SMART CITY URBAN AI OPTIMIZERS

CHECKPOINT 2

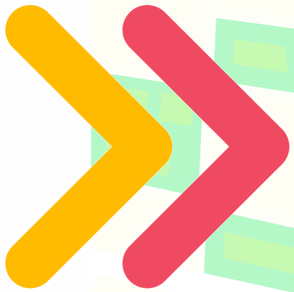
HYPOTHESIS

Hypothesis: By integrating data from diverse sources, including PaCaBa, electric chargers, Barcelona Parking Traffic datasets, satellite imagery, and parking data, our goal is to develop a predictive model that revolutionizes parking space discovery for drivers.

Additionally, this model has the potential to significantly boost operational efficiency for businesses, particularly in real estate and commerce, by optimizing office space allocation and customer flow based on predictive parking availability insights.

Data Acquisition

- Pacaba ✓
- Barcelona Traffic Dataset ✓
- surface parking spots in Barcelona
- eod-grss-ieee
- TomTom trafic index ✓
- Air Quality Immission Maps of the City of Barcelona
- Electric Chargers stations ✓



CVL Computer Vision Lab TU WIEN Informatics

Open Data BCN

IEEE GRSS IADF Image Analysis and Data Fusion

IEEE GRSS Geoscience and Remote Sensing Society

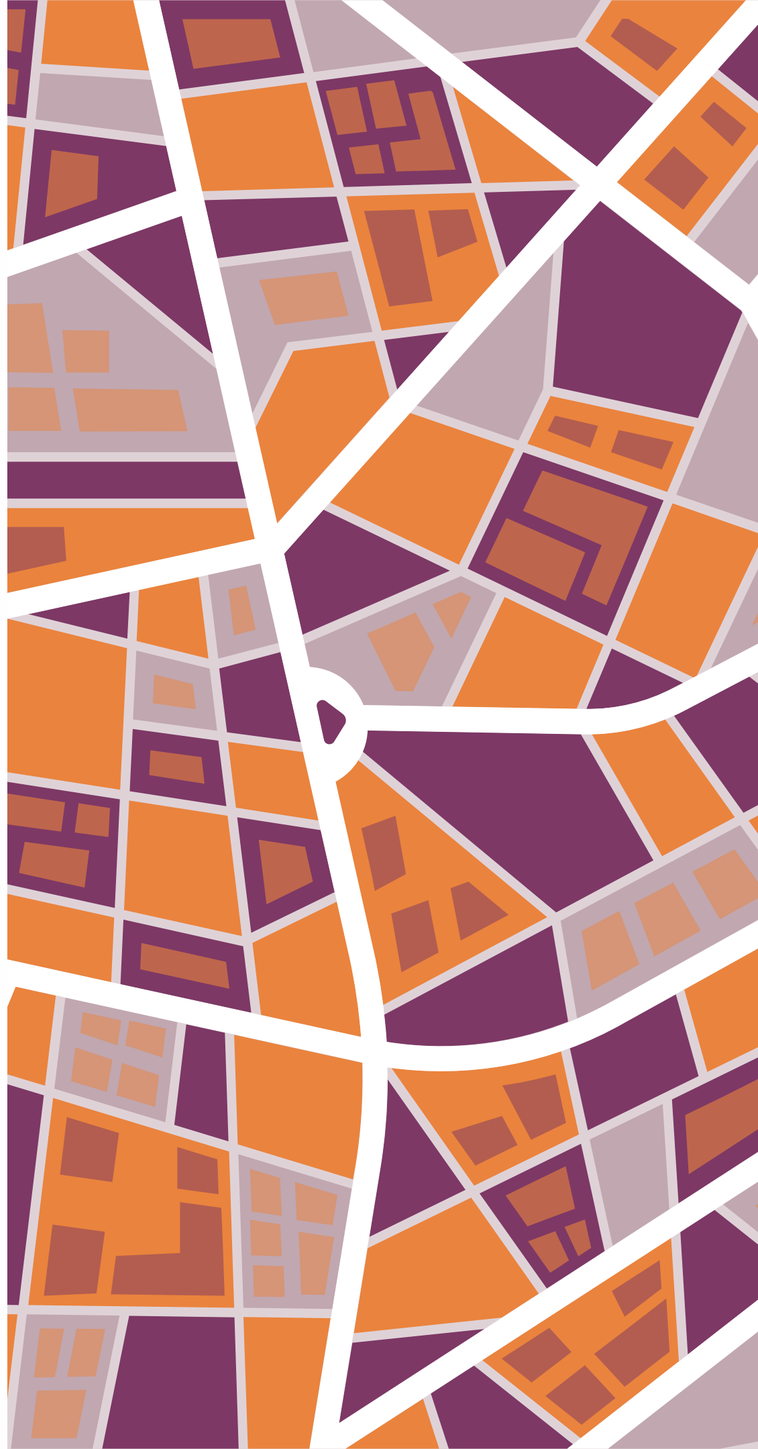
Google APIs

TOMTOM

Data Cleaning and Preparation

- **Standardization and Imputation**:
