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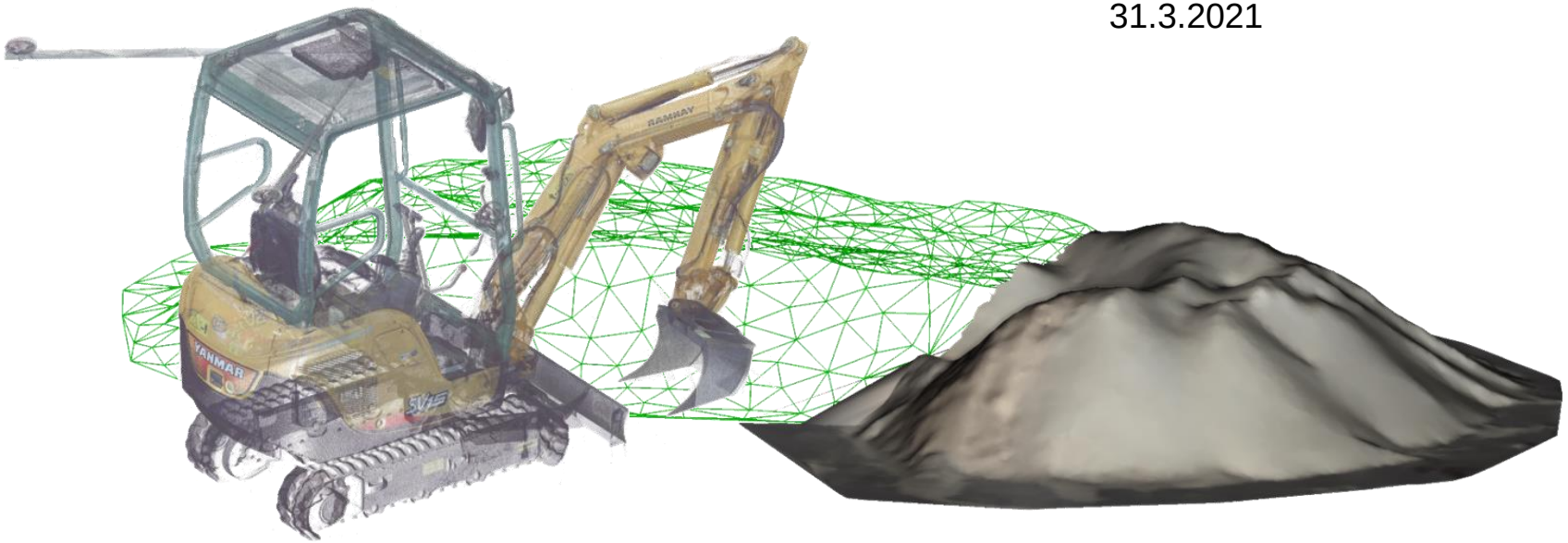
Drones,
a step towards more automated AEC industry
– with TAMK as a multidisciplinary partner

FIIF EVENT: INDUSTRIAL APPLICATIONS OF DRONES

31.3.2021



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Real-life environment

3D Reality Capture

Digital Twins

Photo source: Wikipedia

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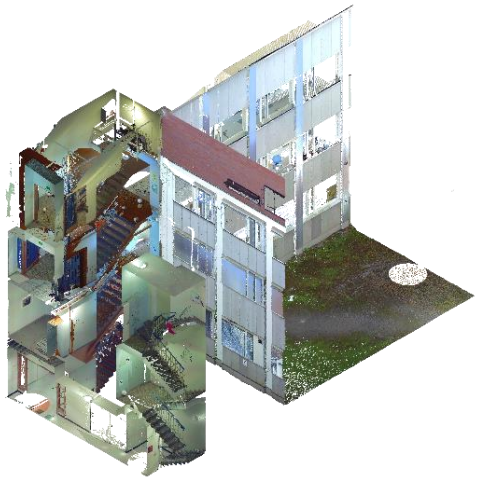
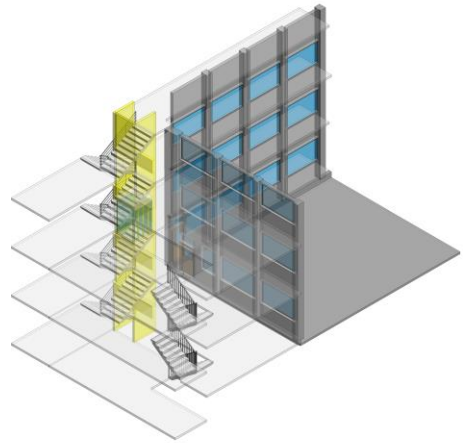
Point clouds are enabling digital workflows





