

Comparative Analysis of Sign Detections: Mach9 vs. Client Dataset

Evaluating Accuracy, Coverage, and Completeness of Extracted Traffic Signs

Prepared by: Your Company/Team Name
Date: Report Creation Date



Executive Summary

This report compares Mach9's LiDAR-extracted sign features with a legacy client dataset. Key findings include:

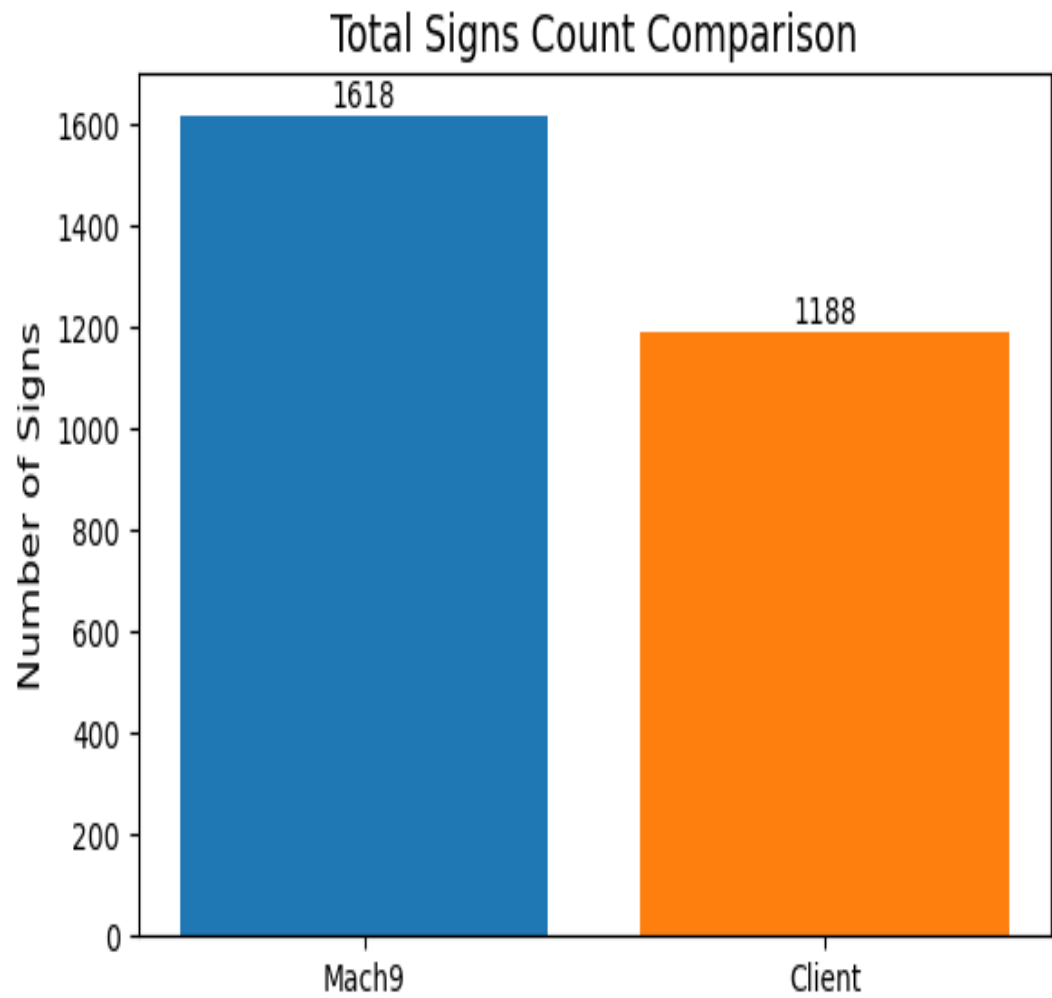
- Total Mach9 Signs: 1618
- Total Client Signs: 1188
- Signs in Mach9 not in Client (by location): 1228 (75.90%)
- Signs in Client not in Mach9 (by location): 794 (66.84%)
- Duplicates Removed - Mach9: 248, Client: 150

Approach and Methodology

1. Standardize column names for latitude, longitude, and MUTCD.
2. Fill missing MUTCD codes with 'Unknown' to avoid classification errors.
3. Remove duplicates using coordinate precision.
4. Compute key metrics based on location and MUTCD code comparisons.
5. Generate charts to illustrate distribution, clustering, and discrepancies.

