Measuring Main Streets

GOOGLE STREET VIEW & ARTIFICIAL INTELLIGENCE POWERED PUBLIC REALM & ACCESSIBILITY ASSESSMENT

August 2025

Canadian Urban Institute
Institut Urbain du Canada

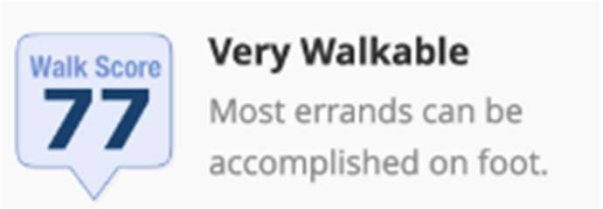
A Complex Problem

How to assess the *quality* of urban environments from a pedestrian or accessibility point of view?

How to accomplish this at scale, using a quantitative methodology?

Traditionally, measures have relied on proximity and density, which can have misleading results...

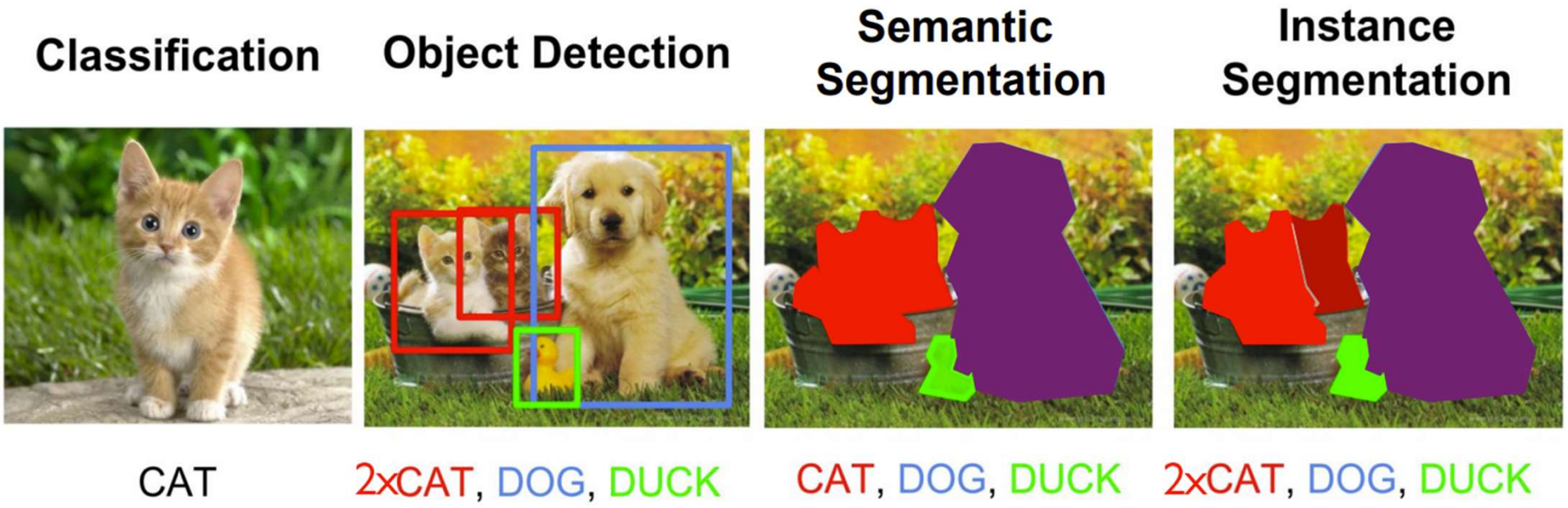
Dundas Street, Mississauga



?

