User Manual: Price Optimization for Storage and Parking

# 1. Introduction

This User Manual provides a detailed overview of the price optimization app for storage and parking spaces. The app aims to optimize prices using predictive models and optimization techniques, with the goal of maximizing revenue.

# 2. Data Preparation and Exploration

The price optimization app allows users to upload data files in Excel format (.xlsx) for processing. The app performs data validation, data cleaning, and data transformation on the uploaded files.

- File Upload: Users can upload data files for processing. The app validates the file format, name, and columns before processing.  
- Data Processing: The app processes the uploaded data files, extracts relevant columns, and performs data cleaning and transformation.  
- File Validation: The app validates the data file format, name, and columns. It also validates the format of year inputs.  
- Data Aggregation: The app combines CSV files based on their names and processes the combined data for further analysis.

# 3. Prediction Models

The price optimization app uses predictive models to estimate prices for storage and parking spaces based on the processed data. The predictive models are built using the Random Forest regression algorithm.

- Feature Selection: The app identifies important features based on feature importance scores.  
- Model Building: The app builds Random Forest regression models using the selected features.  
- Model Evaluation: The app evaluates the models using scatter plots, residual plots, and RMSE.

# 4. Optimization Models

The optimization models are developed to maximize revenue for storage and parking spaces based on the predicted prices. The app uses the Pyomo modeling language and the GLPK solver to build and solve the optimization models.

- Optimization Model Building: The app creates concrete optimization models using Pyomo.  
- Objective Function: The app defines the objective function to maximize revenue.  
- Constraints: The app considers constraints such as price limits.  
- Model Solving: The app solves the optimization models using the GLPK solver.  
- Results: The app presents optimal prices and maximum revenue.

# 5. Using the Price Optimization App

The price optimization app provides an interactive user interface for processing and analyzing data for price optimization. The app offers the following features:

- File Upload: Users can upload data files in Excel format (.xlsx) for processing. The app validates the file format, name, and columns before processing.  
- Data Processing: The app processes the uploaded data files, extracts relevant columns, and performs data cleaning and transformation.  
- File Validation: The app validates the data file format, name, and columns. It also validates the format of year inputs.  
- Data Aggregation: The app combines CSV files based on their names and processes the combined data for further analysis.  
- Data Visualization: The app visualizes the processed data and provides insights into parking and storage revenue.  
- Model Execution: Users can run predictive and optimization models on the processed data.  
- Results Presentation: The app presents optimal prices and maximum revenue for indoor parking, outdoor parking, and storage.

# 6. Conclusion

The price optimization project uses advanced machine learning and optimization techniques to maximize revenue for storage and parking spaces. The price optimization app provides a user-friendly interface for optimizing prices and maximizing revenue, making it accessible to a wide range of users.