

# BeGeo 2024

LA CONNEXION A L'ETAT PUR  
DE ULTIEME CONNECTIE



## CLGE's Young Surveyors' Contest

Suzanna Cuypers, KU Leuven

**KU LEUVEN**

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# CLGE's Young Surveyors' Contest

Finalists at INTERGEO 2023

Berlin, Germany

BeGeo 2024  
begeo.be

19/03/2024 - Brussels Expo



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# CLGE's Young Surveyors' Contest

Engaging the next generation of  
surveyors

## Who can take part?

- 35 years old or less
- European university in the department of geodesy, cadastre, mapping, or geoinformation
- Your work must have been finalised within the last 3 years





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## What should you do?

- Contest Application form, limited to 1000 words
- Maximum 5 illustrations
- Online finals

## Why participate?

- Prizes: €1500, €1000, and €500
- awarding ceremony at INTERGEO
- improve C.V. & meet industry experts, leaders as well as colleagues from other European countries at the awarding ceremony



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# CLGE's Young Surveyors' Contest

## When?

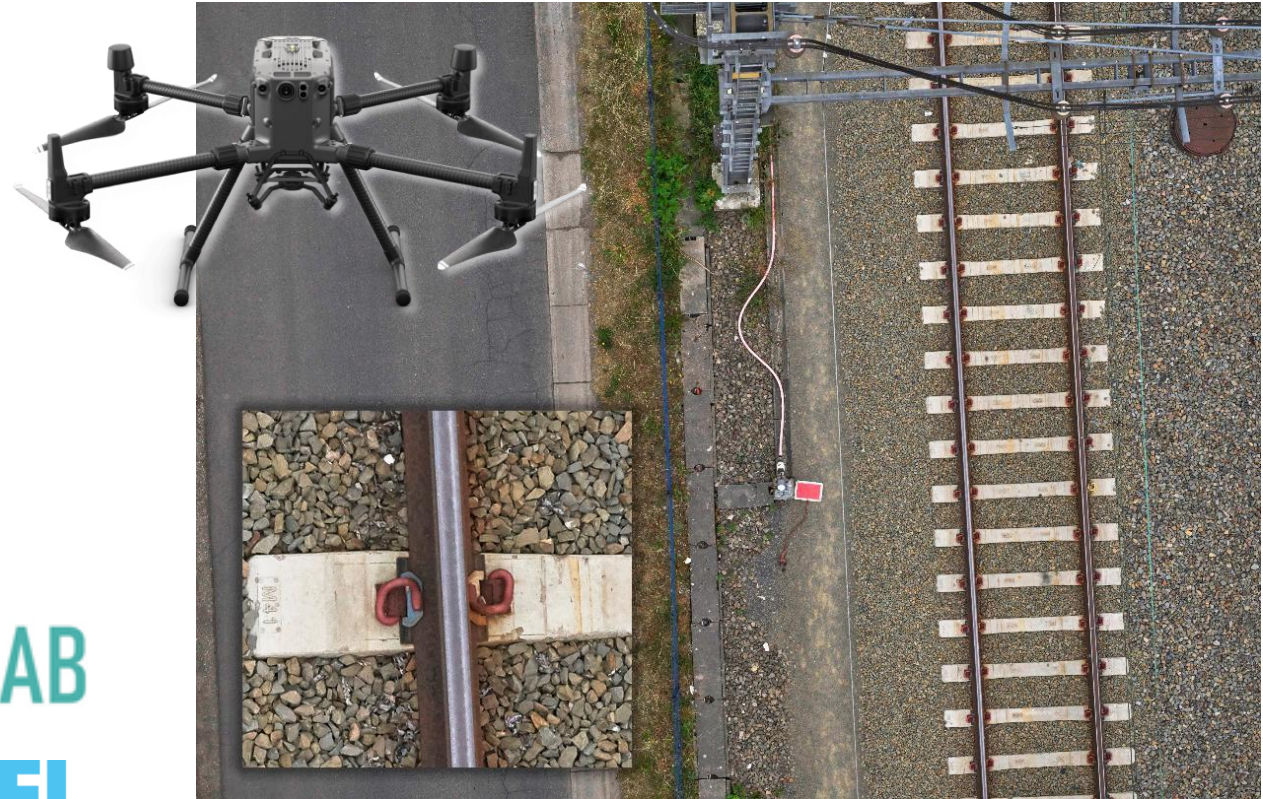
Announcement of the Contest	January, 2024
Submission deadline	15 July, 2024
Announcement of selected ones to proceed to Finals	End of August, 2024
Contest Online Finals (short presentations)	Beginning of September, 2024
Awarding Ceremony ( <b>INTERGEO 2024</b> , Stuttgart)	24 to 26 September, 2024

