

# Point clouds: 3D Medial Axis Transform

ITC visit

Delft, 6 februari 2015

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# Point clouds

# Point clouds

An aerial point cloud visualization of a city, likely Rotterdam, showing a dense grid of buildings and streets. The point cloud is rendered in grayscale, with a semi-transparent dark rectangular box overlaid on the top left portion of the image. The text 'Point clouds' is written in white within this box. The city features a mix of low-rise residential buildings and taller commercial structures, with a prominent canal or river cutting through the urban landscape.

Deltares



3di.nu

3Di [<https://www.flickr.com/photos/111657969@N03/12363990194/in/pool-2600989@N22/>]

# Point clouds

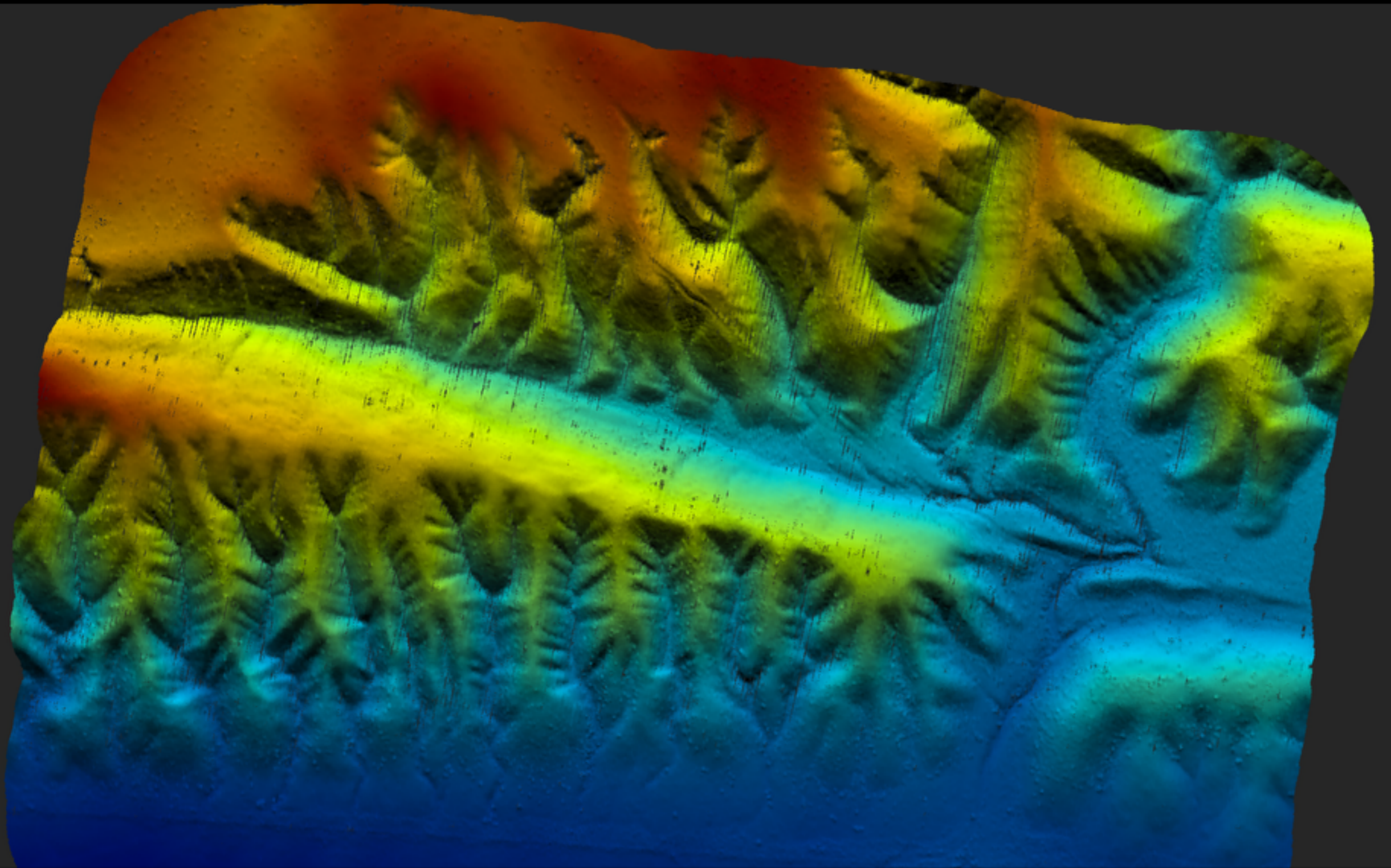
1. Unstructured
2. Accurate
3. Fully 3D
4. Massive



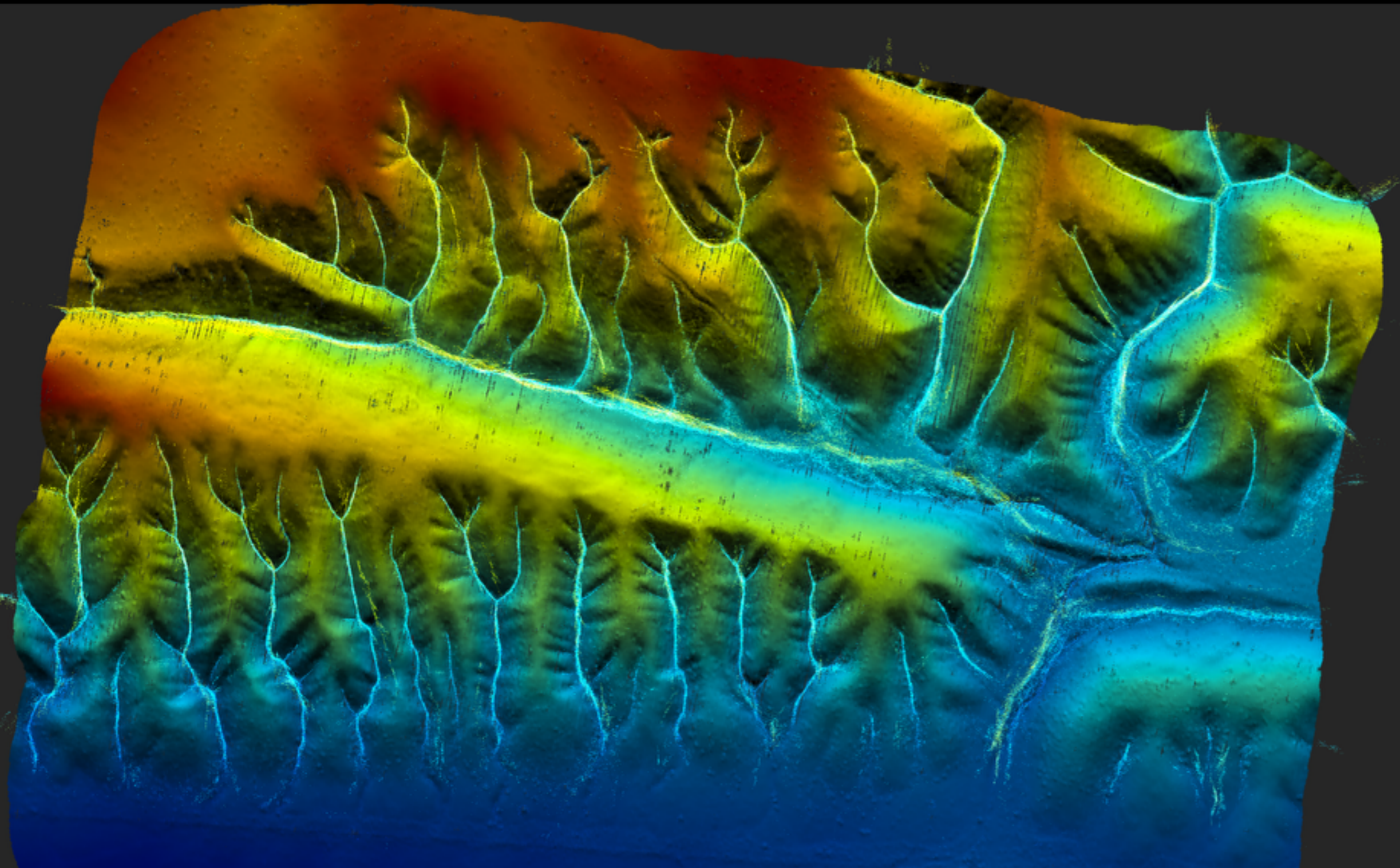
Oliver Kreylos [<https://www.youtube.com/watch?v=cyoJKbzqpZA>]

