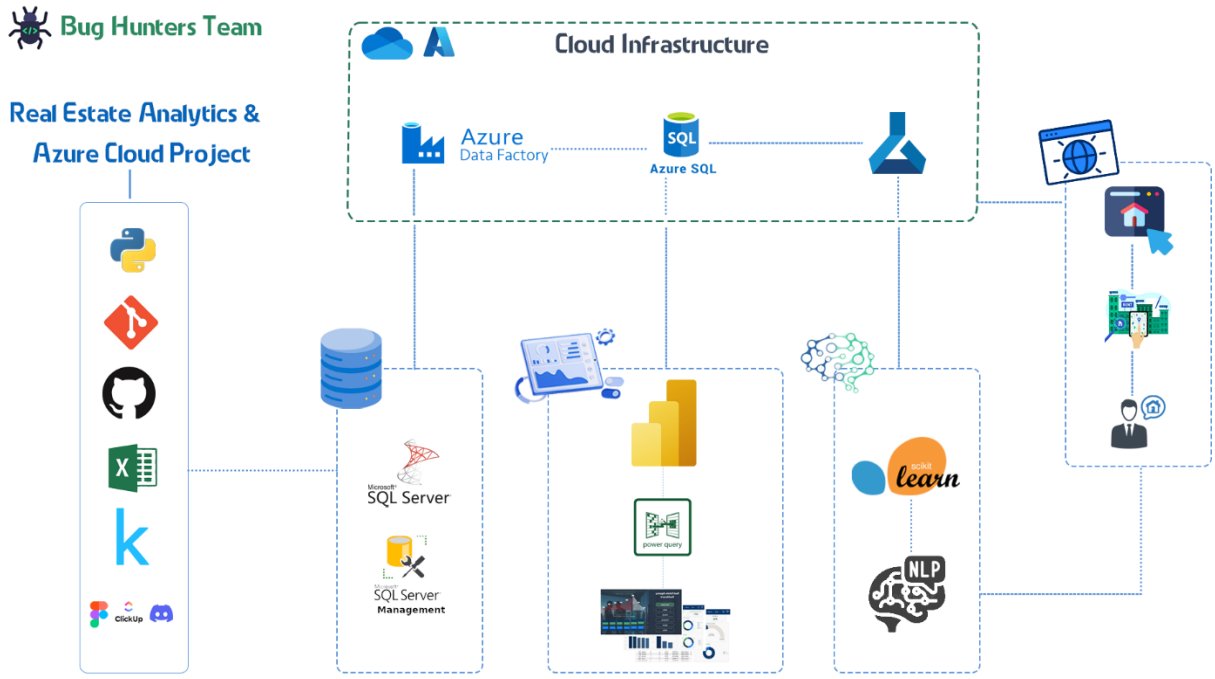
📓 Official Documentation for Real Estate Price Prediction Dashboard + Real Estate Pro Web App



📑 Project Overview

This project delivers a **complete real estate analytics and prediction platform**. It combines:

- Cloud database (Azure SQL) for data storage.
- Machine learning for property price forecasting till 2030.
- Power BI for interactive dashboard reporting.
- A modern responsive web app with an AI-powered chatbot for a smarter user experience.

🎯 Project Goals

- Empower real estate companies with **predictive insights**.

- Offer a **full web solution** for browsing, buying, and selling properties.
- Use **Azure** and **Power BI** for data handling and analytics.
- Provide an engaging and intuitive **user experience** with AI capabilities.

⚙️ Main Components

1. Azure SQL Database

- Real estate data stored securely on **Azure SQL Database**.
- Imported using .bacpac file from local DB to cloud.
- Scalability features:
    - Switched to **serverless mode** for cost optimization.
    - Enabled **Transparent Data Encryption (TDE)**.
    - Configured firewall rules and **TLS 1.2** for encryption in transit.