3D data acquisition

Laser scanning
Photogrammetry
Depth cameras

Point cloud data

Point cloud software

Visualisation & stakeholder interaction

Animation tools
Game engines
VR/AR/XR tools
3D printing

Design, engineering, documentation

CAD/BIM/GIS

Permit process

Construction

Analysis, simulations and research

Use and maintenance

Refurbishments, renovations, retrofits

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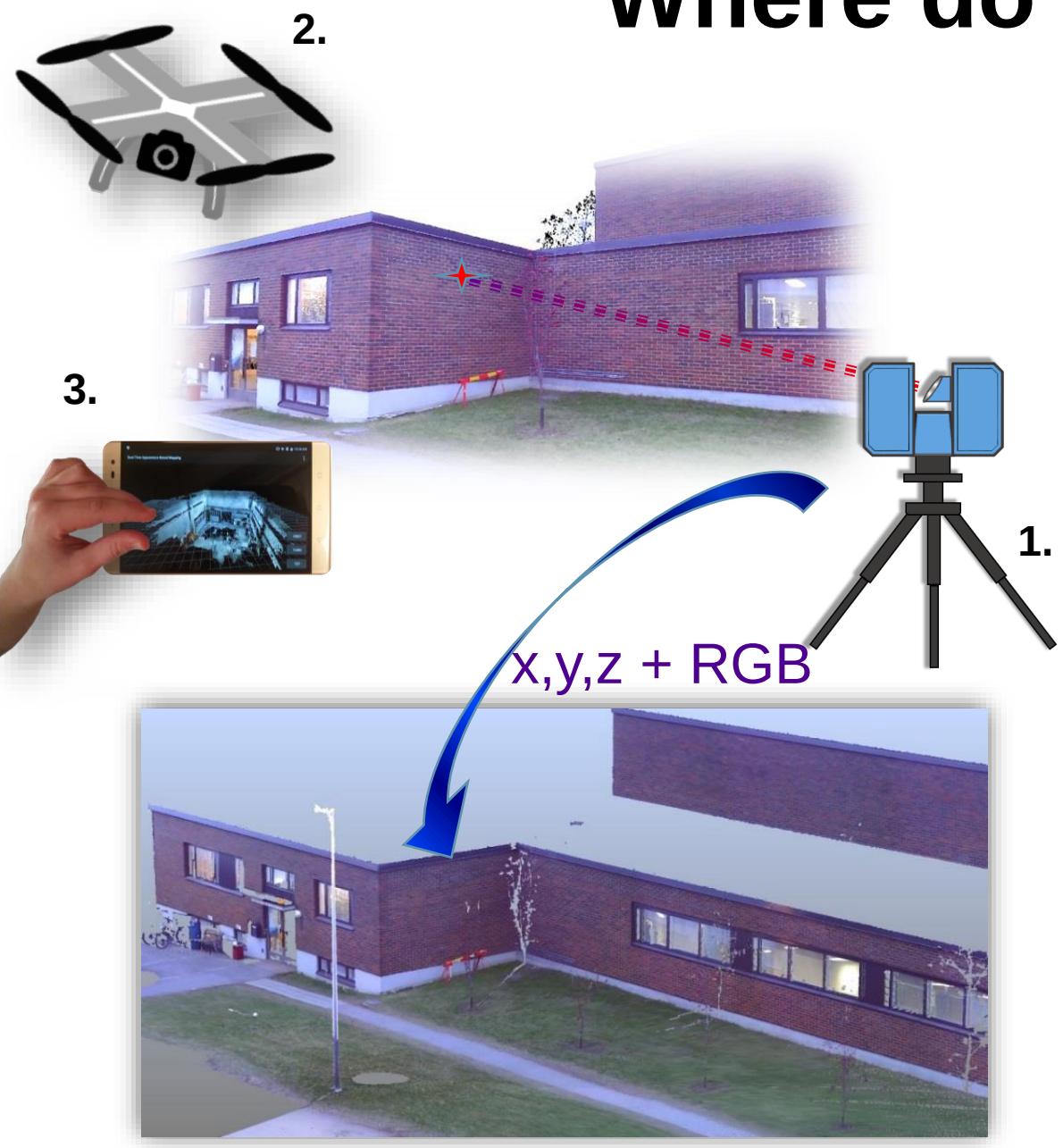
Where do point clouds come from?

(remote sensing, 3D reality capture, 3D documentation, 3D imaging, etc…)



Multisensor technologies to produce 3D imagery and geospatial information of the surrounding environment:

1. 3D laser scanning (a.k.a. LIDAR)

- utilises laser beam for acquiring the point cloud, i.e. active sensor technology
- fast and accurate, 360° coverage reachable
- usable in different lightning conditions, even in darkness
- traditionally equipment has been expensive
- different devices for different purposes and scales (from airborne to handheld)

2. Photogrammetry

- from photographs to 3D point cloud, passive sensor (RGB camera)
- both aerial and close range photos
- external control points for scaling & quality control
- affordable (digital cameras, even DSLR, are inexpensive)
- heavy postprocessing requirements

3. RGB-D/depth camera

- different solutions, but usually combines camera and depth sensing
- e.g. Google Tango, Apple TrueDepth or Matterport camera
- inexpensive, usually consumer grade sensors
- accuracy and data quality may be an issue