Key Metrics and Dataset Comparison

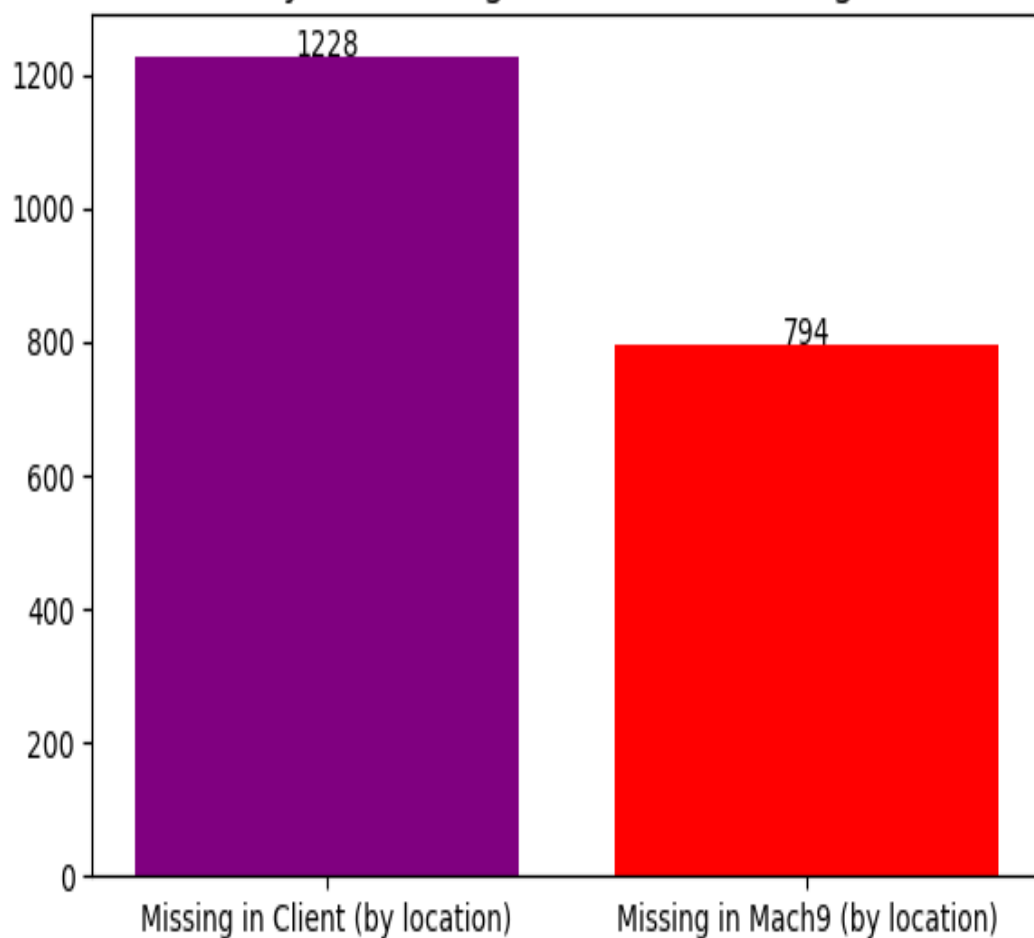
| Metric | Mach9 Dataset | Client Dataset | Percentage |
|---------------------------------|---------------|----------------|------------|
| Total Signs | 1618 | 1188 | 26.58% |
| Missing in Client (by location) | 1228 | - | 75.90% |
| Missing in Mach9 (by location) | - | 794 | 66.84% |
| Duplicates Removed | 248 | 150 | - |



Detailed Error Analysis

The graph below shows errors: missing in Client vs missing in Mach9 based on location.