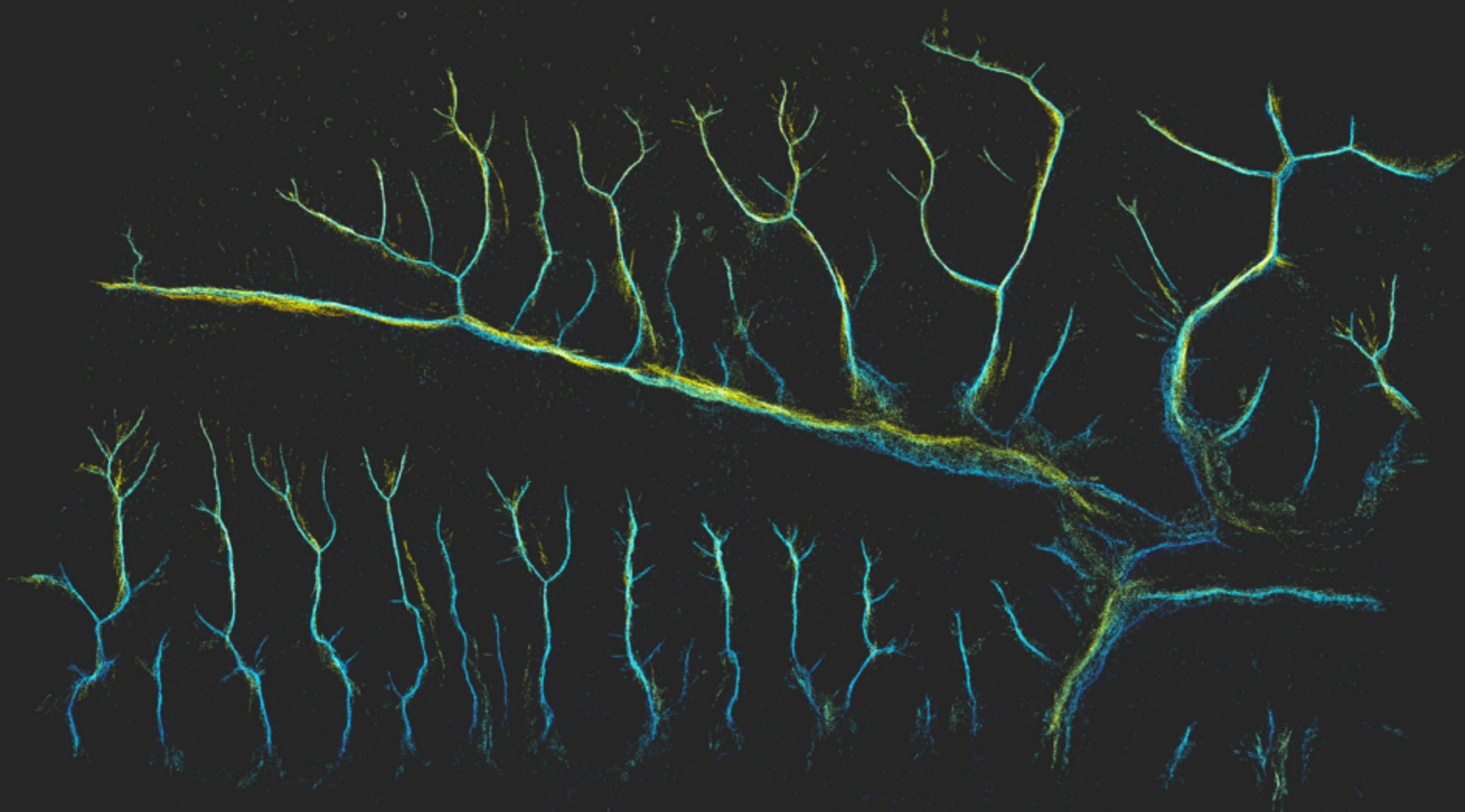


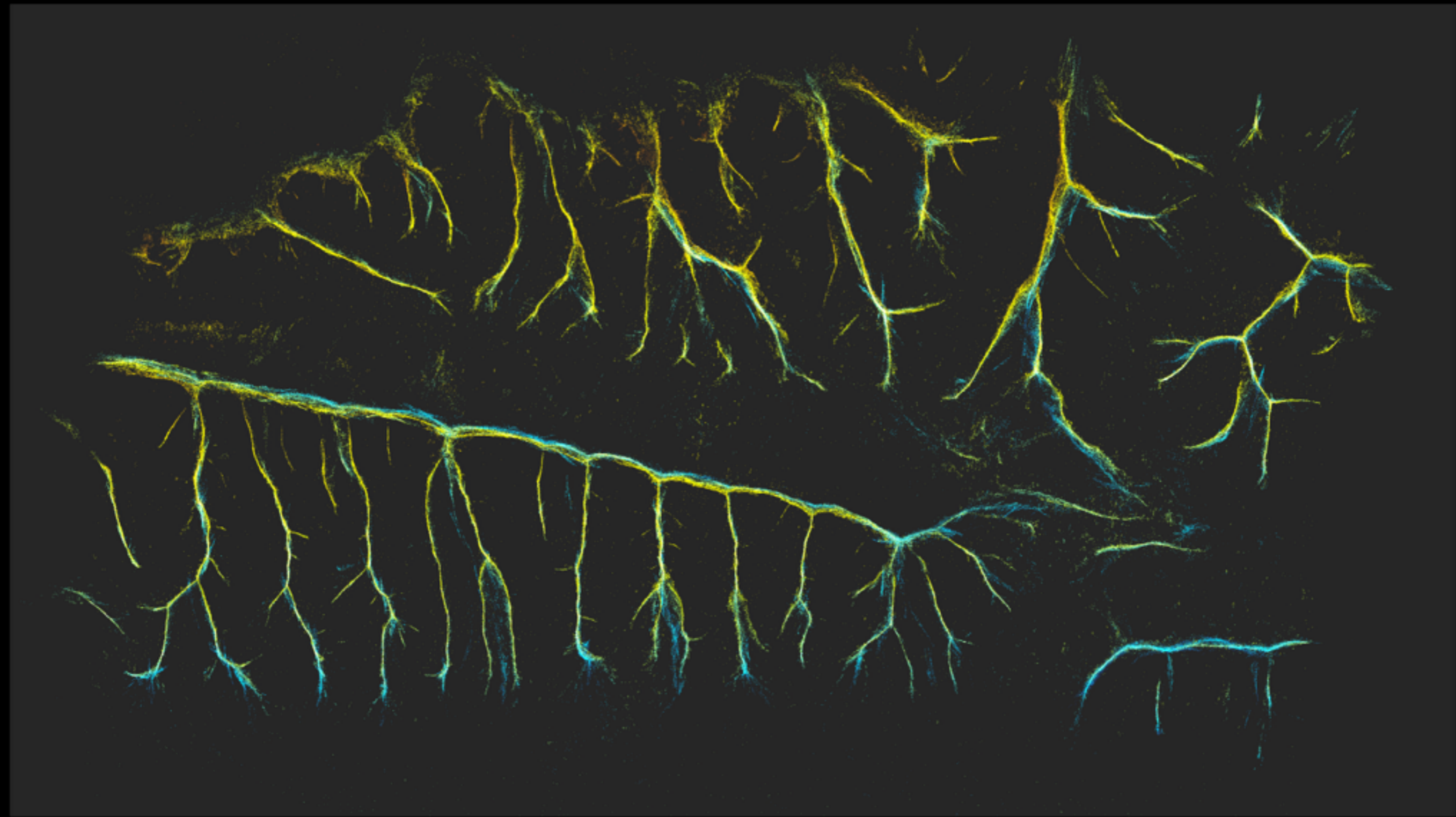
# 3D Skeleton

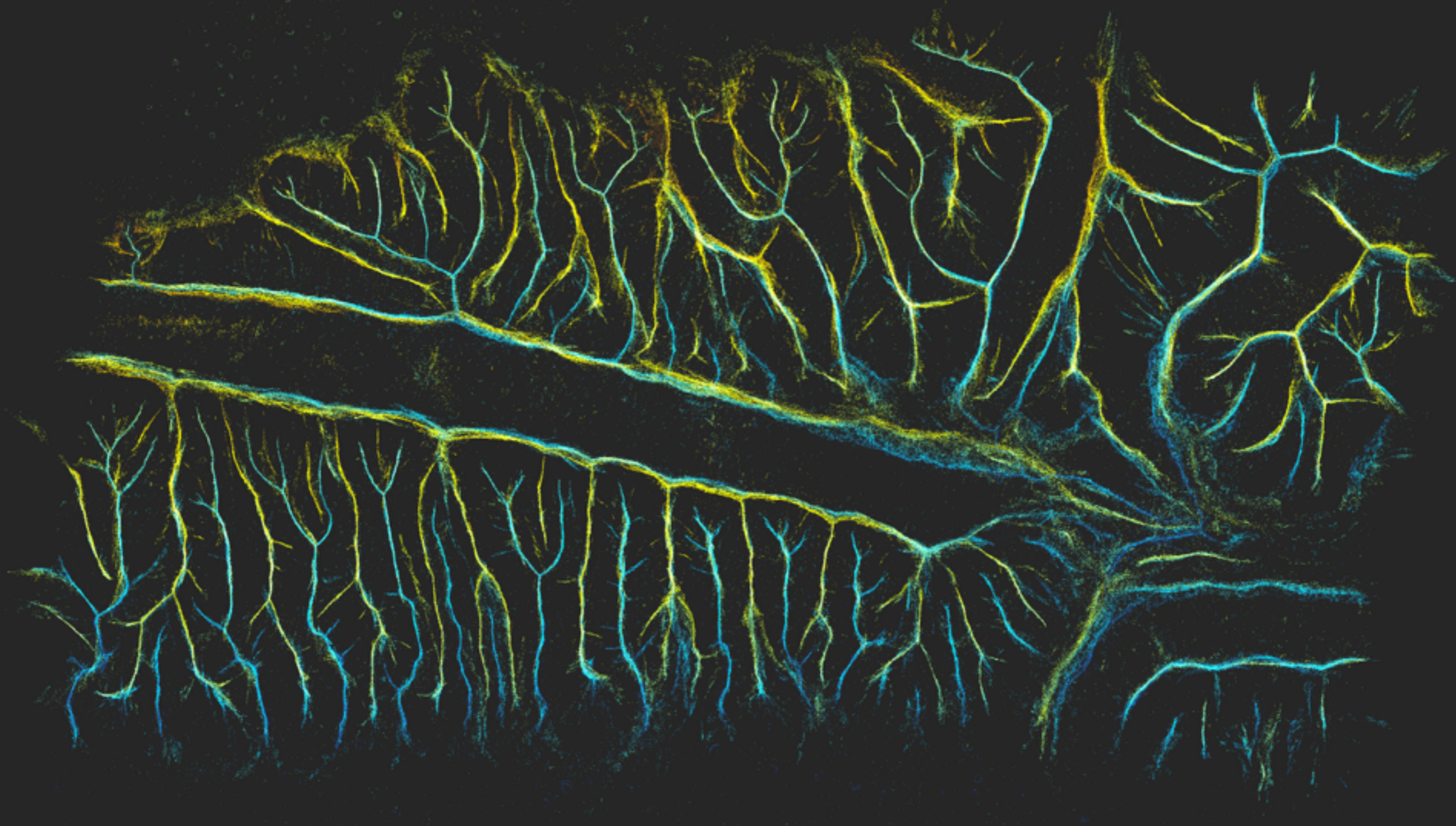


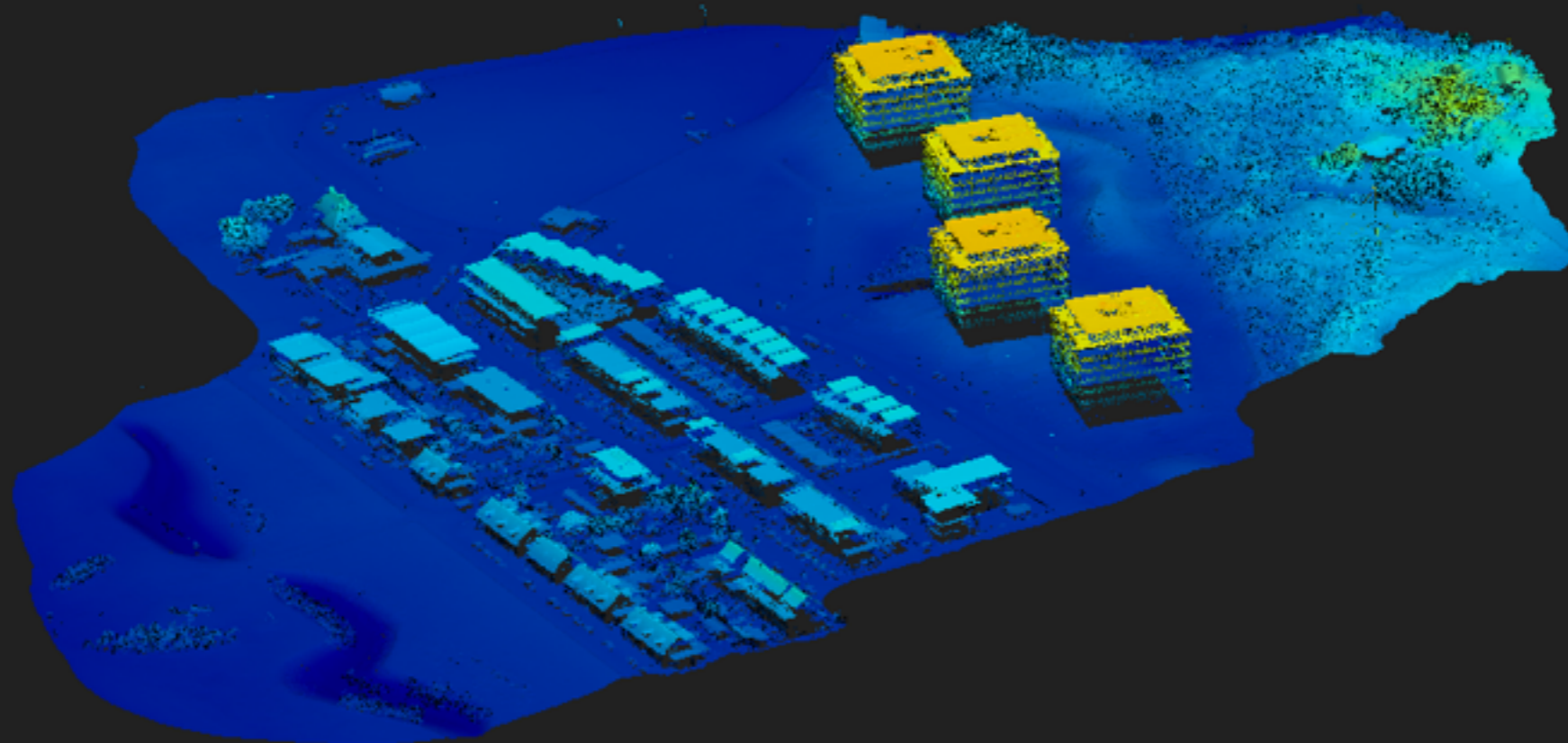












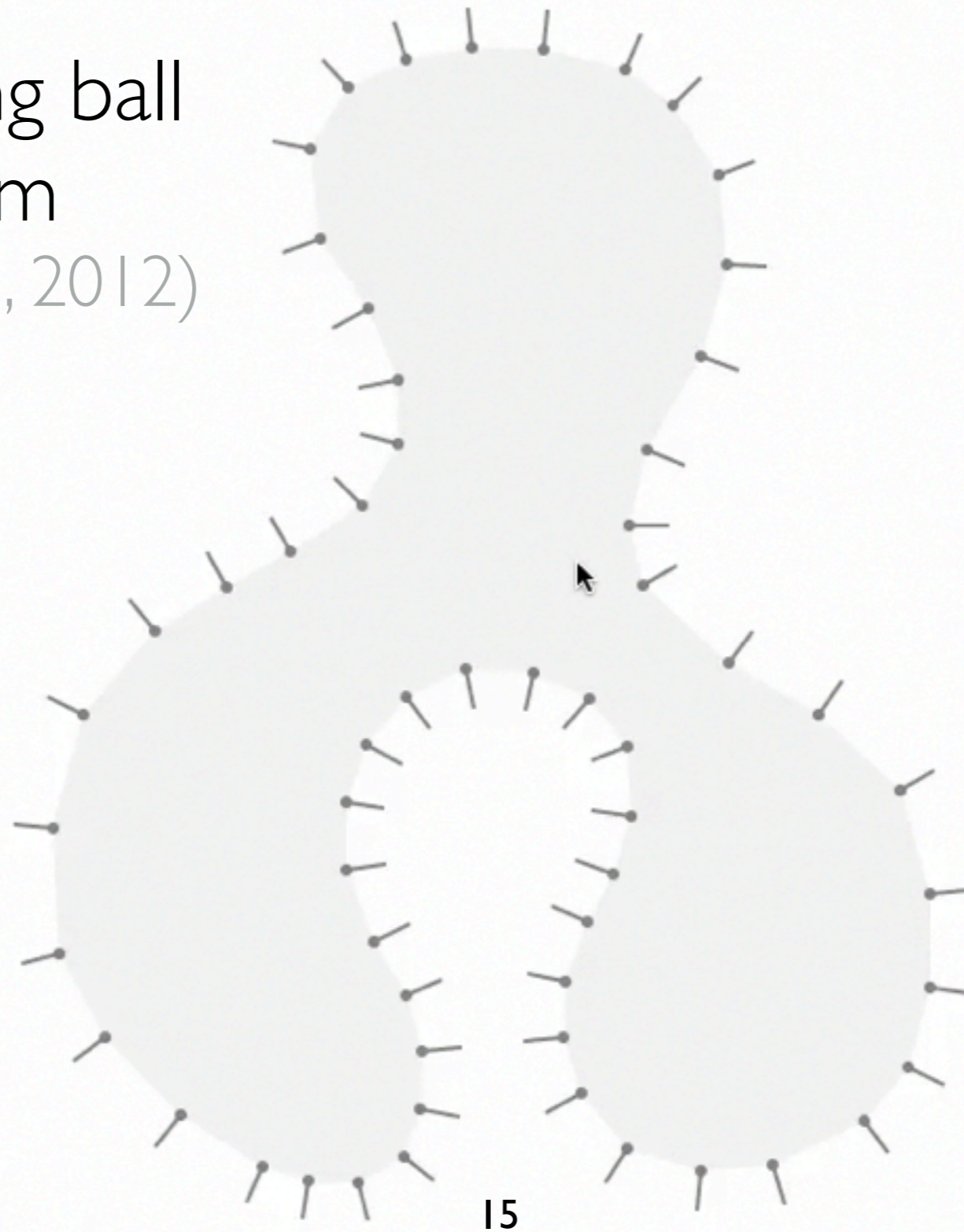
# Hypotheses

Medial Axis Transform (MAT) of LiDAR point cloud:

1. *enables truly **3D** analysis*
2. *can be used to effectively **define features** in point clouds using its **geometry** and **topology***

# MAT approximation

Shrinking ball  
algorithm  
(Ma et al., 2012)