<https://www.clge.eu/2024/clge/clge-launches-the-young-surveyors-contest-2024>



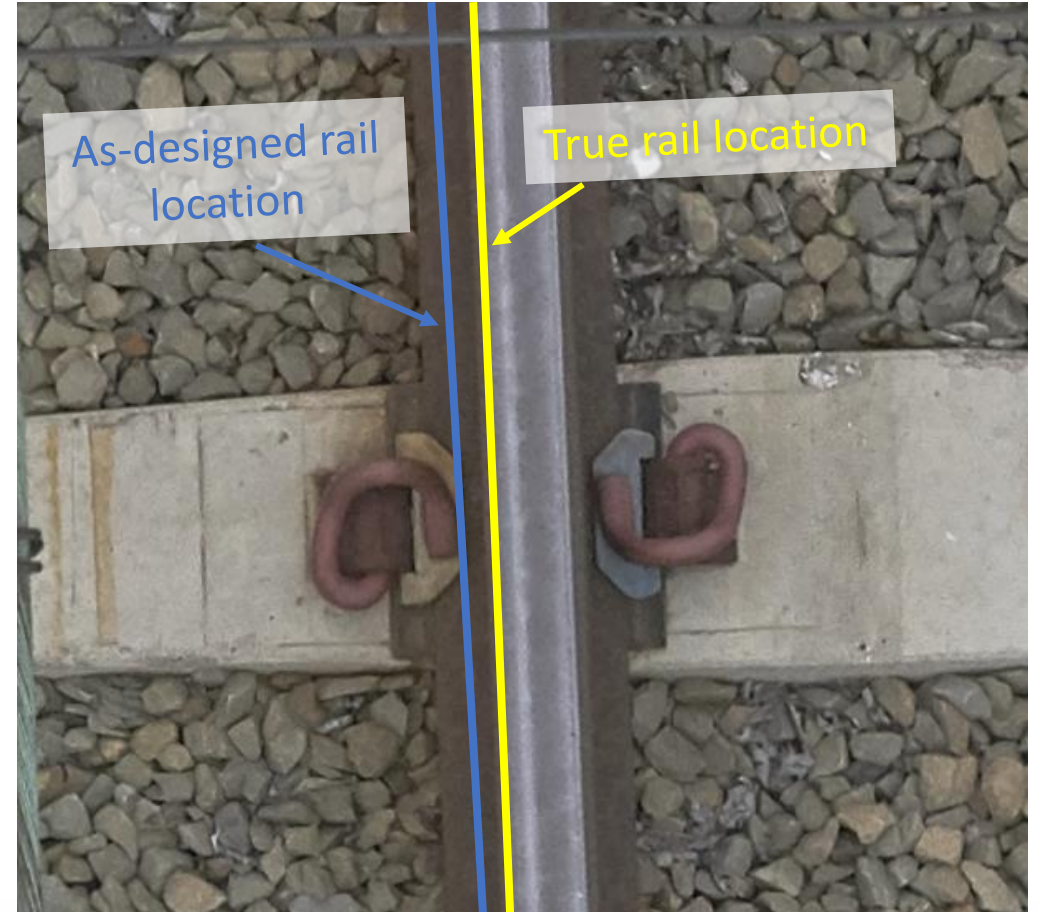
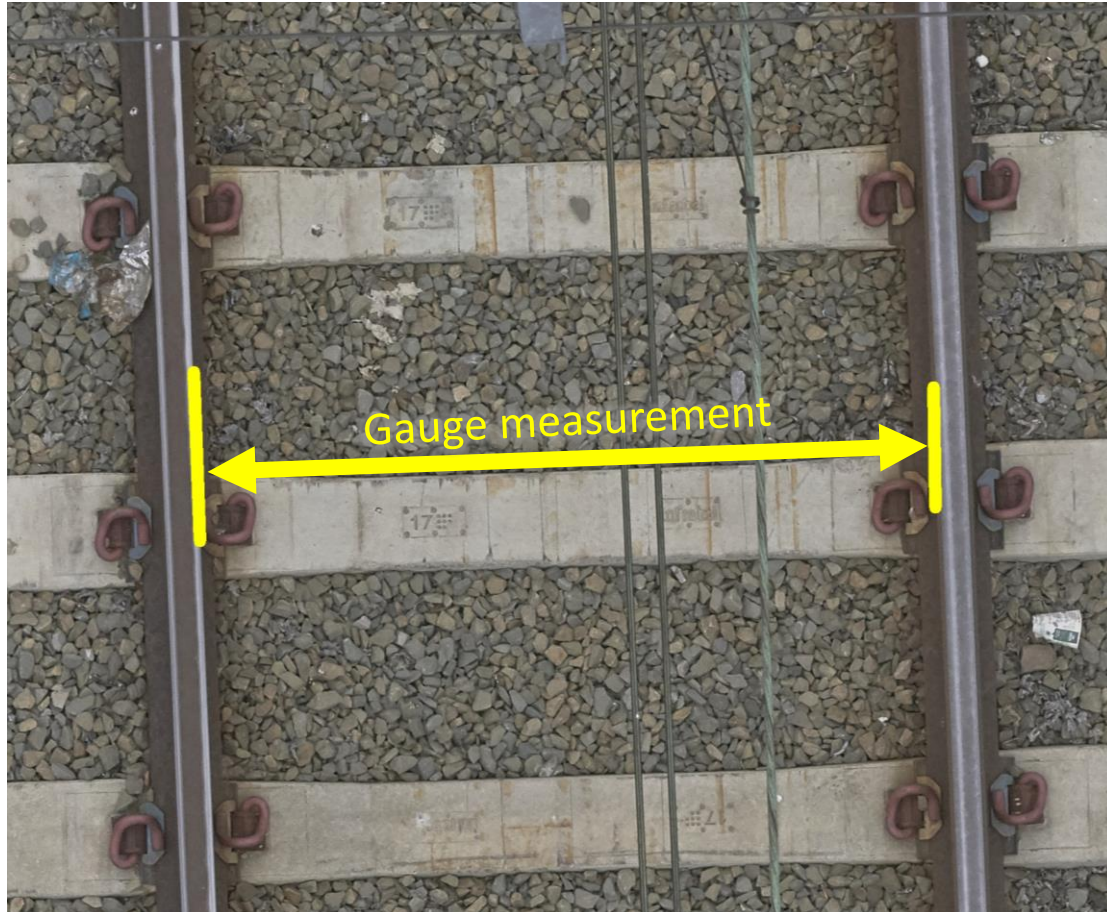
# My Project

