

# **IE 6600: Computation and Visualization for Analytics**

**A report on**

## **Connecticut Price and Value Trends In Residential Real Estate (2007 - 2021)**

**Group 09**

**Shubhang Yadav Sandaveni**

**Sai Deepthi Gali**

**Xinyue Niu**

**Submission Date: 12/10/2023**

## Introduction:

In an era of rapid urbanization and evolving economic landscapes, understanding real estate trends is crucial for a variety of stakeholders. The "Real Estate Sales 2007 - 2021" dataset provides an extensive insight into property transactions across the United States, offering a unique opportunity to explore the dynamics of property markets. This report delves into this dataset to uncover trends, patterns, and insights, crucial for shaping communities and influencing investment decisions.

## Problem Statement:

The real estate sector is a key indicator of economic health and societal trends. However, the sheer volume and complexity of data over an extensive period can obscure underlying patterns and insights. This report aims to analyze and interpret the dataset to reveal significant trends in property value fluctuations, regional disparities, and the effects of economic cycles on real estate transactions.

## Data Description:

The dataset includes a wealth of information on property transactions. Key variables include town, property type, sale amounts, assessed values and more. Additional data points such as latitude and longitude coordinates have been added for geographical context. The dataset primarily covers transactions in Connecticut, with detailed records from 2001 to 2021. <https://catalog.data.gov/dataset/real-estate-sales-2001-2018>

```
data.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 997213 entries, 0 to 997212
Data columns (total 14 columns):
#   Column              Non-Null Count  Dtype  
---  --
0   Serial Number       997213 non-null int64  
1   List Year           997213 non-null int64  
2   Date Recorded       997211 non-null object 
3   Town                997213 non-null object 
4   Address             997162 non-null object 
5   Assessed Value      997213 non-null int64  
6   Sale Amount         997213 non-null float64 
7   Sales Ratio         997213 non-null float64 
8   Property Type       614767 non-null object 
9   Residential Type    608904 non-null object 
10  Non Use Code        289681 non-null object 
11  Assessor Remarks    149854 non-null object 
12  OPM remarks         9934 non-null  object 
13  Location            197697 non-null object
```

## **Methodology:**

The methodology involves a multi-stage process starting with data cleaning where missing values and outliers were addressed from python programming . The analysis focused on key aspects such as residential type and many missing values were found in the dataset. The missing data was reduced from 38% to 8% by narrowing the dataset's timeframe and the remaining missing data is filled using a KNN model for prediction with 75% accuracy.

## **Design Process:**

The design process post data cleaning included visualization. The exploration phase involved analyzing temporal and geographical trends. Hypothetical and research questions guided the process:

Hypothetical Questions:

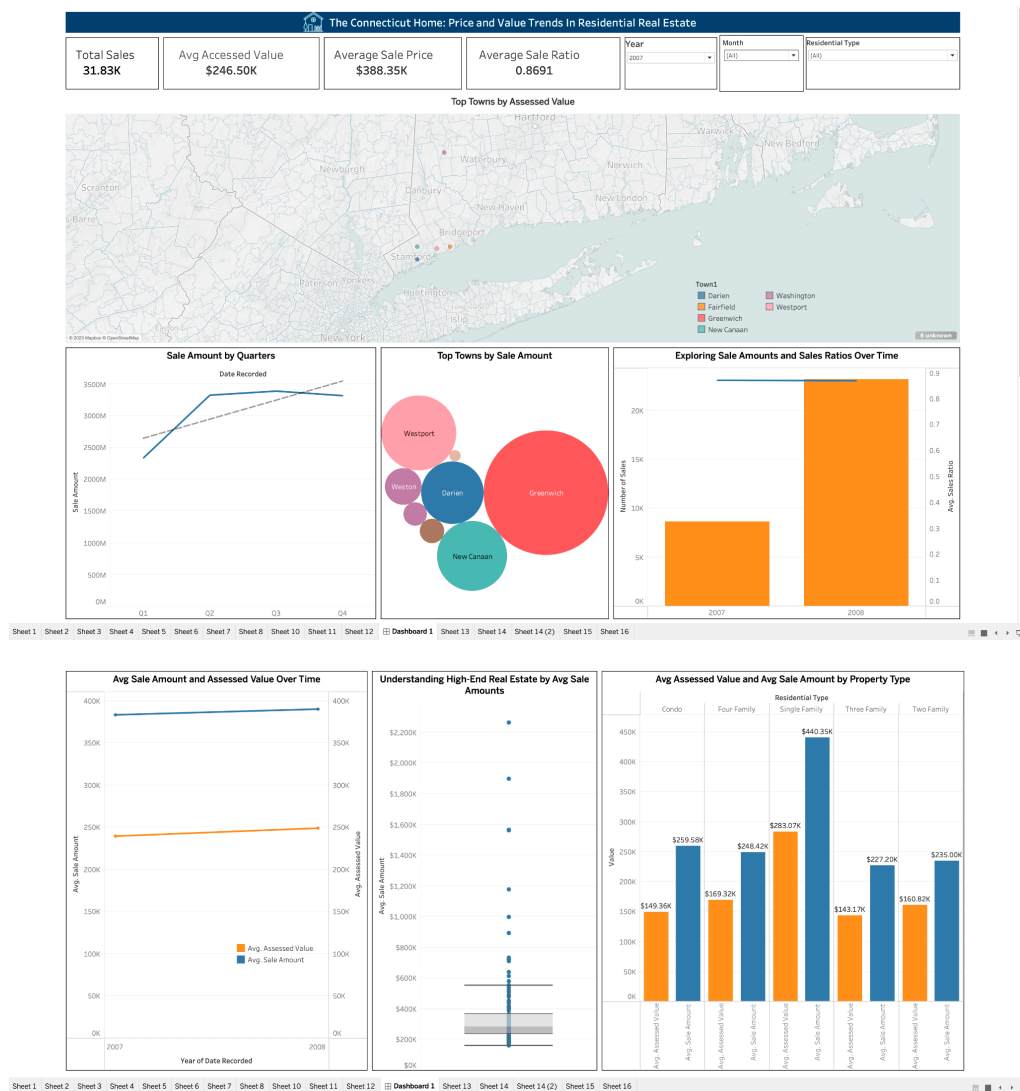
1. Do towns with higher assessed values correlate with higher sales amounts?
2. Are real estate sales seasonal?
3. How do property types impact sales?

Research Questions:

1. What do measurement methods indicate about market dynamics?
2. How do property values differ regionally?
3. Are there consistent patterns in sales over time?
4. What characteristics define high-end real estate?
5. What trends appear in sale and assessed values across property types?

Data processing involved aggregating data and after drawing sample sketches of the dashboard we started implementing on Tableau facilitated effective visualizations, allowing for a nuanced understanding of the dataset's dynamic.

In our Tableau dashboard, we present a series of insightful visualizations derived from the "Real Estate Sales 2007-2021" dataset, offering a granular exploration of key questions within the real estate landscape.