# Application

**Simplification** of LiDAR point clouds:

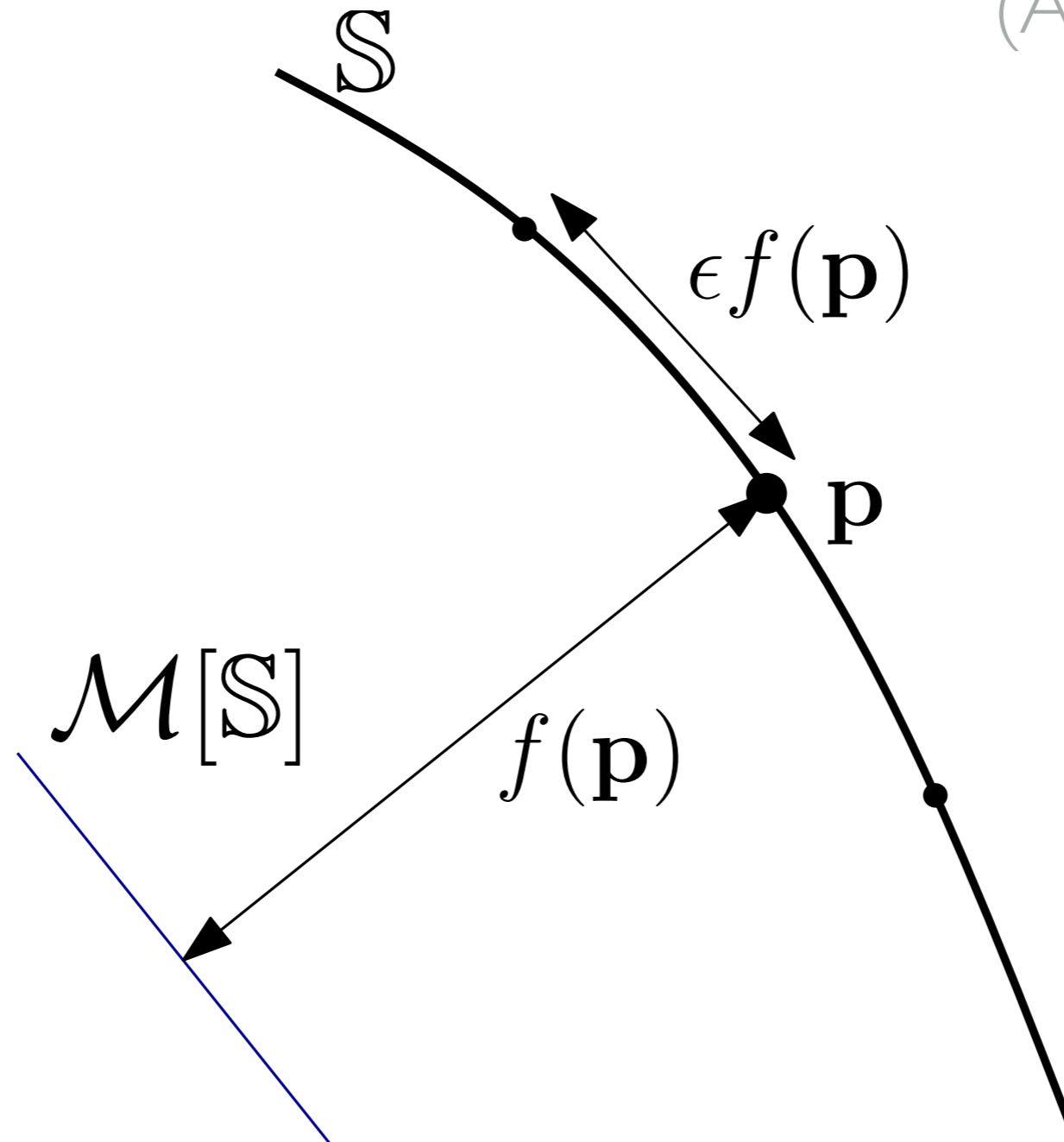
*Reduce number of points while maintaining detail.*

E.g. for visualisation, creation 3DTOP10NL



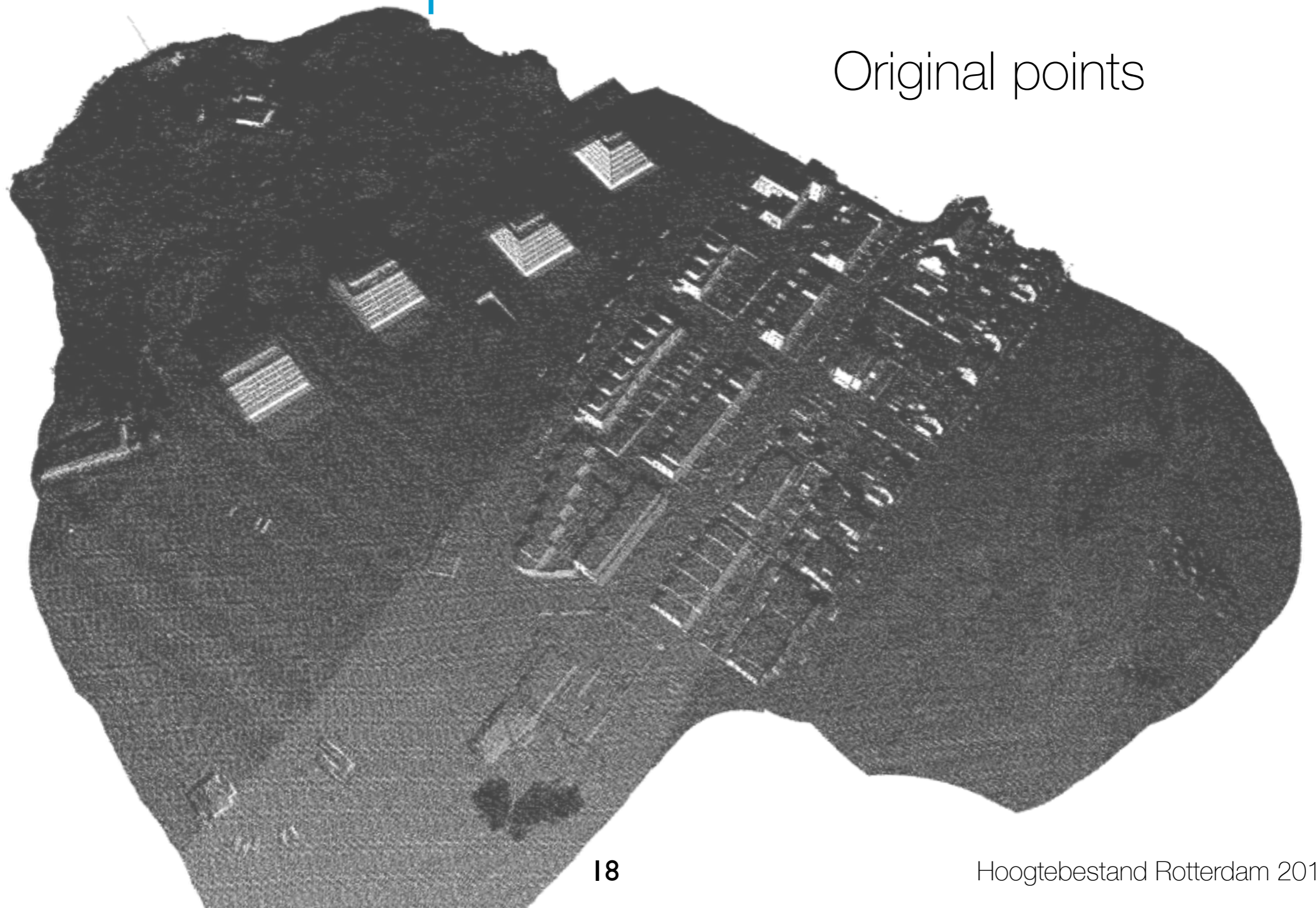
# Local Feature Size (LFS)

(Amenta 1998)