Planimetric Rail  
Positioning  
Using UAV  
Photogrammetry





# Planimetric Rail Survey



# Current Methods



- Manual
- Track access required -> out of service
- Dangerous
- Time consuming

<https://sitml.com/product/amberg-rail-vms-1000/>





DJI Matrice 300  
Phase One iXM-100

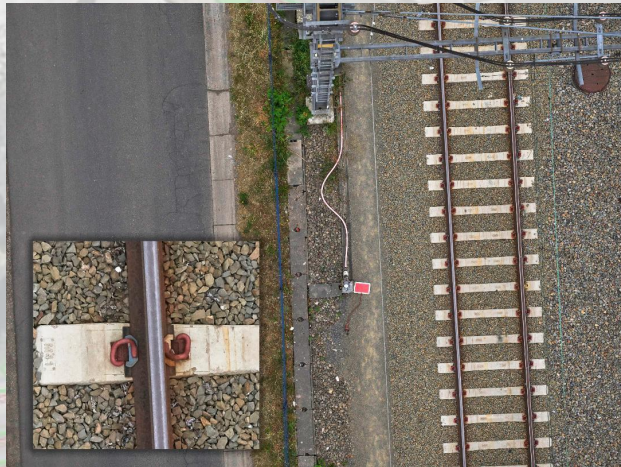
## UAV-based Methods

- No track access required
- Semi-automatic
- Safe
- Fast

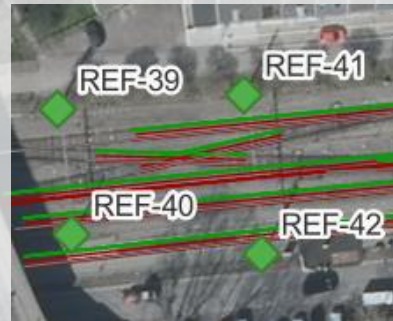
# The Data

- Nadir imagery
- GCPs

study area



GSD: 1.17 mm







Reprojecting  
as-designed rails

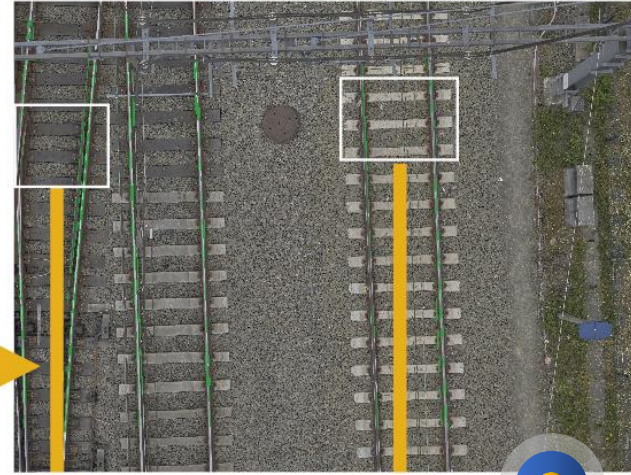
1



