



Inventory Generation with BRAILS

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Outline

- What is BRAILS?
- Classification-Based Modules
- Object Detection-Based Modules
- Segmentation-Based Modules

What is BRAILS?

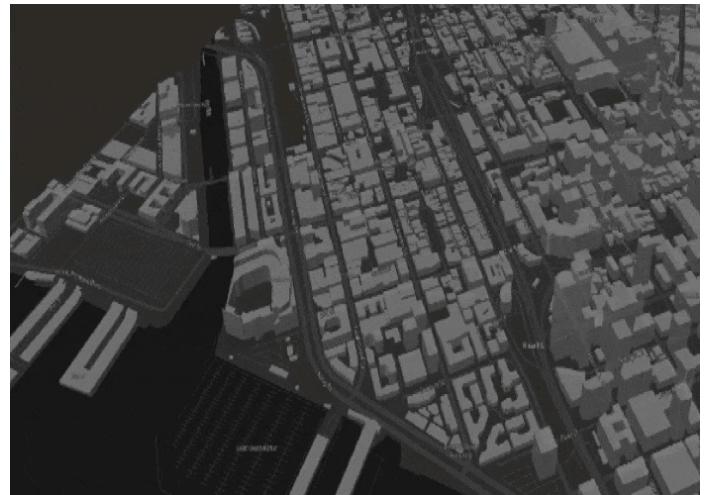


What Is BRAILS?

BRAILS provides a set of Python modules that utilize deep learning (DL), and computer vision (CV) techniques to extract information from satellite and street level images.

The BRAILS framework also provides turn-key applications allowing users to

- Put individual modules together to determine multiple attributes in a single pass
- Train general-purpose image classification, object detection, or semantic segmentation models.



Classification-Based Modules



Roof Type



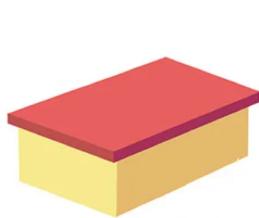
Google
Imagery ©2019



Google Imagery ©2019, U.S. Geological Survey



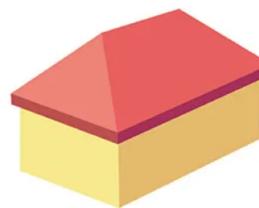
Google
Imagery ©2019



FLAT

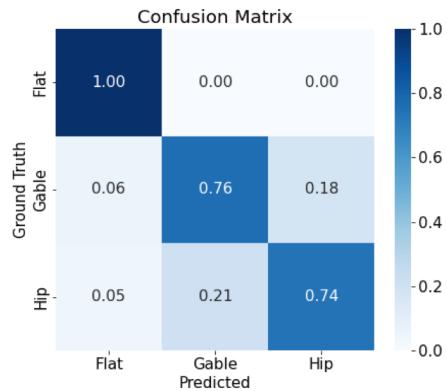


GABLE



HIP

- **Roof Type:** Multi-class transformer
- **Source Data:** Google aerial imagery
- Trained on labeled dataset of 22,800 images (85% training, 10% validation, 5% testing)
- **Output:** gable, hip or flat (HAZUS classes)
- **Performance:** 76% detection accuracy for hip and gable roofs in Lake Charles, LA (StEER)