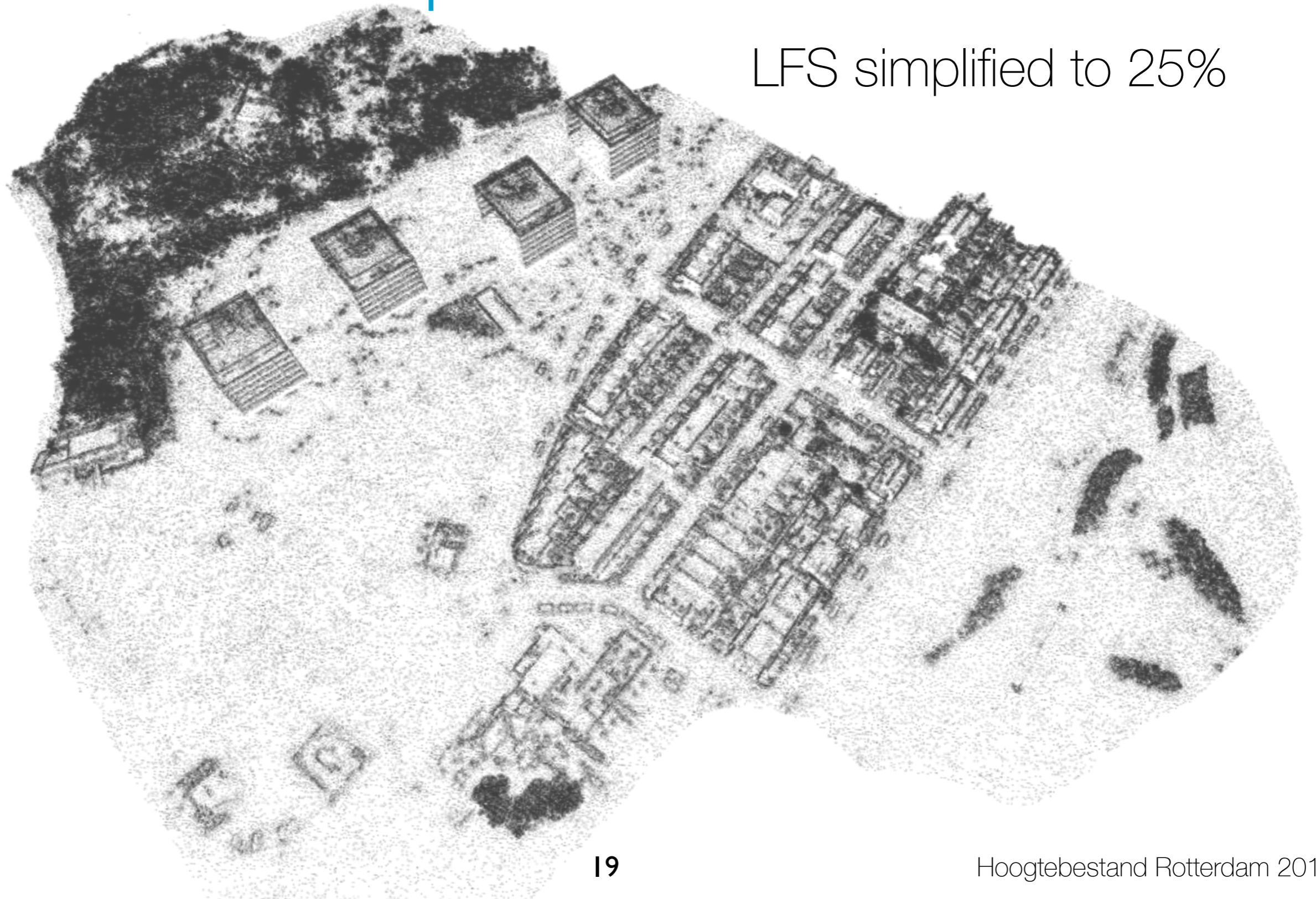
# LFS simplification

Original points



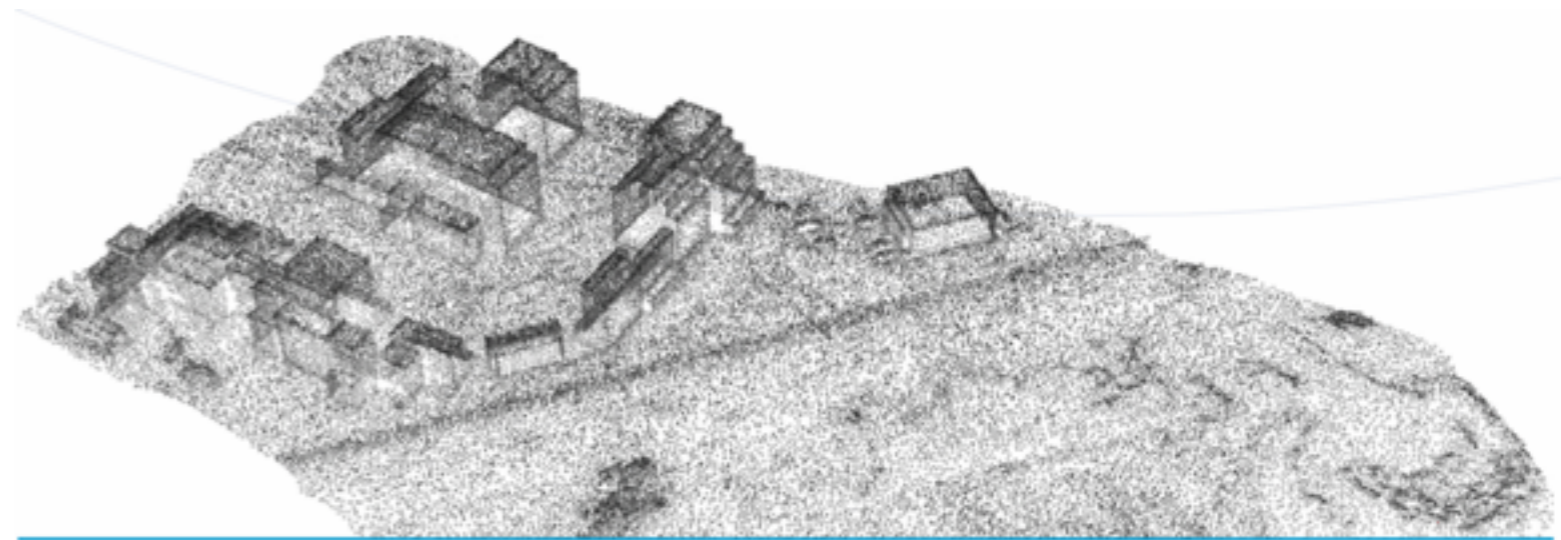
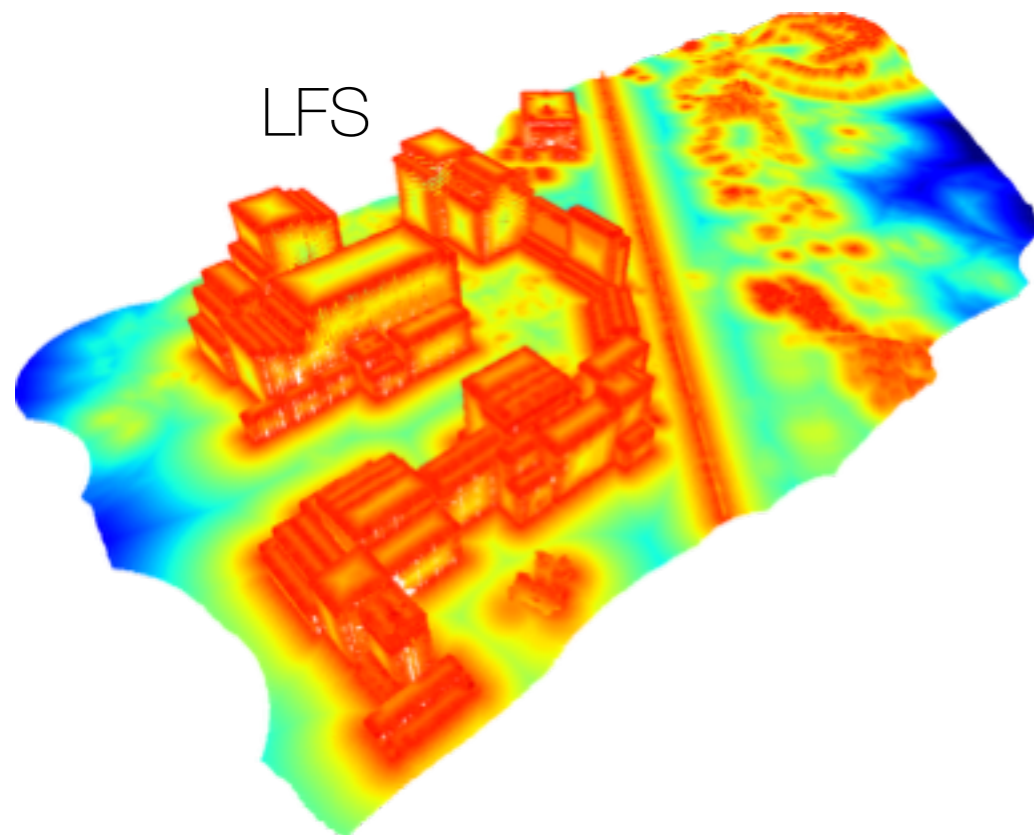
# LFS simplification