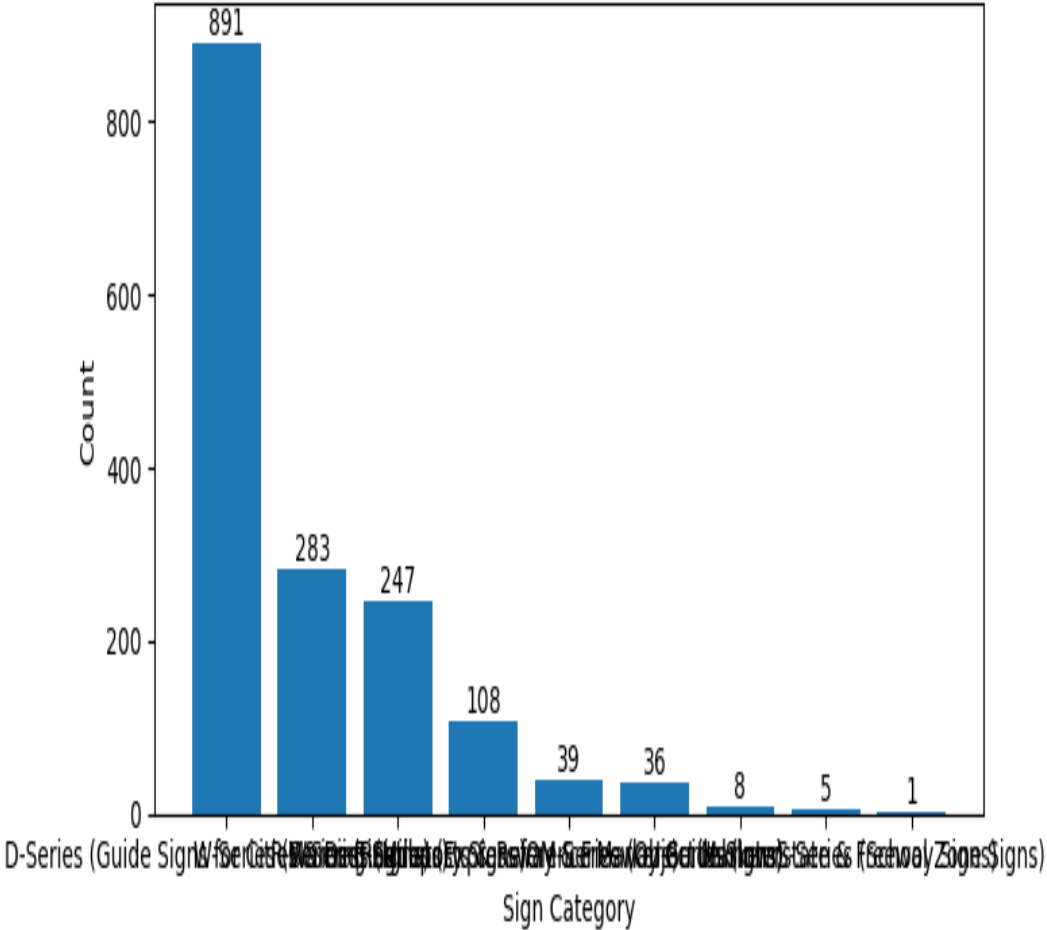
Error Analysis: Missing in Client vs Missing in Mach9



Sign Category Breakdown

| Category | Mach9 Count | Client Count |
|--|-------------|--------------|
| D-Series (Guide Signs for Cities & Destinations) | 891 | 0 |
| E-Series (Expressway & Freeway Guide Signs) | 39 | 0 |
| I-Series (Interstate & Freeway Signs) | 5 | 0 |
| M-Series (Mileposts & Reference Markers) | 108 | 0 |
| OM-Series (Object Markers) | 36 | 0 |
| R-Series (Regulatory Signs) | 247 | 0 |
| S-Series (School Zone Signs) | 1 | 0 |
| Unknown | 8 | 1188 |
| W-Series (Warning Signs) | 283 | 0 |

