



A robust LiDAR feature and metadata extraction pipeline for electric power lines

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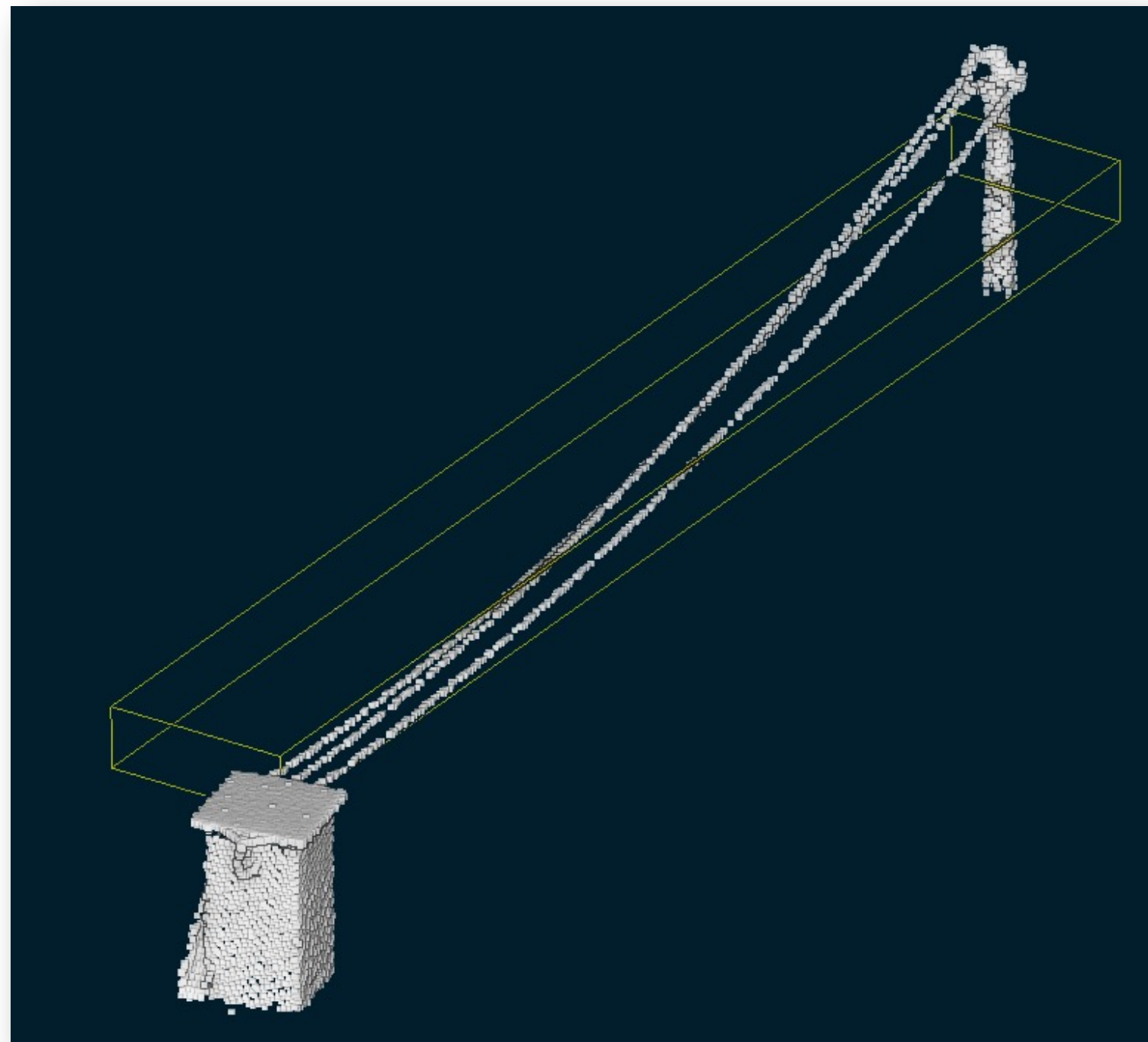
- **Extract knowledge** from location data.
- **Long time experience** in geospatial software development.
- **Opensource** and **geospatial standards**.
- **Whole data lifecycle**.

