Comprehensive Case Study: AI-Powered Job Site Delivery Heatmap for Lowe's

1. Executive Summary

This case study presents the development of an AI-powered heatmap and demand predictor model for Lowe's professional delivery services.
With increased focus on serving Pro customers, Lowe's seeks to identify ZIP codes that show strong potential for targeted delivery outreach, trade shows, or mobile supply unit deployment.
I used a clustering-based approach to categorize ZIP codes into High Demand, Emerging Opportunity, and Low Priority, using simulated Lowe's POS data and public permit indicators.

2. Background & Objective

Lowe's is expanding its offerings to trade professionals through enhanced Pro delivery and loyalty programs. The company's strategy includes reaching professionals in construction, remodeling, and property maintenance.
However, deciding where to focus regional delivery support can be challenging. The objective was to build a data-backed framework to predict where Pro customer demand is likely concentrated.

Step 1: Gather Data

I'll simulate or find:

- Lowe's POS data by ZIP (e.g., frequency of orders, ticket size, Pro account activity)
- Open Renovation Permit Data
- ZIP code-level construction industry employment— via Census
- Store locations + delivery zones (to layer service radius)

Step 2: AI Clustering Model

I'll use KMeans or DBSCAN to segment ZIPs into demand tiers:

Input variables:

- Avg monthly permit volume
- Pro-order frequency (POS)
- Avg order size
- Distance from nearest Lowe's
- Density of Pro-heavy industries

→ **Output:** ZIP clusters tagged:

- "High Demand"
- "Emerging Opportunity"
- "Low Priority"

🗺️ **Step 3: Interactive Heatmap**

I'll create a Folium-based map showing:

- Color-coded ZIP demand clusters
- Hover tooltips with permit + order stats
- Optional: toggle between DIY vs Pro demand layers

3. Data Collection

Data was collected and simulated across 10 ZIP codes in the Dallas-Fort Worth area, including:
- Monthly Lowe's Pro Orders
- Average Order Size (USD)
- Monthly Renovation Permits (as a proxy for trade activity)
- Distance to nearest Lowe's store
- Construction employment percentage (ZIP-level estimates)

Data Used

- Lowe's simulated Pro POS data (Monthly Orders, Avg Order Size)
- Renovation Permits per ZIP (proxy for ongoing construction)
- Distance to nearest Lowe's store

- Construction industry employment % by ZIP

4. Methodology

A KMeans clustering model was applied to normalized values of the variables. ZIP codes were segmented into 3 groups:
- Cluster 0: High Demand
- Cluster 1: Emerging Opportunity
- Cluster 2: Low Priority

Clustering was performed using Scikit-learn in Python, and the outputs were visualized using Folium, a geographic mapping library.

5. Strategic Insights

- ZIPs 75002 and 75034 were marked as High Demand due to high order volume, strong renovation permit activity, and favorable location proximity.
- ZIPs such as 75006 and 75010 showed Emerging Opportunity potential and can be nurtured with increased local engagement.
- ZIPs such as 75023, 75028, and 75038 were categorized as Low Priority due to limited order volume and lower construction activity.

6. Strategic Actions & Use Cases

This clustering model supports multiple applications:
- Prioritizing ZIP codes for localized delivery promotions
- Identifying zones for mobile unit delivery pilots
- Targeting Pro marketing campaigns in underpenetrated but high-activity zones
- Allocating field reps and trade events to ZIPs with proven activity

7. Top High-Demand ZIPs

- 75002 – Orders: 229, Permits: 62, Order Size: $514, Distance: 9.8 mi
- 75034 – Orders: 204, Permits: 57, Order Size: $751, Distance: 2.2 mi

8. Deliverables

- ZIP-level clustering model with demand segmentation
- Heatmap of ZIP codes by opportunity tier
- Strategic summary and one-pager for executive use
- Exportable dataset of top ZIPs with full demand profile

9. Conclusion

This project offers Lowe's a scalable and intelligent framework for identifying job site delivery opportunities and expanding its Pro services footprint.
By combining internal POS data with public activity signals and AI clustering, Lowe's can deploy resources more strategically and reach Pro customers where they work.