Geolocation Case Study

THE PROBLEM

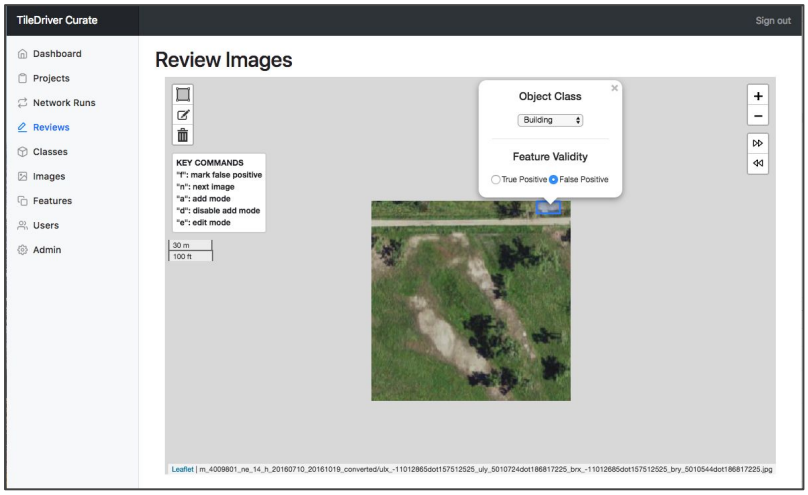
BeamIO was approached to help verify the locations of buildings in rural areas that would qualify for assistance under a large Federal grant program. Unfortunately, traditional approaches using address and census data were unable to meet the demand for high accuracy and inclusion of as many structures as possible. The best way to meet the request was to use imagery to find and verify the right structures, but the customer desired rooftop level accuracy with an automated solution to keep per address costs low.

The BeamIO team identified imagery from USDA's National Agriculture Imagery Program (NAIP) to help keep costs down while meeting resolution requirements. However, the area of interest covered over 5,000 square kilometers and totaled over 55 gigapixels of imagery across ten counties in the midwest. Given that we were working with a new object detection model, we knew that such a large area would be extremely challenging to validate.

Using our Algorithm Toolkit, part of the TileDriver ecosystem, we took the 307 NAIP image tiles for the AOI and tiled them into nearly 800,000 chips. We performed model inference on each chip using our own custom trained object detection model with the TensorFlow™ framework. This resulted in proposed detections across approximately 5% of the image chips; considerably smaller than the number of overall images, but still a large amount of features to review.

TILEDRIVER CURATE

To solve the problem, we used our in house tool TileDriver Curate™. With this product, we were able to import all 800,000 images and 40,000 features identified by the model into a single database. We then used this review tool with it's efficient interface to look at and curate image by image.



Using other tools, such as QGIS or ArcGIS, for this kind of review is prone to errors since reviewers have to look at an entire map. This increases the risk of missed detections as a reviewer loses their place due to fatigue.

OUTCOME

With a small team of three reviewers, we were able to hand curate all features in only four days. Using this approach allowed us to locate over 97% of the hoped for addresses with rooftop accuracy. The BeamIO team took care of the entire end-to-end process including data collection, automated batch processing, result clean-up (via curation) to produce over 10,000 high quality rooftop geocoded addresses.

SEEING RESULTS

The customer desired a spreadsheet of results listing the latitude and longitude of each building plus the county and State in which the object was found. BeamIO can easily generate these types of results; however, we went a step further and provided the individual findings in our TileDriver Visualize™ tool, shown below. TileDriver allowed the company's staff to quickly inspect results overlaid on the same imagery used to generate the results, reducing the overall time to deliver.

CONCLUSION

As you can see, BeamIO can deliver highly accurate rooftop level locations over large areas. These results can be produced very quickly with very low error. When combined, our TileDriver Curate™ and TileDriver Visualize™ tools provides unparalleled power for solving address verification and geolocation tasks.