mix

LKAB

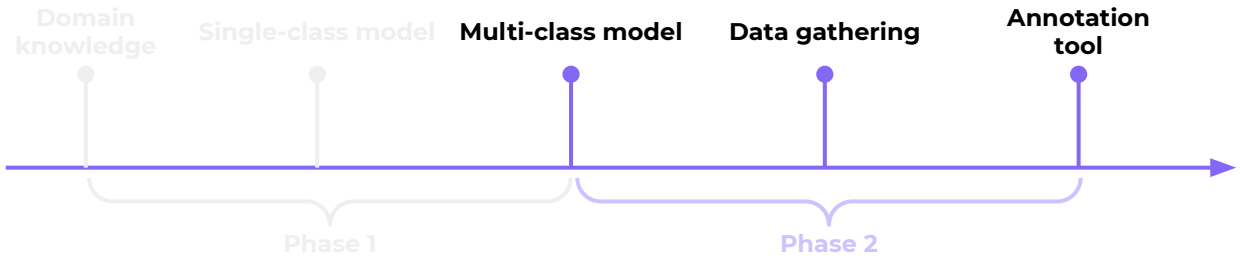
How Deep Learning is Used to Help Mining Geologists

AI in production

Agenda

- Combient Mix
- LKAB
- Challenge
- Project

Project phases



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Combient Mix

Combient Mix Fact sheet

Founded January 2019 by investments from Combient, SEB and SAS

Team: 35 Employees mostly Data Scientists, Engineers and Architects.

Mission: Enable companies capture value from data, AI and advanced analytics at scale

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Our track record

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Luossavaara-Kiirunavaara Aktiebolag

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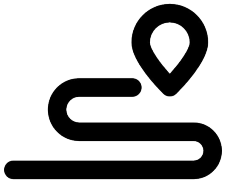

Started 1890

Underground mine

Fe

Iron ore

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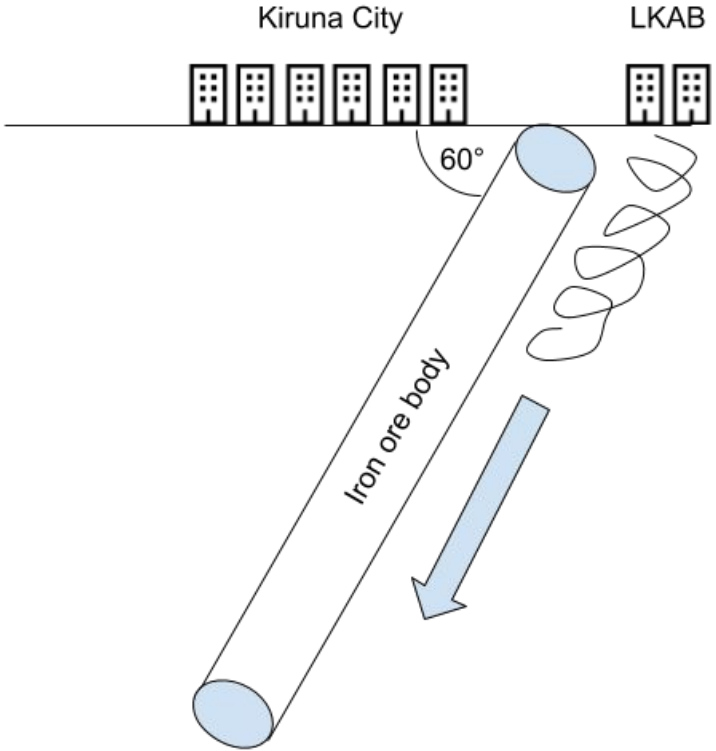