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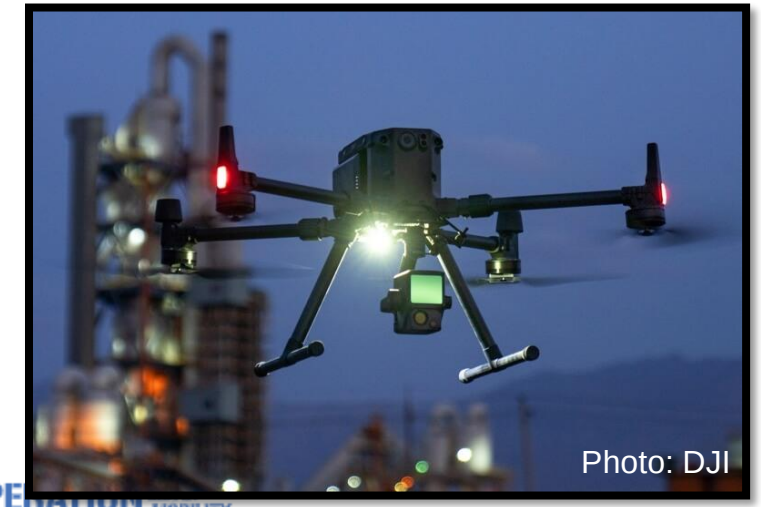
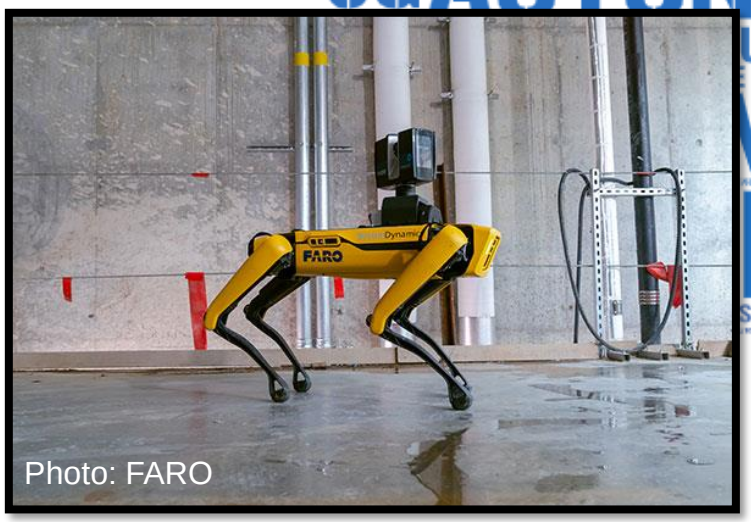
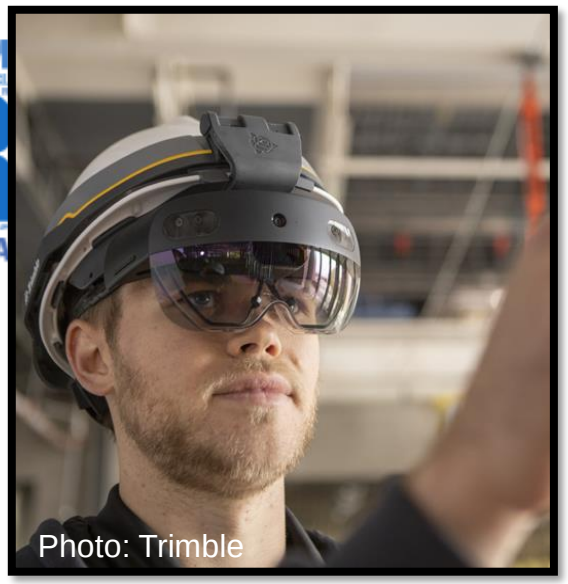
Today or in the future?





