Predicting Rental Apartment Prices in Israel

Motivation:

- High demand, big price differences, no fast estimation tools.
- No similar solution exists in the Israeli market.
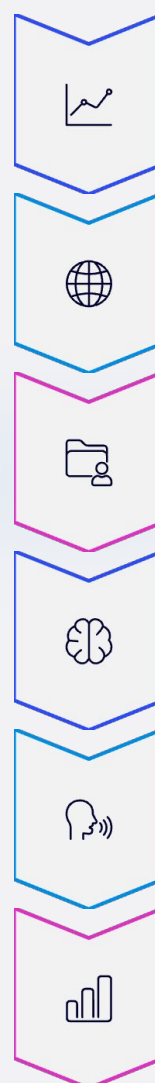
Real Estate Market

Lengthy Search

Data & Analytics

Tech Solution

REAL ESTATE MARKET ANALYSIS

7.450

17,9

19,8

Project Pipeline & Tech Stack

Market Analysis	**Languages:** Python	
Data Parsing	**Parsing:** BeautifulSoup, Selenium, Camoufox	
Database Design	**Database:** PostgreSQL, MySQL	
Model Training	**Machine Learning:** Pandas, Scikit-learn, CatBoost	
Telegram Bot	**Bot Integration:** Telegram Bot API, GeoPy	
Dashboard	**Visualization:** Tableau	

Data Parsing from Yad2 — Challenges & Solutions
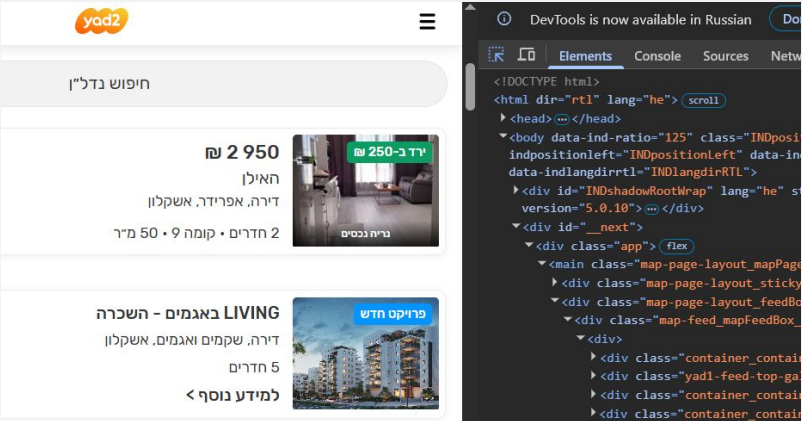
City Selection: Manually compiling an official city ID list and cross-referencing with population data allowed us to filter and focus on the top 20 most relevant cities for analysis.

CAPTCHA Bypassing: Integrated dynamic solutions from GitHub and implemented browser automation techniques to overcome CAPTCHA protections, ensuring uninterrupted data flow.