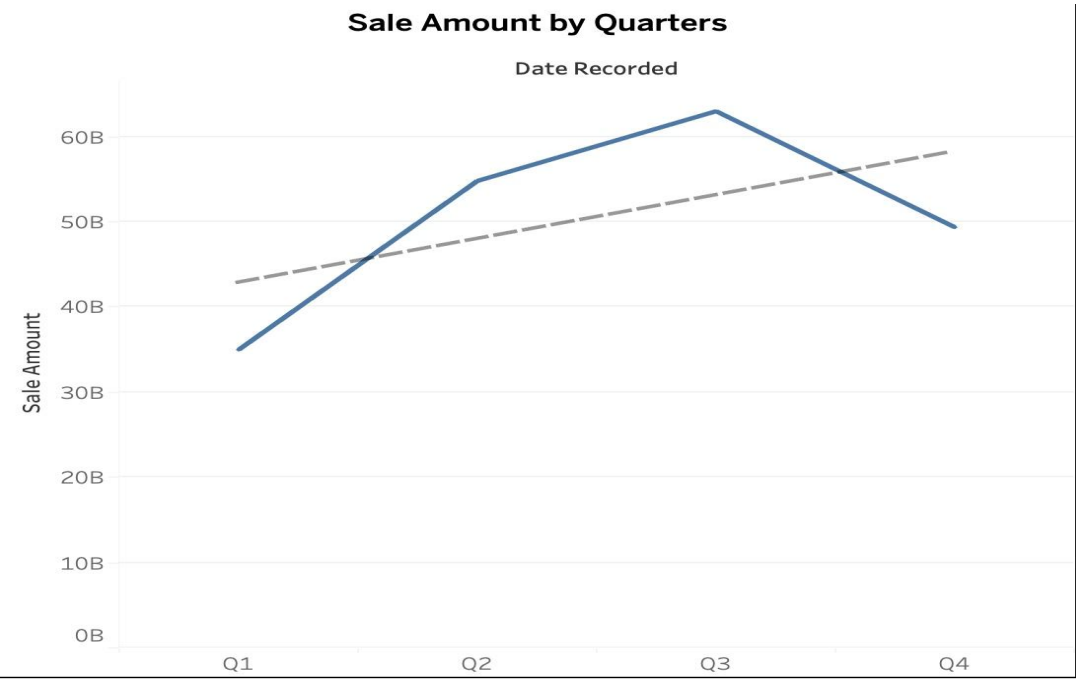


- **Dashboard** simplifies the exploration of Connecticut's real estate trends with four key metrics: Total Sales, Average Assessed Values, Average Sale Values, and Average Sales Ratios. Users can effortlessly customize their insights by selecting years (2007 - 2021), months, and resident types (Single or Multiple Select).

The Connecticut Home: Price and Value Trends In Residential Real Estate						
Total Sales 565.61K	Avg Accessed Value \$252.46K	Average Sale Price \$357.58K	Average Sale Ratio 1.696	Year (All)	Month (All)	Residential Type (All)