Line detection

$L$

$L'$



Inner rail boundary selection

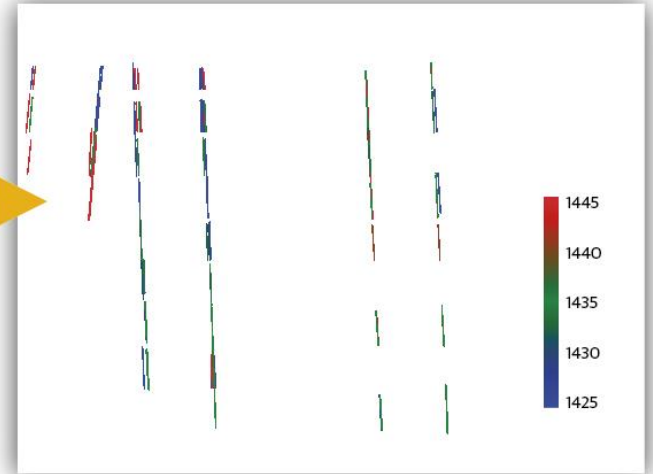
3

$L''$

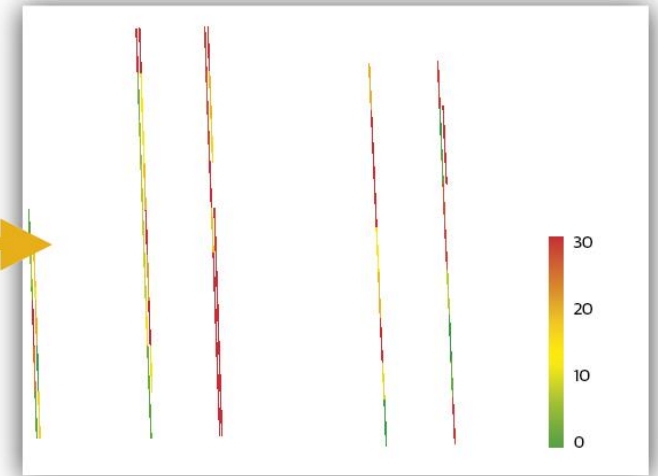
$L''$



Gauge deviation map

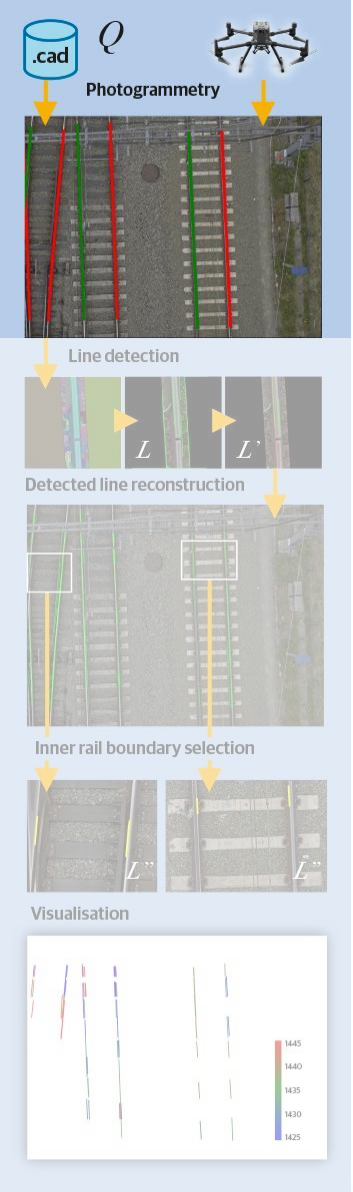


Absolute deviation map



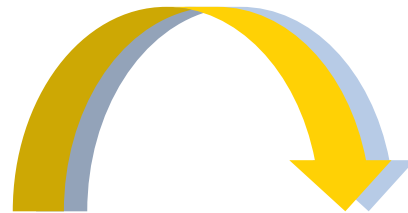
4  
Visualisation

2



# 1 Photogrammetric Preprocessing

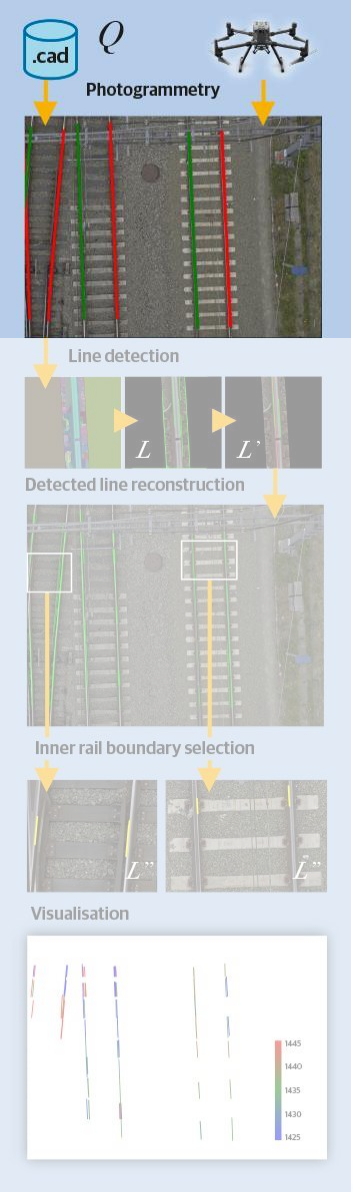
undistorting images



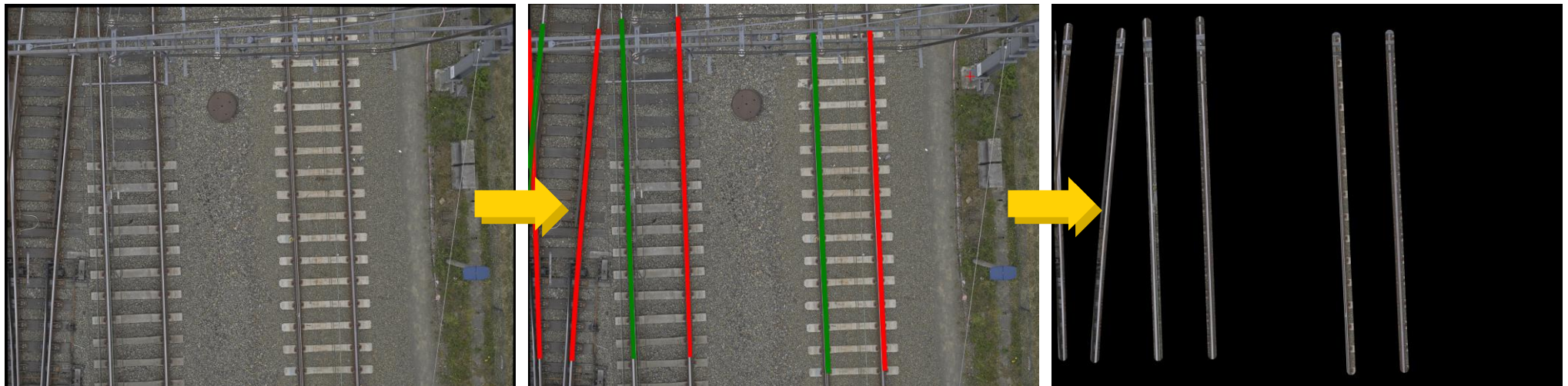
adding 4 GCP



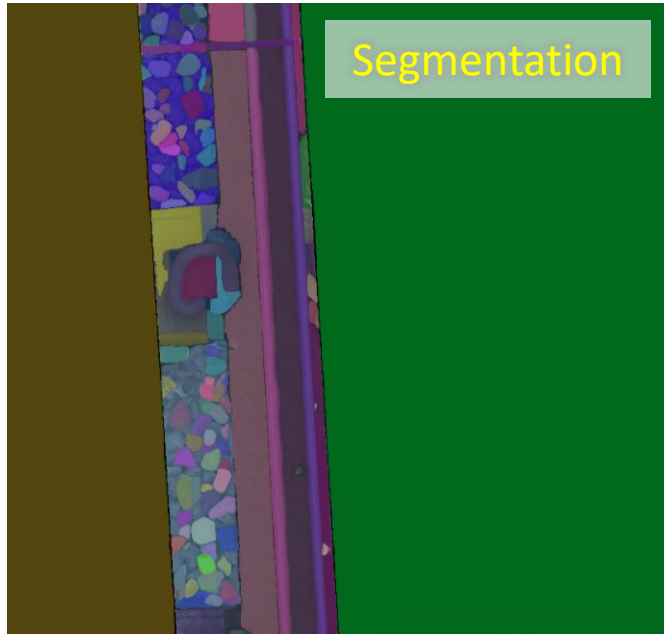
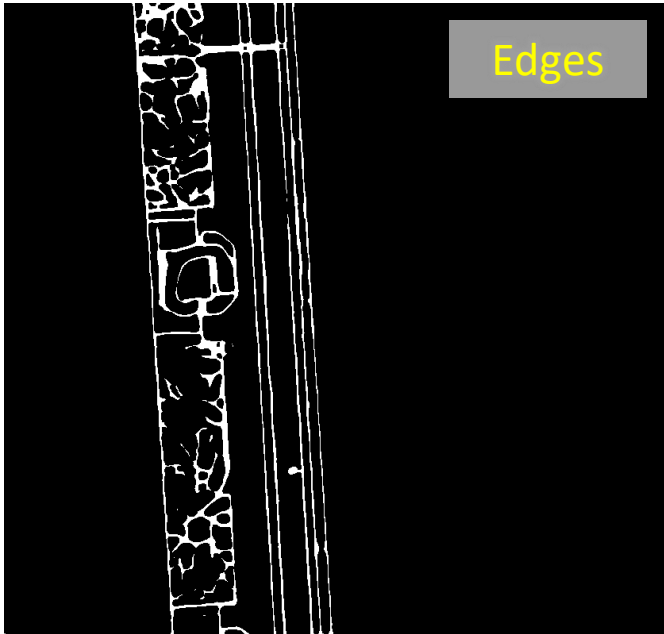
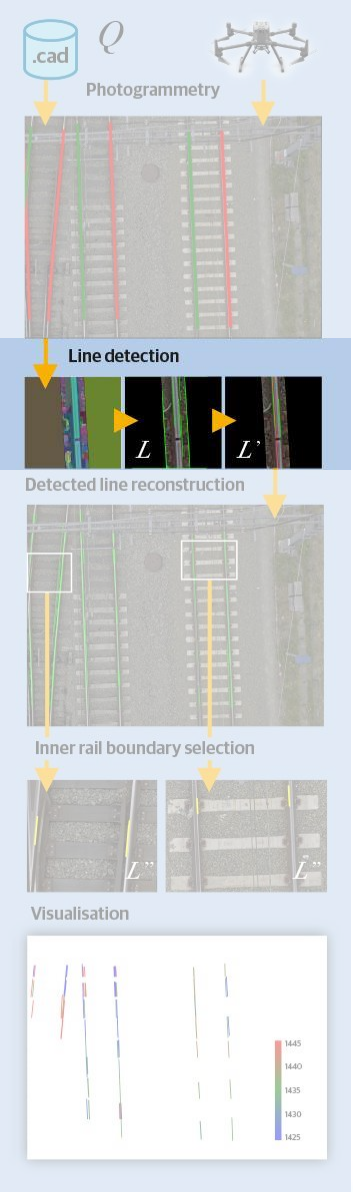




