

Automated Feature Detection of Aerial Imagery from South Pacific

Update: A high-end Category 4 Cyclone has just [devastated](#) the islands of Tonga. The impact on food security is already [evident](#). The purpose of our Open AI Challenge was precisely to prepare for such an eventuality. We need these automated feature detection algorithms now more than ever.

In collaboration with WeRobotics and OpenAerialMap, the World Bank's UAVs for Disaster Resilience Program captured ~80km² of high resolution (under 10 cm) aerial imagery in the Kingdom of Tonga in October 2017. The World Bank now seek qualified teams to develop machine learning classifiers to automate the analysis of this imagery. The classifiers will also be applied to new imagery to speed up baseline analysis and damage assessments in the future.

The winning team(s) will receive public praise and a Certificate of Achievement. More importantly, they will enable the World Bank and partners to significantly accelerate the analysis of aerial imagery before and after major humanitarian disasters. This will help accelerate and improve humanitarian and development efforts across the South Pacific. Winning teams will also have the opportunity to engage in other related projects around the world.

The imagery collected in October comprises four Areas of Interest (AOIs). Three AOIs cover 10km² areas and one AOI covers a 50km² area. The spatial resolution of the optical imagery is 4cm and/or 8cm depending on the AOI. In addition, an AOI of 10km² was collected using a near-infrared sensor. Optical imagery is also available for that same AOI. In general, the AOIs cover a combination of rural and urban areas. Training data for relevant features of interest have been developed by the Humanitarian OpenStreetMap community.

The following classifiers are required in order of priority:

- **Trees** (counts and location of individual coconut trees)
 - Coconut trees
 - Banana trees
 - Papaya trees
 - Mango trees
- **Road type** (size and surface type)
 - 2-way road vs. 1-lane road

- Paved vs. dirt road

Being able to quantify the number of trees that serve as an important source of livelihood for local communities is essential. These trees and their locations can then be compared before and after major disasters to better understand just how much local agriculture and hence food security has been affected. This can directly inform and accelerate subsequent relief efforts. The focus on roads is also meant to help identify the impact of natural disasters on local transportation infrastructure and to inform how best to distribute aid across affected areas.

Parameters for classifiers:

- Use imagery from the **50km² AOI** which has 8cm spatial resolution (data link below)
- Resulting **data made available** in GeoJSON (or other open geospatial vector / raster file format as appropriate).
- The **accuracy** of the classifiers should be **>80%**.
- Future users should be able to run these classifiers themselves, ideally by using a simple **web-based interface** designed for this purpose.
- Classifiers for coconut trees should ideally be available by **March 1, 2018** with remaining classifiers delivered by June 1, 2018. For universities operating on a semester program, we invite you to submit your classifiers by June 2018 so we can compare accuracies.

Training Data

- Roads and Buildings
<https://export.hotosm.org/en/v3/exports/8a5ba924-1f34-4ed8-a4f6-7b0e2921c06e>
- Coconut Trees
https://drive.google.com/file/d/1rumWHzO3_CO40uXhaP69roUyfFzYCe20

Aerial Imagery

https://map.openaerialmap.org/#/-175.34221936224426,-21.095929709180027,15/square/20002233030/5a28640ebac48e5b1c58a81d?_k=4yyxj6

Direct Downloads:

- GeoTIFF
<http://oin-hotosm.s3.amazonaws.com/5a28639331eff4000c380690/0/5b1b6fb2-5024-4681-a175-9b667174f48c.tif>
- TMS:
<https://tiles.openaerialmap.org/5a28639331eff4000c380690/0/5b1b6fb2-5024-4681-a175-9b667174f48c/{z}/{x}/{y}.png>
- WMTS:
<https://tiles.openaerialmap.org/5a28639331eff4000c380690/0/5b1b6fb2-5024-4681-a175-9b667174f48c/wmts>

Note: The aerial imagery provided for this challenge is under a CC-BY creative commons license. The OSM training data (roads, building, trees, etc) is provided under the Open Data Commons Open Database License (ODbL).

Contacts

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Questions & Answers

Answers to frequently asked questions will be posted and updated below. Please feel free to use the “Insert comments” feature of Google Docs to add your questions directly to the Doc.

Q1. What is the evaluation method, submission system, deadlines? (Zbigniew Wojna)

The evaluation method will be based on accuracy including recall and precision. We will be working with university faculty to help evaluate the results. Said results should be submitted by email (and via dropbox or Google Drive if needed) to patrick@werobotics.org. The coconut tree classifier should be submitted by March 1st. All other classifiers must be submitted by June 1st, 2018.