• **Quarterly Sale Amount:**

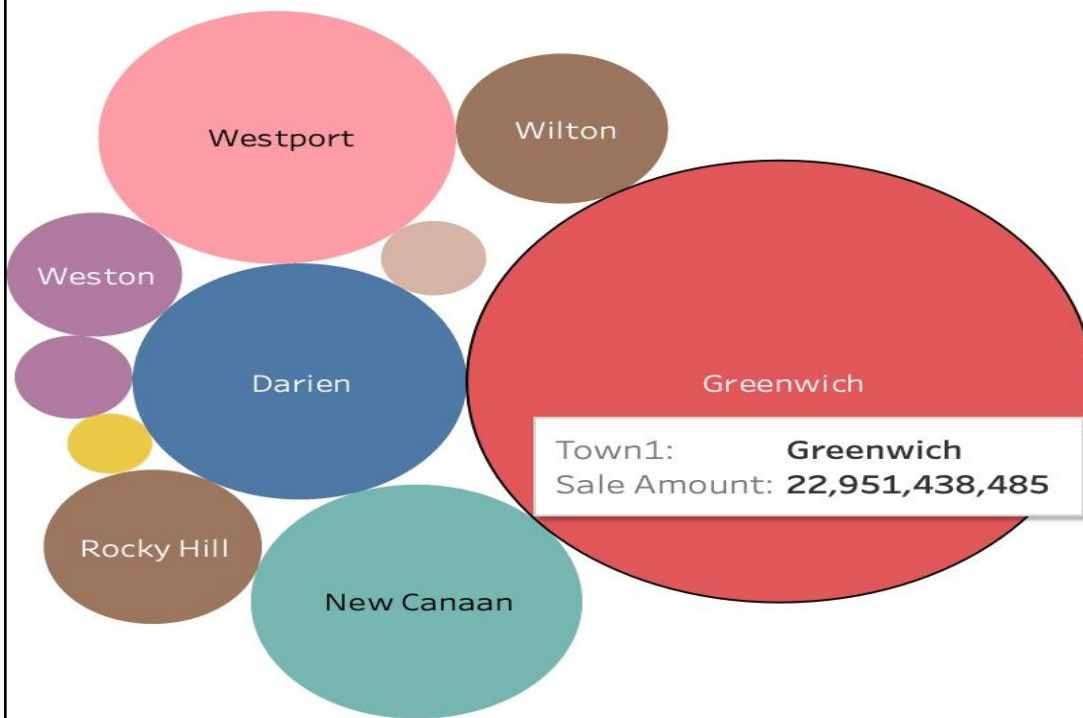
This visualization offers a comprehensive view of real estate dynamics through the lens of quarterly sale amounts. The interactive feature allows for a nuanced exploration of how sale amounts fluctuate over different quarters, providing valuable insights into seasonal trends and year-specific variations within Connecticut's real estate market. Whether aiming for a broad perspective or a granular year-by-year analysis, this visualization facilitates a tailored understanding of quarterly sales dynamics.