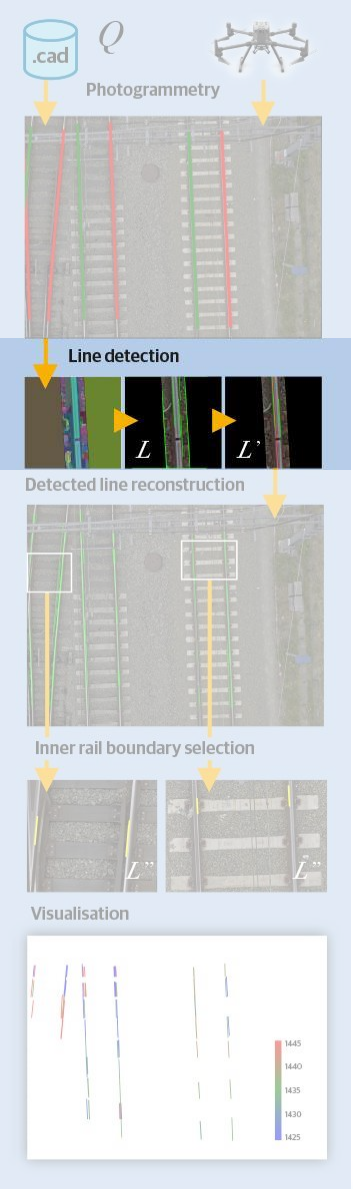
# 1 Photogrammetric Preprocessing



# 2 Line Detection







## 2 Line Detection

Edge detection :

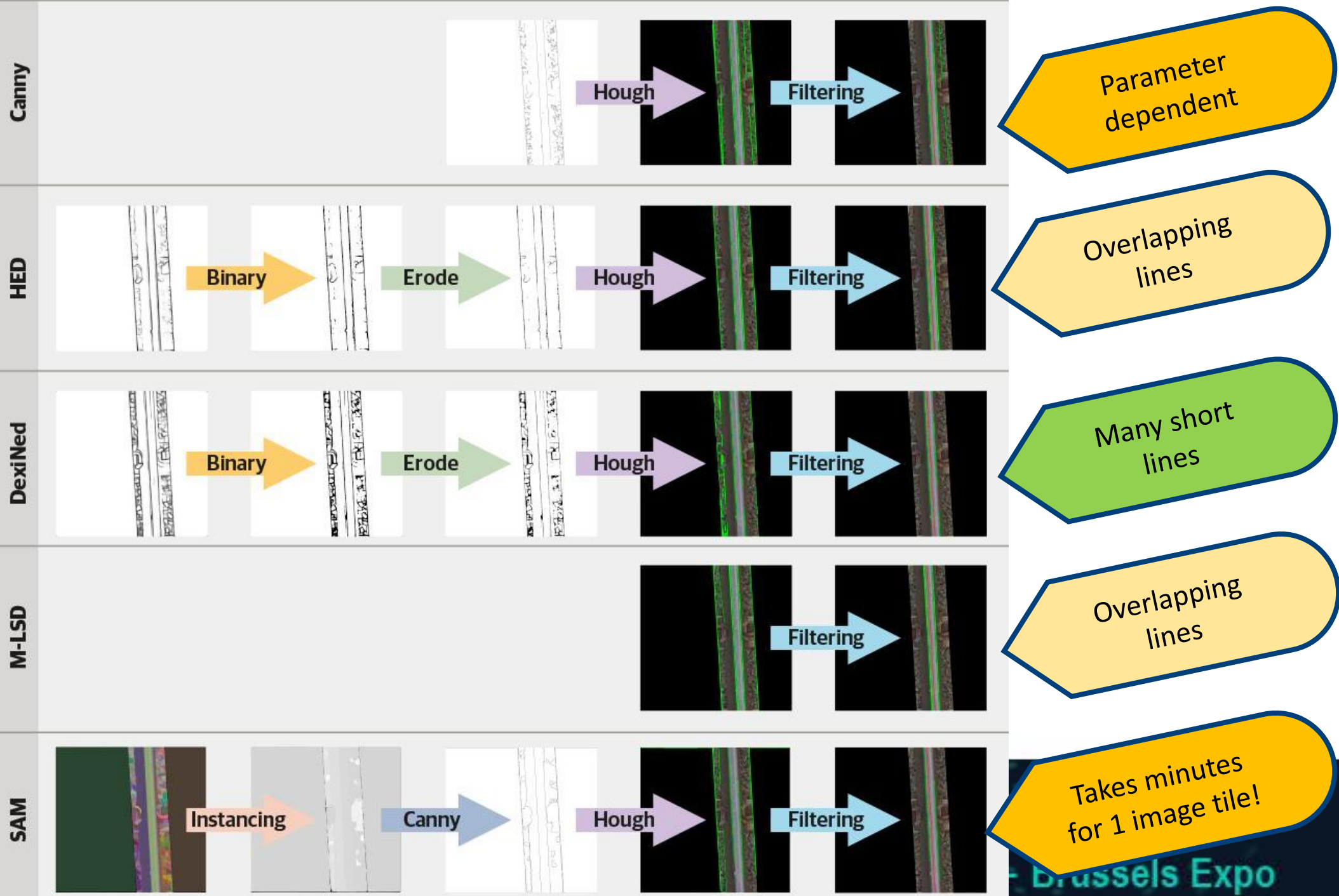
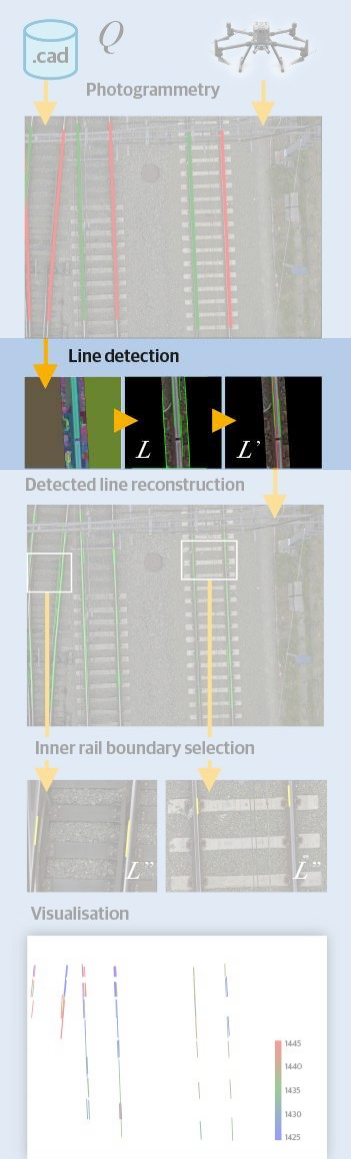
- Canny
- HED 🔄 📄
- DexiNED 🔄 📄

