

## Estimating building height from satellite imagery

Presented by Geospatial Insight

Geospatial Insight (GSI) is a private geospatial intelligence company, operating in the commodities, finance, insurance and public sectors.

One of its products, PropertyView, aims to provide insurance clients with information on a property's physical attributes, including its footprint, roof geometry, construction material and its height using high resolution, commercial satellite imagery.

This challenge wishes to explore the determination of the height of a property from multiple (ideally 2) high resolution (30-60cm) panchromatic image chips of individual buildings.

The height of a building may be estimated from the generation of a digital surface model (DSM) using photogrammetry from two or more satellite images over the same region. Available tools such as ASP allow for such a DSM to be created via its internal photogrammetry algorithms. GSI currently use ASP generated DSMs to infer - by way of an in-house written model - the building height. The challenge is that the accuracy of this approach is variable and unpredictable, as the resolution and completeness of the DSM can vary, and the spatial features it produces can be noisy.

The cause for these errors may lie in:

1. The selection of images to pair together to generate the DSM may not be optimal, we have insights into suitable image pairing parameters which will be shared, but not a complete picture.
2. The use of the ASP tool, as it is not designed for urban scenes and may not be optimised.
3. The in-house model used to determine for a given property the height of a building from the ASP DSMs is a stochastic approach and may require replacing with a better solution. It selects a ground point and a roof

point which it believes best represent the true height of the building within the noise of the DSM, but it is likely non-optimal.

We believe it may therefore be sensible to split this challenge into two themes, one or both may be selected depending on expected complexity and experience:

**Theme 1:** Determination of building height from the provided ASP derived DSMs across multiple scenes (would help with point 3).

**Theme 2:** Determination of building height from the original panchromatic, map projected fortuitous stereo imagery.

Theme 2 is our ultimate goal, but theme 1 would still be of great value to GSI.

To that end, we would be able to provide the following:

- >600 panchromatic, map projected image chips, one for each building across a wide geographic region.
- A building outline for each image chip so that the location of the building footprint is known.
- ASP derived DSMs for each building (for Theme 1).
- Ground truth height for each building (for performance/error analysis).
- Our height estimate for each building (for analysis of improvement beyond our existing approach).
- A document which describes as concisely as possible pertinent information which may help constrain the problem.