A Solution: Computer Vision

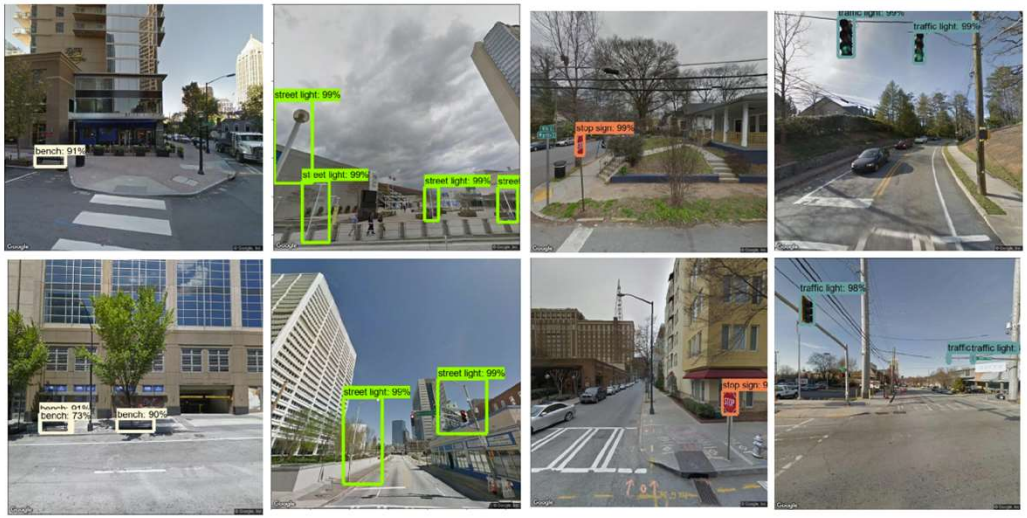
Teaching computers to gain high-level understanding from images or videos



Traditional Approaches

What is Computer Vision?

URBAN CONTEXT

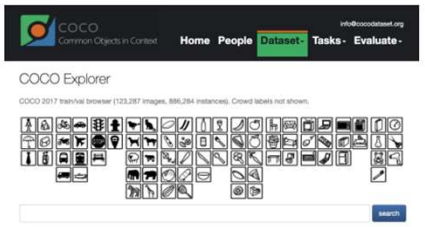


Object Detection

Semantic Segmentation

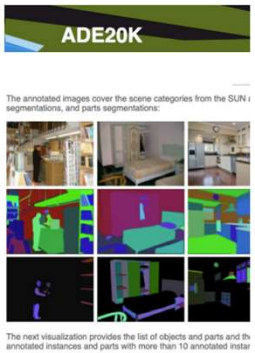
Pre-trained models are limited…

- Require manual feature engineering and large labeled datasets.
- Identifiable categories are limited, training custom models is time-consuming and expensive
- Outputs raw detections (e.g., “crosswalk” “bench”).