• **Top Towns by Sales Amount:**

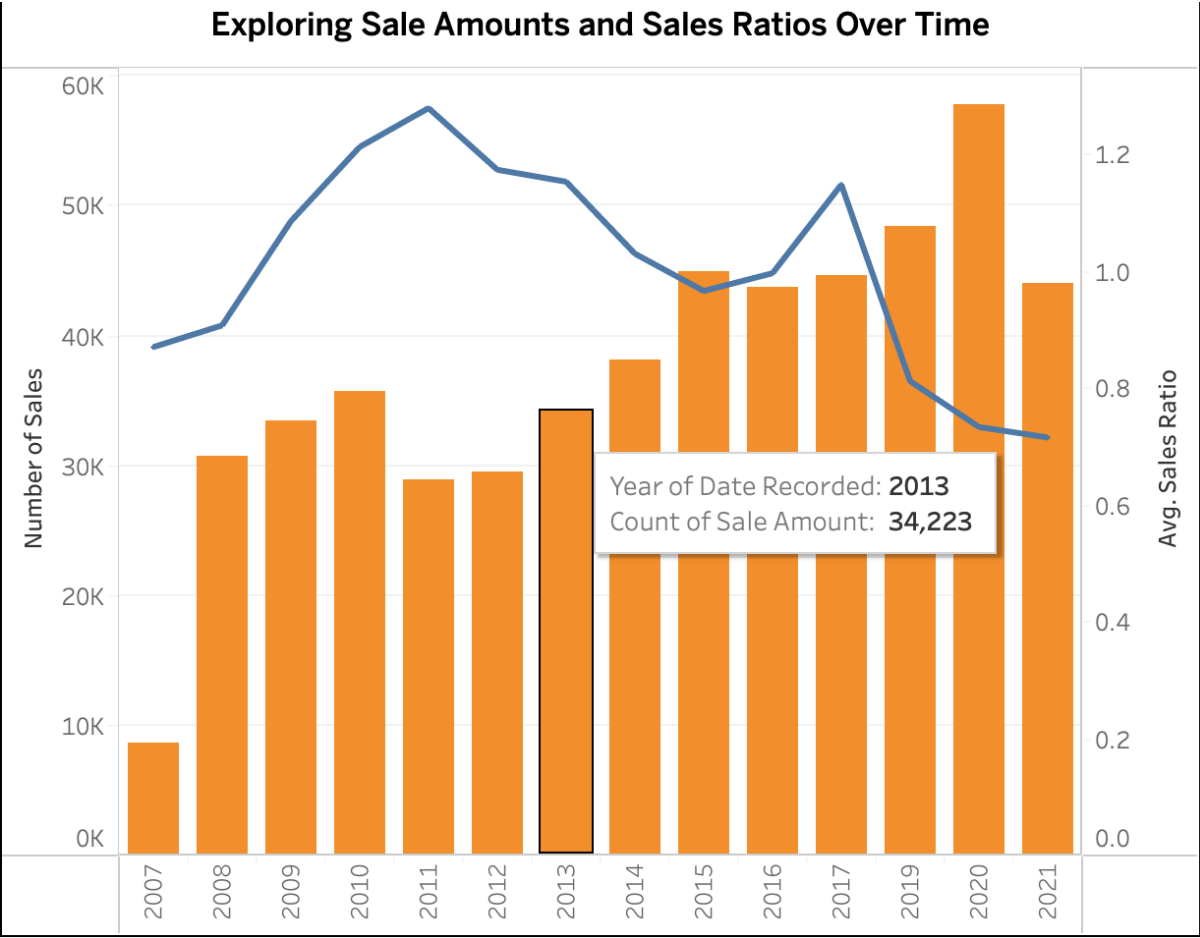
Our visualization spotlights the towns that stand out in Connecticut's real estate landscape based on sales amounts. Whether seeking an overview of the overall top towns or honing in on a particular year, this visualization serves as a valuable tool for discerning patterns and trends in Connecticut's real estate market.

## Top Towns by Sale Amount



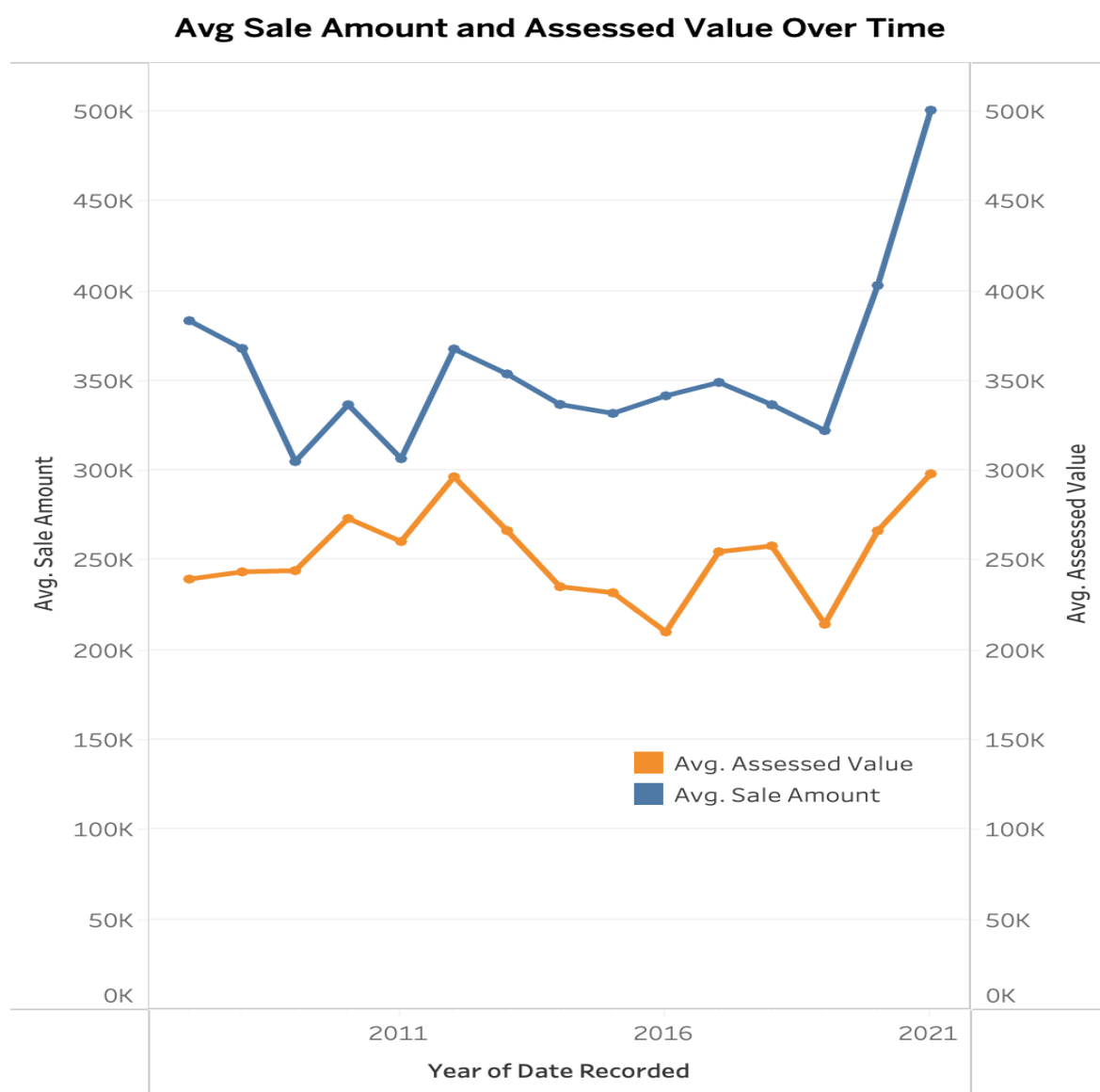
- **Exploring Sales Amount and Sales Ratio Over Time:**

This visualization takes a deep dive into the evolving landscape of sales amount and sales ratio over time in Connecticut's real estate market. The interactive nature of this feature facilitates a comprehensive understanding of how sales amounts correlate with sales ratios, offering insights into the market's pricing dynamics and the relationship between assessed and transaction values.



● **Average Sale and Average Assessed Values Over Time:**

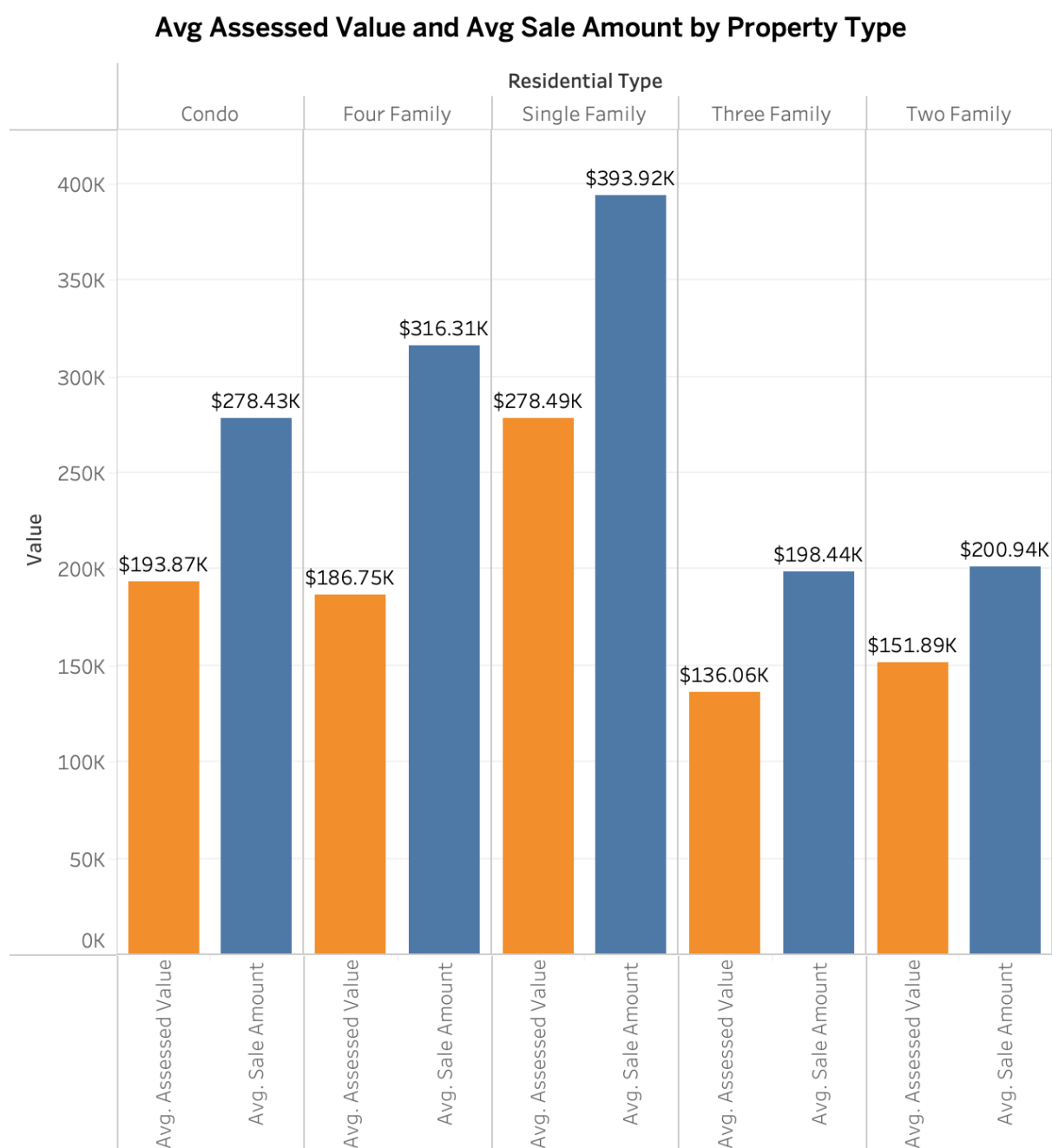
This visualization provides a side-by-side comparison of the average sale values and average assessed values over time in Connecticut's real estate market. This feature allows for a nuanced understanding of how average sale values align or differ from assessed values, offering valuable insights into market dynamics, fluctuations, and potential trends.