https://youtu.be/bYqPcFgbbCI



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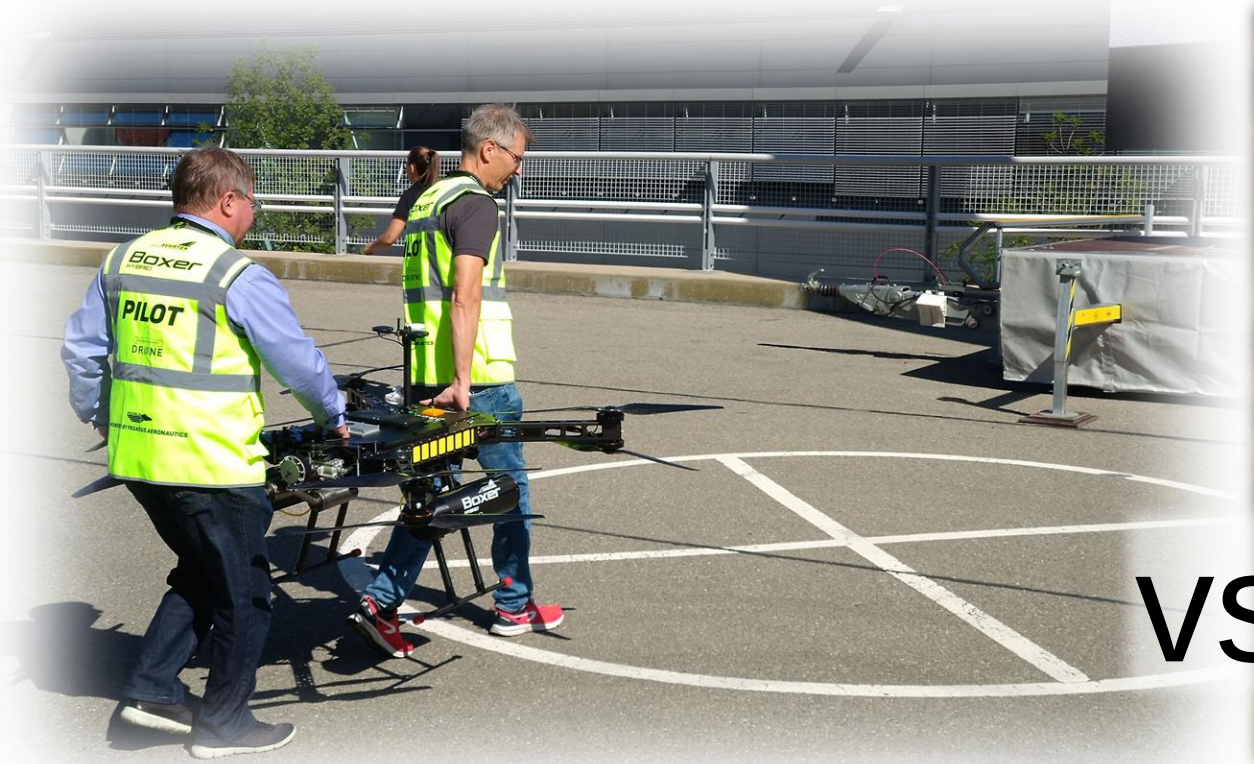
Drone in ~~the~~ *every* pocket?



VS.