Line Segment:

- M-LSD (Mobile Line Segment Detection) 🔄 📄

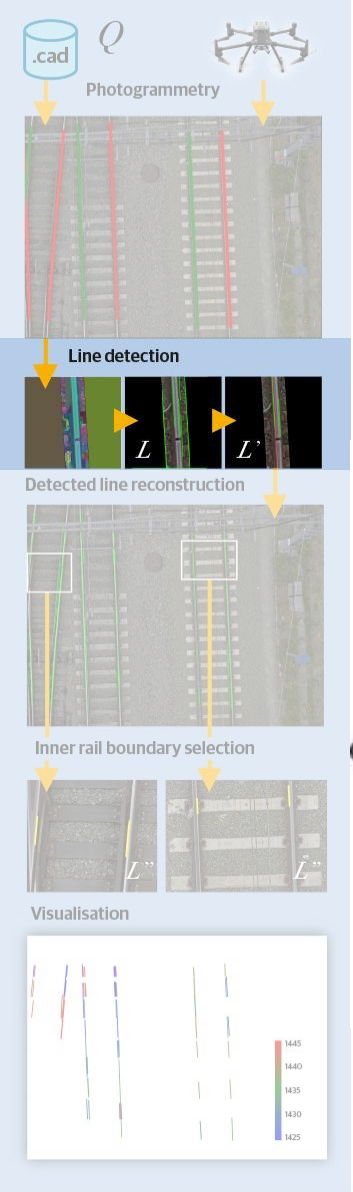
Segmentation:

- SAM (Segment Anything Model) 🔄 📄

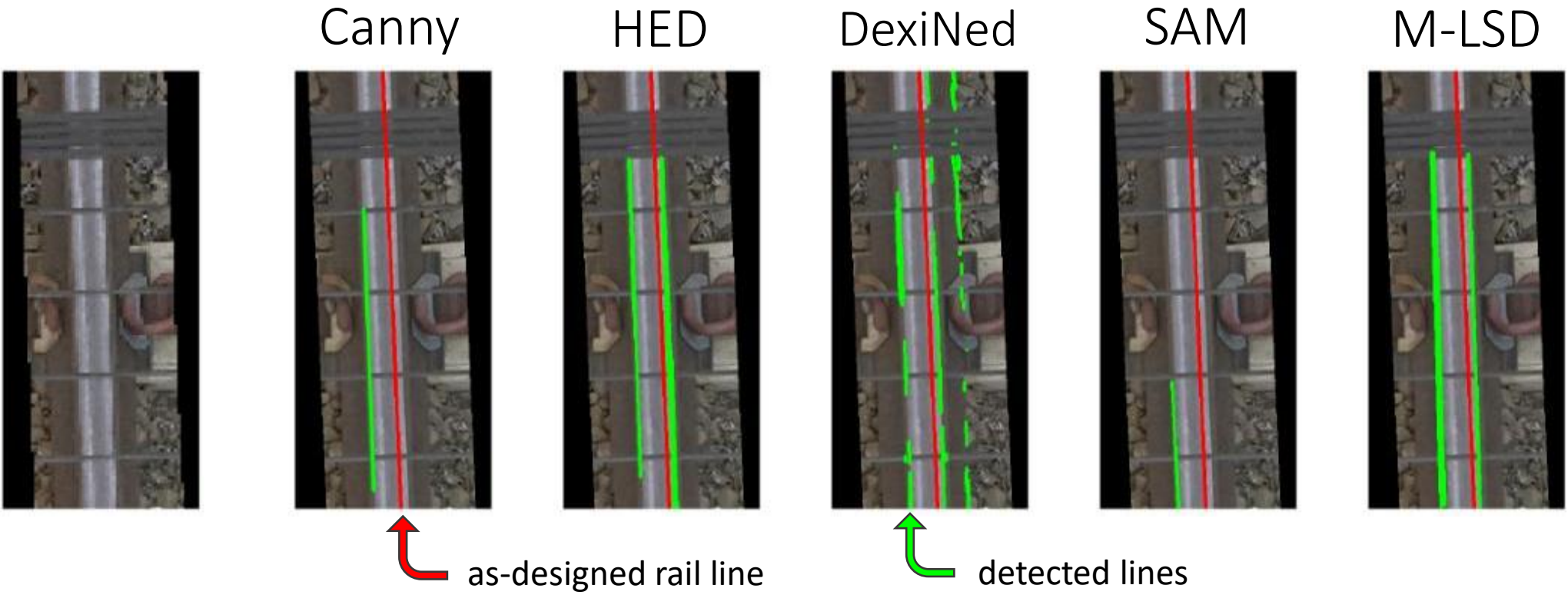




## 2 Line Detection



c)