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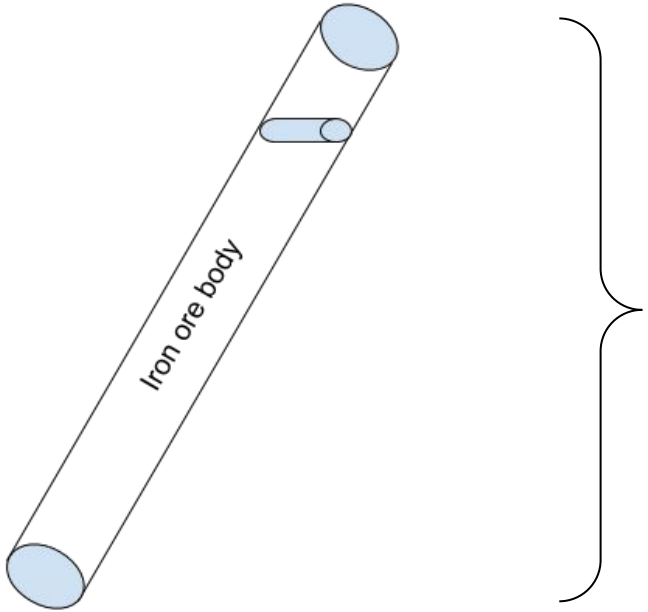

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Challenge

Work process

Drilling & blasting

Scaling & cleaning

Rock reinforcement

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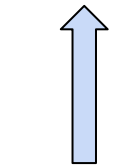
Work process

Drilling & blasting

Scaling & cleaning



Geologist

Rock reinforcement

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Work process

8h vs. 24h

Geologist **Rest of mine**

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Work process

Utilize image segmentation to help the geologist

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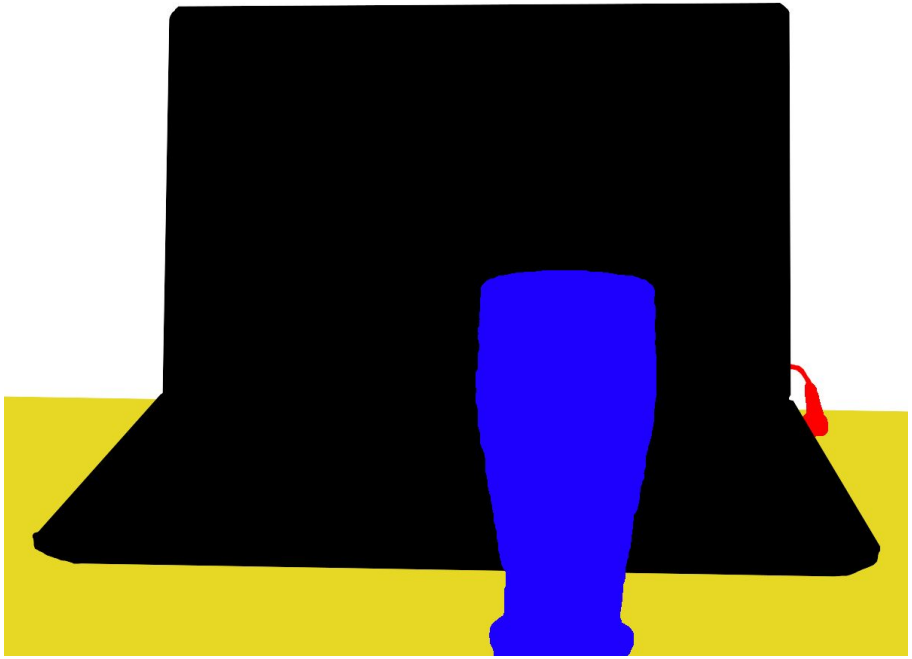
Work process



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Project

Project focus

ML-model | **Data Gathering** | **Annotation**

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ML-model

Classes

Background | **Iron ore** | **Waste rock**

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Classes

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Data

95 images
40 unique walls

JPG (RGB)

