

# Satellite Survey 2026

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Authored by: Jordan Supramaniam



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# Objectives

This project aims to provide proof of concept for a construction detection system to update the US address master file. It will accomplish this goal by using satellite or aerial photography to detect construction and estimate the proper address for the new buildings.

## Methodology

The project was to follow a simple agile roadmap where I set out a minimum viable product, 2 additional features I thought were possible and 2 features that surpassed my expected ability given the constraints.

The minimum viable product was to get the original model provided by Hao Chen working, add a feature to draw boxes around the detected changes and a certainty metric to determine how likely a false result was.

The first additional feature was to test the model's effectiveness outside of the Texas dataset in a region in the US. The second was to create the test images using only API calls to google earth and local computing instead of manual dataset creation.

The first stretch feature was to test the model in an Australian city as the building, terrain and collection methodology difference could lead to different results. The second was to generate predicted addresses based on the GPS coordinates of the detected construction.

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# Progress

One of my goals in my professional career is to work for the Australian bureau of statistics and in researching the ABS and similar institutions I found that the US census bureau had updated their methodology (Ron S. Jarmin, 2025). This change to in-office satellite surveying prompted me to investigate if further improvements could be made to the process using the recent leap in AI capabilities. Searching for satellite-based construction detection journal articles led to the work of Hao Chen who used a combination of ResNet-18 and a transformer to detect construction on the outskirts of Texan cities. This model and the accompanying Levir-CD dataset were the base for this project.

The code provided by Hao Chen had various issues when used out of the box including deprecated functions, requiring a label file for inference and a lack of metrics that could be used to diagnose problems. Upon fixing these issues the outputs were all ineffective for images not part of the sample dataset. This was discovered to be due to strict resolution and image size requirements of 0.5m/pixel and 256x256 image size. The image size requirement was solved through standard image tiling however the google earth image collection pipeline could only produce 3m/pixel accurate images. Thus, a specialized dataset was found on the website for Land Information New Zealand with their Auckland 0.075m urban aerial Photos 2017 and 2024 datasets used.

Subsequently, I produced a program to help identify the changes by placing boxes around groups of pixels above 100 in a single connected mass determined by cardinal adjacency. These boxes significantly improved the legibility of the output and reduced the time spent checking if the program worked correctly significantly.

Next The API cause issues as when requesting images their resolution and size were difficult to control with changes in one variable cascading easily and no easy way to get 0.5m resolution directly. Therefore, I downloaded a small 15Gb section of the dataset and conducted the resolution change and cropping locally allowing complete control

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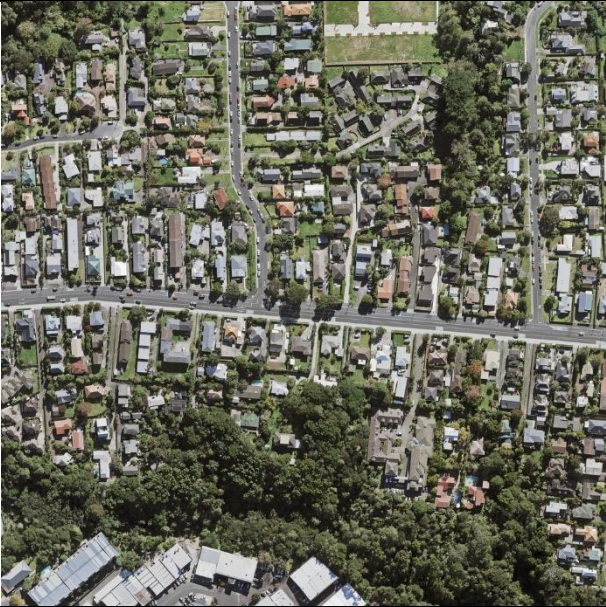
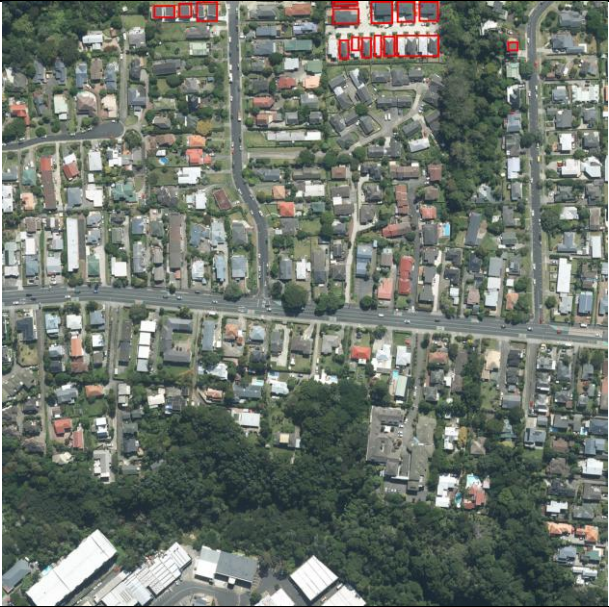
over the process. This process worked by finding all the jpeg 2000 files relevant to the area selected and stitching them together to generate a complete image of the area and then down sampling the 0.075m resolution to 0.5m.