LFS simplified to 25%

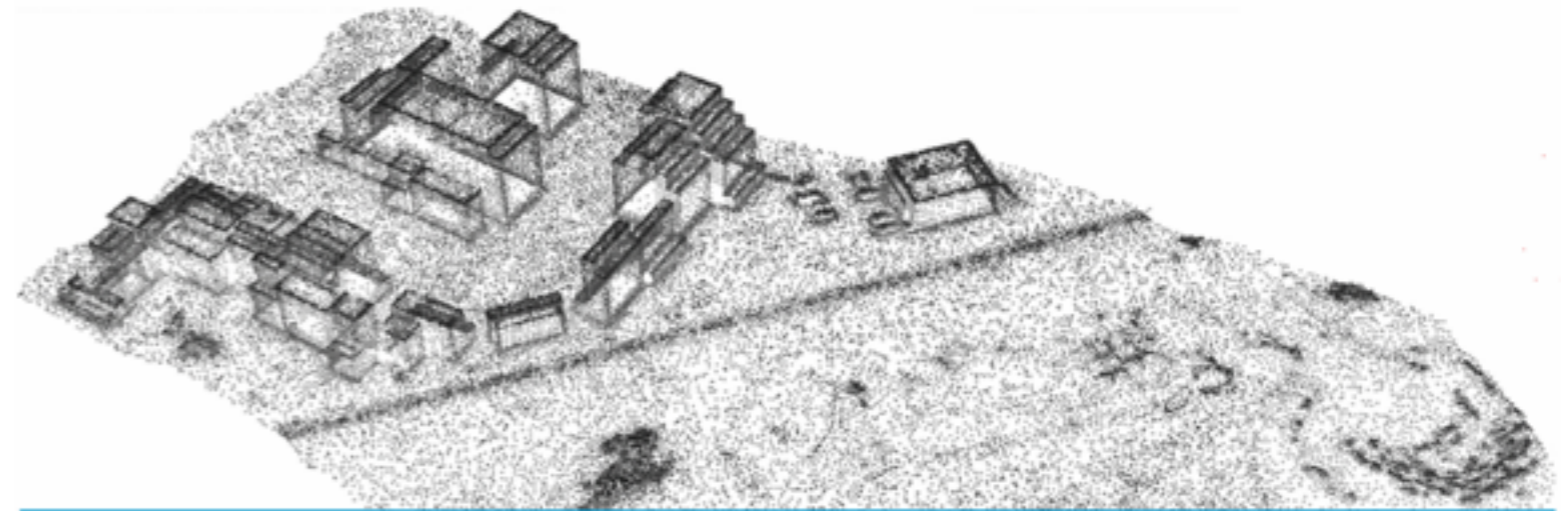


# Results

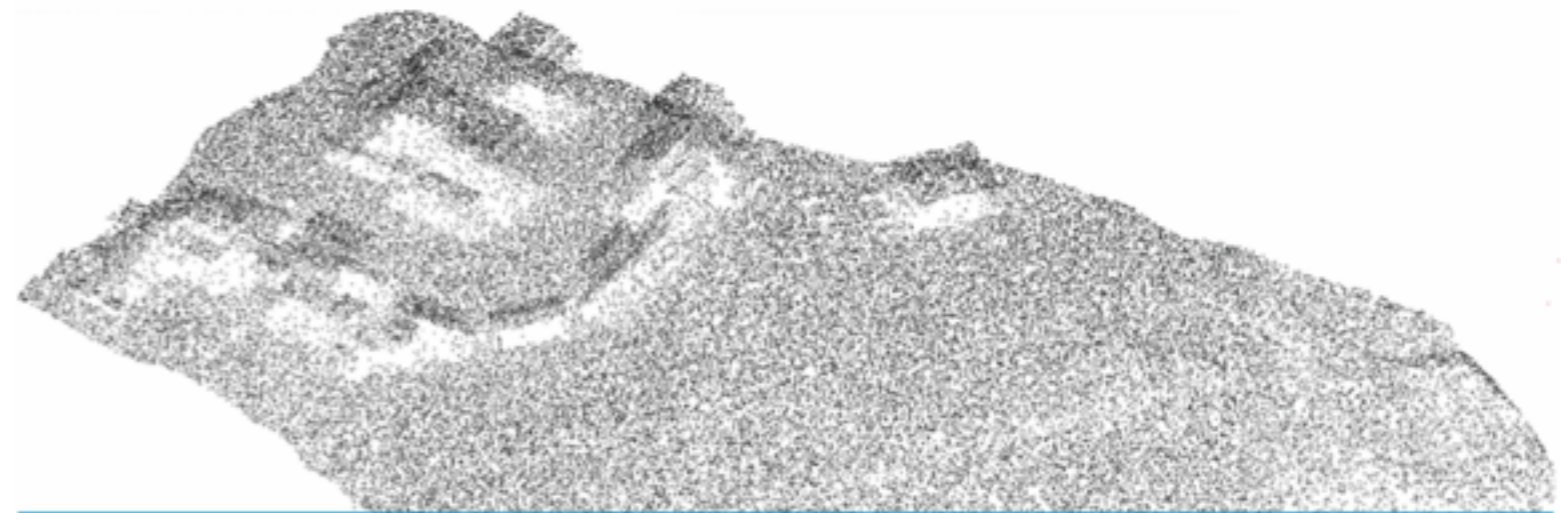
Reduced to 11%



Local feature size simplification (linear)

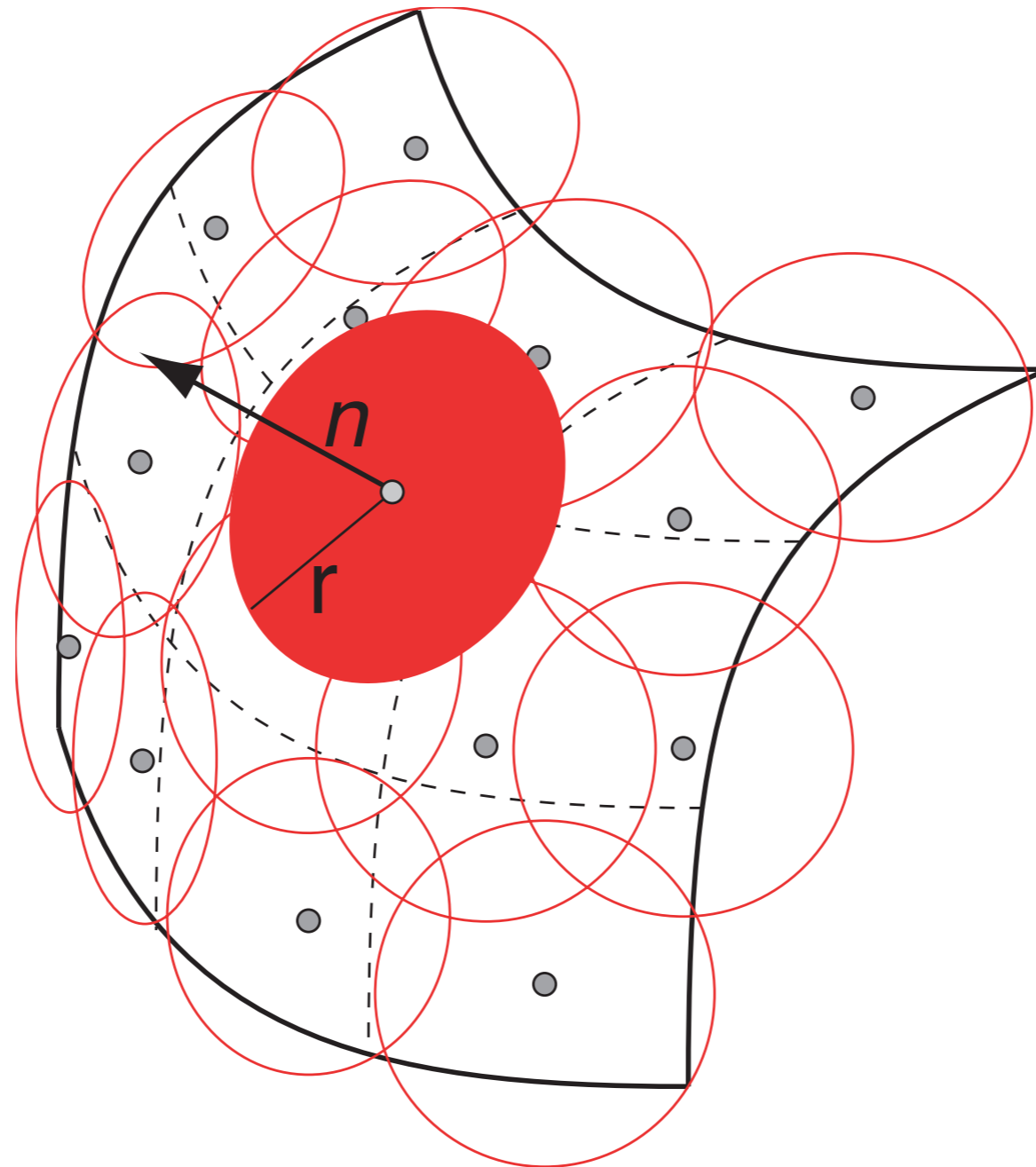


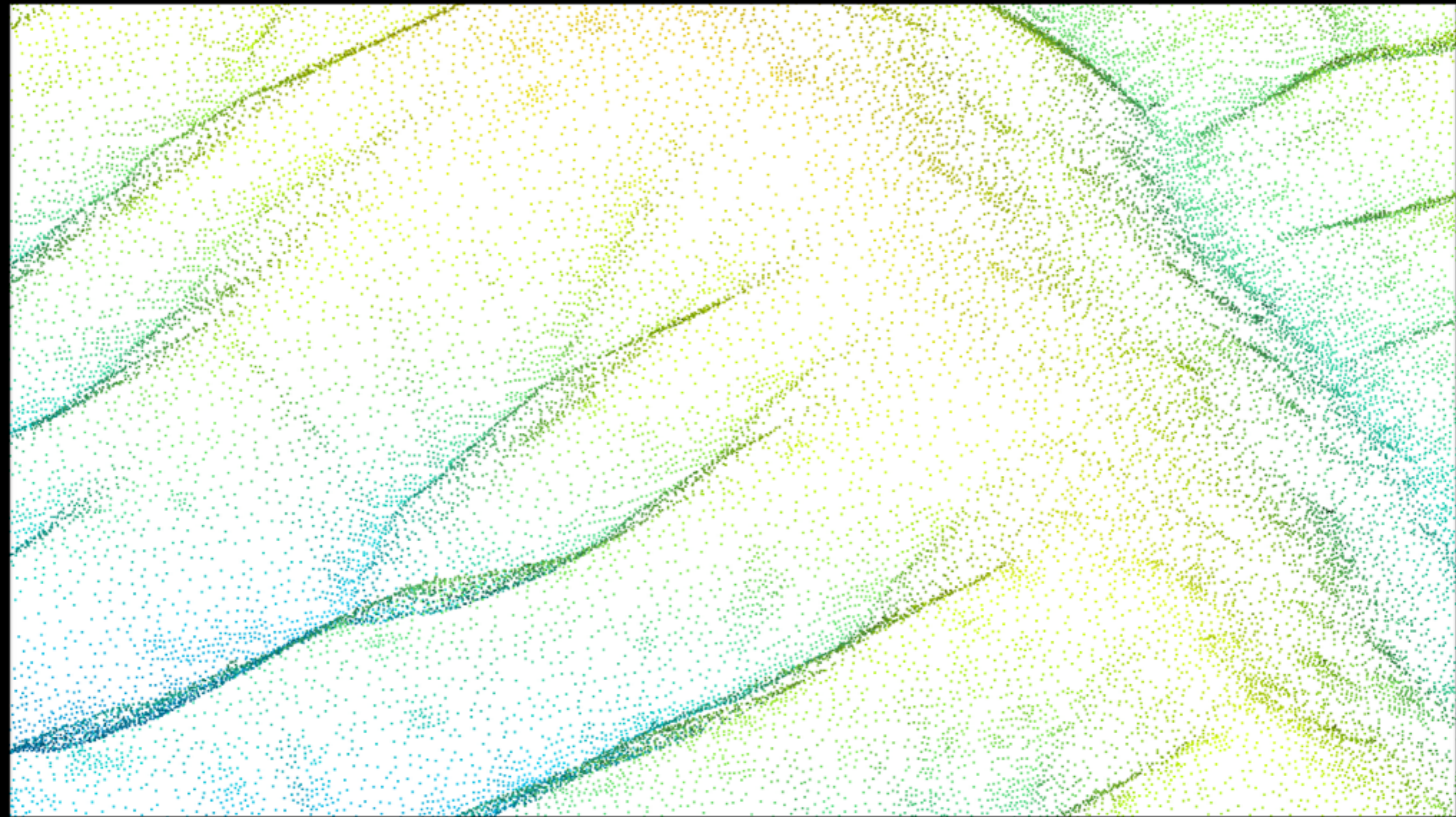
Local feature size simplification (quadratic)