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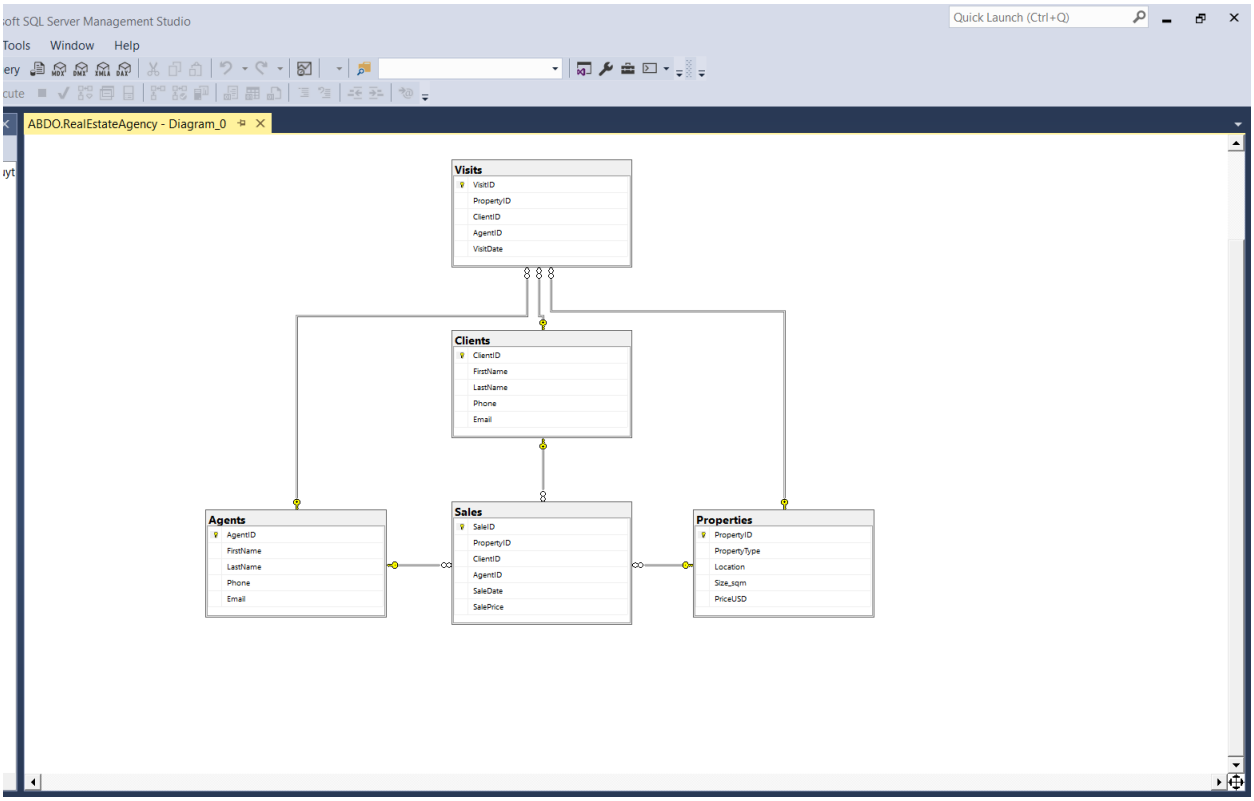
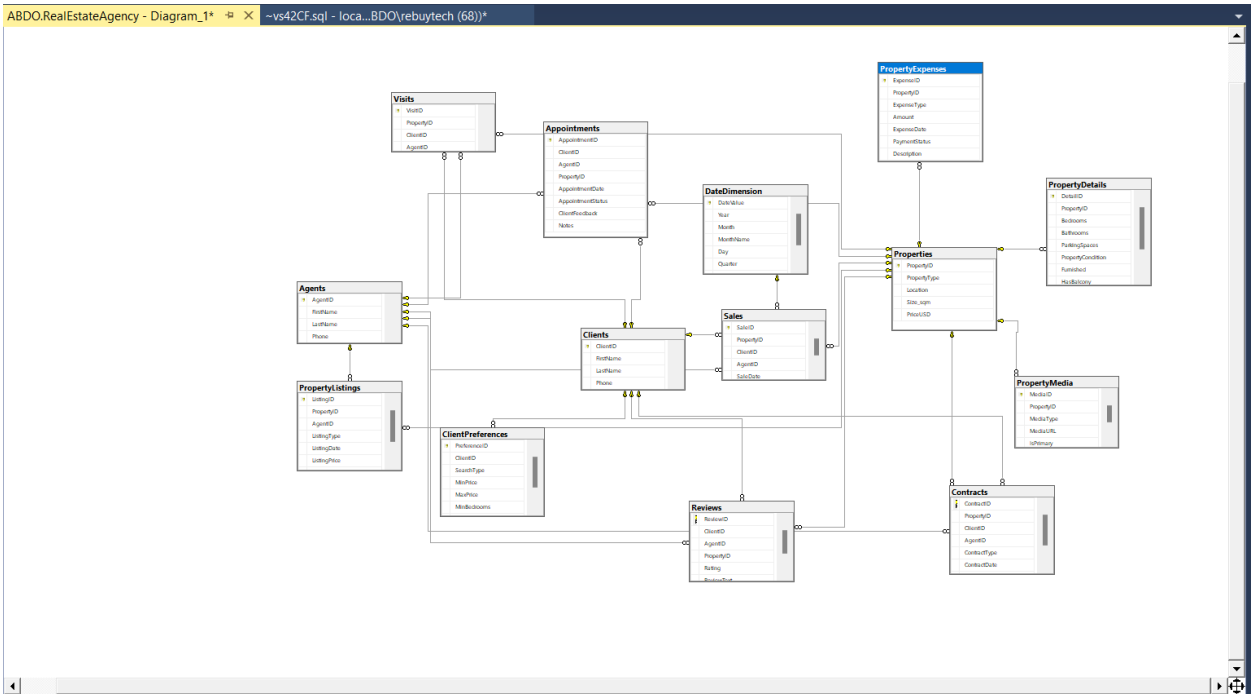
2. Database Before & After Scaling