Database Design & Preparation
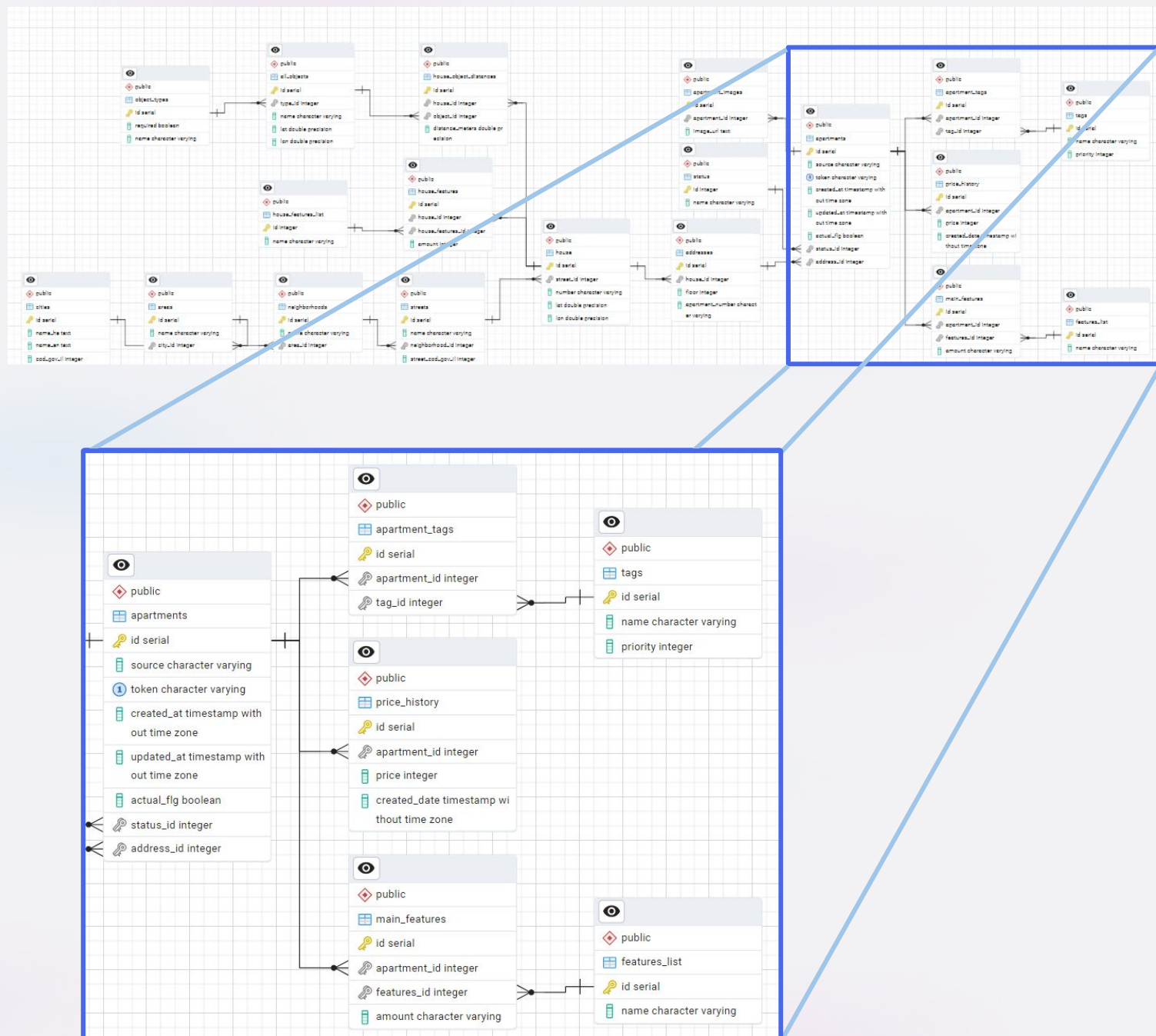
Relational Structure: Designed as a relational database to ensure scalability and maintain data integrity across all linked datasets.

Normalized Schema: Comprises 19 interconnected tables, organized in a normalized structure to minimize redundancy and enhance data consistency.

Automated Population: Data is automatically populated and updated using custom Python functions, streamlining the data ingestion process.

Machine Learning Model — CatBoost

After rigorous testing, CatBoost emerged as the optimal model, delivering superior accuracy for rental price prediction.

Model	R²	MAE	RMSE
ElasticNet	0.39	1717	2297
GradientBoosting	0.71	959	1586
RandomForest	0.72	887	1544
CatBoost	**0.73**	**882**	**1529**

Why CatBoost?

High Accuracy: Achieved the best performance metrics among all tested models, with a remarkable R² score of 0.73.

Categorical Feature Handling: Excels at processing categorical data, which is abundant in rental market datasets (e.g., city, neighborhood, property type).

Robustness: Less prone to overfitting, ensuring reliable predictions even with complex datasets.

Telegram Bot with Geo API

A user-friendly Telegram bot provides instant rental price predictions, leveraging geolocation for precise results.

Seamless User Experience

Familiar Platform: Utilizes Telegram, a widely adopted and secure messaging platform, for easy accessibility and immediate use.

Geo-location Integration: Seamlessly incorporates Geo API to accurately pinpoint user locations, enabling highly precise price predictions based on geographical coordinates.

