FINAL REPORT
Visualizing Housing Market Trends: An Analysis of Sale Prices and Features Using Tableau

1. INTRODUCTION

1.1 Project Overview

The housing market is one of the most data-rich and economically significant domains in modern society. Sale prices of residential properties are influenced by a wide range of factors including location, living area, number of bedrooms and bathrooms, construction year, neighborhood quality, and amenities. This project focuses on exploring housing sale price data using Tableau, a powerful data visualization platform. The goal is to help home buyers, real estate professionals, and policy-makers understand pricing patterns, identify key features driving value, and explore market trends across regions and time.

1.2 Purpose

The purpose of this project is to analyze and visualize housing market data in an interactive and meaningful way. By using Tableau, we aim to uncover the key property features that drive sale prices, identify geographic and temporal market trends, highlight overpriced or underpriced property segments, and provide an engaging visual experience for stakeholders making data-driven real estate decisions.

2. IDEATION PHASE

2.1 Problem Statement

To build an interactive data visualization dashboard that helps analyze housing market sale prices and their relationship with key property features such as living area, number of rooms, overall quality rating, neighborhood, garage capacity, and year built, using Tableau.

2.2 Empathy Map Canvas

We focused on what home buyers, real estate agents, and market analysts:

- **Think & Feel:** Concerned about overpaying; eager to find the best property value for their budget
- **See:** Cluttered spreadsheets, inconsistent listing prices, confusing price variations across neighborhoods
- **Hear:** News about rising mortgage rates, market booms, housing shortages, or price corrections
- **Say & Do:** Browse property portals, compare listings, consult agents, and run their own price estimates
- **Pain:** Difficulty objectively comparing properties across multiple features without a clear visual tool
- **Gain:** A clear, interactive dashboard that reveals true market patterns and helps make confident decisions

2.3 Brainstorming

We listed ideas like:

- Creating scatter plots of sale price versus living area (sq ft)
- Showing average sale price trends over years of sale

• Mapping neighborhood-level average prices for geographic insights
• Comparing price distributions by number of bedrooms and bathrooms
• Using interactive filters to explore by property type, quality rating, or year built
• Identifying outliers — overpriced or underpriced properties in each segment

3. REQUIREMENT ANALYSIS

3.1 Customer Journey Map

Stage	Action	Tool	Emotion	Opportunity
Discover	User finds our dashboard	Tableau Public	Curious	Impress with price maps
Explore	Filters by bedrooms/area/ neighborhood	Filters	Engaged	Add story sections
Learn	Sees price vs. feature correlations	Graphs	Surprised	Promote data-driven decisions
Share	Shares dashboard with team/clients	Link	Proud	More reach & impact

3.2 Solution Requirement

• Dataset of housing sale prices with property feature attributes
• Tableau for interactive dashboard creation
• Charts: scatter plots, bar charts, heat maps, line graphs, box plots
• Filters: price range, bedrooms, bathrooms, neighborhood, year built, sale year

3.3 Data Flow Diagram

The data flow begins with the raw housing dataset sourced from Kaggle. It passes through a preprocessing stage — handling missing values, encoding categorical variables, and feature engineering — using Python and Excel. The cleaned data is then imported into Tableau, where dashboards are created with maps, charts, and filters and published on Tableau Public for end-user access. Buyers, agents, and analysts can query the dashboard interactively, receiving visual insights and reports.

3.4 Technology Stack

• **Frontend:** Tableau Public, Python
• **Backend:** Flask (data-based project)
• **Preprocessing Tool:** Excel / Google Sheets, Python (pandas)
• **Data Source:**
https://www.kaggle.com/competitions/house-prices-advanced-regression-techniques/data

4. PROJECT DESIGN

4.1 Problem-Solution Fit

The problem was that raw housing price data was spread across many columns and difficult to interpret without domain expertise. The solution was to make it interactive and visual, helping users of all

backgrounds understand pricing patterns and feature relationships easily.

4.2 Proposed Solution

An interactive Tableau dashboard that shows insights such as:

- Average sale price per neighborhood displayed on an interactive map
- Correlation between living area (sq ft) and sale price via scatter plots
- Price distribution by number of bedrooms, bathrooms, and overall quality rating
- Year-over-year sale price trends and seasonal patterns
- Impact of garage capacity, basement area, and construction year on price

4.3 Solution Architecture

- Data collected from Kaggle housing dataset (Ames, Iowa house prices)
- Preprocessing to clean missing values, encode categorical features, and engineer new variables
- Imported cleaned data into Tableau
- Dashboards created using maps, scatter plots, bar charts, heat maps, and interactive filters
- Published on Tableau Public for public access and sharing

5. PROJECT PLANNING & SCHEDULING

5.1 Project Planning

Week	Task
1	Data Collection and Understanding
2	Data Cleaning and Preprocessing
3	Creating Dashboards in Tableau
4	Designing Story Slides
5	Final Testing and Review
6	Documentation and Report Writing