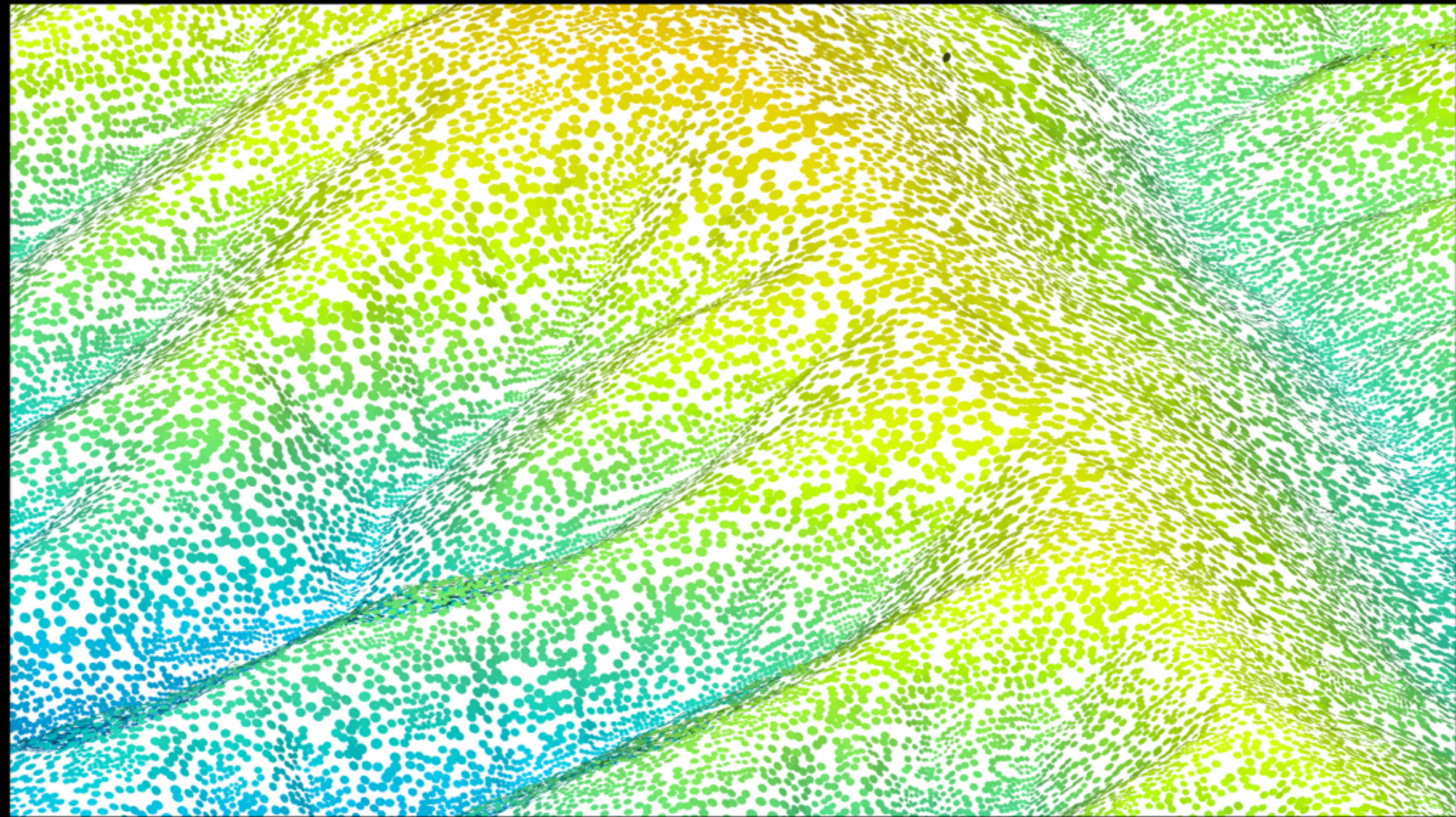


Random point thinning

# Point splatting





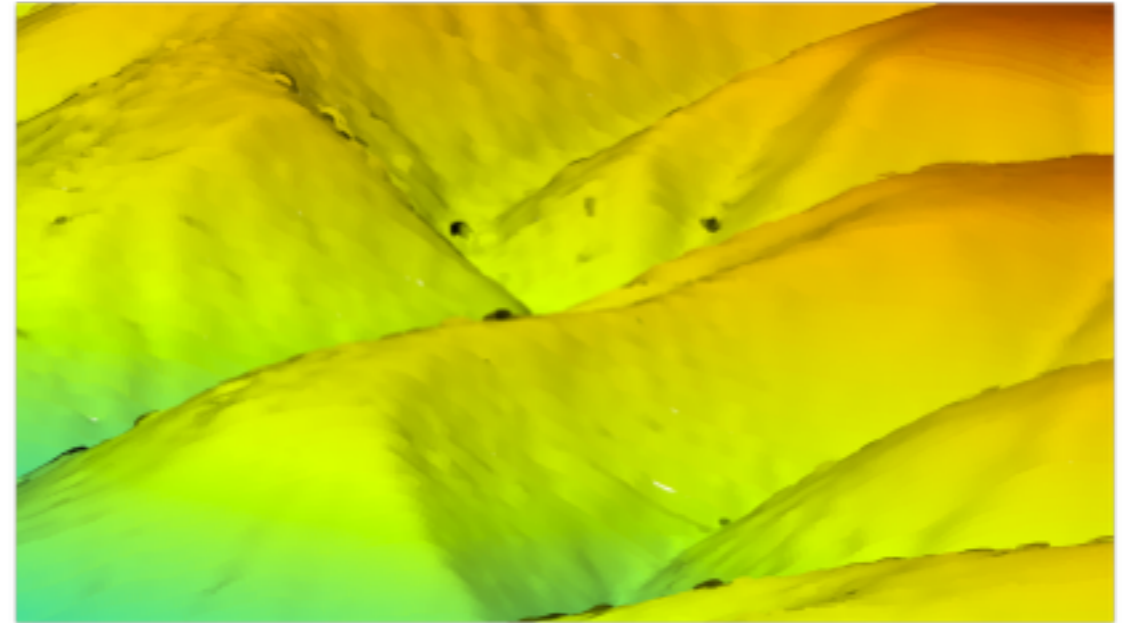
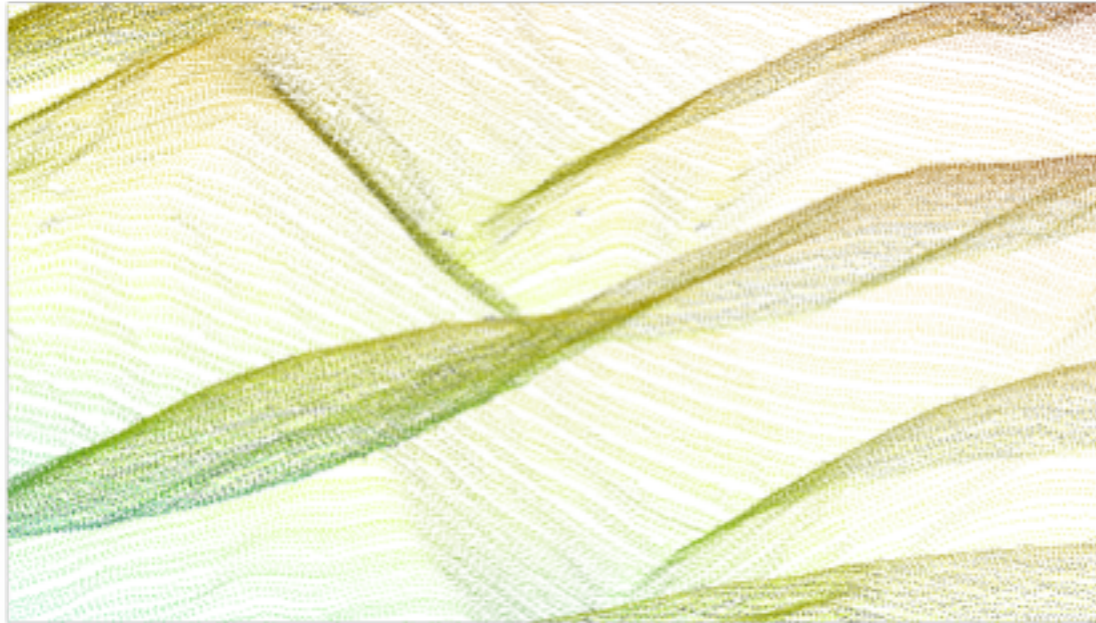