Instant Predictions: Provides quick, on-demand rental price estimations, empowering users to make informed decisions without delay.
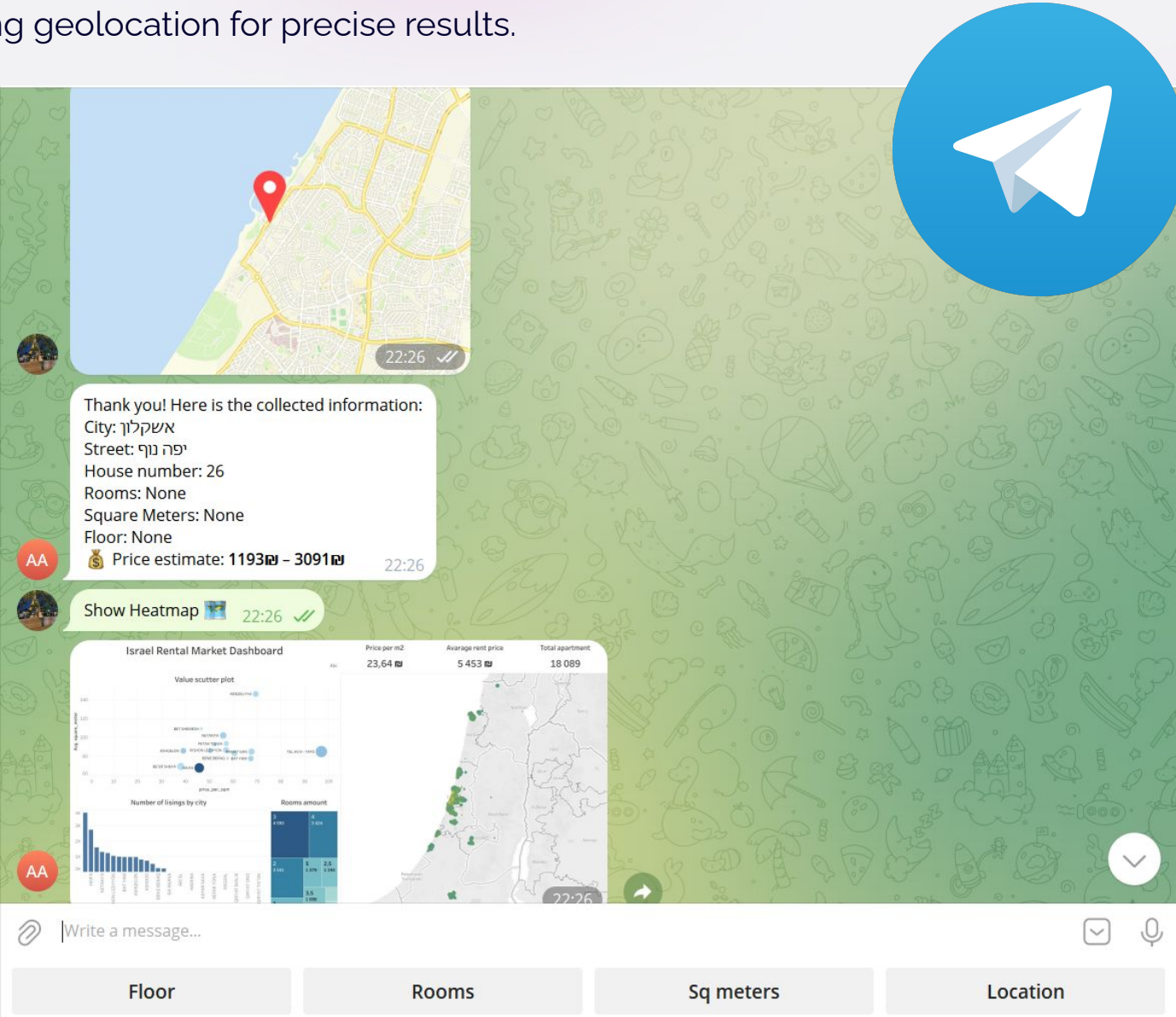
# Interactive Tableau Dashboard — City Analytics

The Tableau dashboard provides a comprehensive analytical view of rental market trends across Israeli cities, enhancing data-driven insights.