Occupancy

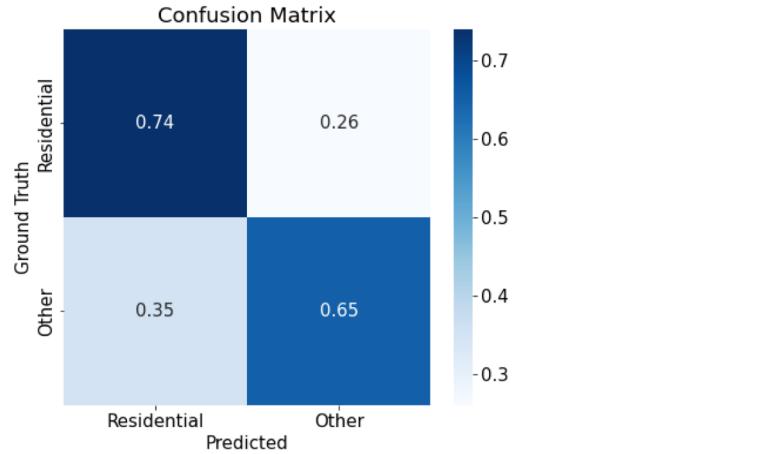


Residential



Other

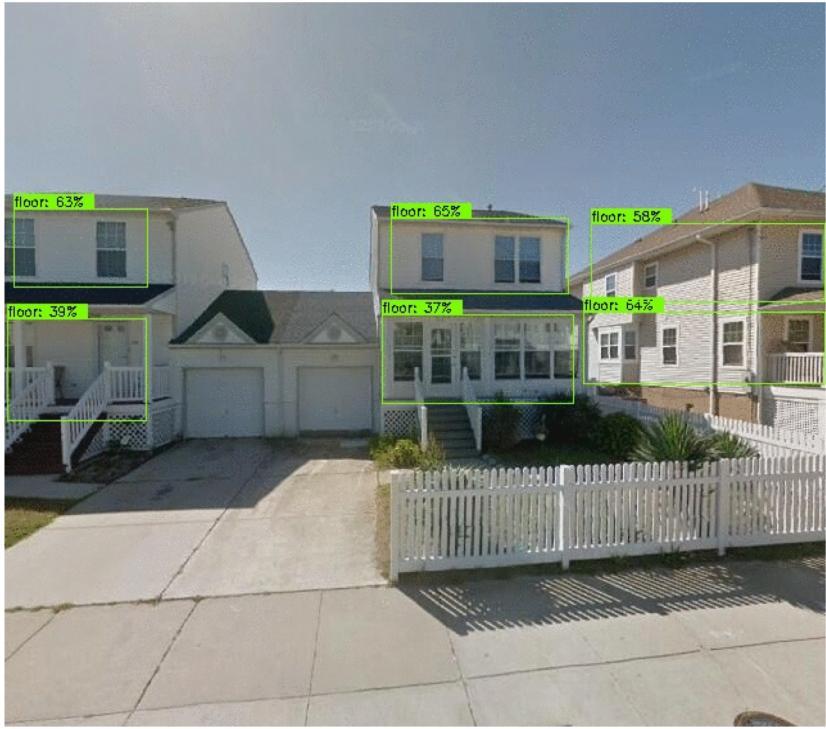
- **Occupancy classifier:** Multi-class transformer
- **Source Data:** Google street-level imagery
- Trained on dataset of 38,000 labeled images (80% training, 10% validation, 10% testing)
- **Outputs:** Residential, Other
- **Performance:** 71% prediction accuracy