Then I produced a program that could take the original mask, center longitude and latitude and total image size in meters and predict the GPS coordinates of the Centre of each detected mass and search that in Nominatim to get the street address of the construction.

Finally, I produced end stage programs including a pipeline program to run the whole set efficiently and a GUI to display the results more Legibly.

# Results

The project can detect new construction with high accuracy, however multiple constructed buildings in a single area as shown below can lead to the buildings merging into a single detection. The addresses generated also can be inaccurate with the same address appearing multiple times or the wrong street being chosen if the properties center is closer to a second street. This is especially common in corner building or ones with both front and rear street access.

| 2017                                                                               | 2024                                                                                |
|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  |  |
| <b>Addresses:</b>                                                                  |                                                                                     |
| 15, Maika Lane, Highbury, Birkenhead, Kaipātiki, Auckland, 0626                    | 2, Maika Lane, Highbury, Birkenhead, Kaipātiki, Auckland, 0626                      |
| 6, Maika Lane, Highbury, Birkenhead, Kaipātiki, Auckland, 0626                     | 22A, Aorangi Place, Highbury, Birkenhead, Kaipātiki, Auckland, 0627                 |
| 22C, Aorangi Place, Highbury, Birkenhead, Kaipātiki, Auckland, 0627                | 22E, Aorangi Place, Highbury, Birkenhead, Kaipātiki, Auckland, 0627                 |
| 15, Maika Lane, Highbury, Birkenhead, Kaipātiki, Auckland, 0626                    | 18, Maika Lane, Highbury, Birkenhead, Kaipātiki, Auckland, 0626                     |
| 10, Maika Lane, Highbury, Birkenhead, Kaipātiki, Auckland, 0626                    | 16, Maika Lane, Highbury, Birkenhead, Kaipātiki, Auckland, 0626                     |
| 22, Maika Lane, Highbury, Birkenhead, Kaipātiki, Auckland, 0626                    | 20, Maika Lane, Highbury, Birkenhead, Kaipātiki, Auckland, 0626                     |
| 24, Maika Lane, Highbury, Birkenhead, Kaipātiki, Auckland, 0626                    | 26, Maika Lane, Highbury, Birkenhead, Kaipātiki, Auckland, 0626                     |
| 20, Park Avenue, Highbury, Birkenhead, Kaipātiki, Auckland, 0627                   | 4, Maika Lane, Highbury, Birkenhead, Kaipātiki, Auckland, 0626                      |

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# Conclusions

The project meets the overarching goal of a proof of concept for increased automation of the system to update the address Masterfile. This is due to the program accurately detecting new construction 100% of the time, however the size and address of the construction was unable to be determined with high precision requiring manual intervention in a real-world application. This project had to have multiple scope changes such as the understanding of the abilities of certain tools including google earth and the BIT CD model changed leading to several features and ideas being replaced with more relevant project objectives with the consent of project leadership.

# Acknowledgement of support

Hao Chen provided the core model, original dataset and model weights for this project through his paper and GitHub.

Claude was used to assist in programming the project and understanding sections of Hao Chen's paper.

Farzad Tofigh Assisted in understanding Hao Chen's paper, provided coding and troubleshooting tips and suggested, critiqued and accepted project scope changes.

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# References

Hao Chen, Z. Q. (2022). Remote Sensing Image Change Detection With Transformers. *IEEE Transactions on Geoscience and Remote Sensing*, vol. 60.

Jarmin, R. S. (2025, AUG 19). *Source Data Innovation at the Census Bureau: Improving the Quality and Sustainability of Our Statistics*. Retrieved from United states census bureau: <https://www.census.gov/newsroom/blogs/director/2025/08/source-data-innovation.html>

Land Information New Zealand. (2026, May 17). *Data*. Retrieved from Land Information New Zealand: <https://data.linz.govt.nz/>