# LFS Point splatting

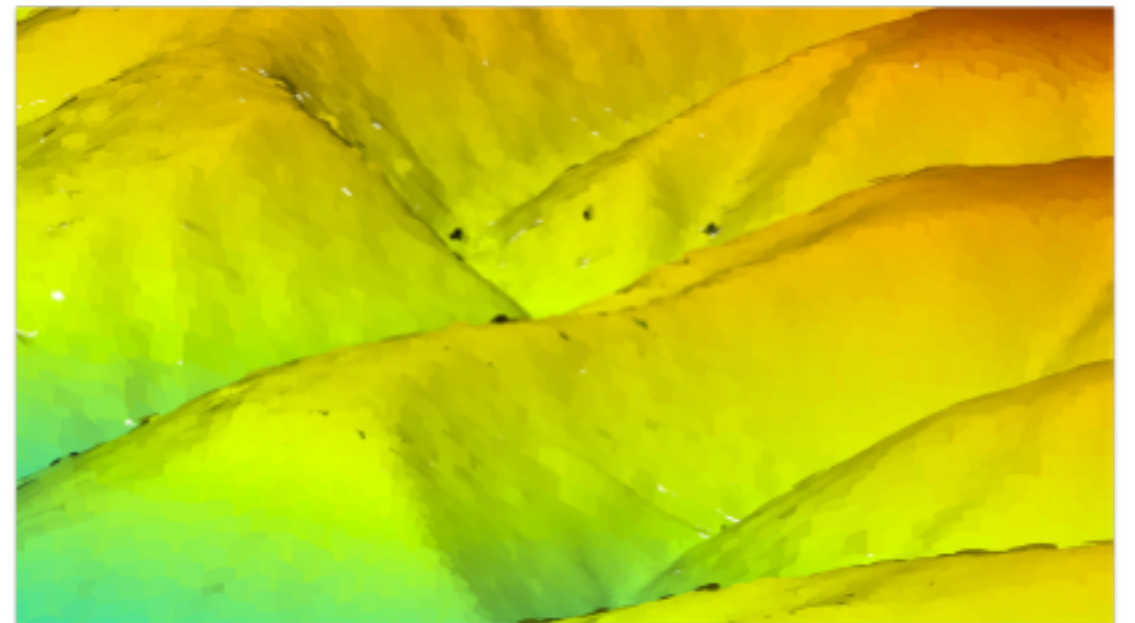
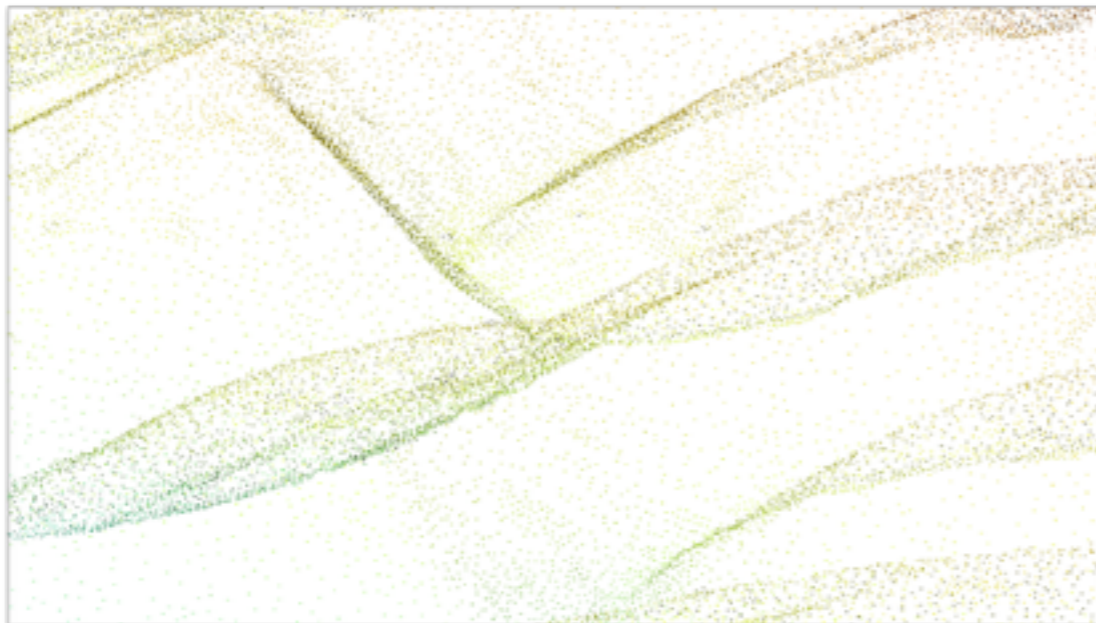
Simple points

Splats

Full data

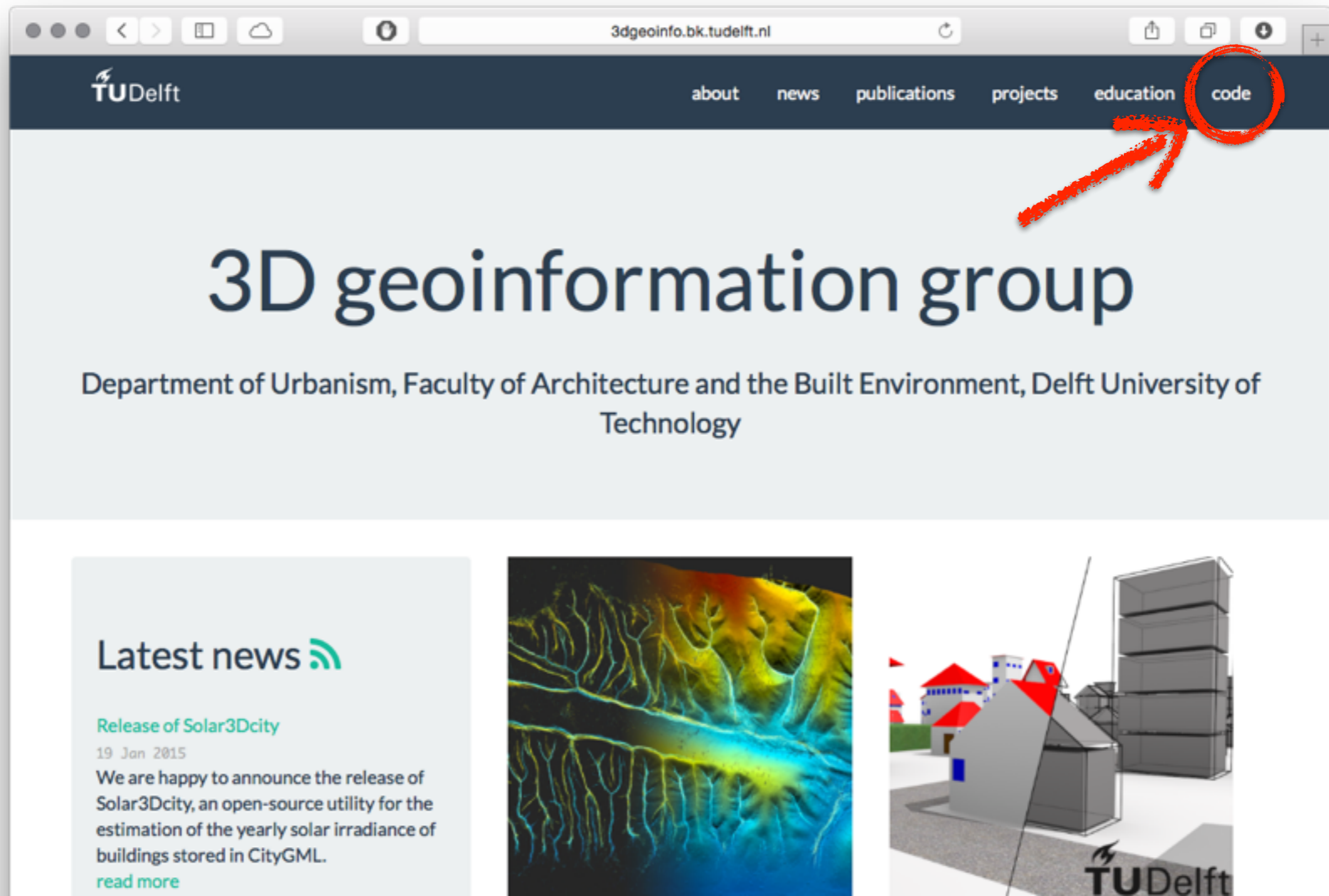


LFS simplified





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## 3D geoinformation group


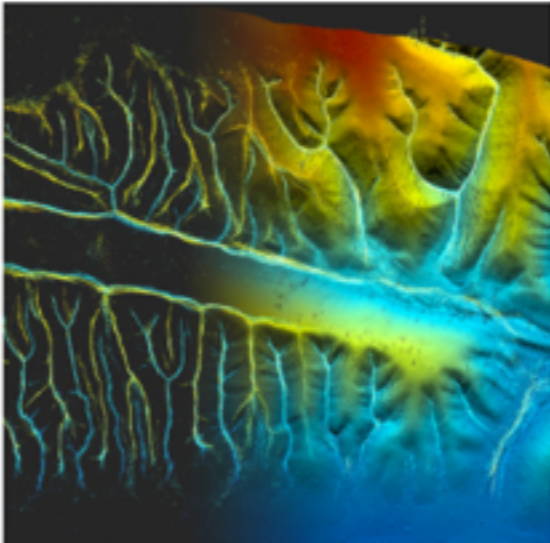
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### Latest news

**Release of Solar3Dcity**  
19 Jan 2015

We are happy to announce the release of Solar3Dcity, an open-source utility for the estimation of the yearly solar irradiance of buildings stored in CityGML.

[read more](#)



TU Delft

# Thank you!

Ravi Peters

[3dgeoinfo.bk.tudelft.nl/rypeters](https://3dgeoinfo.bk.tudelft.nl/rypeters)

# References

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