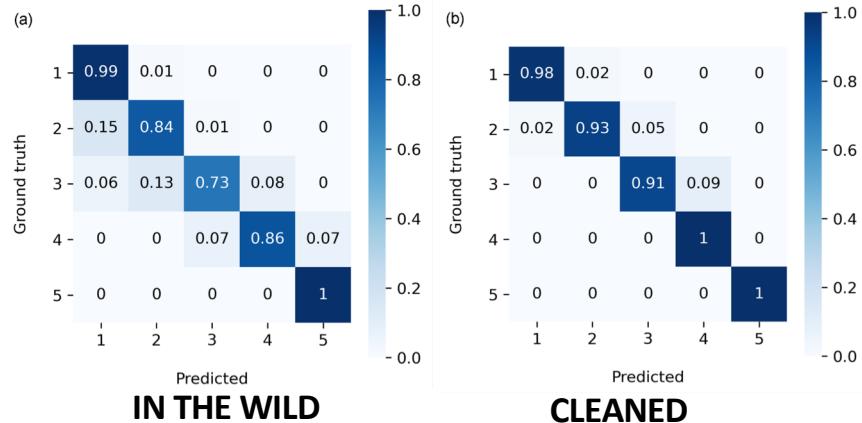
Object Detection-Based Modules



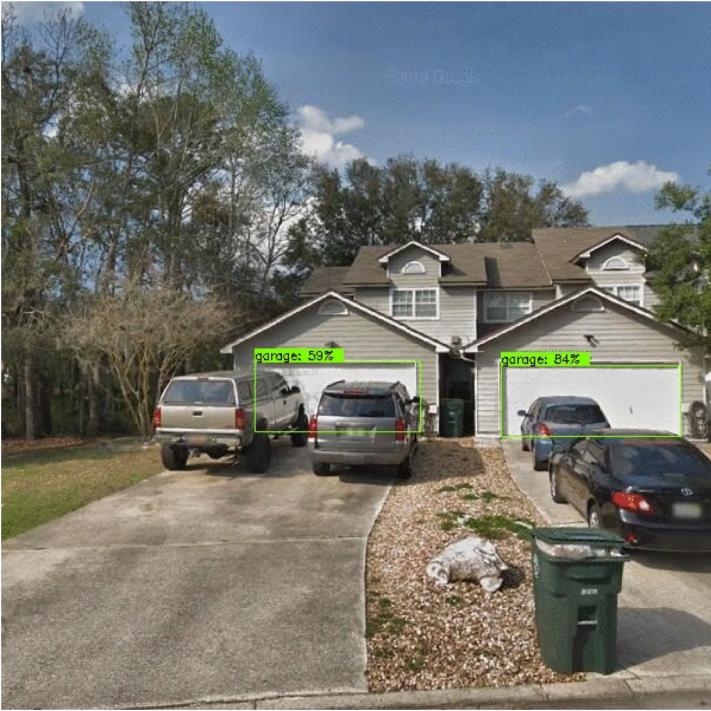
Number of Floors



- **Object detection model** automatically detect rows of building windows
- Trained on dataset of 60,000 images (80% training, 15% validation, 5% testing)
- Number of stacked bounding boxes indicates number of stories
- **Performance:** Identified accuracy on 3,000 Google Street View images in Atlantic County, NJ of 86% (wild) and 95% (clean)



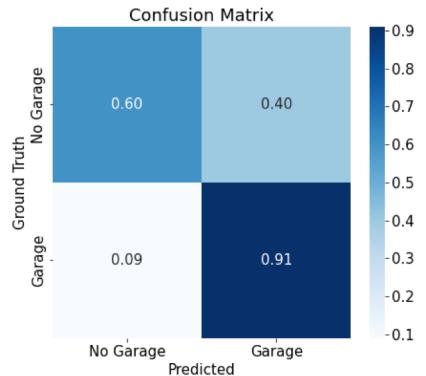
Garage Detection



- Object detection model automatically detect garages (**BRAILS**)
- Trained on dataset of 1,887 crowd-sourced images (80% training, 10% validation, 10% testing)
- If a bounding box is detected, the building is determined to have a garage
- **Performance:** Identified accuracy on 359 Google Street View images of 76%



ZOONIVERSE



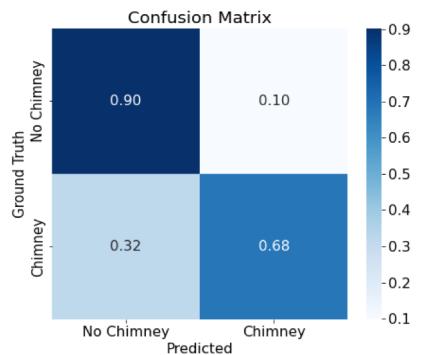
Chimney Detection



- Object detection model automatically detect chimneys (**BRAILS**)
- Trained on dataset of 1,700 crowd-sourced images (80% training, 10% validation, 10% testing)
- If a bounding box is detected, the building is determined to have a chimney
- **Performance:** Identified accuracy on 353 Google Street View images of 79%