3

# Inner Rail Boundary Selection

.cad Q

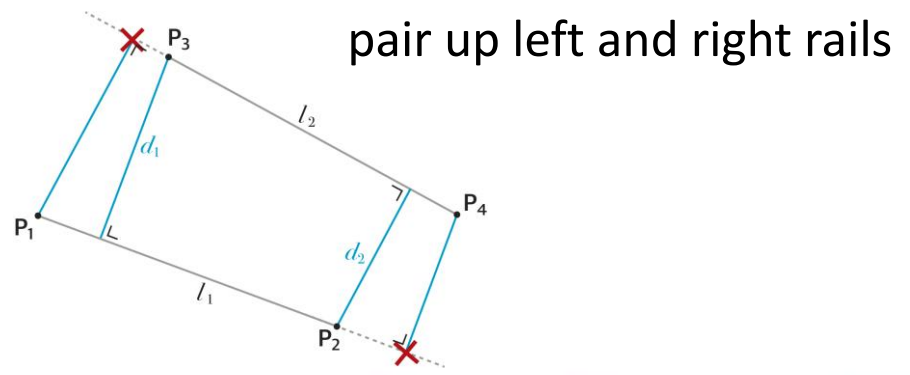
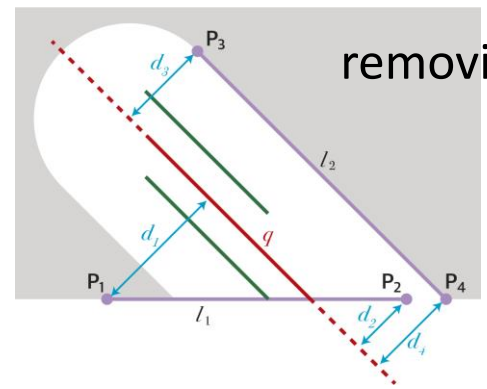
Photogrammetry

Line detection

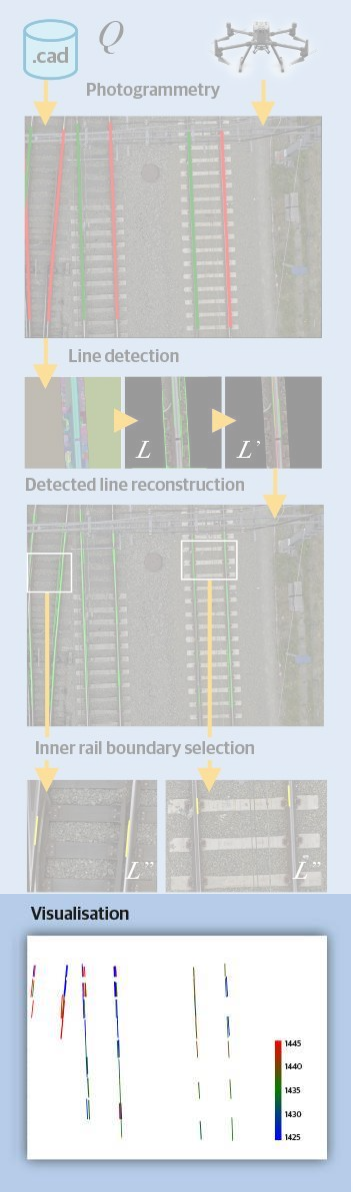
Detected line reconstruction

Inner rail boundary selection

Visualisation



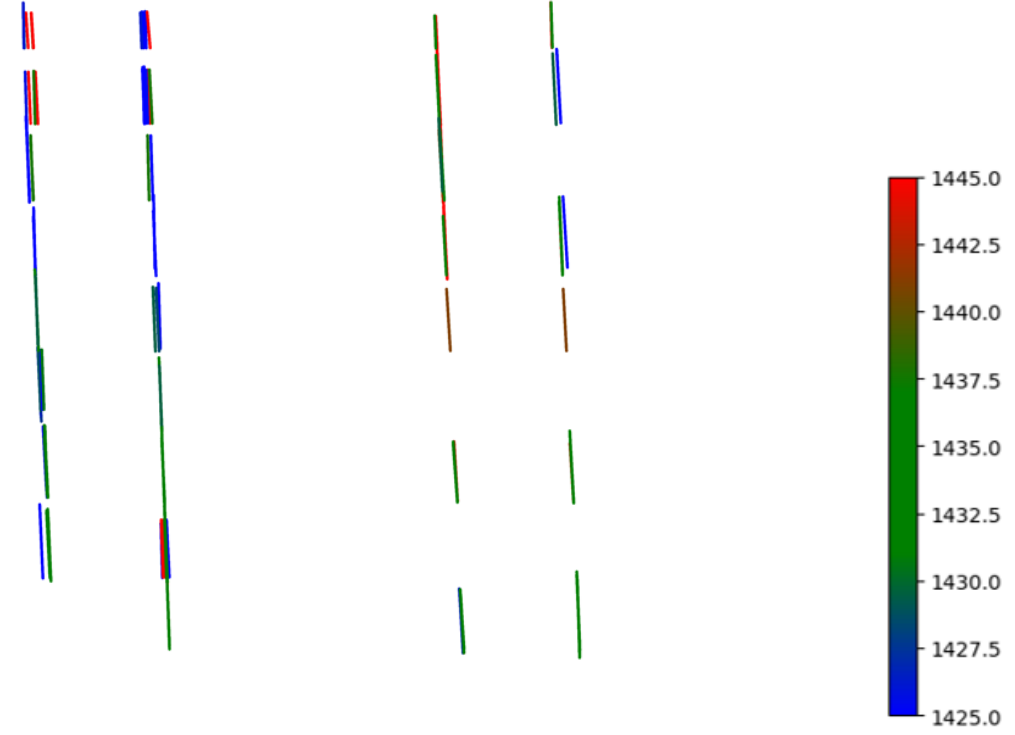
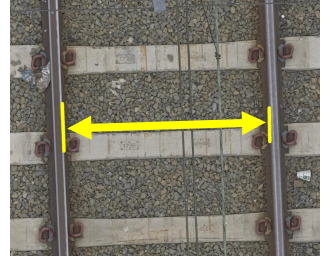