4032 x 3024

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Data

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Method

U-Net

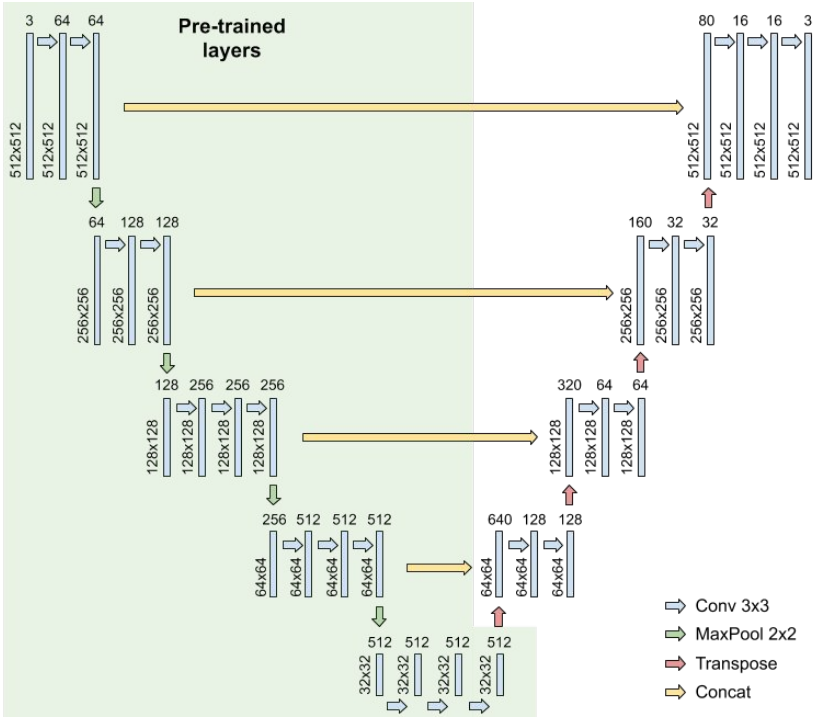
with transfer learning

Pretrained VGG16 (ImageNet)

Weighted loss

Image augmentation

5 loss functions



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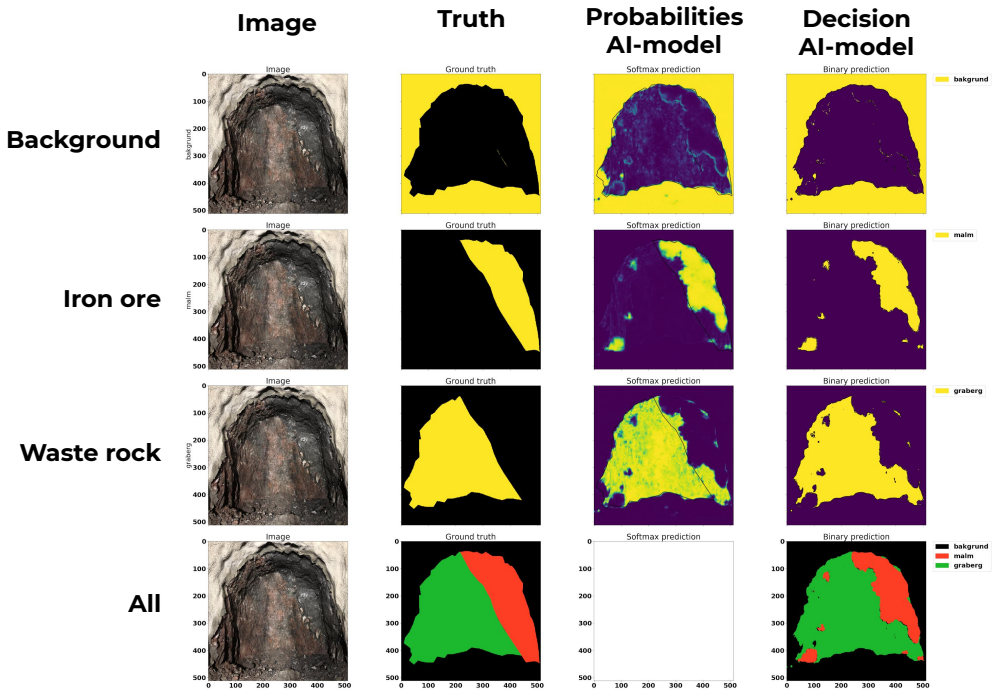
Phase 2 - Example results