  Standardized date-time formats and filled missing numerical and categorical data.
- **Geo-Spatial Transformation**:
  Converted datasets into GeoDataFrames for improved spatial analysis and visualization.
- **Outlier Management**:
  Identified and removed outliers using z-scores to preserve data integrity and model accuracy.

Data Relationships & EDA



- **Parking Type Diversity:**
  Explored parking types for understanding infrastructure diversity.
- **Parking Distribution Across Districts:**
  Investigated parking spot distribution across different districts to identify spatial trends.
- **Temporal Trends Evaluation:**
  Evaluated the 'Data_Alta' column for suitability in analyzing trends over time.
- **District-Level Trends Analysis:**
  Analyzed district-level data to track parking spot additions and patterns.

Model Training & Initial Discoveries

Model Preparation and Training:

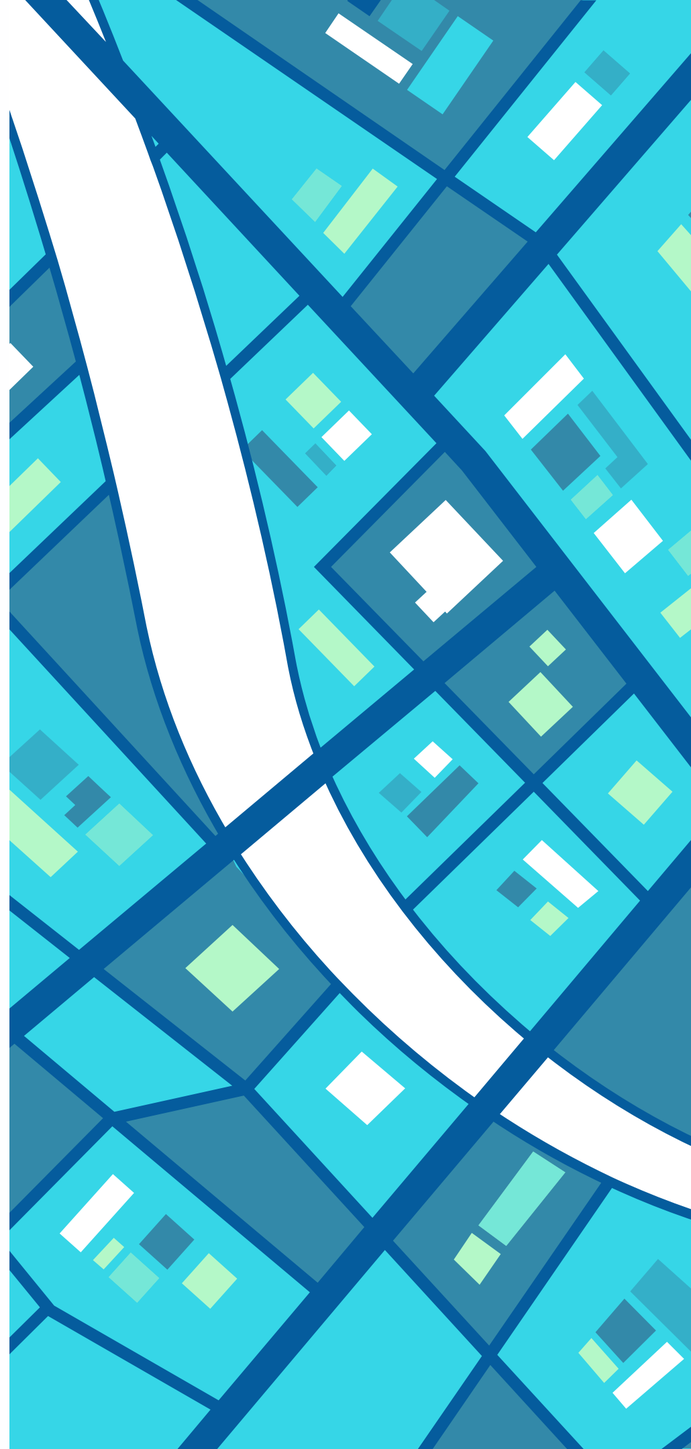
- Selected features (e.g. district, year, month, day) for modeling.
- One-Hot Encoding for categorical data and split dataset into training/testing.
- Established a baseline with Linear Regression model.