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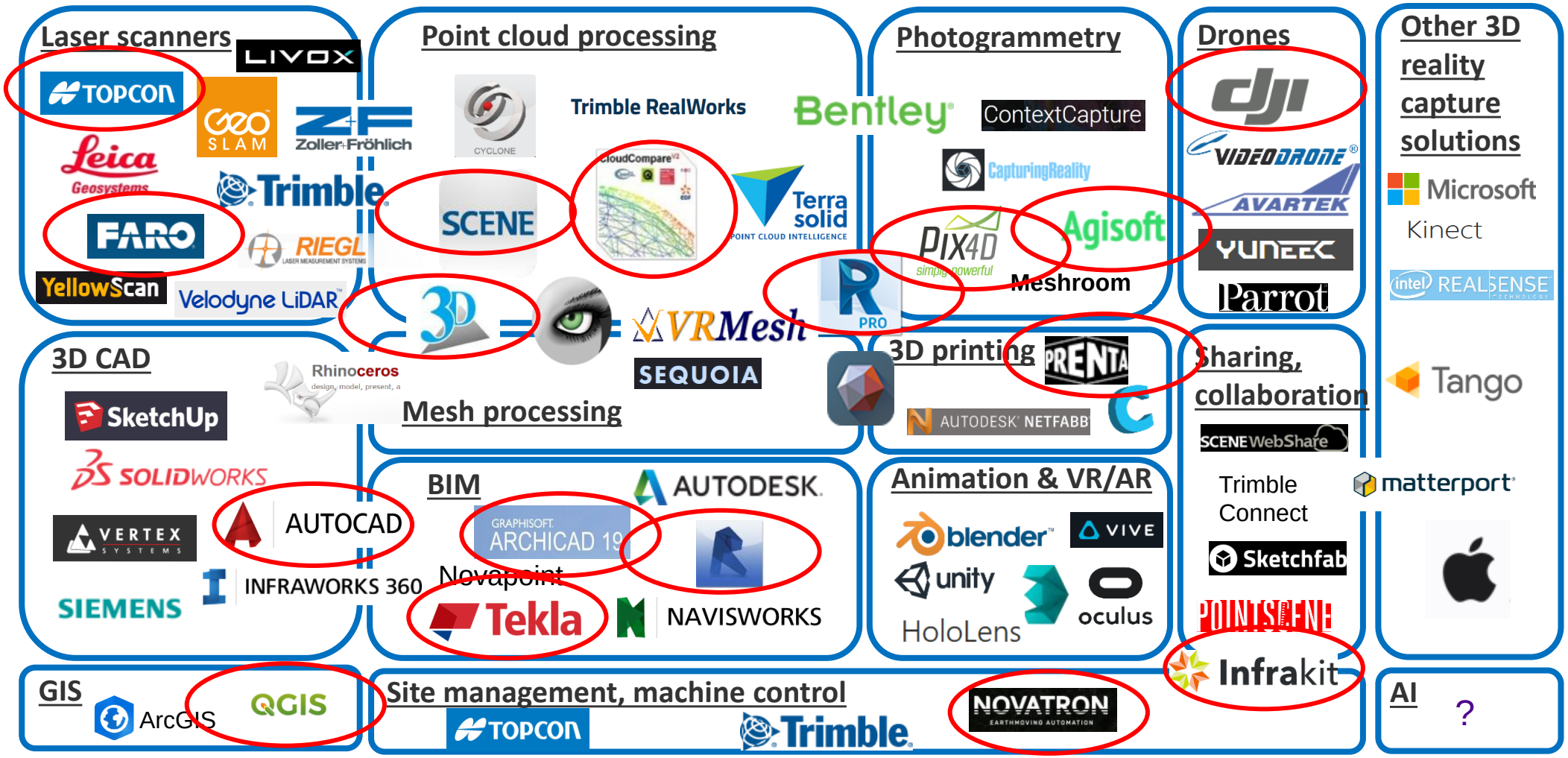
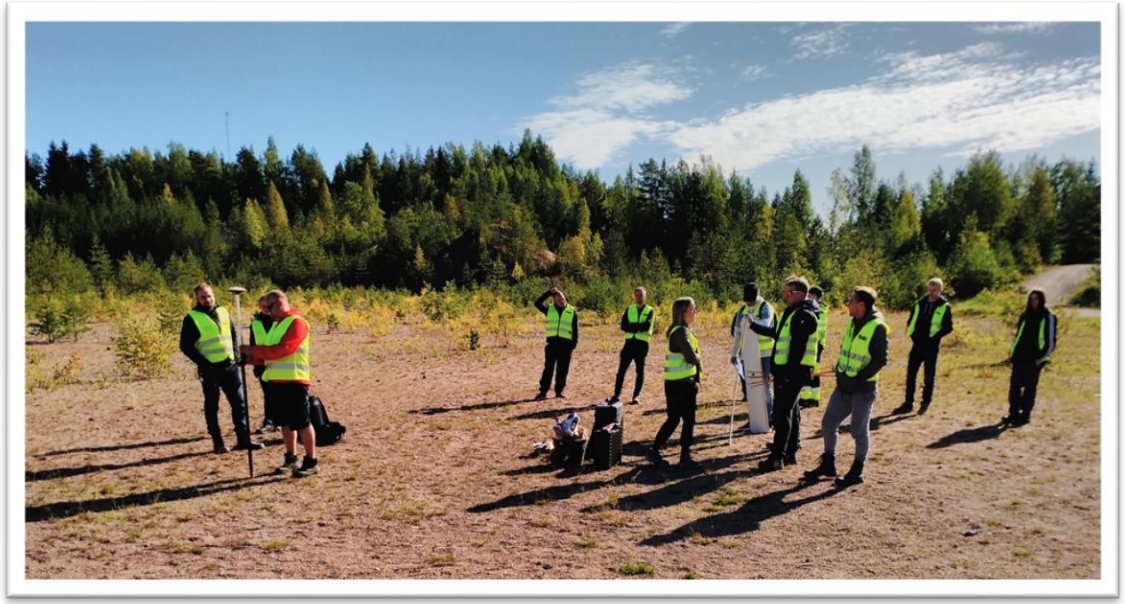
Drones in AEC education at TAMK

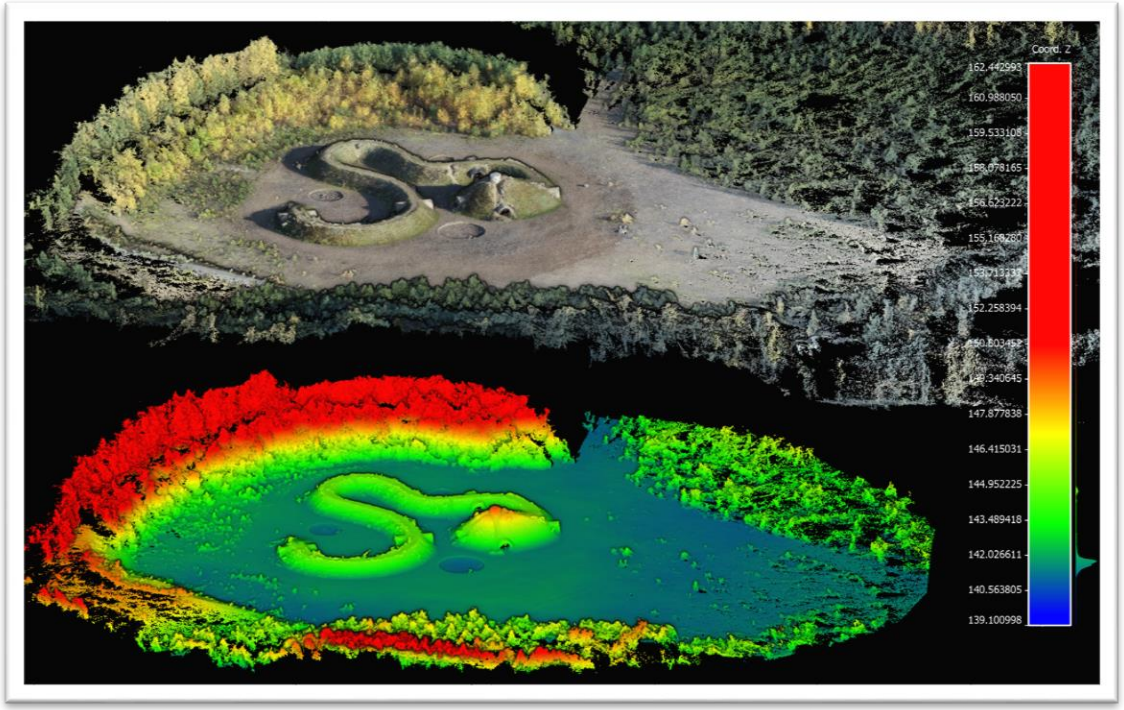
- Annually:
  - ~ 200 - 300 students get theoretical basics on drones
  - ~ over 100 students have field exercise and computer lessons on how to utilize drones and photogrammetry
- Multiple degree programs:
  - Building Services Engineering
  - Construction Architect
  - Construction Engineering
  - Construction Site Management
  - Environmental Engineering
- R&D projects and cooperation with companies and public organisations
- Participation in industry networks
- Versatile equipment and software