Building a power network Digital Twin



- We have been involved in the **process of building a Digital Twin** for the power network of a utility company.
- **No information available other than spatial position.**
- **LiDAR can be used** to enrich spatial data with appropriate information.

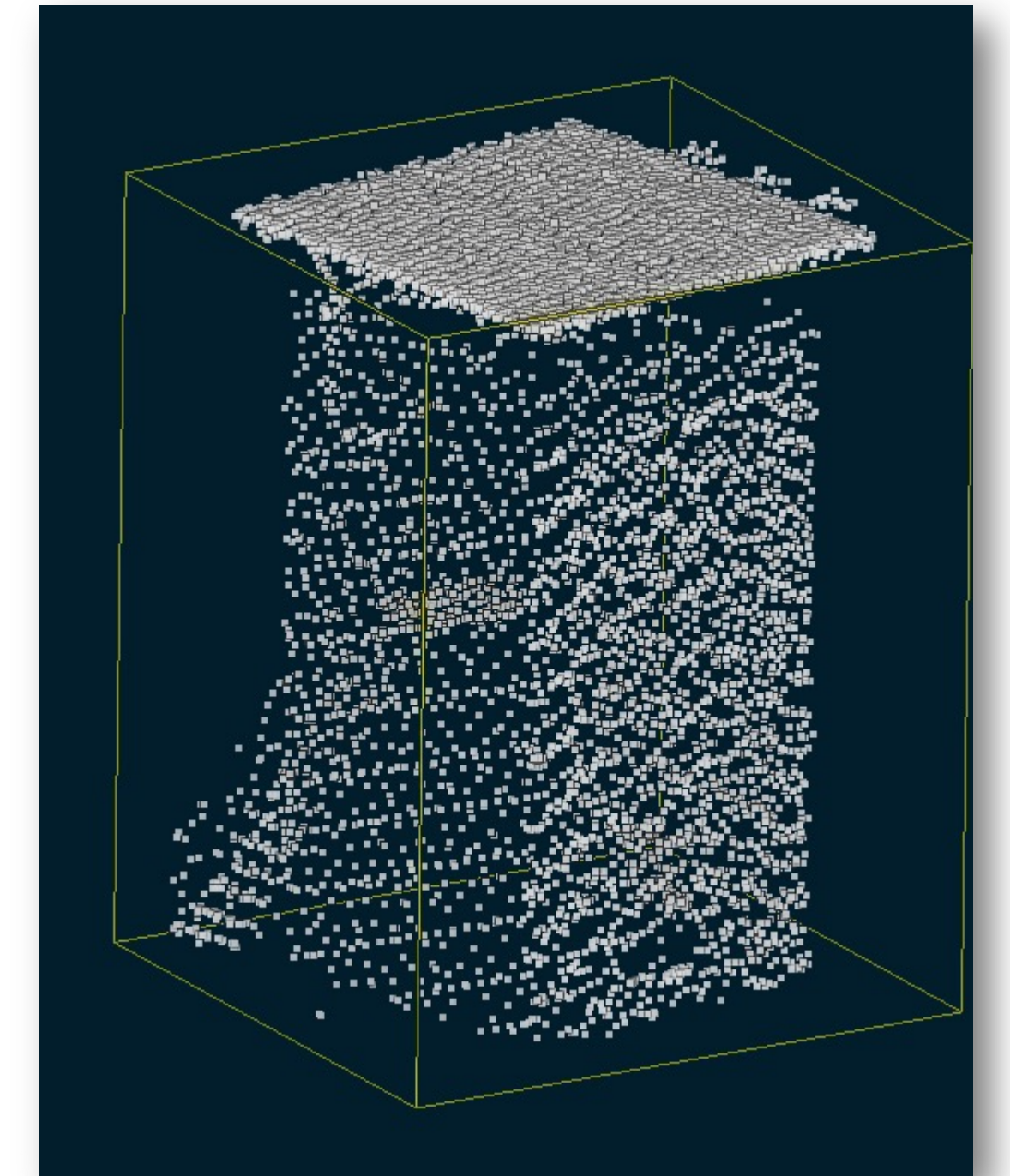
Core elements



CONDUCTORS

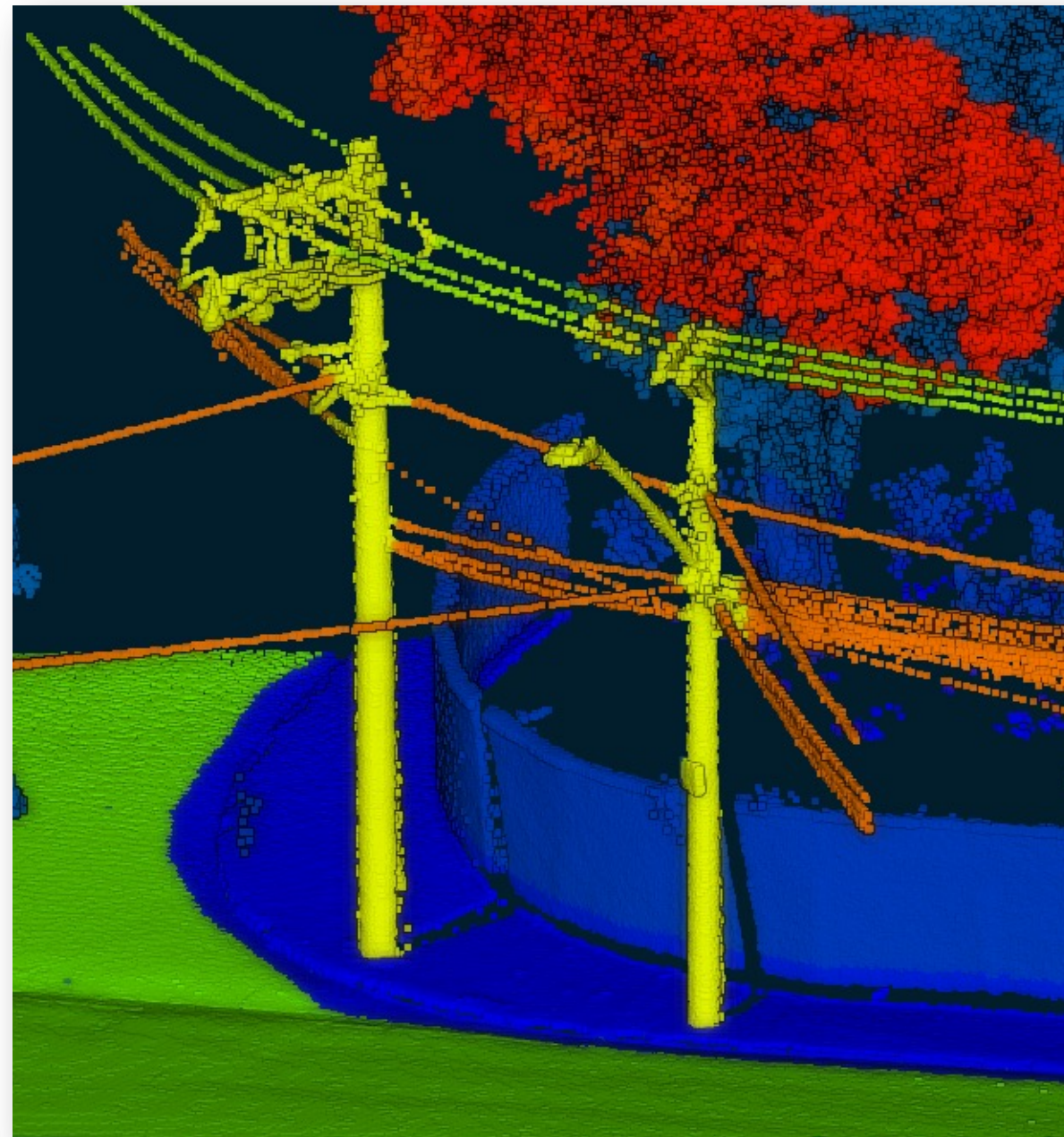


SUPPORTS

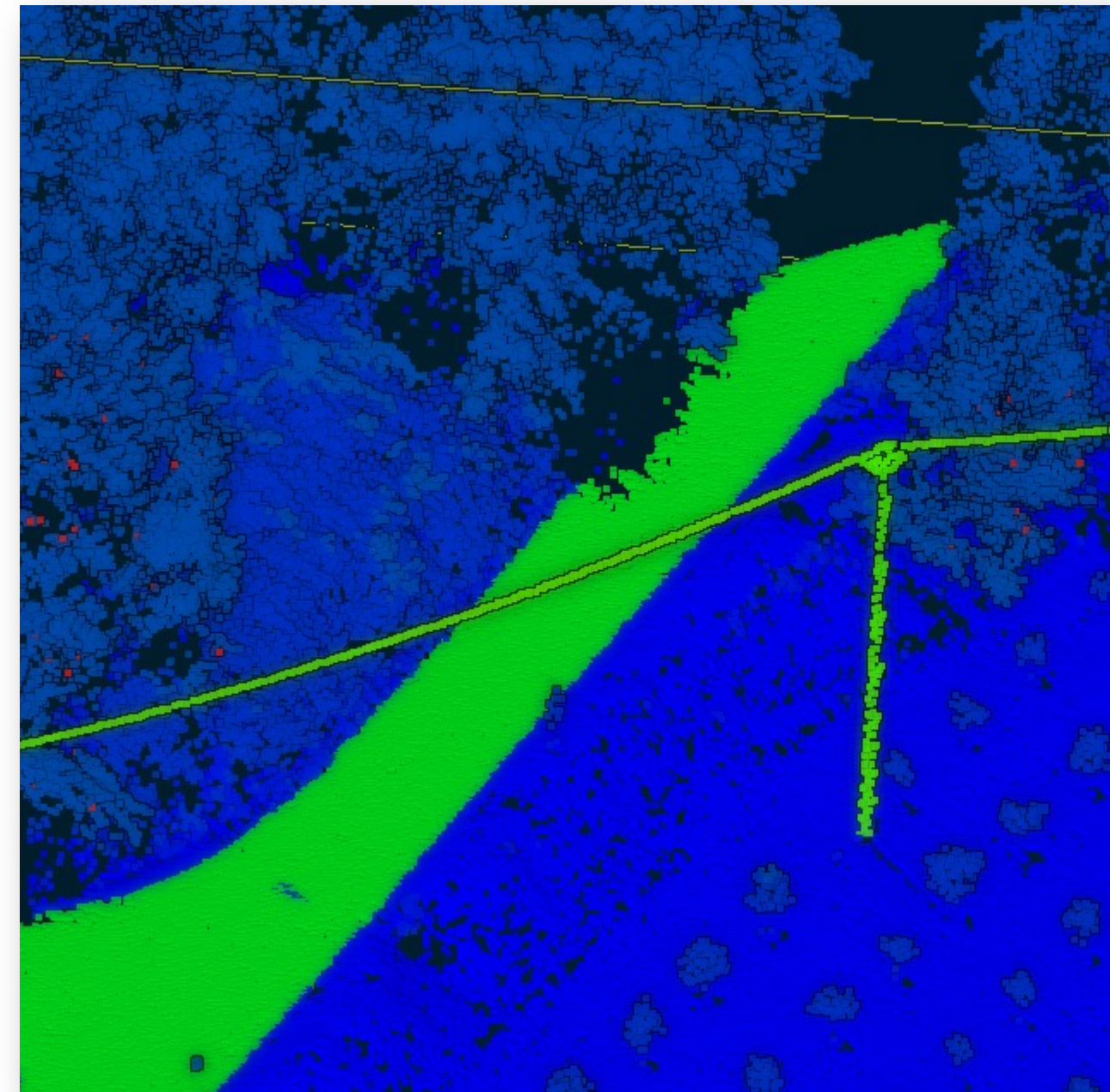


SUBSTATIONS

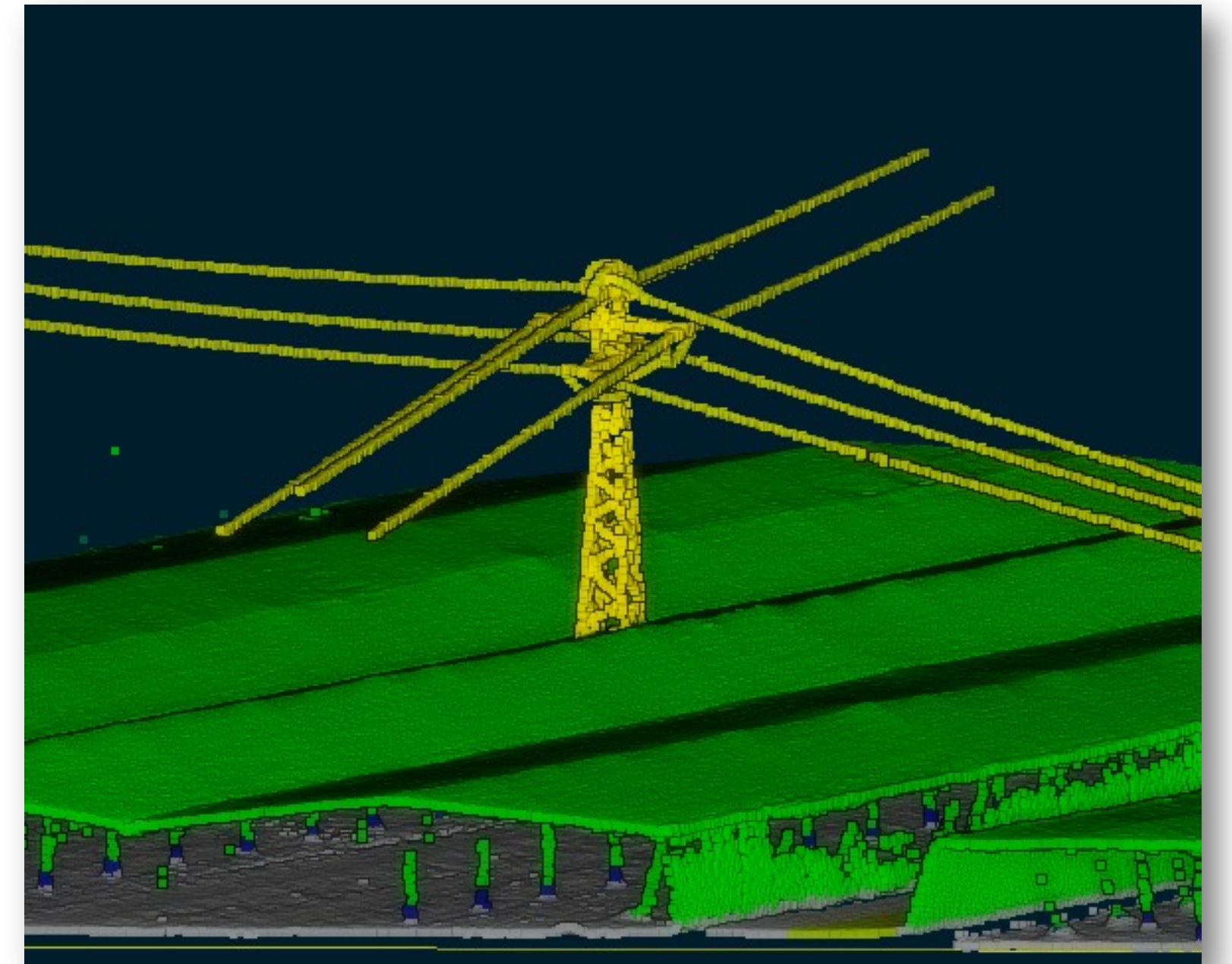
Facing the environment



VEGETATION



GROUND / ROADS / WATER



BUILDINGS

Main challenges



- Very **large dataset** (2 millions km of power lines).
- LiDAR density is **not homogeneous** among datasets.
- Very **different kinds of environments** (rural, urban, mountain).
- Point clouds from **multiple kinds of sources** (airborne, mms, drone).

System overview



Metrics for quality evaluation



How do we know if the data delivered by contractors complies with the requested specifications?

- **Set of KPI** for every class of interest.
- Mixed approach of **statistical indicators** and geometric **anomalies detection**.
- We detected a lot of anomalies: **tools need to be resilient**.