Should be as similar as possible



Phase 2 - Example results

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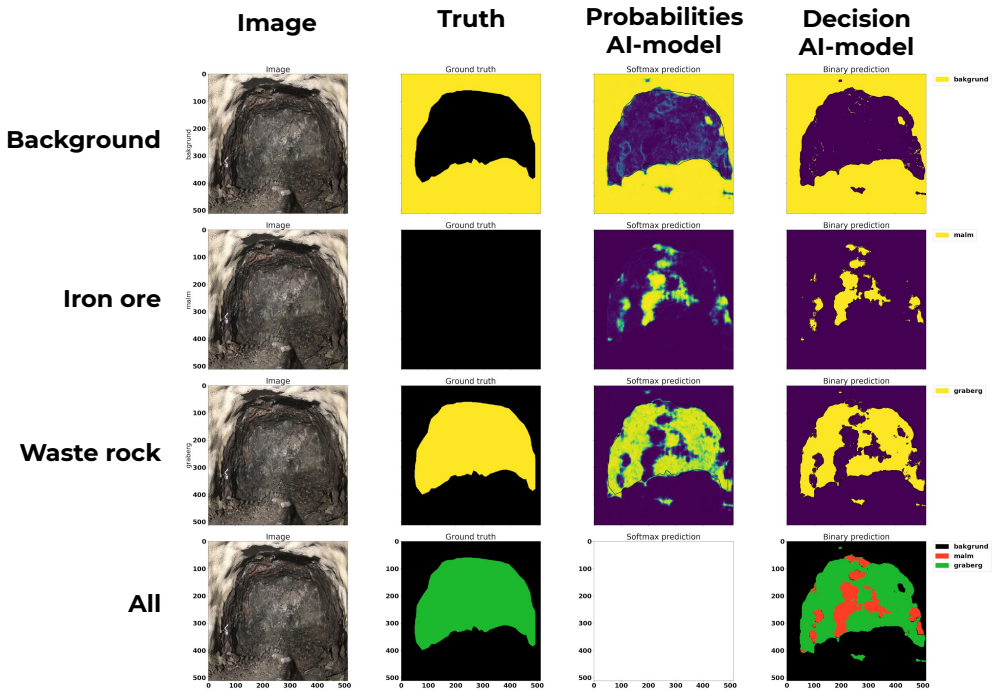