Correlation Analysis:

- Combined parking and yearly congestion data for correlations.
- Analyzed city-wide congestion and district-level parking correlations.

Initial Insights:

- Found correlations between parking additions and congestion levels, to validate the hypothesis of parking availability predicting congestion.
- Highlighted potential predictive relationships for future model improvements.



Conclusions & Support for Hypothesis

- **Validation of Hypothesis:**
  - EDA and model training confirm hypothesis: parking availability can predict urban traffic congestion.
  - The predictive model based on Linear Regression provides a foundation for understanding the dynamics between parking behavior and traffic flow.

- **Implications for Urban Mobility:**
  - Insights can lead to apps that assist drivers in finding parking, reducing search time and traffic congestion.

- **Commercial & Real Estate Efficiency:**
  - The findings suggest potential for improving office space usage and customer flow, increasing overall business efficiency.

Risks 

Data Access and Quality:

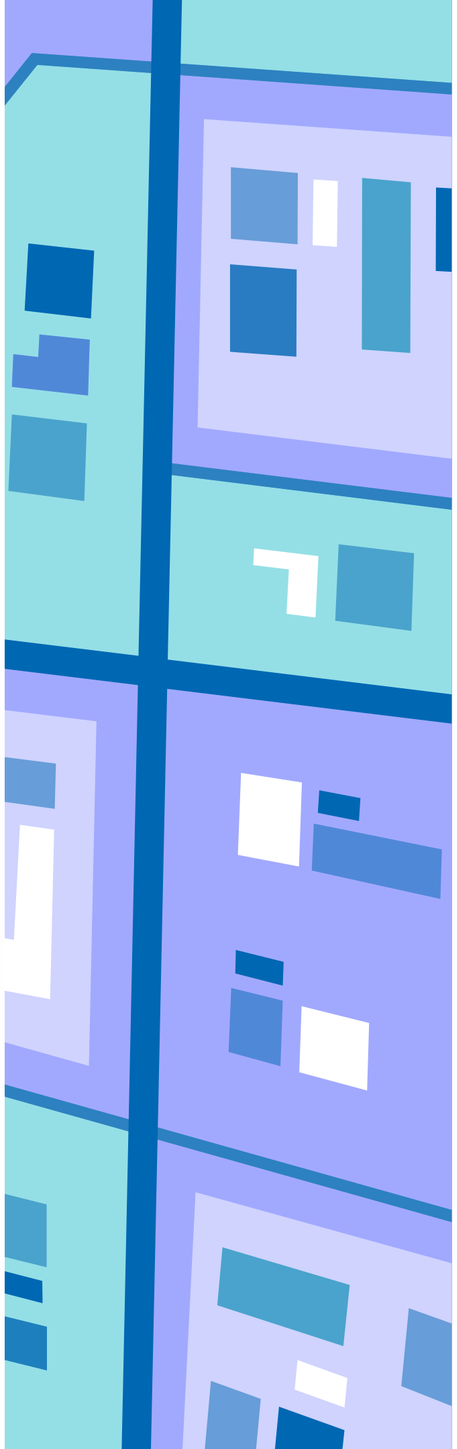
- Limited real-time traffic and parking data access can impact predictive accuracy and application relevance.

Model Limitations:

- Initial model might not cover all variables (like special events, weather, urban changes) influencing parking and traffic.

Technical Challenges:

- Risks of overfitting or underfitting due to urban data complexity may require more sophisticated modeling techniques.



Next Steps

Further Data: Our next crucial step involves expanding our dataset range and incorporating real-time data sources.

This includes integrating real-time weather data, additional traffic datasets specific to Barcelona's districts for enhanced city accuracy, and diversifying our image datasets.

Additionally, we will explore methods to incorporate the charging dataset into our model.

THANK YOU