**Automated Feature Detection of Aerial Imagery from South Pacific**

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 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>

* This links to the export.hotosm.org page which describes an export that was done on Dec 21 (description: Subset of data derived from UAV imagery around Kolovai, Tonga.). Then there are three “runs”, one from Dec 21, one from Jan 8 and one from Feb 17, each of which link to three zip files: a shapefile (kolovia-tonga\_shp.zip), a GoogleEarth file (kolovail-tonga\_kml.zip – (keyhole markup language)), and an OSM file (kolovia-tonga\_export\_pbf.zip)). Each file is <1MB. The files from the older “runs” are no longer available on the page.
* The files from the Feb 17 “run” are all in our git repo
* You can click a “View This Area” link to go to an OpenStreetMap Analytics page where you see the area with what I believe are open-sourced labelings of buildings superimposed on a map (ie; not satellite imagery).
* Coconut Trees

<https://drive.google.com/file/d/1rumWHzO3_CO40uXhaP69roUyfFzYCe20>

* These files have been uploaded to the git repo

**[Aerial Imagery](https://tasks.hotosm.org/project/3928" \l "bottom)**

[https://map.openaerialmap.org/#/-175.34221936224426,-21.095929709180027,15/square/20002233030/5a28640ebac48e5b1c58a81d?\_k=4yyxj6](https://map.openaerialmap.org/" \l "/-175.34221936224426,-21.095929709180027,15/square/20002233030/5a28640ebac48e5b1c58a81d?_k=4yyxj6)

* This takes you to the OpenAerialMap page for Kolovai UAV4R Subset (OSM-Fit) with the aerial image of the village of Kolovai which looks to be about 1km x 2km. There are two images there which you can download as tiffs. Brie downloaded one.
* UPDATE: Now there are six images. 3 from October: 2 very similar and 1 very big one (2.67GB) that is basically the entire western portion of the island with apparently 13cm resolution. 3 from February which together cover the entire island but with a lot of cloud cover and ~1m resolution. Possibly post-cyclone?

[Direct Downloads:](https://map.openaerialmap.org/" \l "/-175.34221936224426,-21.095929709180027,15/square/20002233030/5a28640ebac48e5b1c58a81d?_k=4yyxj6)

* [GeoTIFF](https://map.openaerialmap.org/" \l "/-175.34221936224426,-21.095929709180027,15/square/20002233030/5a28640ebac48e5b1c58a81d?_k=4yyxj6)

<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, ets) is provided under the Open Data Commons Open Database License (ODbL).

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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)  
Previous*  
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](mailto:patrick@werobotics.org). The coconut tree classifier should be submitted by March 1st. All other classifiers must be submitted by June 1st, 2018.