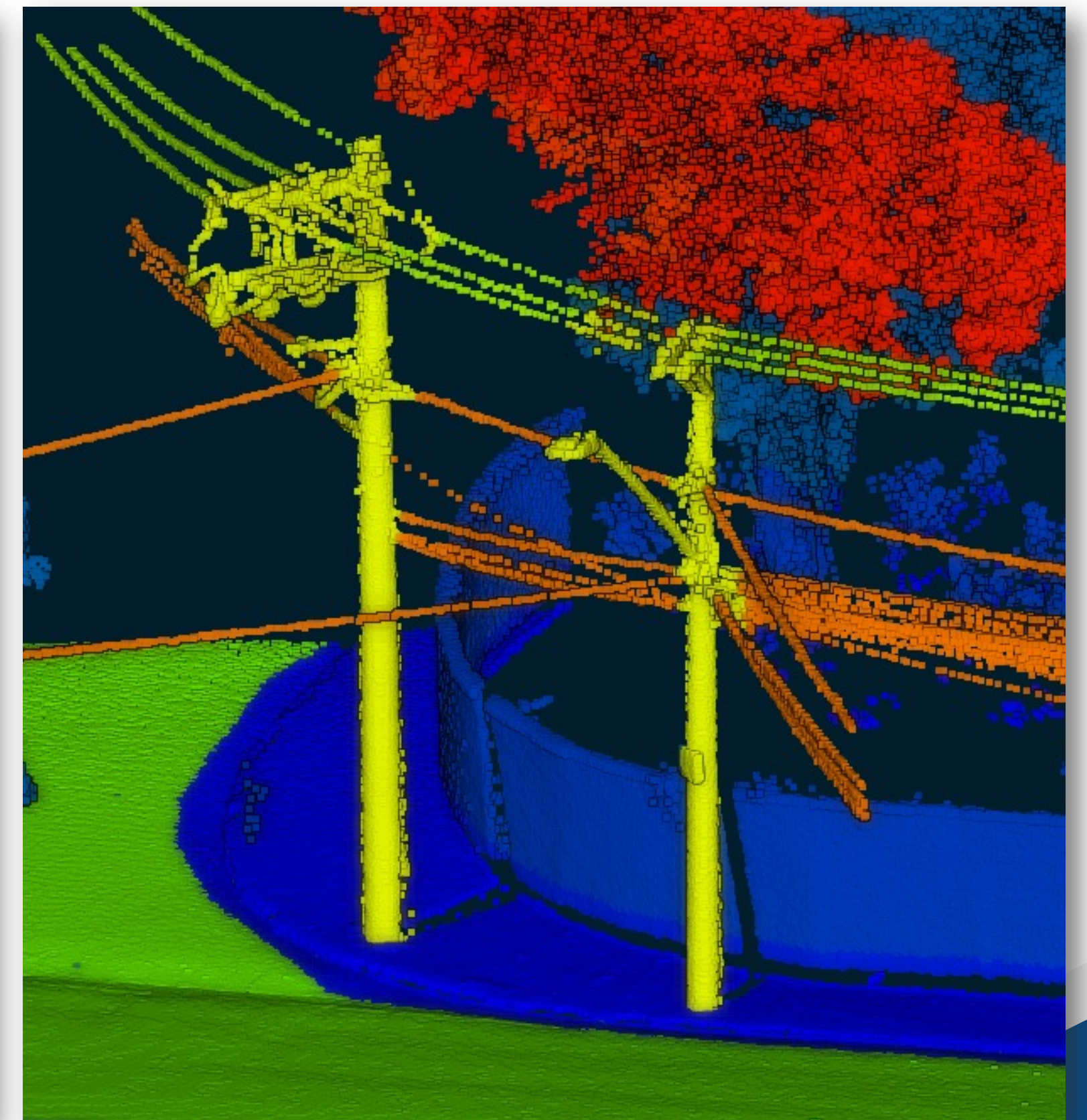
Feature & metadata extraction



- **Feature extraction:** a portion of the cloud representing each core elements.
- **Metadata extraction:** metadata of the extracted feature (type specific).
- Each dataset is **loaded into a domain geodatabase**, identified by a **global UUID** and a basic set of global metadata.