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2. Machine Learning Workflow

- Algorithm: RandomForestRegressor
- Preprocessing:
    - Categorical: OneHotEncoder
    - Numerical: StandardScaler

Input Features:

- Property Type
- Location
- Area (sqm)
- Number of Visits
- Visit Popularity = Visits ÷ Area

Output:

- property_price_predictions.csv (forecast to 2030)
- price_predictions.png (visual graph)
- property_price_model.pkl (trained model)

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3. Data Pipeline

- Raw data extracted from Azure SQL.
- Cleaned, encoded, and features engineered.
- Forecast assumes **5% yearly growth** in visits.
- Generates forecasted prices per property type and location till 2030.

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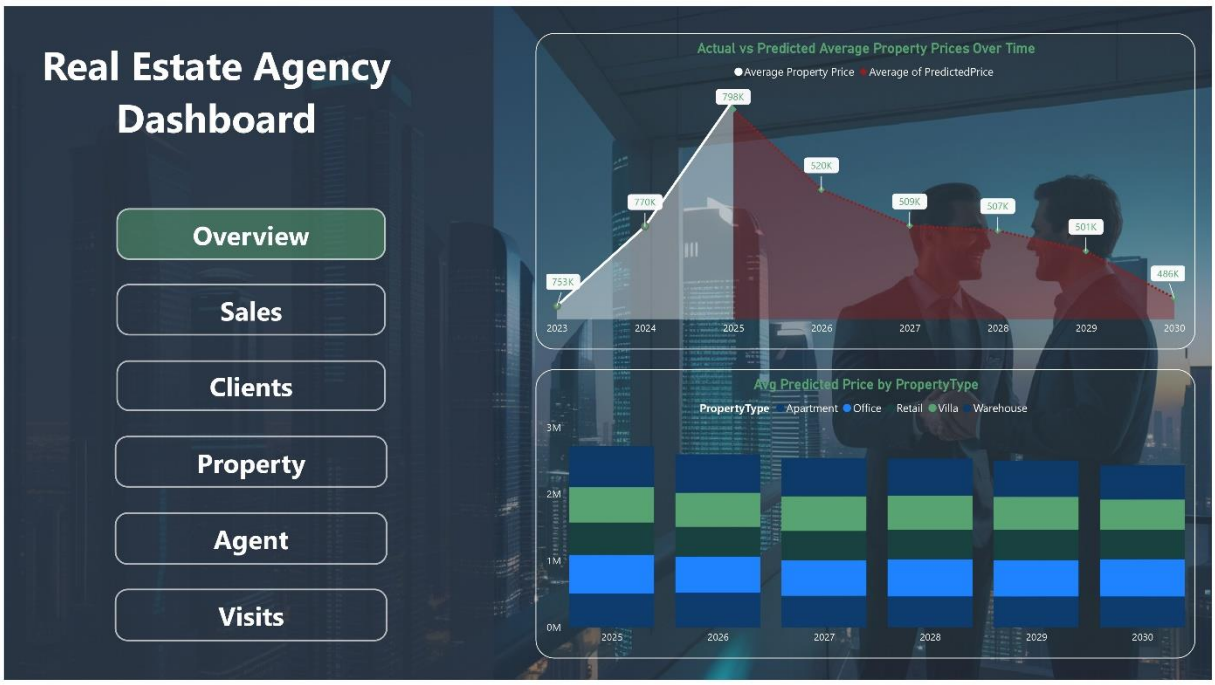
4. Power BI Dashboard