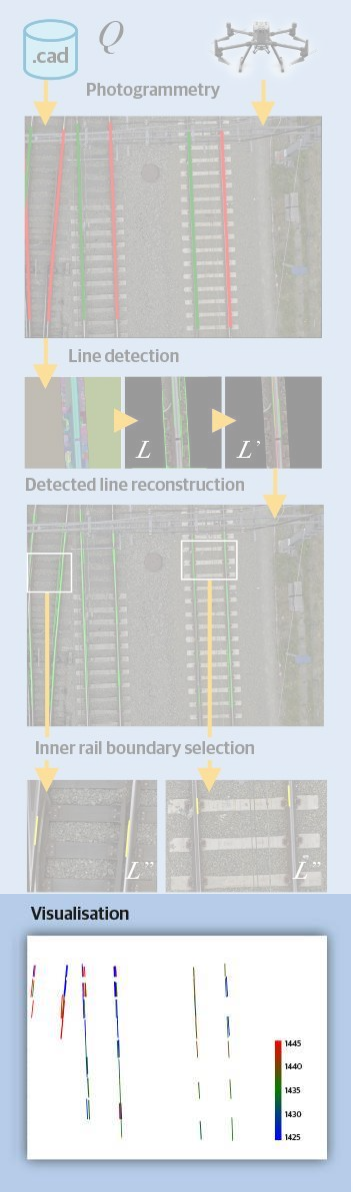
# 4 Visualisation



Gauge deviation



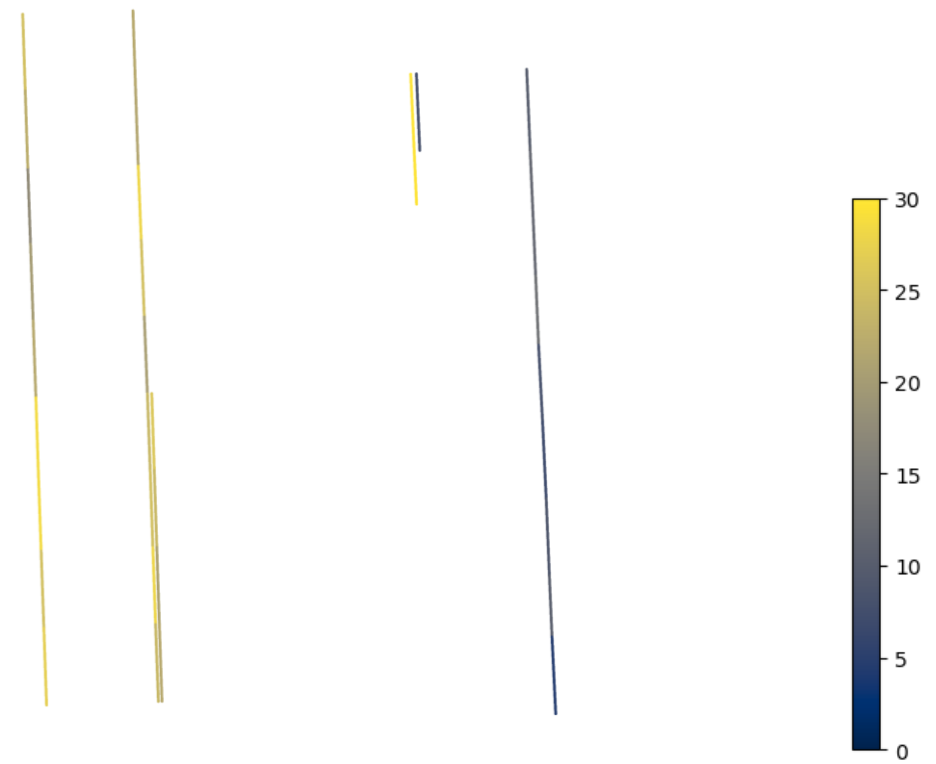
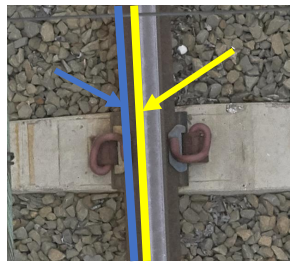




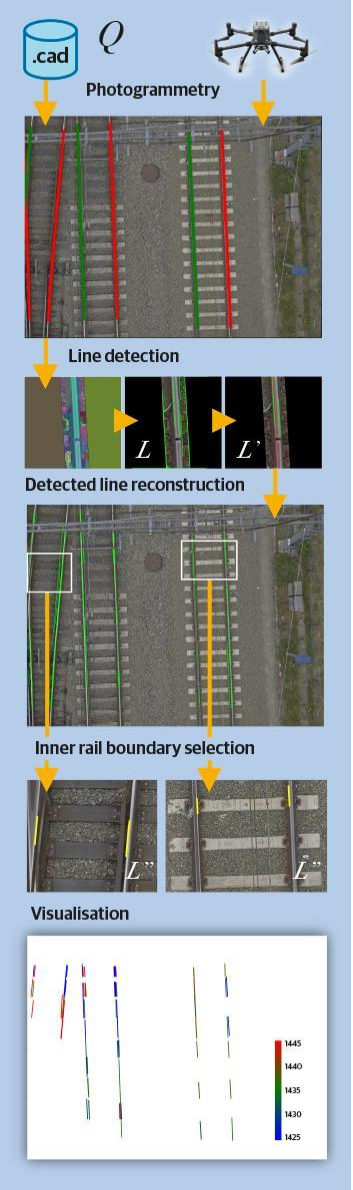
# 4 Visualisation



Deviation from as-designed rail lines







# Conclusion

- Semi-automatic workflow
- Camera based
- Line detection with Deep Learning

**TO IMPROVE:** GSD & GCP

➤ Flight altitude < 21m

**KU LEUVEN**

# Geomatics Research Team

**2 professors**

Maarten Vergauwen  
Guido Kips

**4 post-docs**

Maarten Bassier  
Stan Vincke  
Roberto de Lima Hernandez  
Hilton Tnunay

**7 researchers**

Suzanna Cuypers  
Sam De Geyter  
Heinder De Winter  
Lakas Mattheuwsen  
Jelle Vermandere  
Liang Zeng  
Erkki Tobias Bartczak

**2 educational staff**

Micheline Bekaert  
Sarah De Seranno

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Photogrammetry

Data Survey to BIM

# Geomatics Research Team

Data acquisition techniques

Large scale topographic inventory

Integration of multi-scale data

Laser scanning



Intelligent data models

Geo-data management

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How do we tackle the current challenges in the built environment using remote sensing observations?



<https://iiw.kuleuven.be/onderzoek/geomatics>





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# Participate in CLGE's Young Surveyors' Contest

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