Combinations of equipment and software



Examples





Up and Under: Combining drone mapping and TLS (2020)

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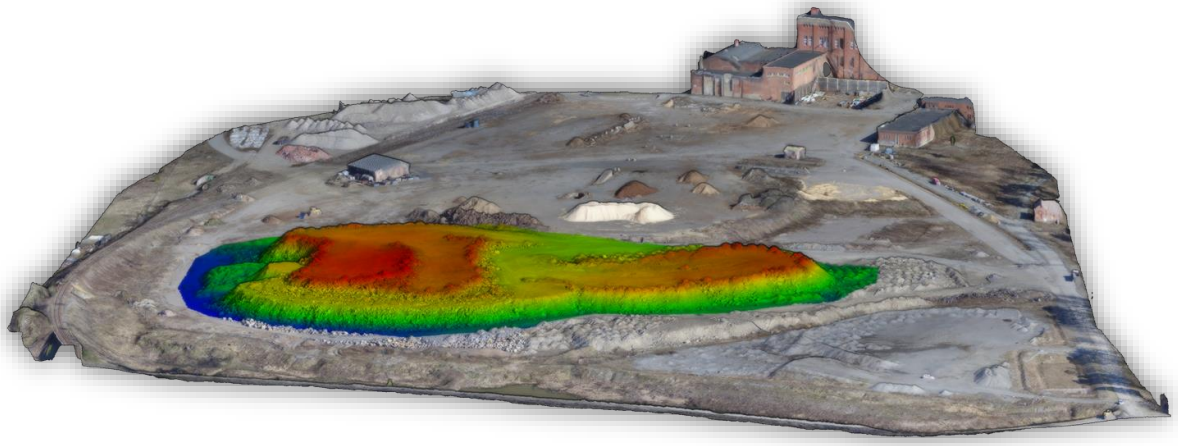
Examples

Mapping
Volume calculations

Särkänniemi Event Beach (2020)



Hiedanranta, piling area (2017)