- Visualizes price predictions using:
    - Line charts

    - Bar charts
    - Map visuals
    - KPI indicators
- Filters/slicers for:
    - Property Type
    - Location
    - Forecast Year


Real Estate Agency Dashboard
Overview
Sales
Clients
Property
Agent
Visits
Actual vs Predicted Average Property Prices Over Time
Average Property Price
Average of PredictedPrice
798K
770K
753K
520K
509K
507K
501K
486K
2023
2024
2025
2026
2027
2028
2029
2030
Avg Predicted Price by PropertyType
PropertyType
Apartment
Office
Retail
Villa
Warehouse
3M
2M
1M
0M

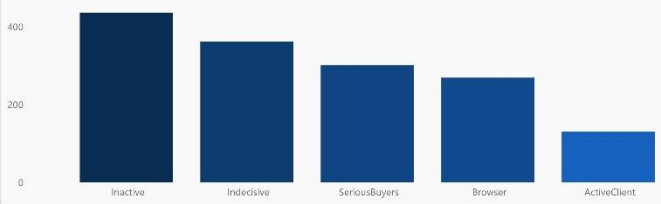
Real Estate Dashboard
Sales
Clients
Property
Agents
Visits
Total Revenue
2bn
Total Sales
2000
Avg Sale Price
769K
Max Deal Value
1M
Latest Month Sale YoY %
-75%
Monthly Sales Performance Vs Revenue Trend
SalesCount
Total Revenue
January
February
March
April
May
June
July
August
September
October
November
December
Total Sales by PropertyType
17%
25%
18%
21%
19%
Apartment
Villa
Retail
Office
Warehouse
Total Revenue by Region
0.3bn
0.2bn
0.1bn
0.0bn
Northeast
Southeast
West
South
Midwest
Total Sales by Price Segment
1,000
500
0
Luxury
Mid-Range
Budget
Total Sales by Season
24%
26%
24%
25%
Spring
Winter
Summer
Autumn

Real Estate Dashboard

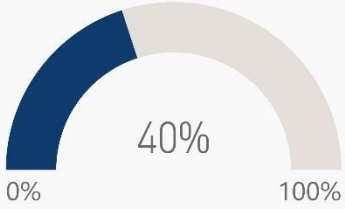
Sales | Clients | Property | Agents | Visits

Avg Visits per client	Total Clients	Retention Rate	Win Rate
3	1500	2.4%	40%

No of Clients by Client Segmentation



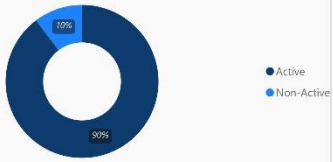
Conversion Rate, Tot . Visits and Tot . Sales



Top 10 Clients By Revenue

ClientID	FirstName	Count of VisitID	VisitCount	Sum of SaleID	Sum of SalePrice	CustomerSegment
1452	Dennis	1	1	4514	4126863	High Value
1416	Eric	4	4	4849	4319775	High Value
973	James	4	4	2912	4726575	High Value
798	Jessica	5	5	4250	4301397	High Value
507	Laurie	1	1	2797	4210548	High Value
864	Mary	5	5	4710	3806017	High Value
1034	Miranda	5	5	6633	5309528	High Value

