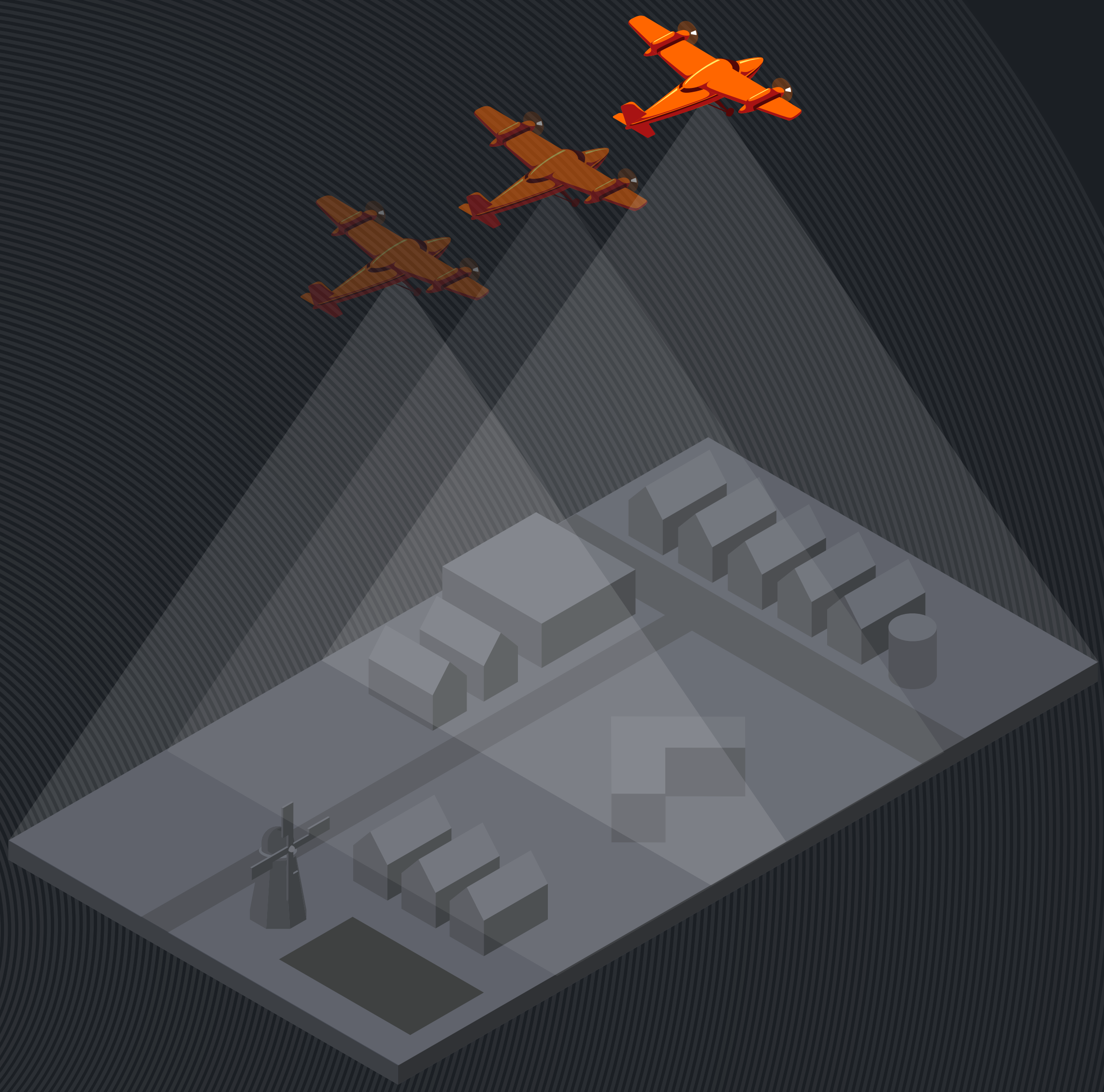
READAR
real estate radar

Productsheet



VERSION 2019

Readar mines data from aerial imagery using remote sensing and machine learning. This product sheet gives more detail on our data products, the source material used, the methods applied, the preferred data formats and the properties of the data.