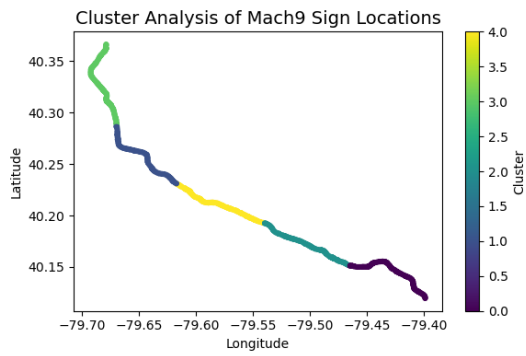
Sign Type Distribution (Mach9)



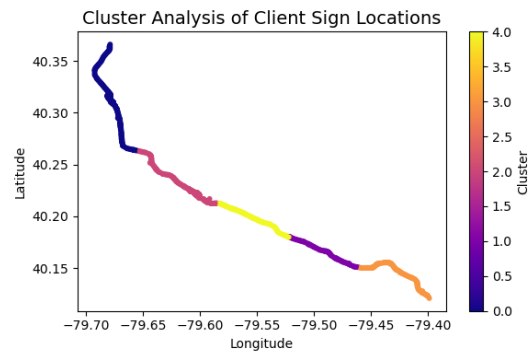
Spatial Distribution and Cluster Analysis

Below are the cluster analysis graphs for sign locations in each dataset.