Phase 2 - Example results

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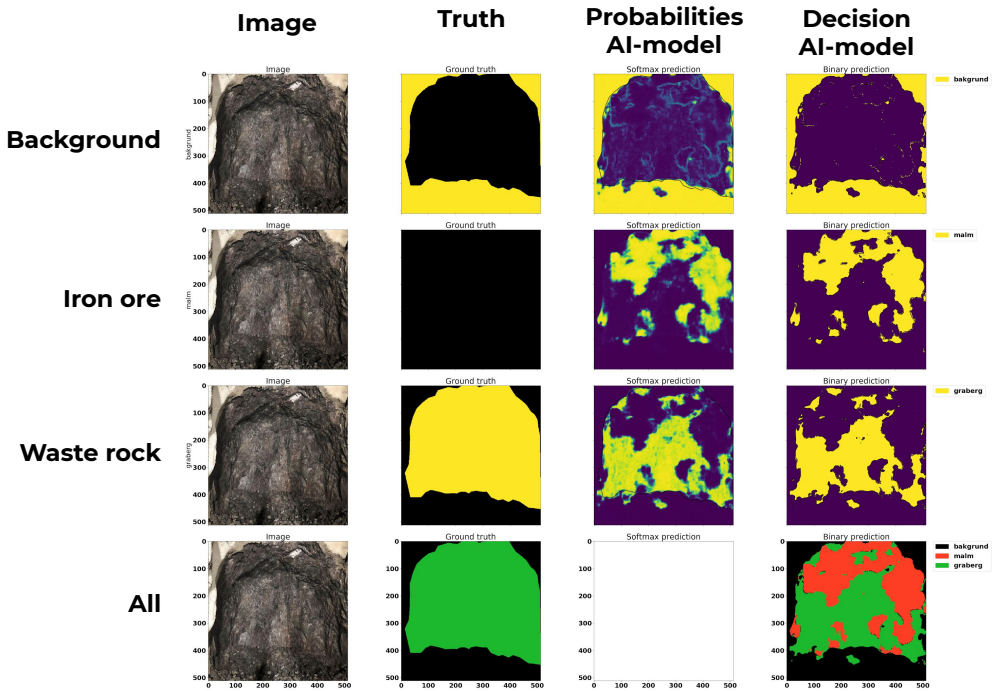

Data gathering

Data Gathering

Android app

Used in the mine

U-Net on edge

Integrated with annotation tool

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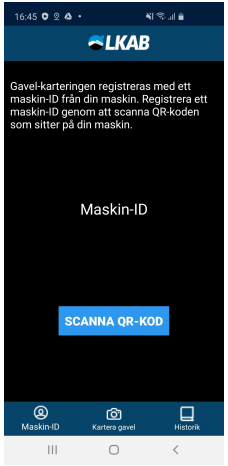
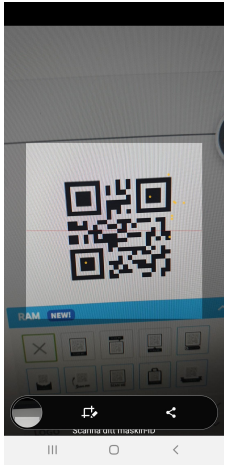
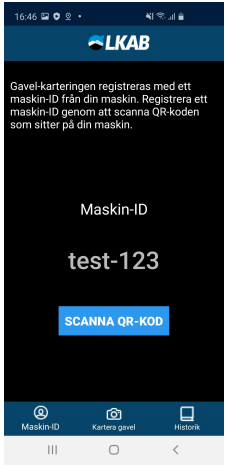
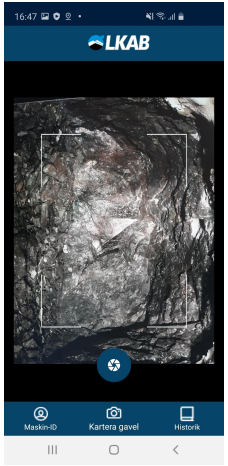
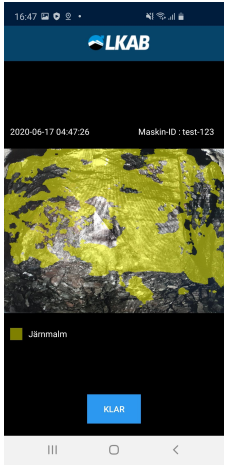
Data Gathering