Count of VisitID by ActivityStatus

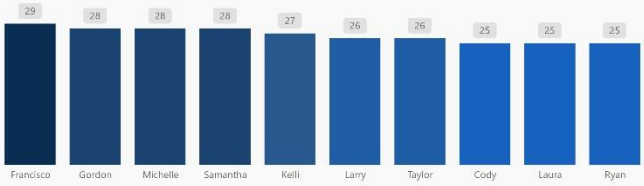


Real Estate Dashboard

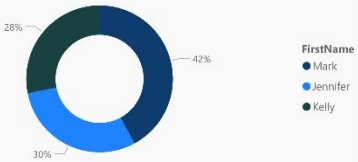
Sales | Clients | Property | Agents | Visits

Active Agents	Agent Sales Performance	Avg Sales Per Agents
100	20	15M

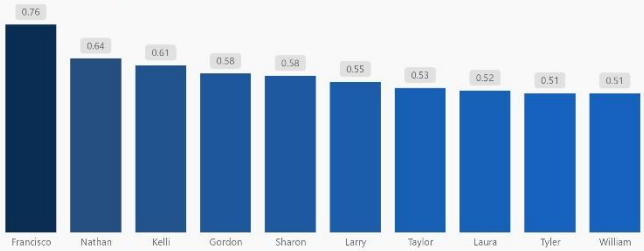
Top 10 Agents by No of Clients



Top 3 Agent by Sales



Conversion Rate By Agent



Top 3 Agent by number of property sold

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5. Real Estate Pro Web Application (Next.js)

A modern web platform for clients, agents, and admins.

Key Features:

Feature	Description
AI Assistant Chatbot	Smart chat support for finding properties
Smart Filters	Natural language filtering of listings
Agent Directory	List of real estate agents
Add Listings	Users can add new properties
Full Responsive Design	Optimized for mobile, tablet, and desktop

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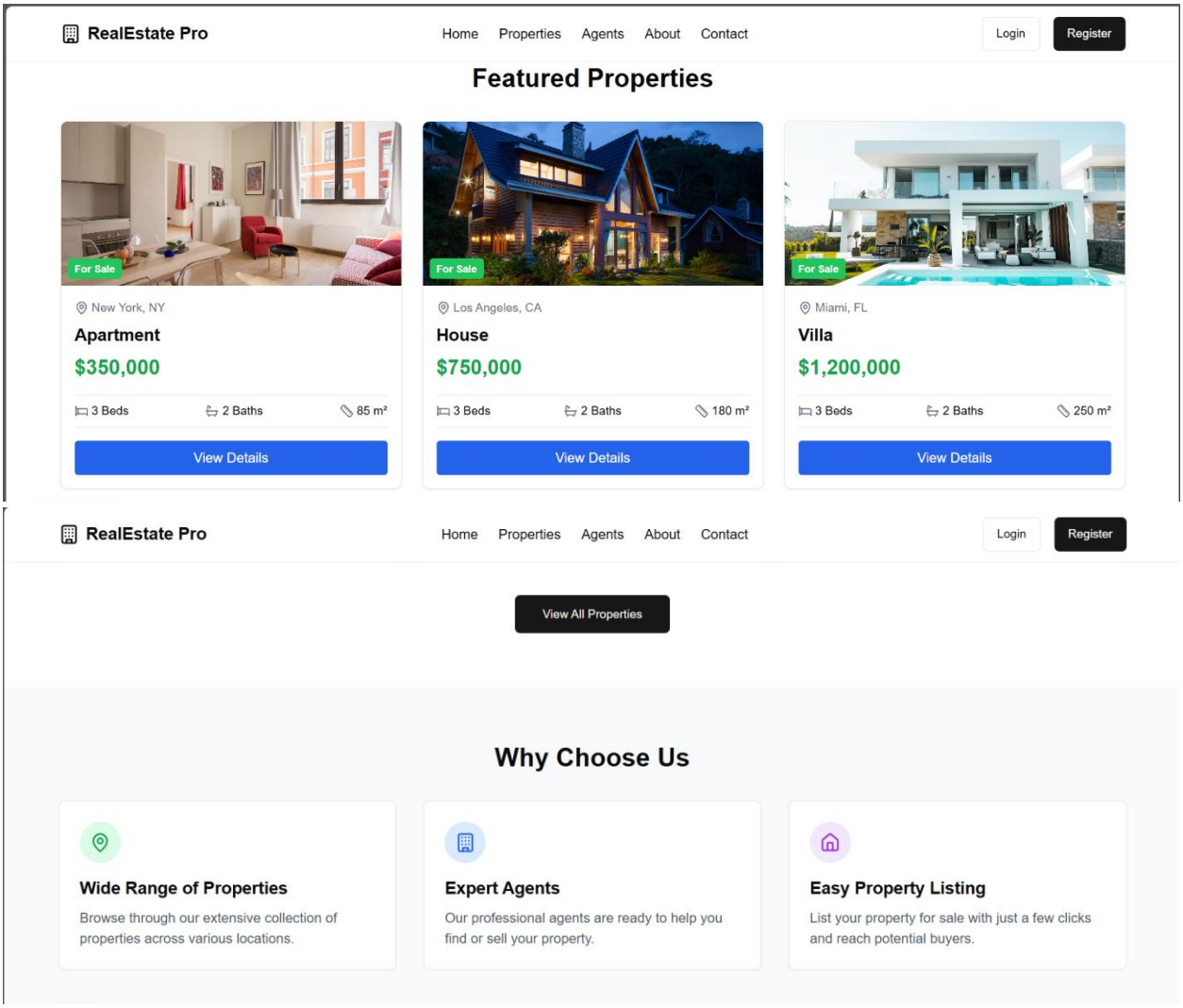