Mach9 Dataset

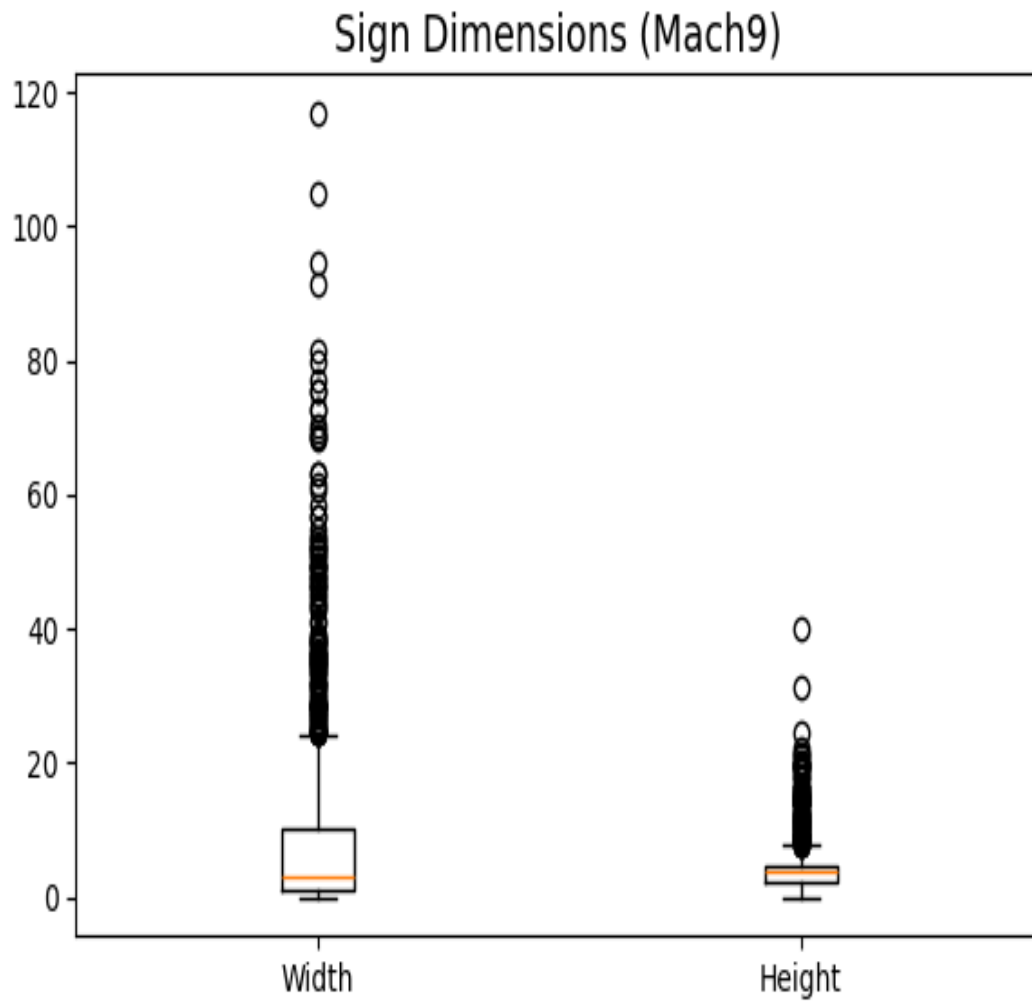


Client Dataset



Sign Dimensions and Condition Analysis

Box plots below illustrate the distribution of sign widths and heights as captured in Mach9.



Quality Metrics and Performance Evaluation

No confidence data found or insufficient data to display.

Annotated Case Studies / Sample Comparisons



MUTCD: Unknown

Text: nan

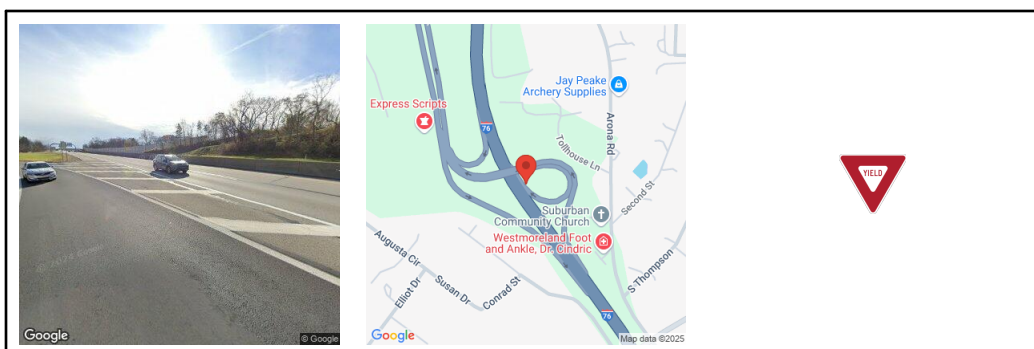
Source: Client

Lat/Lon: 40.222803, -79.603214

Street View URL: https://www.google.com/maps/@?api=1&_action=pano&viewpoint;=40.222803,-79.603214

Capture Date: 2018-04

Sign present in Client dataset only (not found in Mach9 dataset).



MUTCD: R1-2

Text: YIELD

Source: Mach9

Lat/Lon: 40.31041472, -79.67725479

Street View URL: https://www.google.com/maps/@?api=1&_action=pano&viewpoint;=40.31041472,-79.67725479

Capture Date: 2024-11

Sign present in Mach9 dataset only (not found in Client dataset).



No MUTCD Sign Image for
Unknown

MUTCD: Unknown

Text: nan

Source: Client

Lat/Lon: 40.20753722, -79.57187245

Street View URL: https://www.google.com/maps/@?api=1&_action=pano&viewpoint;=40.20753722,-79.57187245

Capture Date: 2018-04

Sign present in Client dataset only (not found in Mach9 dataset).



No MUTCD Sign Image for
W1-3

MUTCD: W1-3

Text: CURVES AHEAD 55 MPH NEXT 5 MILES

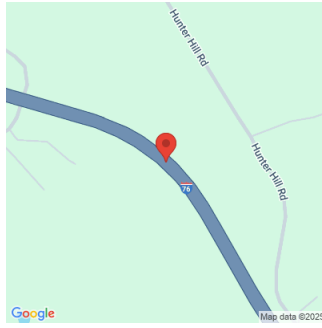
Source: Mach9

Lat/Lon: 40.12621448, -79.4043461

Street View URL: https://www.google.com/maps/@?api=1&_action=pano&viewpoint;=40.12621448,-79.4043461

Capture Date: 2018-04

Sign present in Mach9 dataset only (not found in Client dataset).