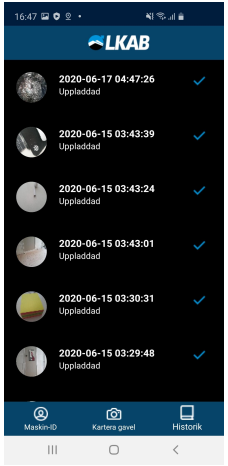












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Annotation tool

Annotation tool

COCO annotator

Integrated with app

Used by geologists

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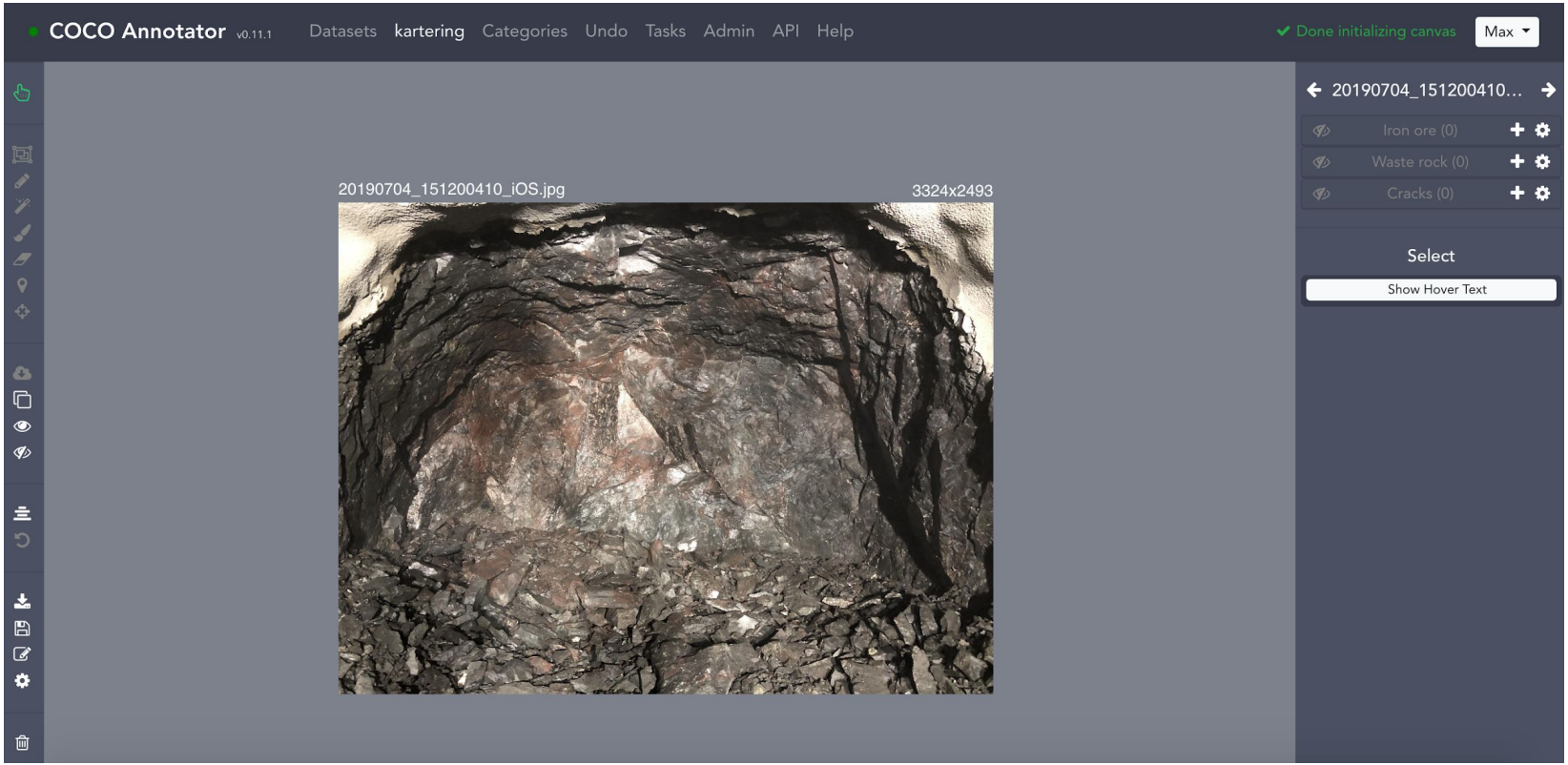
Annotation tool



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Questions?