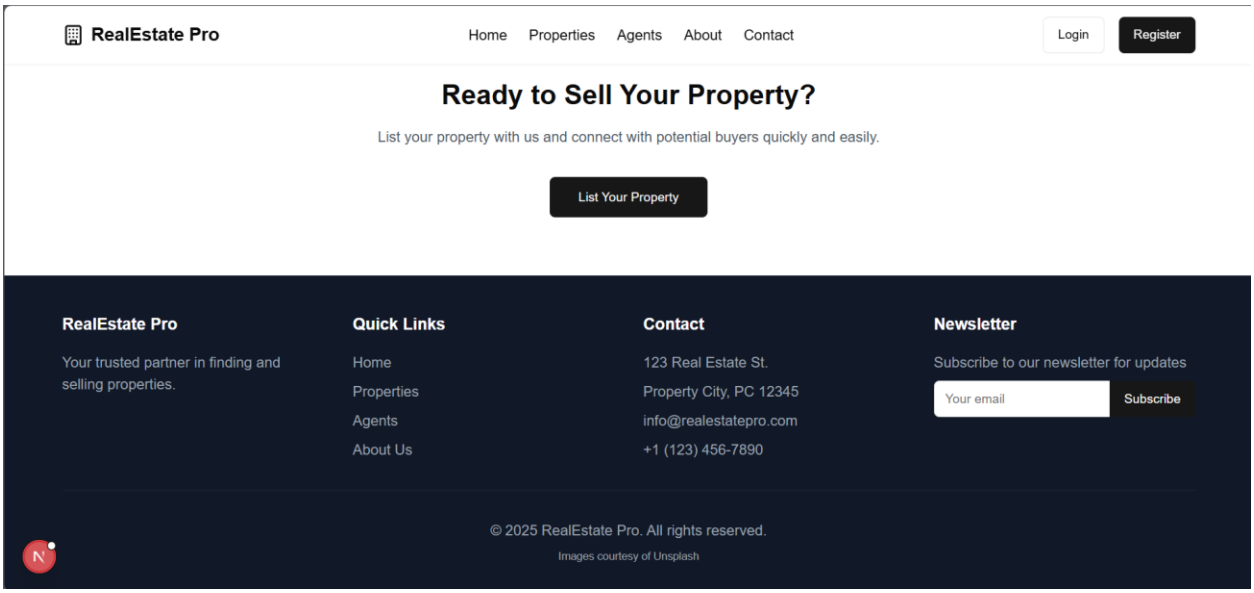
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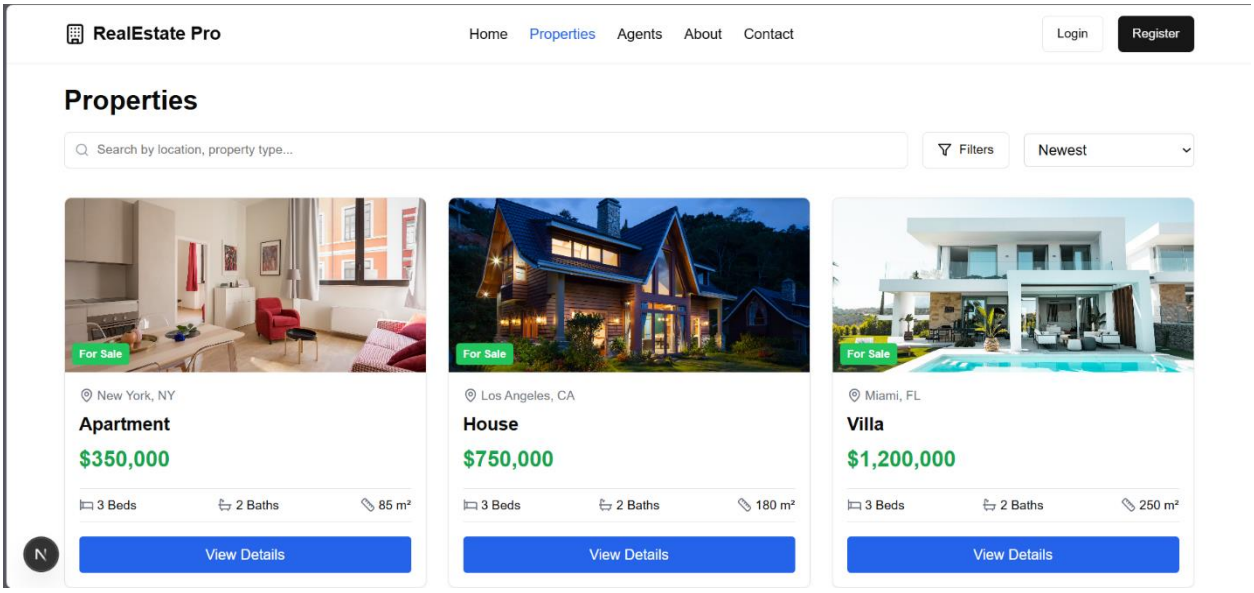
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New York, NY
Apartment
$350,000
3 Beds
2 Baths
85 m²
View Details
For Sale
Los Angeles, CA
House
$750,000
3 Beds
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View Details
For Sale
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Villa