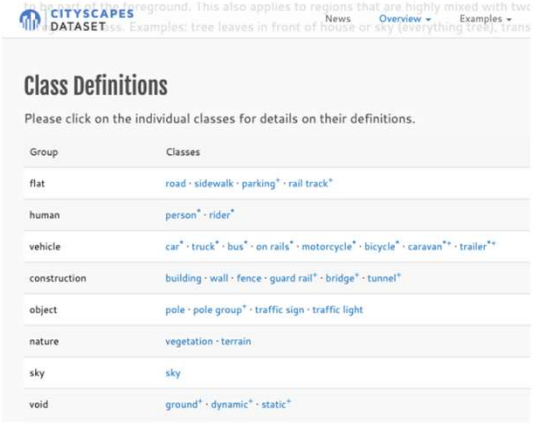
COCO - Common Objects in Context

80 object categories



ADE20K

150 categories



CITYSCAPES

30 categories

A new approach: Large Language Models

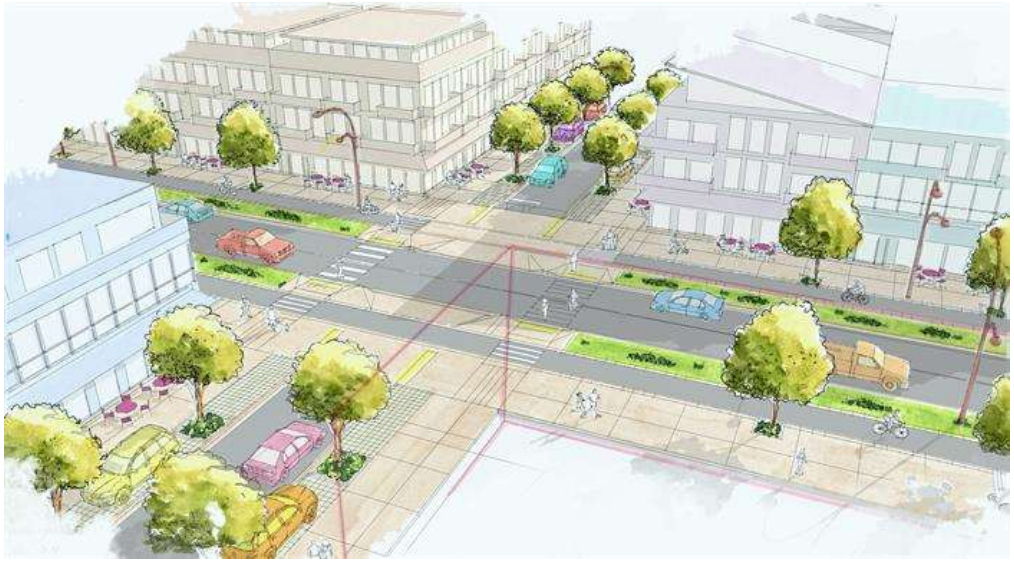
How It Works

- Image Encoding: The model processes street-level images using **multimodal AI** (vision + language) models via an API.
- Contextual Evaluation: Using a **structured prompt**, it assesses urban elements
- Human-Like Insights: Instead of binary detections, it provides **scored evaluations**, qualitative analysis and **reasoning** (e.g., “The sidewalk is too narrow for two wheelchairs”).

Structured Prompt

Flexible and Transparent

- Tree cover & shade
- Traffic Calming Measures
- Sidewalks
- Bicycle Infrastructure
- Street Furniture & Lighting
- Public Amenities
- Accessibility
- Building Characteristics



Presence, Condition, Quality → overall score and sub-scores for each category

Case Study: Arbutus Station (Kitsilano), Vancouver

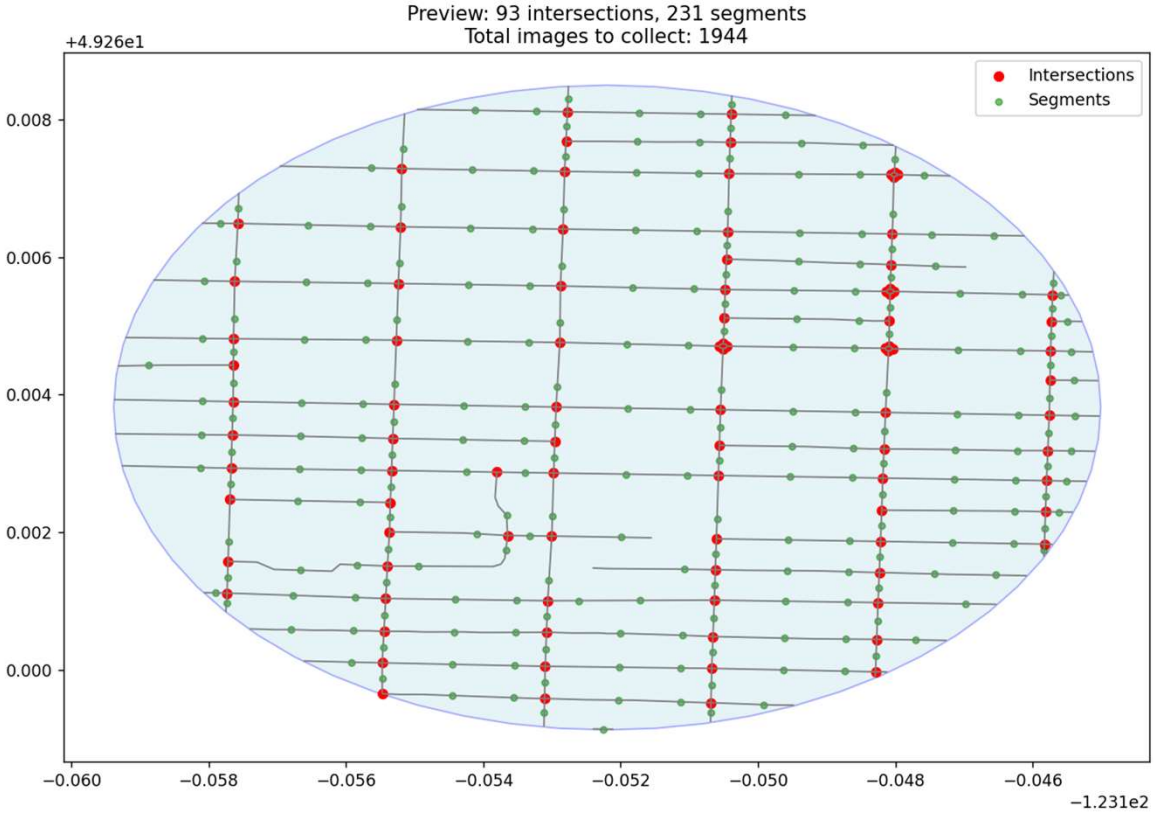
"Sidewalks are wide enough for mobility devices, but the lack of TWSI may hinder some users.”