Our products

1. Point clouds

Elevation model produced from stereo aerial imagery. Each pixel from the image is located at the correct x,y,z position. The x,y,z position is determined by matching the same pixel in at least two different images. The height (z) is determined based on the difference in parallax.

Source[1]: Aerial imagery. A 60-0 overlap (60% forward overlap and 0% side overlap) is sufficient for useful results, but more overlap generates more accurate results.

Method used[2]: Deep learning. Note: we do not use Semi Global Matching, as our Deep Learning-based method generates better coverage than typical SGM.

Data format: TIFF, LAZ

Properties: Point cloud. RGB values can also be generated, depending on the licence used. From the RGB pointcloud we can generate a true orthophoto (see 17).

2. Building Outline

The roof, including the guttering, is projected vertically onto the ground.

Source[1]: Aerial imagery or LiDAR data.

Method used[2]: Deep Learning

Data format: Shapefile, Excel, CSV

Properties: Geometry

3. Trees

Trees taller than 8m.

Sources[1]: Aerial imagery or LiDAR data

Method used[2]: Deep Learning

Data format: Shapefile, Excel, CSV, LAZ

Properties: Geometry, point cloud

4. Roof segments

Building rooftops are split into separate roof segments. A roof segment is defined as any section having the same incline and orientation.

Sources[1]: Aerial imagery or LiDAR data

Method used[2]: Remote sensing, Deep Learning

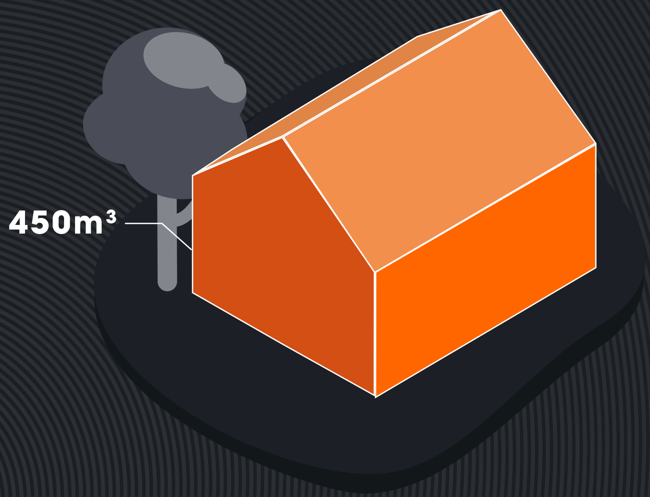
Data format: Remote sensing, Deep Learning

Properties: Geometry, orientation (degrees), slope (degrees), surface area (m^2)

5. 3D Citymodel

A 3D model with both buildings and trees in 3D geometry.

Sources¹:	Aerial imagery or LiDAR data
Method used²:	Remote sensing
Data format:	Shape, Excel, CSV, LAZ
Properties:	Geometry



6. Volume

The volume between the building footprint (2) and rooftop (4). Overhanging trees (3) are not included in the volume.

Sources¹:	Aerial imagery or LiDAR data
Method used²:	Remote sensing
Data format:	Excel, CSV
Properties:	Volume (m^3)

7. Floor surface area

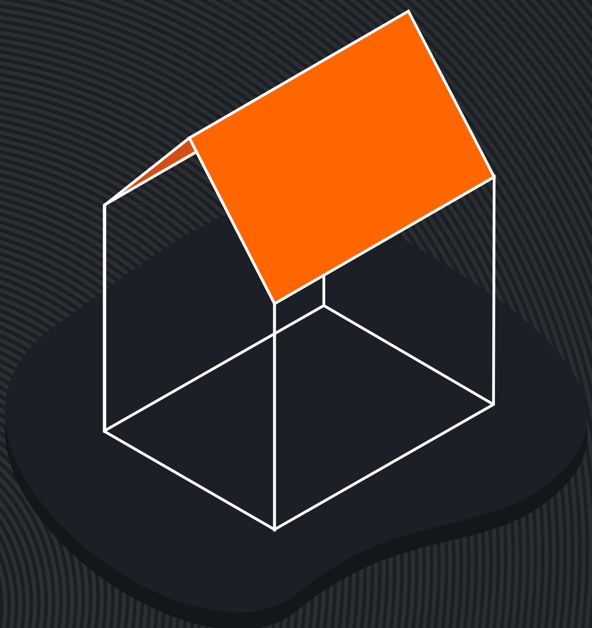
Estimate of the floor area based on the building's volume, taking into account the building's height, the exterior wall thickness (possibly depending on year of construction) and the dwelling type (14).