Key Features

Dynamic Heat Map: Visualize average rental prices per square meter across different cities in Israel at a glance.

Comprehensive Metrics: Provides essential data points including average price per sqm, total number of listings, and average total rental price for each city.

User Interactivity: Allows users to filter and explore data, gaining deeper insights into specific urban rental markets.
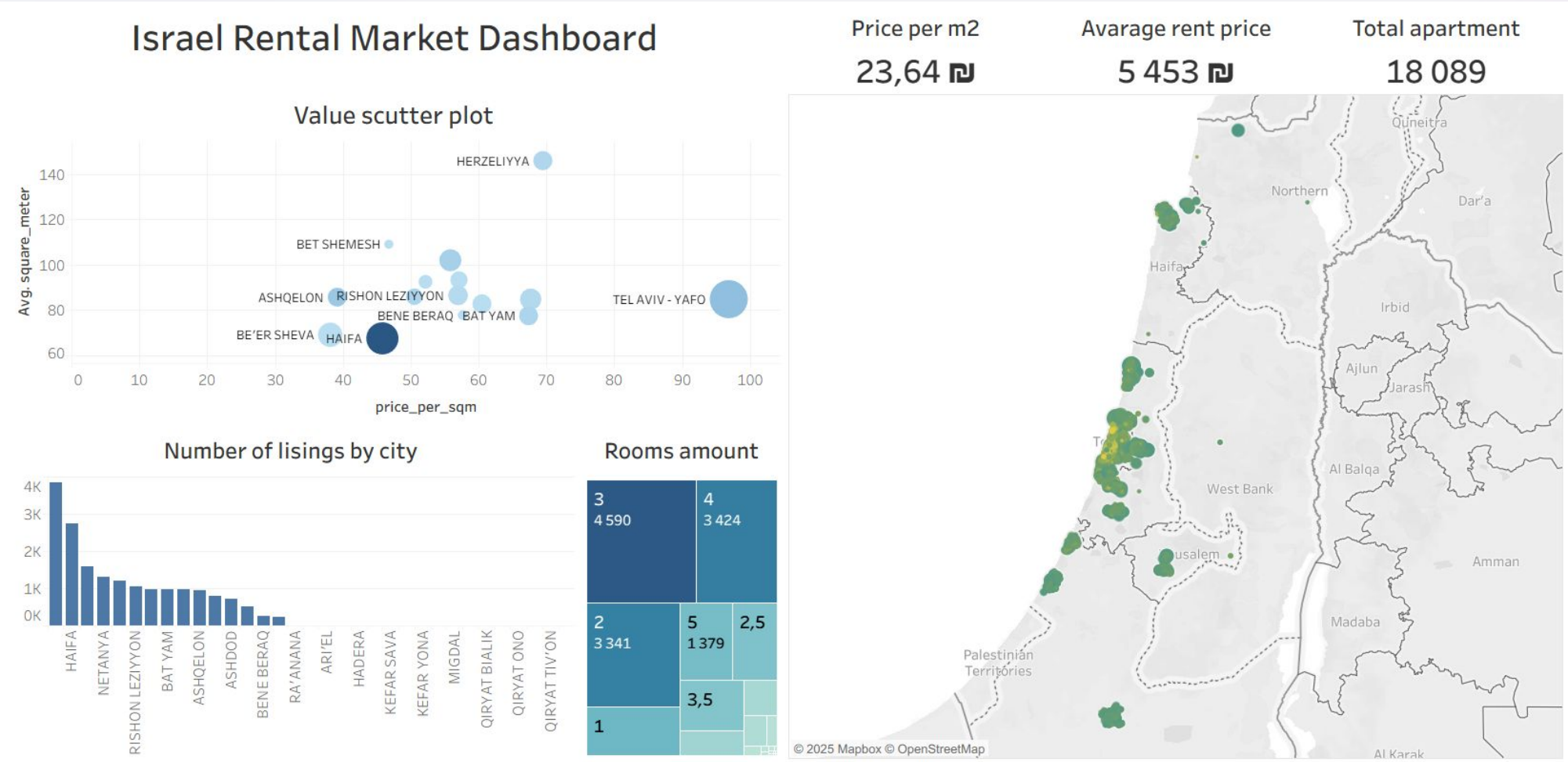
Future Steps — Project Growth

Our roadmap includes strategic enhancements to expand the project's value and coverage, ensuring continuous innovation and utility.

