

MiCROTEC

Innovating Wood

Innovation
Passion
Dedication

MICROTEC



1. Introduction MiCROTEC
2. Applied AI Technologies at MiCROTEC
3. Challenges in Organization

Company

MICROTEC



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Key Facts

- Foundation: 1980
- Employees: 450
- Turnover: 105 Mio €
- R&D 15% of annual turnover
- Only provider of scanning & optimization solutions for the complete wood processing industry
- Global Operations

Global Network of Innovation

MICROTEC



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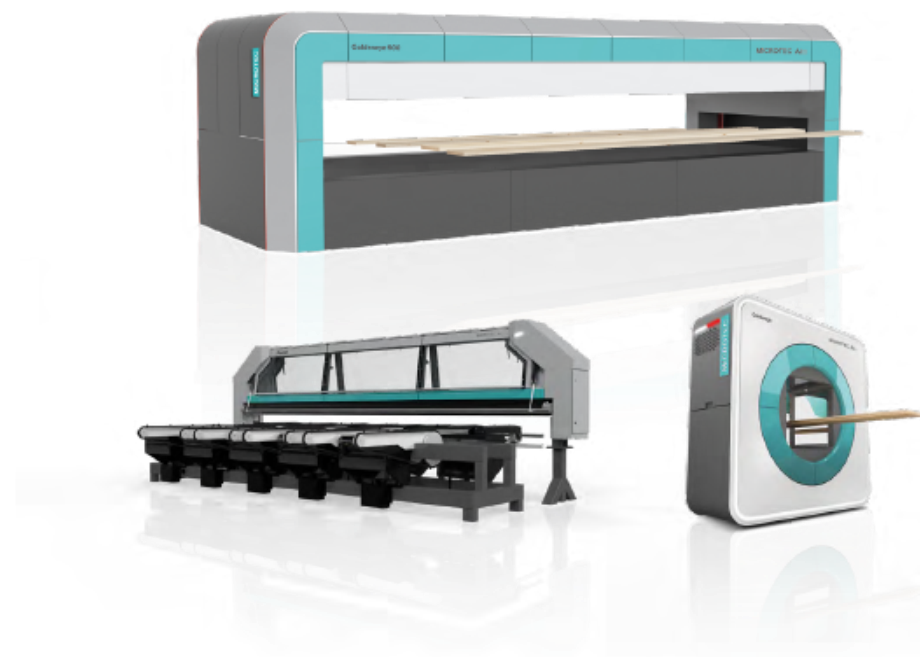
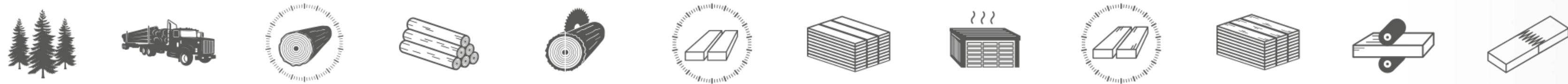
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Happinger Str. 94
83026 Rosenheim
Germany