Sources[1]: Aerial imagery or LiDAR data and building footprints

Method used[2]: Machine Learning

Data format: Shapefile, Excel, CSV

Properties: m^2



8. Rooftop surface area

Total surface area of a roof in m2, taking slope into account.

Sources[1]: 4

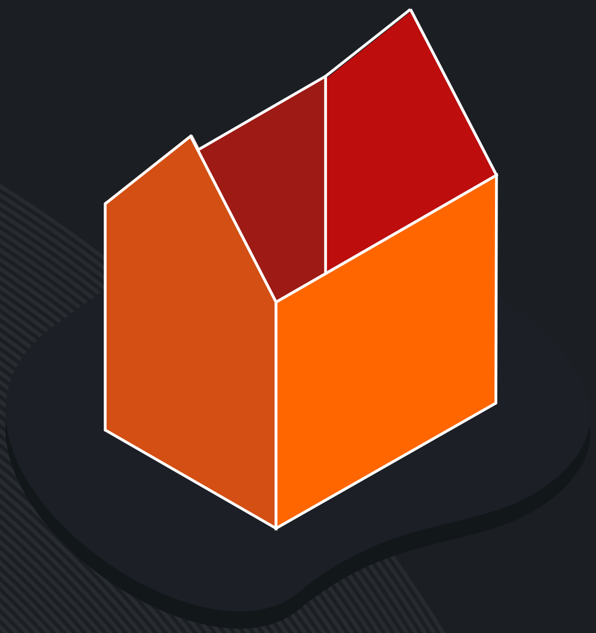
Method used[2]: Remote sensing

Data format: Excel, CSV

Properties: m^2

9. Exterior wall area

Surface area of the exterior walls between the rooftop and the building footprint. Windows and doors are included in the exterior wall area.



Sources[1]:	2 + 4
Method used[2]:	Remote sensing
Dataformat:	Excel, CSV
Properties:	m^2

10. Potential solar panels

The total area of the roof that is suitable for solar panels. This area is determined by calculating the total annual irradiation, taking into account the slope and direction of the roof segment and the effect of shadows from nearby objects. Based on the irradiation a yield estimate is given.

Sources[1]:	4 + 5 + sunlight data
Method used[2]:	Remote sensing
Data format:	Excel, CSV
Properties:	m^2, percentage of maximum sunlight exposure

11. Existing solar panels

Solar panels present on roof tops. Both presence and amount of installed panels are available. We only consider solar panels which are visible to the eye, i.e. not integrated into roofing tiles or windows.

Sources[1]: Aerial imagery +2 + 4

Method used[2]: Remote sensing, Machine Learning

Data format: Excel, CSV, shape

Properties: Probability of solar panels being present (%), validated presence of solar panels (yes/no), amount of panels, orientation, year of construction (provided several aerial images are available)

12. Green roofs

Roofs covered with sedum or other vegetation. We only show green roofs planted by people – deteriorated roofs (natural weed and moss growth) are excluded as far as possible.

