Overstory Geospatial Data Engineer Take-Home Exercise

This exercise shouldn't take you more than 4 hours, half a day at most. Do the exercise at your own pace, but please let us know if you won't be able to finish it within a week.

At Overstory we want to know everything there is to know about trees, and tree height is one very important factor. For this we create large-scale Canopy Height Maps (CHM) through stereo processing satellite imagery taken from various angles.

In our pipelines, we want to only know the height of trees, i.e. not the altitude of a tree, but how tall a given tree is. For this purpose, we create a time-sensitive Digital Surface Model (DSM) close to the date our clients care about, which we then subtract with a general Digital Elevation Model (DEM) (assuming it has been filtered out from some surface elements).

For the assignment we'd like you to create an accurate Canopy Height Map (CHM) as a single unified mosaic.

We have provided you with:

- an existing DEM from Copernicus
- Three Digital Surface Maps (DSMs) created from a sparse point cloud, in turn created from multiple overlapping satellite images:
    - DSM 1
    - DSM 2
    - DSM 3

More information on Copernicus DEMs (product handbook etc) is available here and here. A good primer on stereo matching can be found here.

We have given you access to both a Digital Elevation Model and a Digital Surface Model and leave it up to you to generate the best Canopy Height Map possible with the data we gave you access to.

Optional:
As extra data (not required for the assignment, but you might find helpful) you also have access to:

- The 3 Skysat images we used to create the above shared DSMs:
    - https://storage.googleapis.com/overstory-public/DE_candidate/assignmentA/3d-1_skysatscene_basic_panchromatic.zip
    - https://storage.googleapis.com/overstory-public/DE_candidate/assignmentA/3d-1_skysatscene_basic_panchromatic.zip
    - https://storage.googleapis.com/overstory-public/DE_candidate/assignmentA/3d-3_skysatscene_basic_panchromatic.zip
    - https://storage.googleapis.com/overstory-public/DE_candidate/assignmentA/3e-1_skysatscene_basic_panchromatic.zip
    - https://storage.googleapis.com/overstory-public/DE_candidate/assignmentA/3e-2_skysatscene_basic_panchromatic.zip
    - https://storage.googleapis.com/overstory-public/DE_candidate/assignmentA/3e-3_skysatscene_basic_panchromatic.zip
    - https://storage.googleapis.com/overstory-public/DE_candidate/assignmentA/3g-1_skysatscene_basic_panchromatic.zip
    - https://storage.googleapis.com/overstory-public/DE_candidate/assignmentA/3g-2_skysatscene_basic_panchromatic.zip
    - https://storage.googleapis.com/overstory-public/DE_candidate/assignmentA/3g-3_skysatscene_basic_panchromatic.zip
- For each satellite image we provide you with the individual “scenes” (see the planet product spec for what this means) at 50cm resolution, all at three different angles (therefore 3×3=9 zips). These are scenes in their raw uncalibrated format, also known as “basic panchromatic” so not yet atmospherically processed and with their RPC camera information as well.

For more info on how to process Skysat imagery and the meaning of the different bands see:

- the Planet product description
- Python notebook examples of processing the data

You’re free to use any Python libraries, as well as desktop IDEs (except ArcGIS) to complete the exercise. Please zip up the resulting CHM, the description of the steps you took to generate it, and any code (if you used any) and upload it using the link provided in the email.

If anything is unclear or if you have any other questions, do not hesitate to ask!