"The presence of trees and greenery along the median enhances the aesthetics and provides shade.“

"The buildings have a human scale that fits well with the street width."

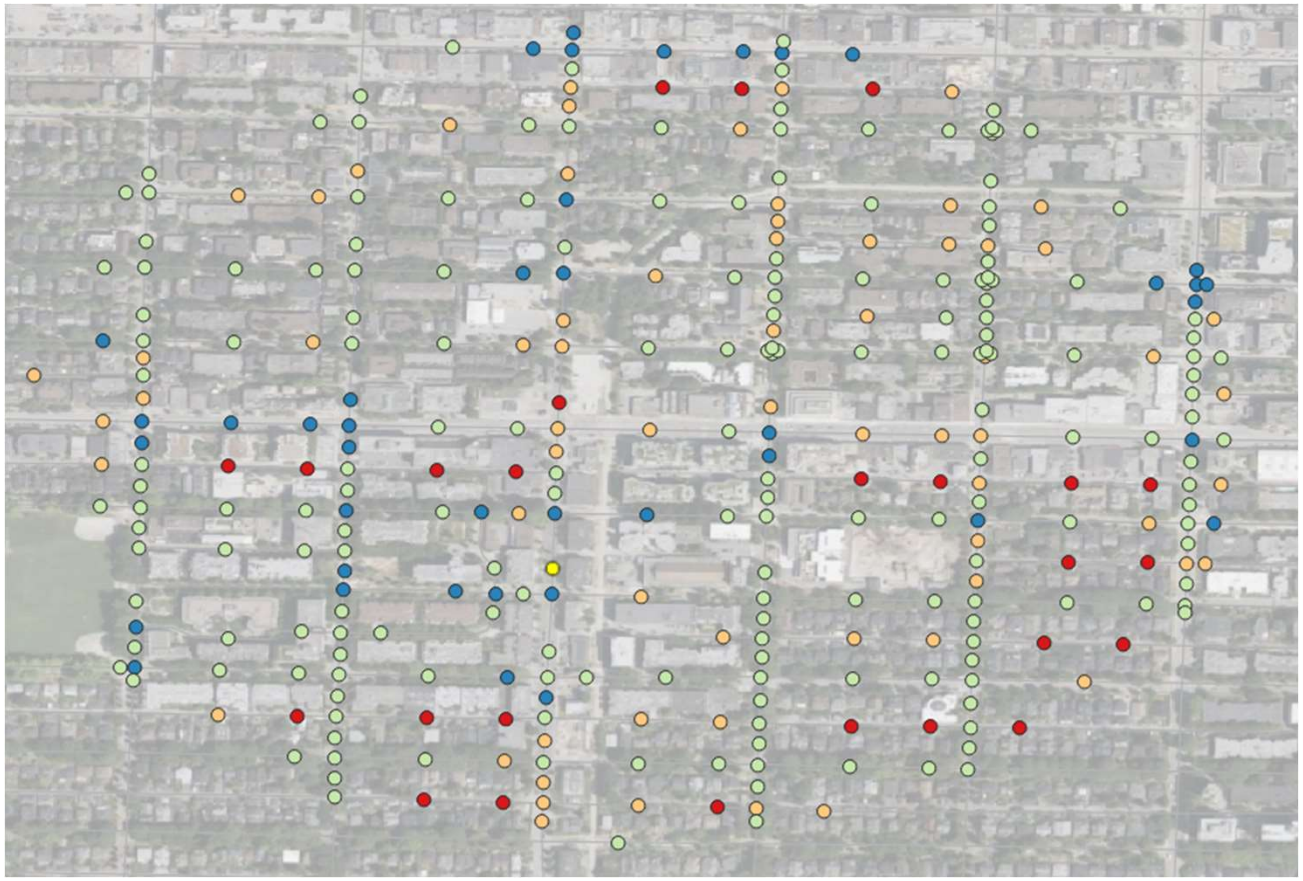
Overall Score: 4/5

Case Study: Arbutus Station (Kitsilano), Vancouver



- 800m radius
- Sample points at every intersection and 100m in between intersections
- Sample 6 images at each point to capture a 360° view
- 1944 Google Streetview Images captured