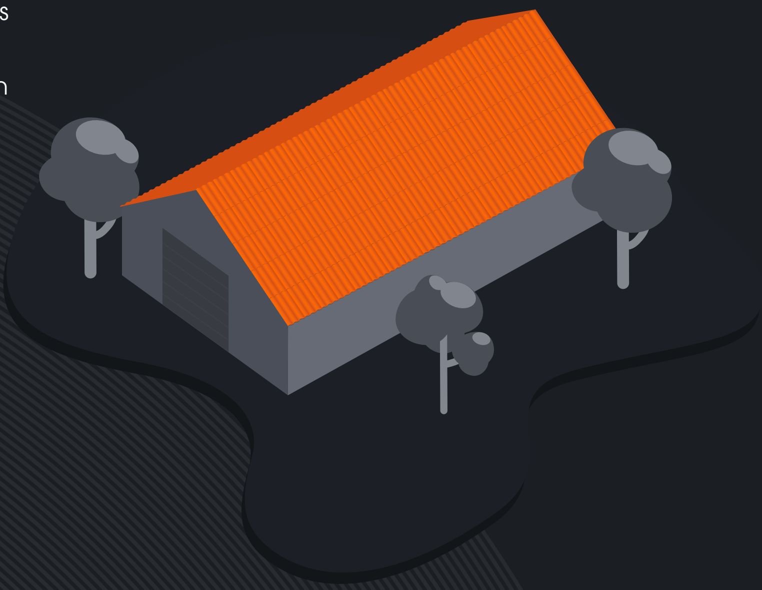
Sources[1]: Aerial imagery + 4

Method used[2]: Remote sensing + Machine Learning + manual checks

Data format: Excel, CSV, shape

Properties: m^2, geometry

13. Asbestos roofs



Roof material that is suspicious of containing asbestos fiber. These are roofs that meet three conditions:

1. The roof was very probably built in the period when asbestos was allowed as construction material.
2. The roof is constructed from a material in which asbestos was used (mostly corrugated sheets and slates).
3. The roof is unlikely to have been replaced since asbestos was banned in roofing materials.

Sources[1]:	Aerial imagery + 4
Method used[2]:	Remote sensing + Machine Learning + manual checks
Data format:	Excel, CSV, shape
Properties:	Suspect roofs (m^2), non-suspect roofs (m^2), roofs not visible (m^2), geometry

14. Dwelling type

Type of dwelling.

Sources[1]:	2 + land registry title
Method used[2]:	GIS
Data format:	Excel, CSV
Properties:	Terraced house, corner house, semi-detached, detached, apartment

15. Outbuilding

Building on the same plot of land as a dwelling, but unlikely to be used for habitation.

Sources[1]: Land registry title + 2

Method used[2]: GIS

Data format: Excel, CSV, shape

Properties: m^2, quantity, geometry

16. Change detection

We distinguish between two types of alterations. Alteration in volume: for example, a new structure, a new dormer or extension. Alteration of materials: for example, a new roof. Depending on the application, the alterations identified can also be classified and given a probability percentage (what is the probability that the change identified is relevant for the intended application)

Sources[1]: At least two Aerial imagery + 1 + 2

Method used[2]: Remote sensing, Machine Learning

Data format: Excel, CSV, shape

Properties: Geometry, probability as a percentage that an alteration is relevant for the client, classification according to type of alteration

17. True ortho

Top view aerial imagery where each pixels is positioned on the correct X,Y position, generating an image without building lean. True orthophotos can be used directly for mapping objects above ground level such as buildings. These objects would have a shift in X,Y in normal orthophotos.

18. Specials

Readar has had all manner of special enquiries such as the mapping swimming pools, ponds, roof material and parking areas. Basically, data collection for any type of object that is visible by the eye on an aerial photograph can be automated. The source material resolution plays an important role on what objects are visible and thus can be detected. If you are looking for data which is not included in our product description, please get in touch. We can quickly investigate whether your enquiry is feasible or not.

1) Explanation: Source material versus reliability

Preferably, Readar uses stereo aerial imagery taken in TIFF-format with a large format or pushbroom camera. Metadata is important, we use the image recording time, camera position and orientation (Exterior Orientations). The resolutions to be used vary between 3 and 30cm, with a focus on 10cm or better. If the preferred material is not available we can also use orthophotos or even satellite images. The reliability of the end product depends on the source material. This generally means that:

- Higher resolution imagery gives more reliability
- TIFF-format gives more reliable results than ECW
- Stereo images give more reliable results than orthophotos

2) Explanation: methods used and IP

Readar applies in-house developed detection and analysis software. We use various open source programming languages, development environments, tools and libraries such as: Docker, Python, Postgres, PyTorch, Tensorflow and Keras. Cloud processing is our starting point for development, cloud computing makes it possible to process aerial imagery on a large scale. Since we control all processes in-house we can easily adapt our processes to your specific question.