No MUTCD Sign Image for
Unknown

MUTCD: Unknown

Text: nan

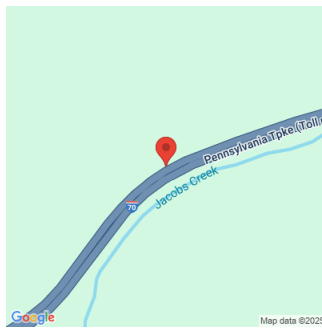
Source: Client

Lat/Lon: 40.165367, -79.487518

Street View URL: https://www.google.com/maps/@?api=1&_action=pano&viewpoint;=40.165367,-79.487518

Capture Date: 2024-12

Sign present in Client dataset only (not found in Mach9 dataset).



MUTCD: D10-1

Text: 0.7

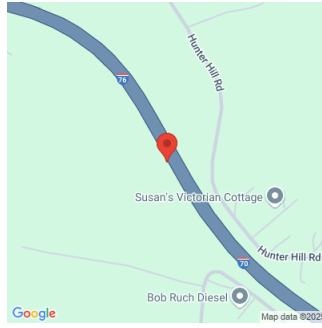
Source: Mach9

Lat/Lon: 40.15395784, -79.44402394

Street View URL: https://www.google.com/maps/@?api=1&_action=pano&viewpoint;=40.15395784,-79.44402394

Capture Date: 2018-04

Sign present in Mach9 dataset only (not found in Client dataset).



No MUTCD Sign Image for
Unknown

MUTCD: Unknown

Text: nan

Source: Client

Lat/Lon: 40.16314, -79.485788

Street View URL: https://www.google.com/maps/@?api=1&_action=pano&viewpoint;=40.16314,-79.485788

Capture Date: 2018-04

Sign present in Client dataset only (not found in Mach9 dataset).



No MUTCD Sign Image for
M6-1

MUTCD: M6-1

Text: nan

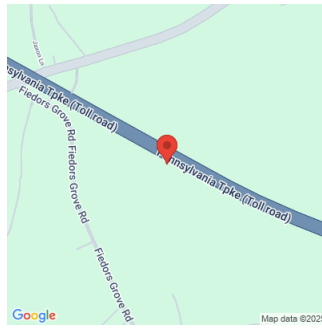
Source: Mach9

Lat/Lon: 40.1582722, -79.47912008

Street View URL: https://www.google.com/maps/@?api=1&_action=pano&viewpoint;=40.1582722,-79.47912008

Capture Date: 2018-04

Sign present in Mach9 dataset only (not found in Client dataset).



MUTCD: M1-4

Text: 76

Source: Mach9

Lat/Lon: 40.17858081, -79.51883161

Street View URL: https://www.google.com/maps/@?api=1&_action=pano&viewpoint;=40.17858081,-79.51883161

Capture Date: 2018-04

Sign present in Mach9 dataset only (not found in Client dataset).



No MUTCD Sign Image for
Unknown

MUTCD: Unknown

Text: nan

Source: Client

Lat/Lon: 40.29493086, -79.67190699

Street View URL: https://www.google.com/maps/@?api=1&_action=pano&viewpoint;=40.29493086,-79.67190699

Capture Date: 2024-12

Sign present in Client dataset only (not found in Mach9 dataset).

Extended Methodology and Glossary (Appendix)

Extended Methodology:

- Data standardization: Columns were aligned across datasets.
- Duplicate removal: Duplicates were removed based on geographic coordinates (5 decimal precision).
- Spatial and cluster analysis: Data was analyzed for clustering and coverage patterns.
- Quality metrics: Confidence scores and sign dimensions were evaluated.

Glossary:

- *Missing in Client (by location)*: Signs present in Mach9 but absent in Client dataset based on location.
- *Missing in Mach9 (by location)*: Signs present in Client but absent in Mach9 dataset based on location.
- *Duplicates Removed*: Duplicate sign entries removed during preprocessing.
- *MUTCD Codes*: Standardized sign classification codes used by Mach9.
- *Confidence Score*: A measure of detection certainty.
- *Cluster Analysis*: Grouping of similar sign locations.