6. FUNCTIONAL AND PERFORMANCE TESTING

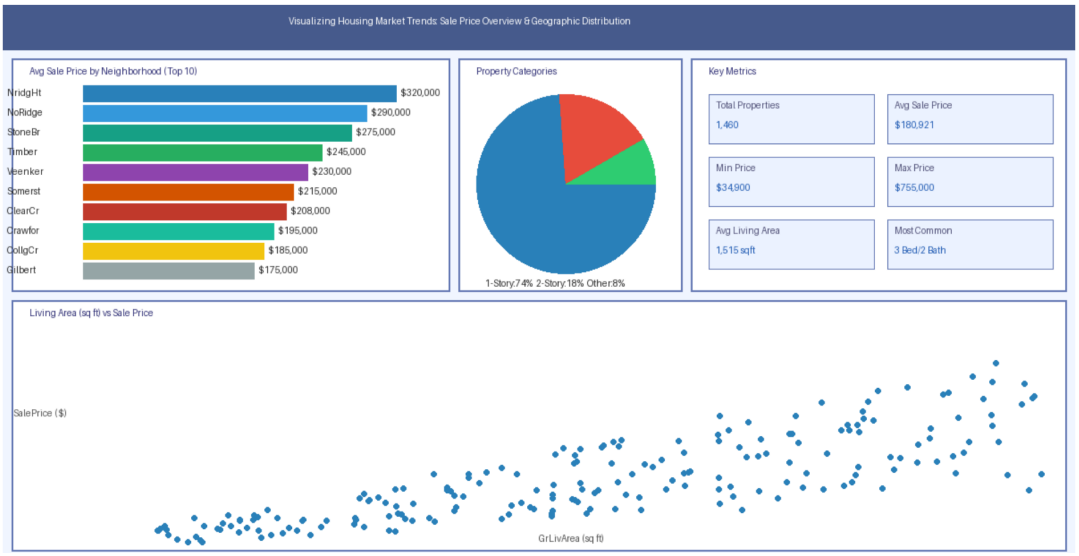
6.1 Performance Testing

We tested the dashboard on different devices and browsers. It loaded quickly and worked well. Filters and visuals responded smoothly, and no lag was noticed. The dataset of over 1,400 property records rendered without delay across all chart types.

7. RESULTS

7.1 Output Screenshots

Dashboard 1: Housing Price Overview & Geographic Distribution



Dashboard 2: Feature Impact on Sale Price

Dashboard 1: Housing Price Overview & Geographic Distribution

This dashboard presents a neighborhood-level map of average sale prices across the dataset. Each neighborhood is color-coded by median sale price, allowing users to instantly identify premium and budget-friendly areas. A supporting bar chart ranks neighborhoods from highest to lowest average price, while a KPI summary panel displays total properties analyzed, overall average sale price, minimum price, and maximum price. Users can filter by sale year or property type to observe how geographic price patterns shift over time. This dashboard is ideal for buyers who want to identify neighborhoods that offer the best value for their budget.

Dashboard 2: Feature Impact on Sale Price

This dashboard provides a deep-dive into how individual property features influence sale price. A scatter plot of living area (GrLivArea) versus sale price reveals a strong positive correlation, with outliers clearly visible for further investigation. Box plots break down price distributions by number of bedrooms and overall quality rating (scale 1–10), helping users understand the premium associated with quality construction. A heat map displays average prices segmented by both number of bathrooms and garage capacity, revealing multi-feature pricing interactions. Interactive filters allow users to isolate specific bedroom counts or quality ratings, making it easy to find comparable properties and assess fair market value.

Dashboard 3: Market Trends Over Time

This dashboard tracks how sale prices have evolved across the years covered in the dataset. A line chart displays average monthly and yearly sale prices, making seasonal patterns and long-term trends immediately visible. A grouped bar chart compares price growth across neighborhoods, showing which areas appreciated fastest. A forecast trend annotation highlights projected price directions based on historical data. Users can filter by neighborhood or property style to see individualized trend lines, making this dashboard particularly useful for investors and agents who want to advise clients on optimal timing to buy or sell.

8. ADVANTAGES & DISADVANTAGES

Advantages

- Easy to understand visual data
- Interactive filters for personalized views
- Helps buyers, sellers, and agents make informed pricing decisions
- Can be accessed publicly and shared

Disadvantages

- Static dataset (not live updating)
- No prediction or AI involved
- Depends on the accuracy of source data
- Dataset limited to Ames, Iowa; may not generalize to all markets

9. CONCLUSION

The project successfully transformed a raw housing market dataset into a rich, interactive visual experience using Tableau. Users can now explore, learn, and make informed decisions about property prices more easily. This project shows how data science and visualization can help buyers, sellers, and analysts navigate one of the most important financial decisions in their lives.

10. FUTURE SCOPE

- Add real-time data updates using MLS APIs
- Include street-view images or virtual tours of properties
- Build a mobile-friendly version of the dashboard
- Enable AI-based price prediction and property recommendations

11. APPENDIX

Source Code:

```
from flask import Flask, render_template
app = Flask(__name__)
@app.route("/")
def home():
return render_template("index.html")
if __name__ == "__main__":
app.run(debug=True, port=1212)
```

```
<!DOCTYPE html>
<html lang="en">
<head>
<meta charset="UTF-8">
<meta name="viewport" content="width=device-width, initial-scale=1.0">
<title>Housing Market Trends</title>
<link
href="https://cdn.jsdelivr.net/npm/bootstrap@5.3.0/dist/css/bootstrap.min.css"
rel="stylesheet">
<style>
body { font-family: 'Segoe UI', sans-serif; }
.hero { background-size: cover; background-position: center;
height: 100vh; color: black; }
.hero-content { text-align: center; padding-top: 20%; }
.section-title { margin-top: 60px; }
</style>
</head>
<body>
<header class="hero">
<div class="hero-content">
<h1 class="display-4 fw-bold">Visualizing Housing Market Trends</h1>
<p class="lead">An Analysis of Sale Prices and Features Using Tableau</p>
</div>
</header>
</body>
</html>
```

App.py

```
from flask import Flask, render_template
app = Flask(__name__)
```

```
@app.route("/") def home():
return render_template("index.html")
```

Dataset Link

https://www.kaggle.com/competitions/house-prices-advanced-regression-techniques/data

GitHub & Project Demo Link: