavior class?
2. Are there any differences in usage patterns between male and female users?
3. How do app usage time and screen-on time correlate with battery drain?
4. Can user behavior be accurately classified using this dataset?
5. Are certain age groups more prone to extreme usage behavior?





steps in the analysis

Data Source and Description

Data Wrangling and Cleaning Steps

1. Missing Value Handling:

2. Duplicate Removal

3. Data Type Conversion:

- Ensured numerical and categorical features had correct data types.

4. Outlier Detection and Removal:

- Applied the IQR method to identify and remove outliers for numeric columns while excluding specific variables such as gym and lift.

steps in the analysis

4. Standardization:

- Normalized numerical features to ensure consistent scaling for machine learning models.

5. Feature engineering

- a.added new features like capacity , 'avg_power_consumption', 'Battery_life', 'cycle_number_per_day

key findings(Correlation Analysis:)

- Strong correlations found between app usage time and screen-on time.
- Battery drain significantly correlated with screen-on time and app usage .
- High correlation between data usage and the number of apps installed. As the number of apps installed increases, so does the amount of data usage. This relationship implies that users with more apps on their devices may engage in more online activities, which leads to higher data consumption
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key findings(Correlation Analysis:)

- User Behavior Based on Device Type: Samsung Galaxy S21 users are predominantly male, while female users are more inclined to use the Xiaomi Mi 11. iPhone 12 users tend to be balanced between males and females.
- A positive correlation between data usage and the number of installed apps, showing that the more apps installed on a device, the more data is used



Demographic Analysis:

- Males had slightly higher screen-on times compared to females, but app usage time was relatively consistent across genders.

Visualizations Used:

01.

- Correlation heatmap to identify relationships between features.

02.

- Box plots and IQR to detect outliers and analyze class-wise distributions.

03.

- Scatter plots to explore feature relationships.



Model Comparison

Best Results

- RandomForest, LogisticRegression, SVM, and DecisionTree are all performing equally well (perfectly).
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Okay results

KNeighbors is slightly behind but still performing well overall

Model Pipeline

- 30% of the data is allocated for testing, and 70% is used for training.
- hyperparameter tuning to optimize the model parameters and improve performance by `n_estimators=100`, `max_depth=10`, and `learning_rate=0.01` optimal values.



Conclusion:

- App usage time, screen-on time, and battery drain were the most significant factors influencing user behavior.
- Behavioral classification is feasible with high accuracy using the dataset.
- Insights suggest targeted optimization for extreme user classes (e.g., power-saving features for heavy users).



Recommendations:

1. Developers should focus on optimizing high-drain applications for heavy users.
2. Marketing strategies can target specific age groups prone to extreme usage.
3. Future studies should include more granular features like app categories.



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**THANK YOU
SO MUCH!**

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