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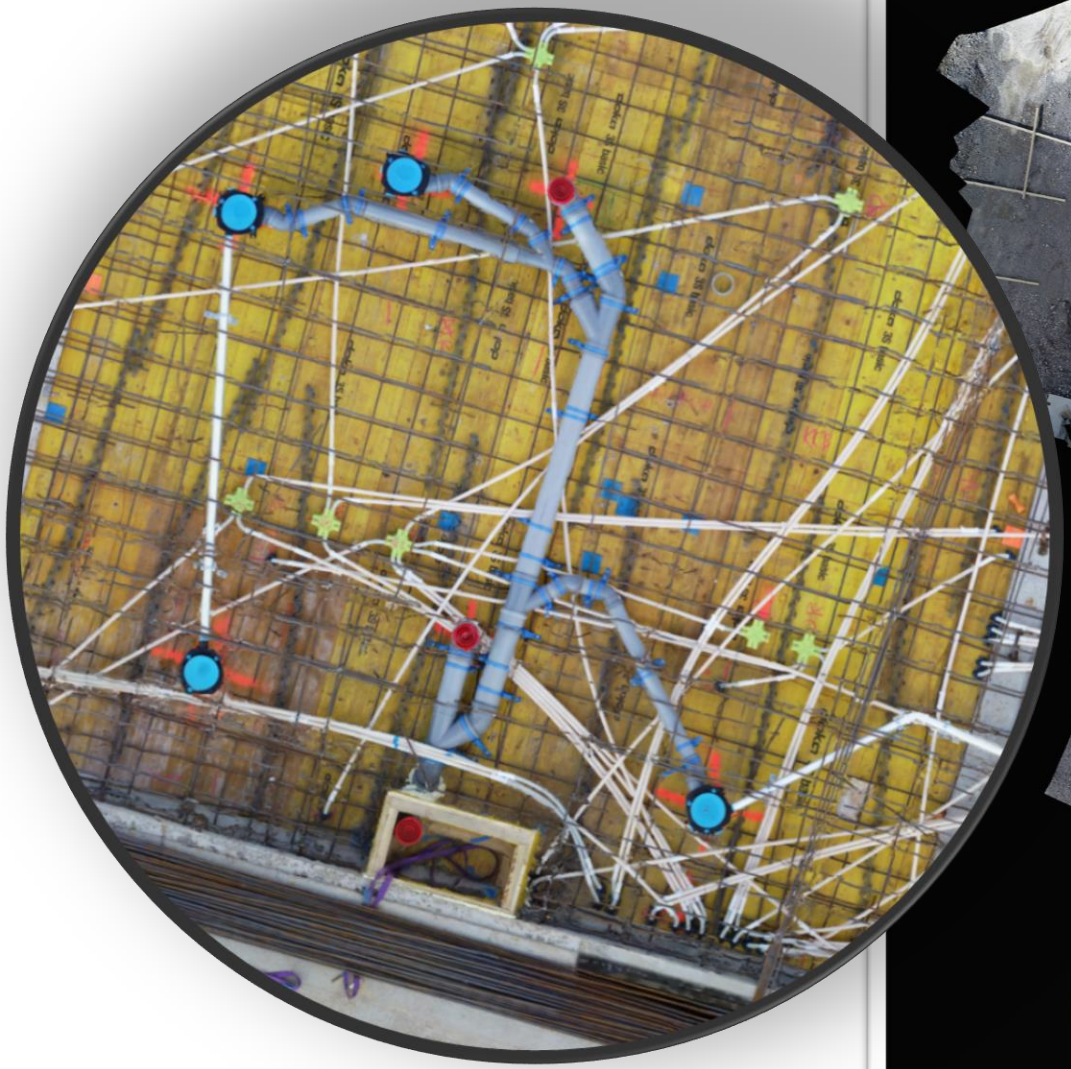
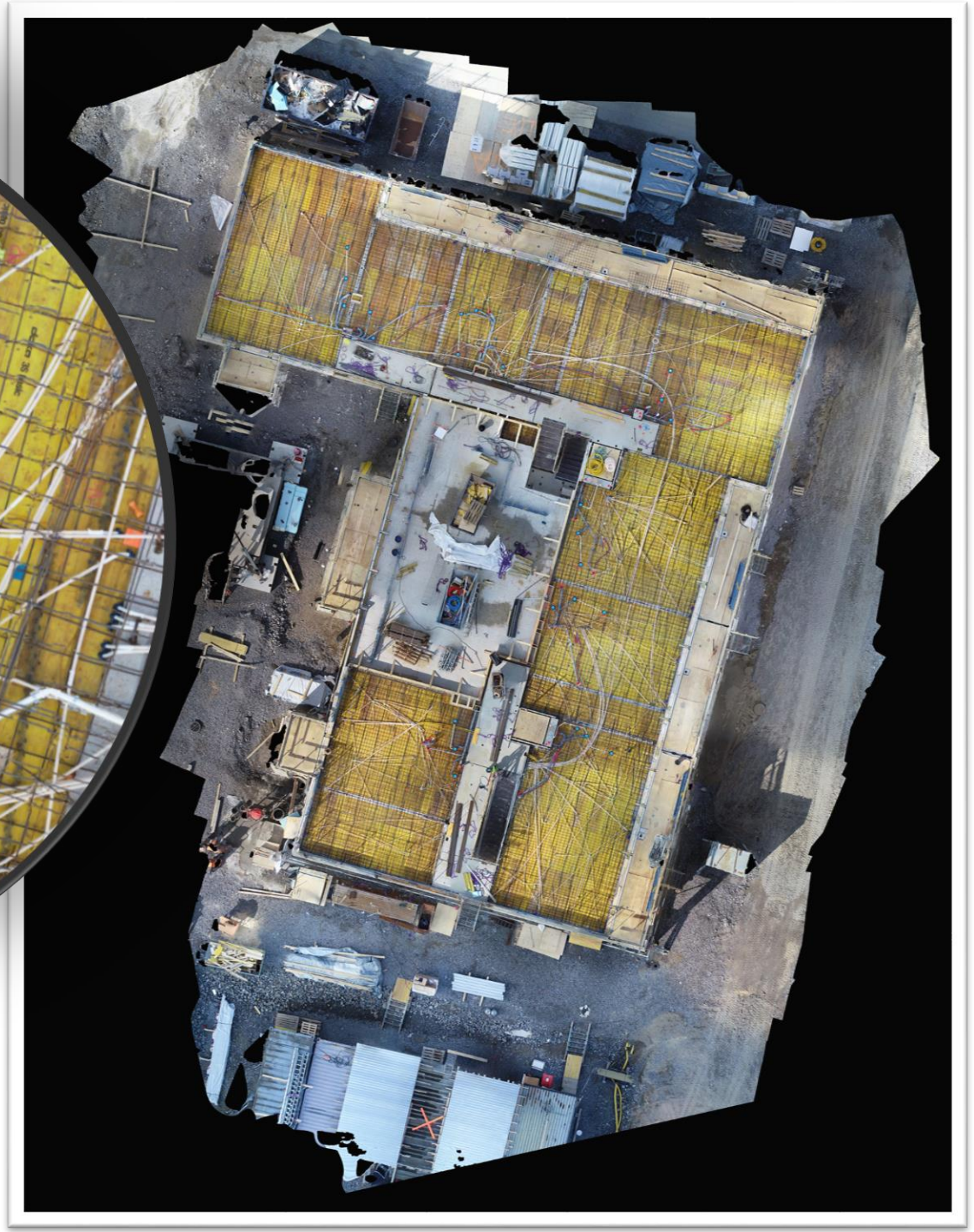
Examples