New Features

- Distance to Tel Aviv
- Infrastructure score

New Data Sources

- Telegram channels
- Other platforms

Model Improvement

- More data
- Higher accuracy

Expansion

- More cities
- Property types

Summary & Conclusion

This project demonstrates a comprehensive, end-to-end solution for rental price prediction, transforming raw data into a powerful, user-ready tool.

Working ML Model

CatBoost with high accuracy for precise predictions.

User Interface
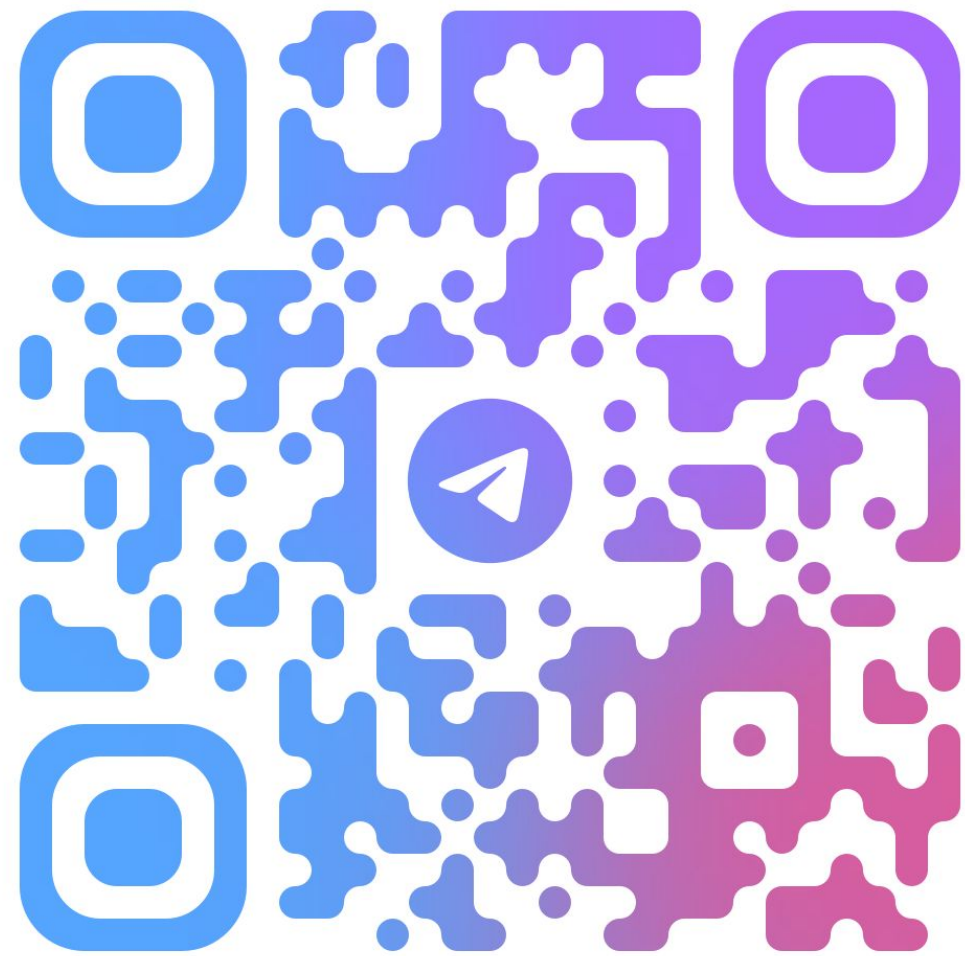
Intuitive Telegram bot with Geo API for instant access.

Analytics

Interactive city-level dashboard for market insights.

✨ End-to-End Project: From raw data to a ready-to-use tool ✨

Thank you!

Questions?

@APARTMENTA_BOT

Try the bot now!