ZOONIVERSE



Segmentation-Based Modules

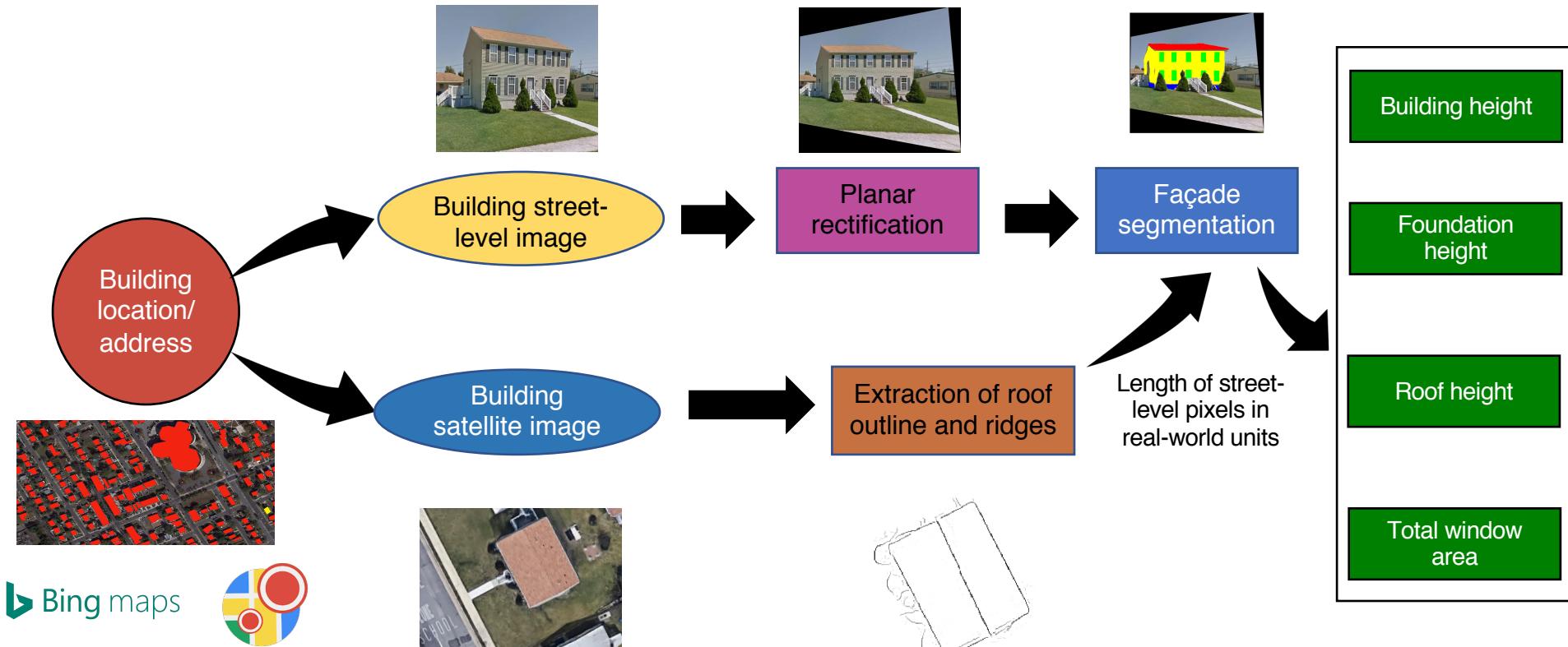


Metric Building Measurements

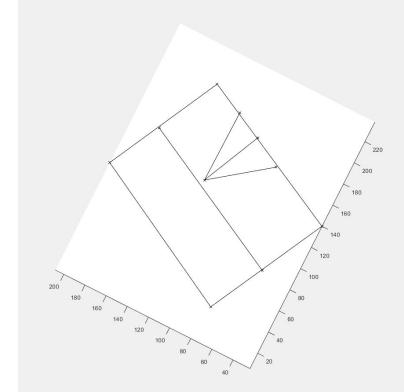
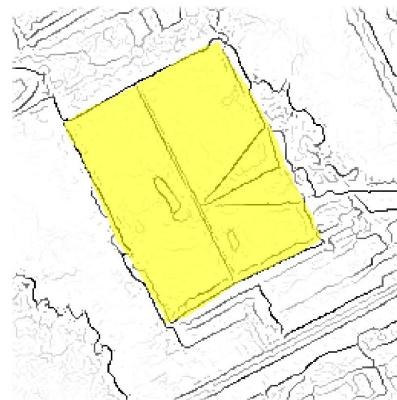


- **Semantic segmentation model** automatically detects the pixels that can be used for the predictions (**BRAILS**)
- Once coupled with an image rectifier and a scale determination algorithm (**BRAILS**) all metric quantities can be extracted
- Trained on dataset of 5,000 images (80% training, 15% validation, 5% testing)

Automated Single Image Metrology Pipeline



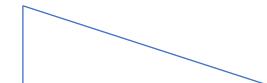
Automated Single Image Metrology Pipeline



Roof height: 1.25 m

Roof pitch: 15.5°

1.25 m



4.5 m

Questions?