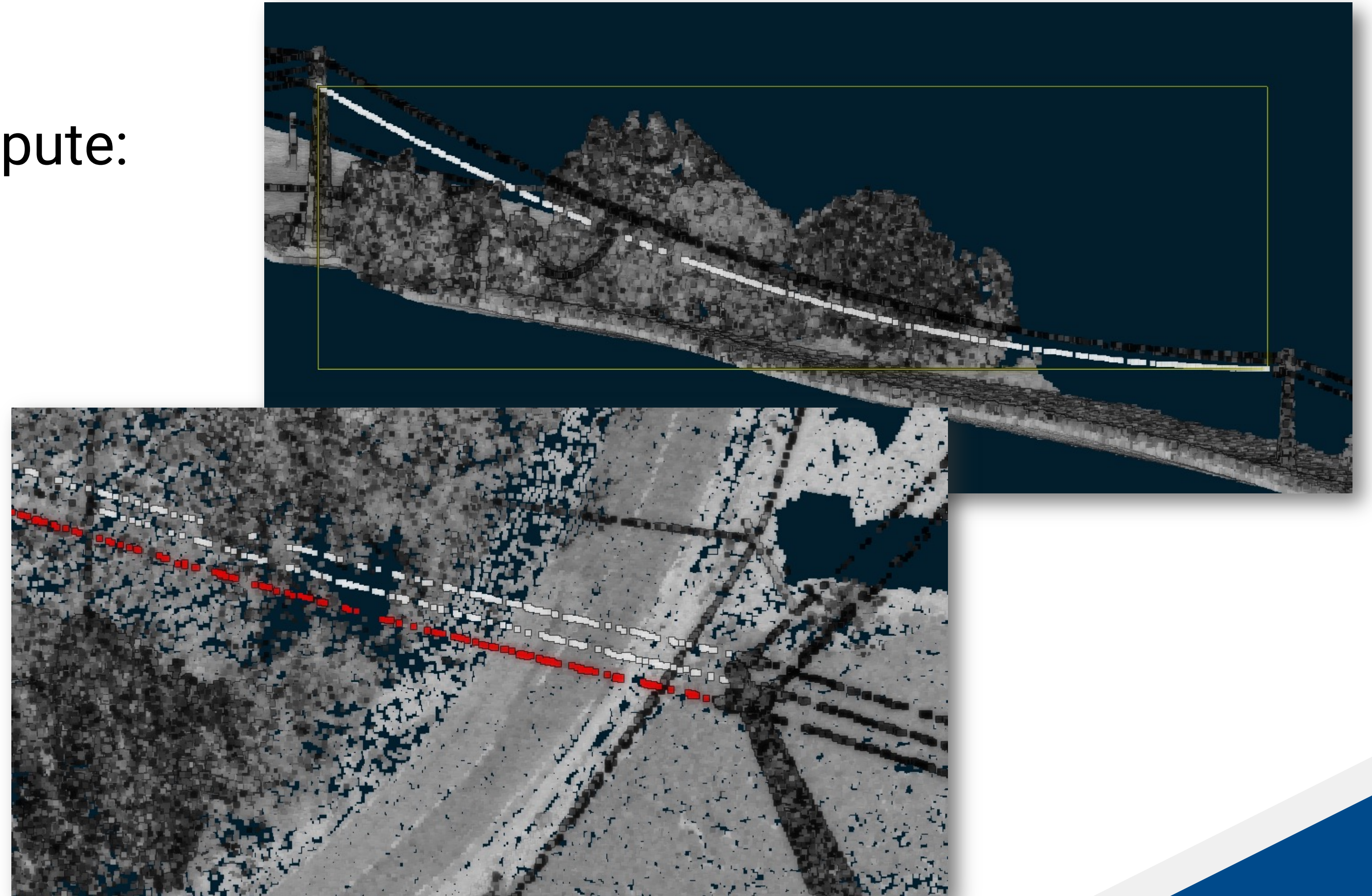
Supports extraction

- We have been able to compute:
 - **Height**
 - **Type** (pole, pylon, portal)
 - **Heeling angle** and level
 - **Guywires** presence
 - Building **interferences**



