

# Housing Market Cluster Analysis Program

## Project Summary and Description

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### Problem Statement:

This project stemmed from the challenge of understanding complex housing market patterns across different cities in the United States. With varying growth rates, price volatility, and average prices across different housing sizes (1-5+ bedrooms), it can be difficult for people to identify market patterns and make data-driven decisions. Analyzing individual metrics in isolation fails to reveal underlying market segments and patterns.

### Solution Approach:

The program leverages machine learning, specifically K-means clustering, to identify distinct housing market segments based on three key metrics:

1. **Growth Rate:** Measures price appreciation from 2020 to present
2. **Volatility:** Captures price stability/instability
3. **Average Price:** Indicates overall market positioning

### Program Features:

- Data preprocessing to handle missing values and standardize features
- Automated determination of optimal cluster count using silhouette scoring
- Interactive visualization allowing users to explore relationships between different metrics
- Support for analysis across different housing sizes (1-5+ bedrooms)

## **Technical Implementation:**

### **The program utilizes:**

- Zillow Home Value Index (ZHVI) dataset in CSV format for reliable housing price data
- Scikit-learn for machine learning library
- Pandas for data manipulation and cleaning
- Matplotlib for data visualization
- Standard scaling to normalize features before clustering

## **Real-World Value:**

- This tool provides value to various users:
  - Investors can identify markets with similar characteristics for portfolio diversification
  - Homebuyers can understand market dynamics across different cities, giving them insights into optimal buying markets
  - Analysts can explore relationships between various metrics
  - Policymakers can identify patterns in housing market behavior

## **Reflection:**

As a young adult aiming to buy a home one day in an increasingly challenging market, this project combines my programming skills with a personal interest. The housing crisis facing my generation motivated me to better understand which cities offer opportunities and which show warning signs. Through analyzing the data, I've learned that housing markets often behave in unexpected ways – some expensive cities show extreme volatility, while other lesser-known markets demonstrate promising stability and growth. Building this program has not only improved my own understanding of where I might be able to afford a home someday, but I hope it can empower others in my generation to make more informed decisions about one of the biggest investments of their lives.