Case Study: Arbutus Station (Kitsilano), Vancouver

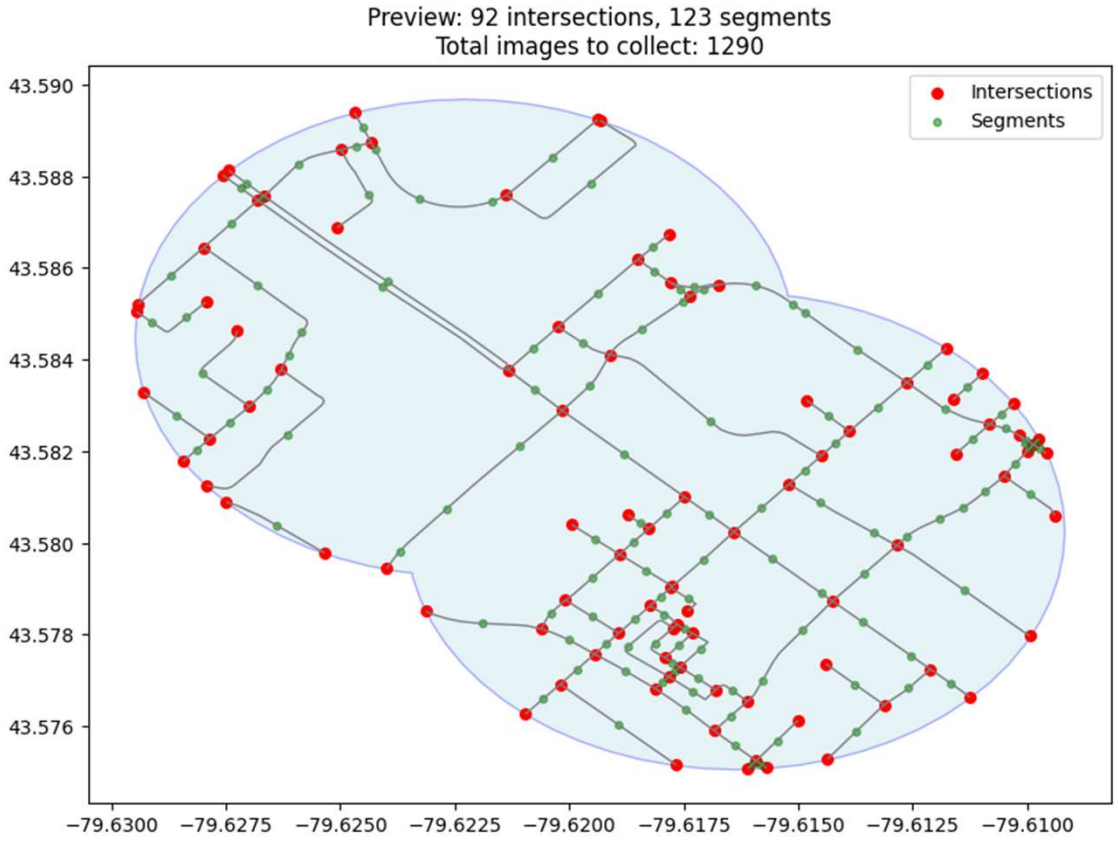


Overall Score

- 1 - 1.75
- 1.75 - 2.5
- 2.5 - 3.25
- 3.25 - 4

+ sub scores for each category

Case Study: Cooksville, Mississauga



- 800m radius
- Sample points at every intersection and 100m in between intersections
- Sample 6 images at each point to capture a 360° view
- 1290 Google Streetview Images captured