Site management





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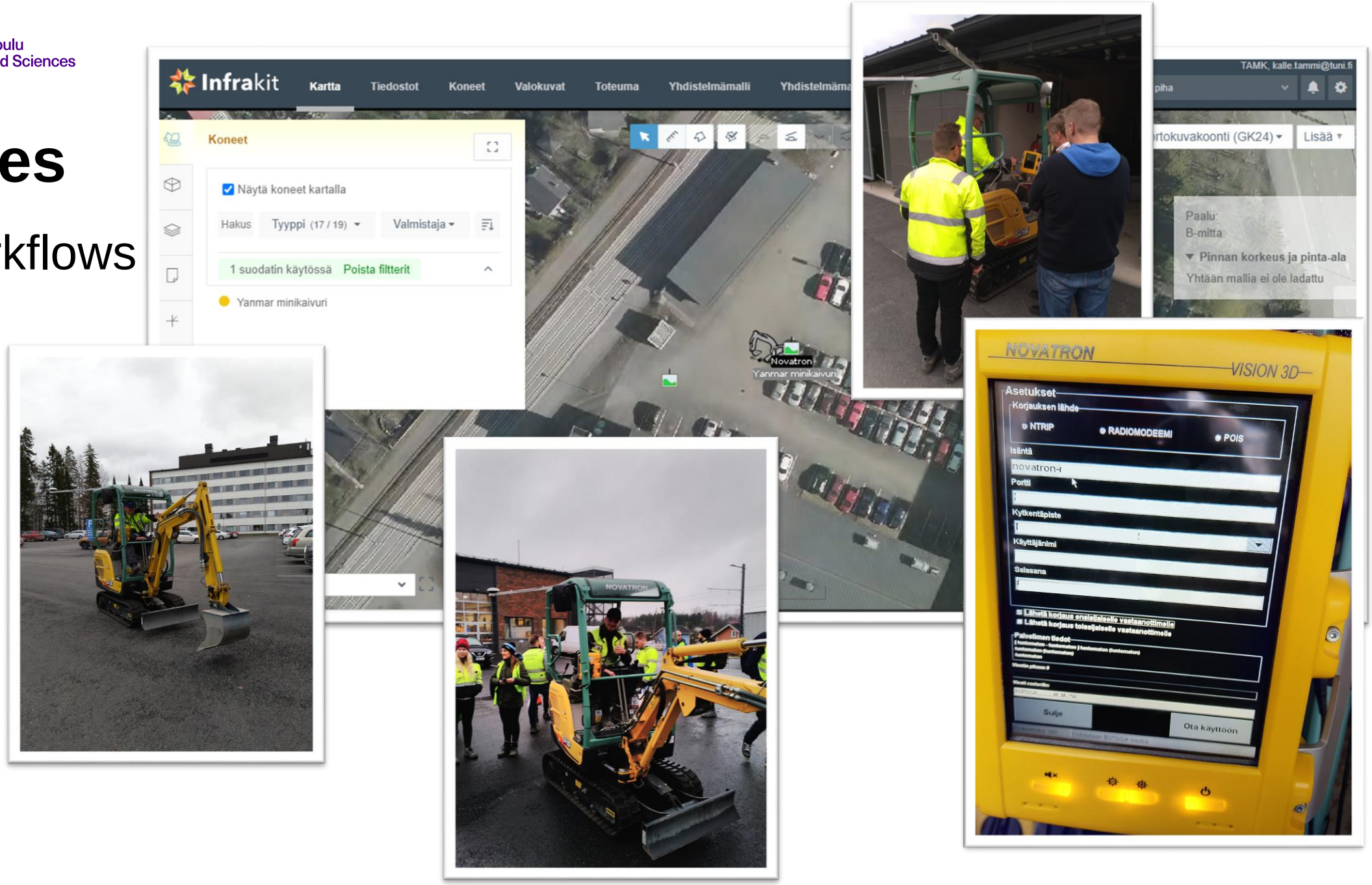
Examples

Digital workflows



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