- **Average Sale and Average Assessed Values Over Property Types:**

In this visualization, users can delve into the distinct trends across various property types by comparing the average sale values and average assessed values. The interactive feature enables users to gain insights into how different property types contribute to overall market trends.

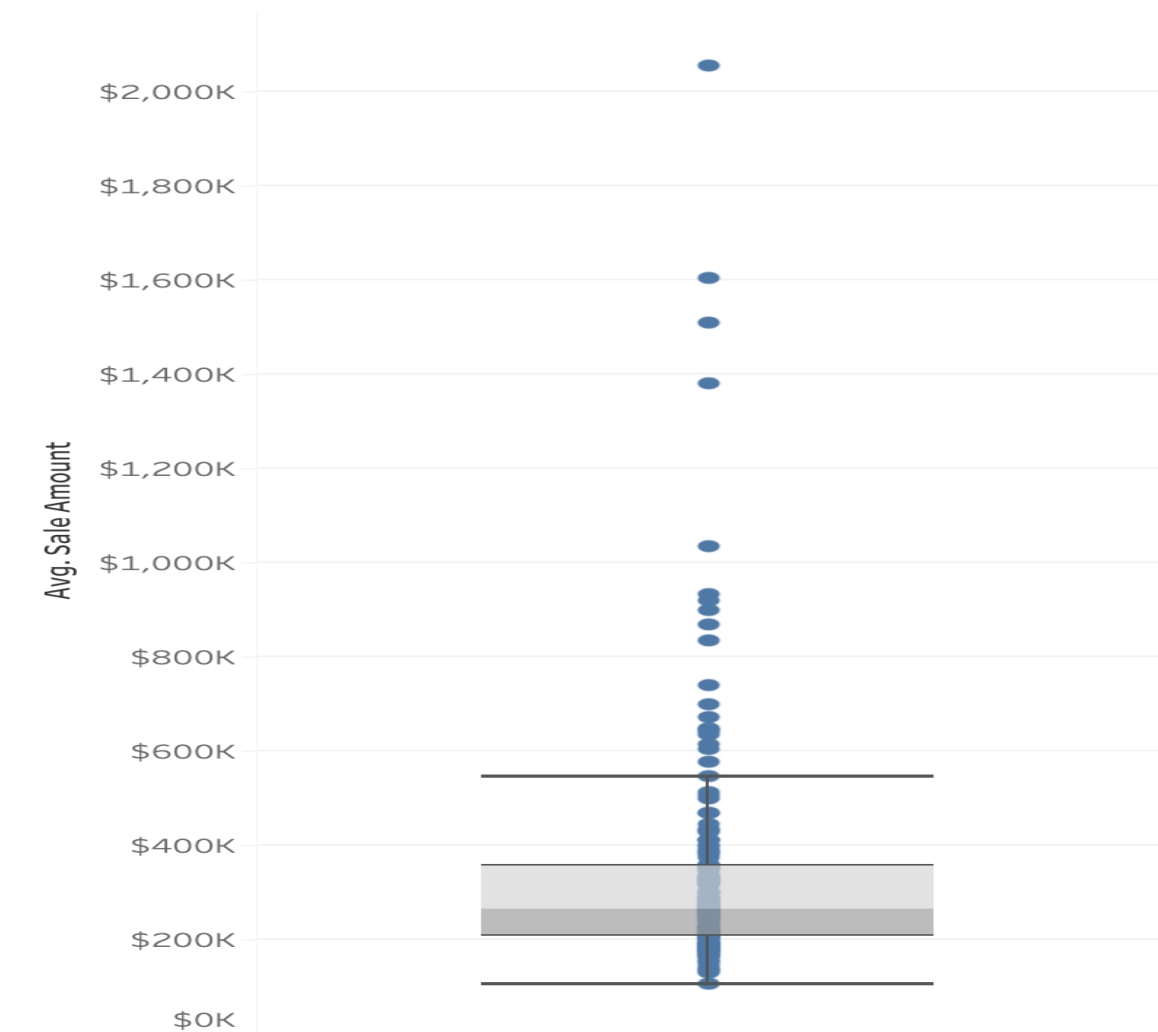




- **Understanding High-End Real Estate by Average Sale Amount:**

This visualization hones in on the high-end segment of Connecticut's real estate market by analyzing average sale amounts. Users can gain insights into the characteristics and trends associated with high-value properties.

## Understanding High-End Real Estate by Avg Sale Amounts



### Take Aways:

#### 1. Long-term Value Assessment:

- The dataset highlights a divergence between sale amounts and assessed values, with sale amounts showing an upward trajectory, suggesting a market heating up over time.

#### 2. Property Type Valuation:

- Single-family residences lead in both assessed and sale values, followed by multi-family homes, indicating a strong preference for these property types.

#### 3. Market Dynamics:

- There's a notable growth in sales, particularly in affluent towns like Westport and Darien.

A contrast between stable assessed property values and escalating sale prices suggests a market where demand surpasses supply.

#### **4. Seasonal and Yearly Trends:**

- Sale amounts vary seasonally, with Quarter 3 often experiencing the highest transaction volumes. The data also reflects a post-2008 economic recovery in the real estate sector and a spike in sales in 2020.

#### **5. Geographic Trends:**

- Geographic location, especially proximity to urban centers, significantly influences real estate sales amounts. Towns like Greenwich and Westport emerge as high-value markets due to factors like local economic strength and desirable amenities.

#### **6. High-End Real Estate:**

- The luxury segment of the market is evident with properties transacting significantly above the median, reaching up to \$2 million. This segment shows distinctive characteristics in terms of sale amounts and property types.

#### **7. Sales Ratio Trends:**

- Homes are selling at an average of 69.6% above their assessed values, indicating a dynamic market.