Case Study: Cooksville, Mississauga

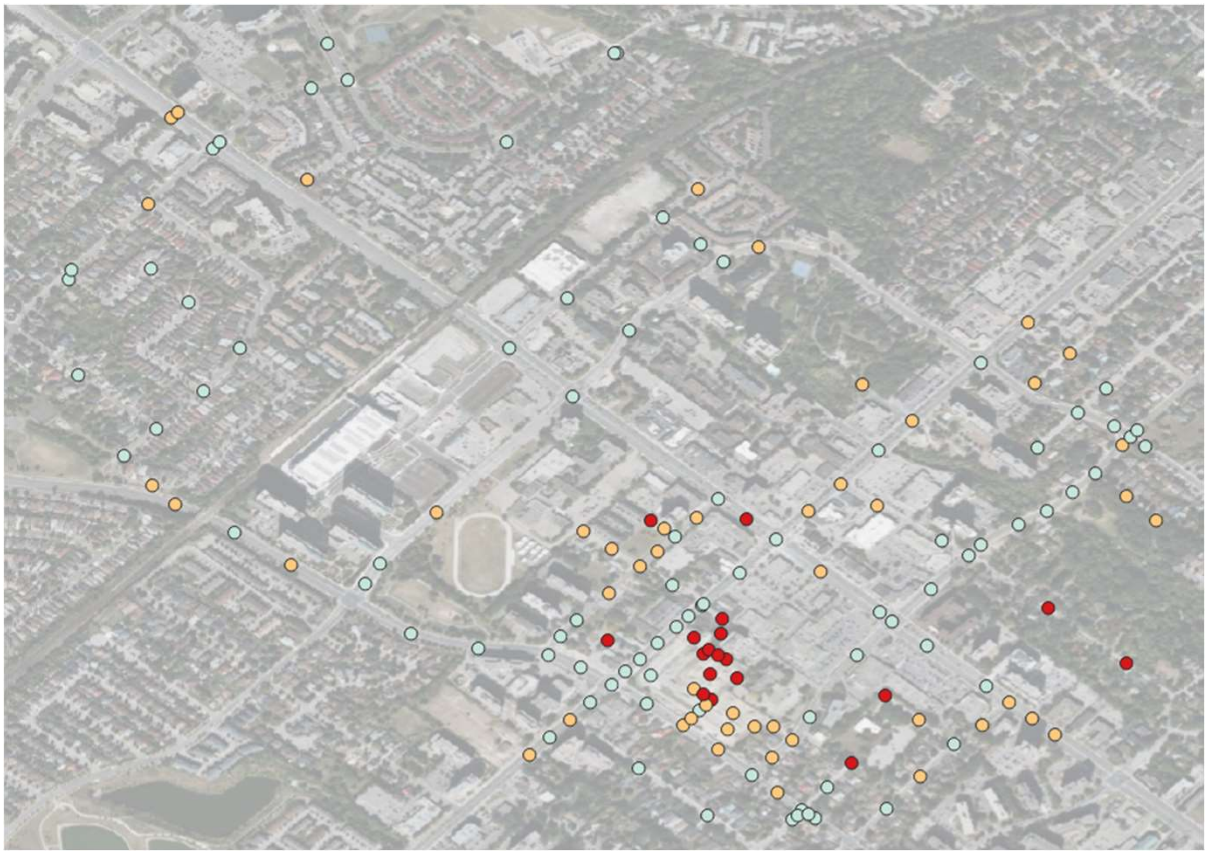
"No visible curb ramps at most crosswalk locations."

"Crosswalks are not clearly marked."

"Minimal landscaping visible; a few trees along the street."

Overall Score: 2/5

Case Study: Cooksville, Mississauga



Overall Score

- 1 - 1.75
- 1.75 - 2.5
- 2.5 - 3.25
- 3.25 - 4

+ sub scores for each category

Limitations

- Source of imagery (Google Street View) isn't consistently updated, image resolution is limited
- Models are currently limited in being able to accurately spatially place or measure objects within images (ex: "The sidewalk is wide" ✅ vs. "The sidewalk is 5m wide" ❌)
- Models may struggle to differentiate between specific or similar objects (sign indicating transit stop vs. sign indicating parking hours)

Next Steps & Possibilities

- **Varying prompt and criteria based on type of street (residential vs. commercial)**
- Identifying alternative sources and methods of imagery / data collection.
- Combining traditional computer vision (object detection and segmentation) approaches with large language model-based approach.
- ‘Fine-tuning’ generic models to answer more specific questions and make more accurate, local judgements
- … and many more!

Thank You!