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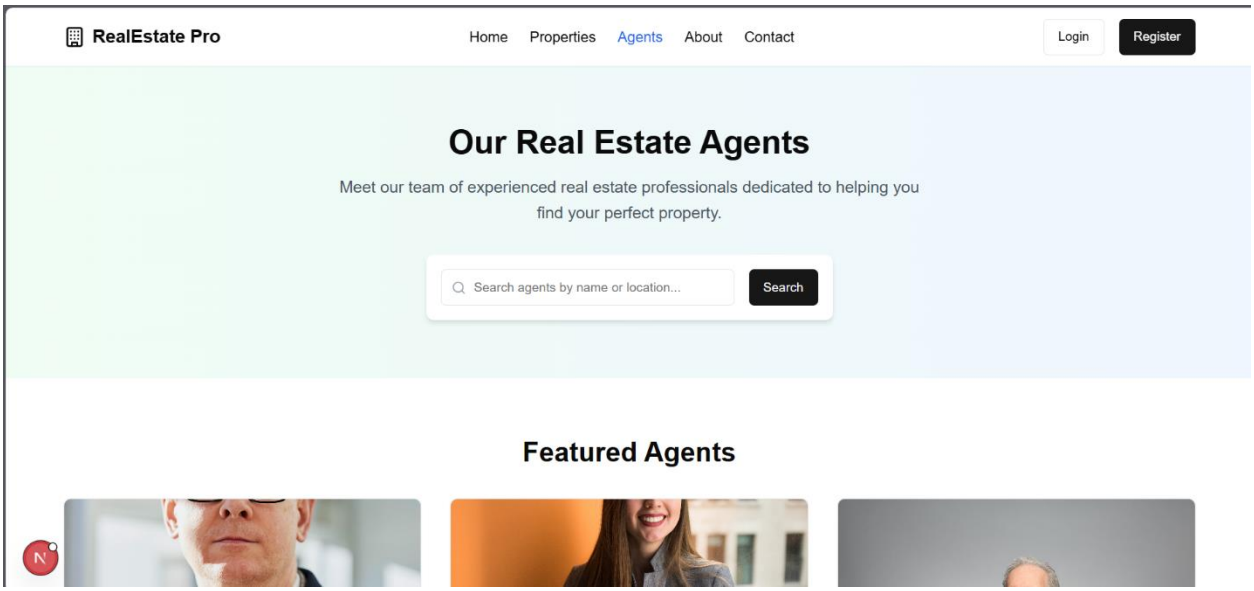
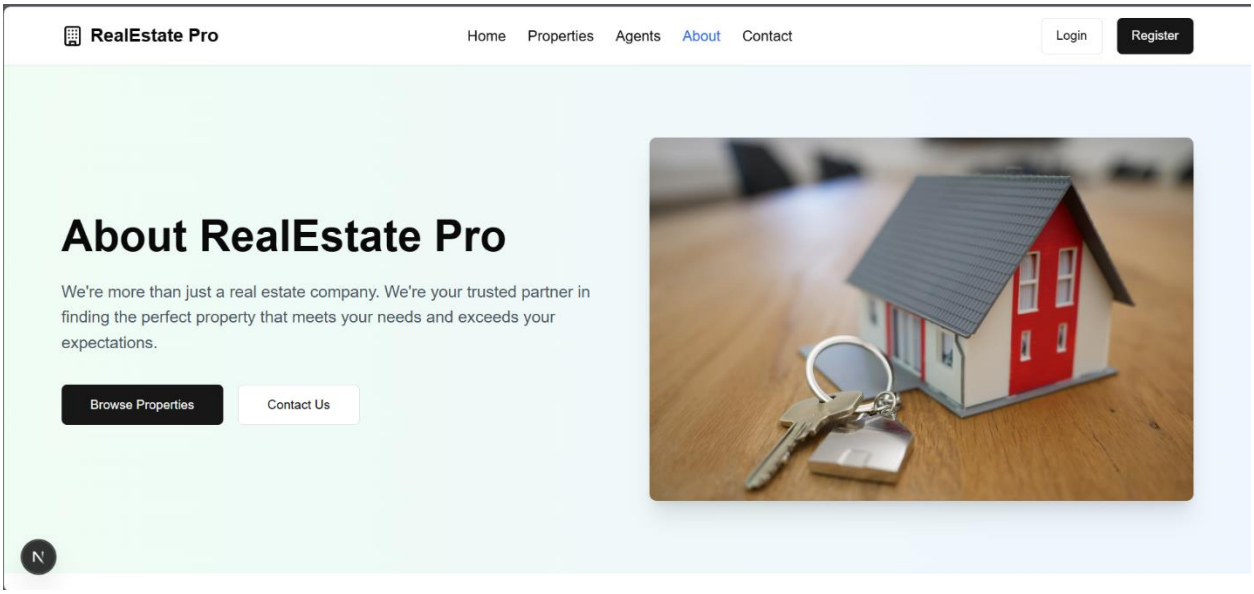
3 Beds
2 Baths
250 m²
View Details





✅ Progress Summary

Task	Status
Azure SQL setup	✅

Task	Status
Data migration from local to Azure	✅
Machine learning forecasting	✅
Power BI report with forecast data	✅
Full-stack responsive web app	✅
AI chatbot integration	✅
Infrastructure security & scalability	✅

🧭 Future Enhancements

- **Real-time price updates** using public property APIs.
- Automated retraining via **Azure ML Pipelines**.
- Feature expansion with school ratings, crime rate, traffic info.
- Production deployment of inference model via FastAPI or Azure ML endpoint.

🏁 Final Deliverables

✅ Accurate price predictions (2030)
✅ Modern data visualizations in Power BI
✅ AI-powered web app for property browsing
✅ Scalable Azure-based infrastructure