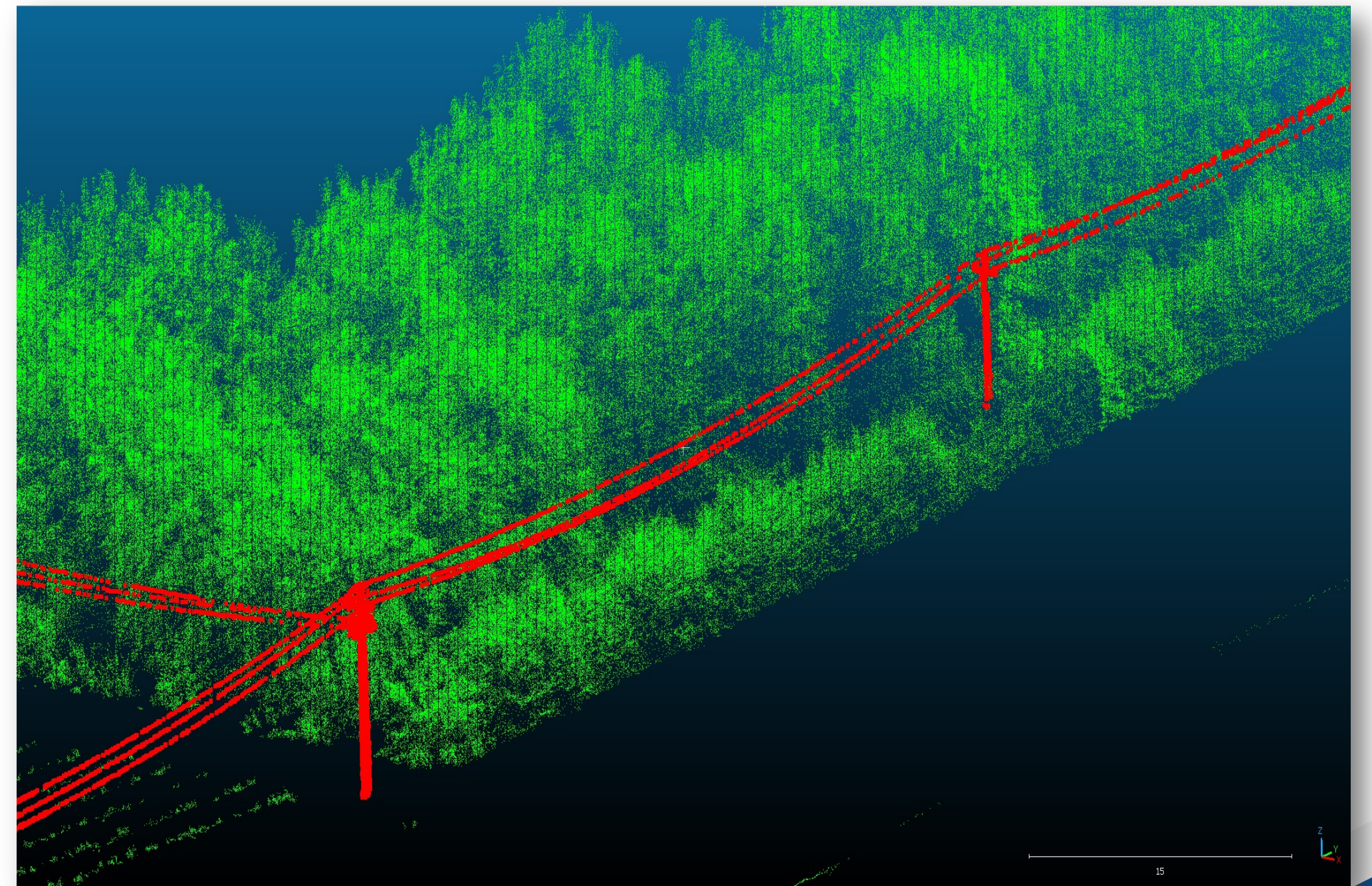
Wires extraction

- We have been able to compute:
 - **Single wires**
 - **Count**
 - **Anchor points**
 - **Linear length**
 - **Catenary length**
 - **Ground clearance**



Falling trees and interfering vegetation

- **Trees may fall on the conductors** or in an area nearby the power line.
- **Vegetation zones within a distance threshold** needs to be maintained.



Technical approach and results



- We mixed **computer vision, statistic** indicators and **geometric data** analysis.
- Everything runs on Amazon AWS through Docker.
- **Automatic extraction** of core elements.
- **All data available** to the other parts of the system.
- **Identification of damaged features.**
- **Creation of better maintenance plans.**

Business impact



- **Standardized quality** assurance.
- **Cost reduction** due to process automation.
- **Reduction on pollutants** emission, due to less on the field activities.
- **Data is shared** between business units.
- Fast **simulation** of the power network **evolution**.

Q & A

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