Solutions provided by MiCROTEC

MiCROTEC

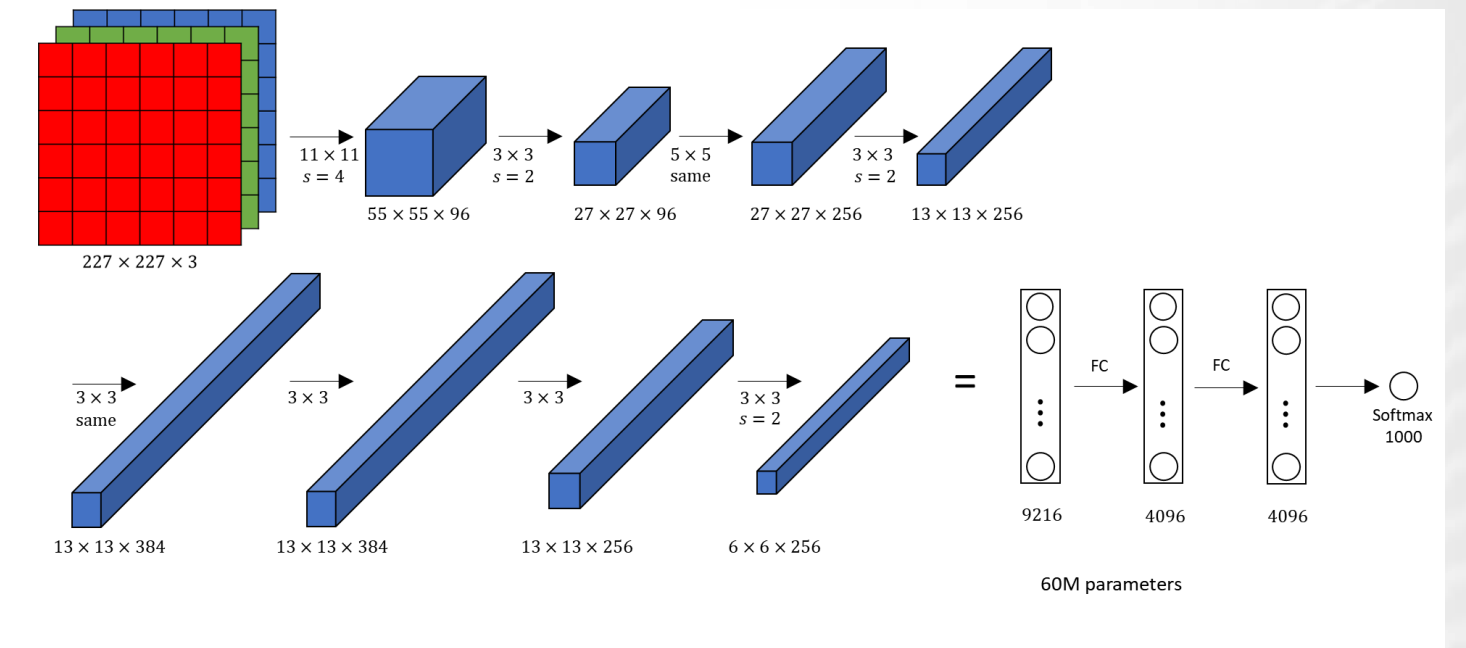
FROM LOG

TO FINAL PRODUCT



Deep Learning AI

AlexNet (2012) demonstrates huge gains over state-of-the-art



2012 GPU Brake Through – training and inference in smaller and cheap gaming GPU's possible

History of Artificial Intelligence in MiCROTEC Product

Advantages

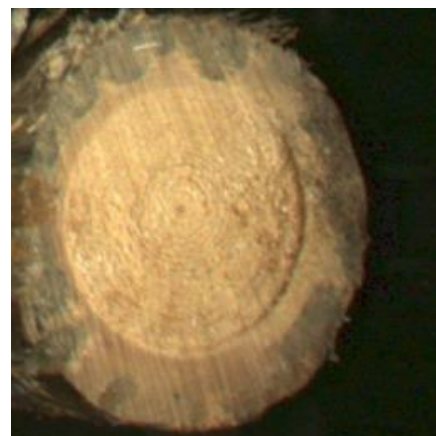
- 1999 – First use of Neural Networks for strength prediction of Boards
- 2012 – Break Through of Deep Learning with Affordable GPU Power and the Alex Net – First trials with detection of Objects like knots on boards
- 2015 – First Lumber scanner with Semantic Segmentation for wood characteristics inline
- 2017 – Lumber Scanner with up to 50 output classes in production
- 2018 – AI Detection on 3D objects in Logs from the CT-Log, like knots, wormhole, metal of bark
- 2018 – AI on Fruit classification
- 2021 – Full AI on Fruit defect detection
- 2023 – MiCROTEC AI Platform – System for Cross and Transfer Learning
- 2023 – 200+ Scanners with AI Defect detection in the field

Applied AI Technologies

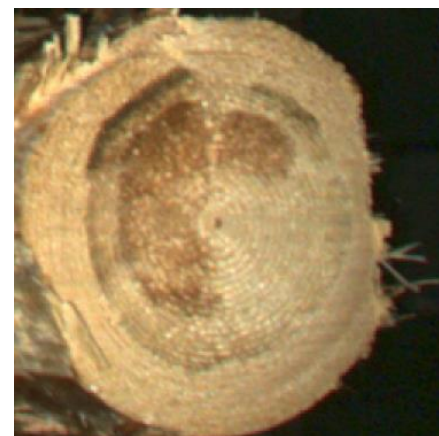
Defects detection with Semantic Segmentation

- Segmentation on color, scatter and 3D information (up to 15 Inputs in one Net)
- Neural Networks basic set for specific applications (more than 20 different basic nets)
- Performances refinement using real customer data

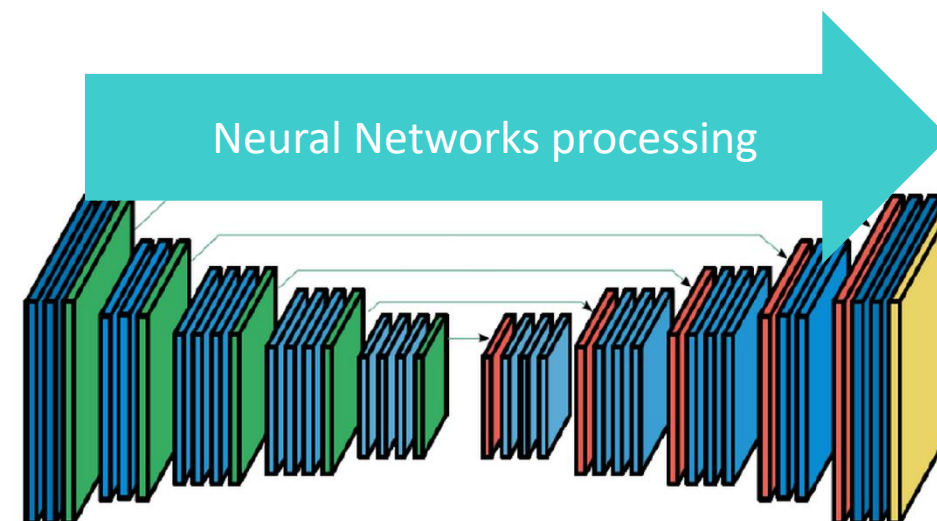
Input data



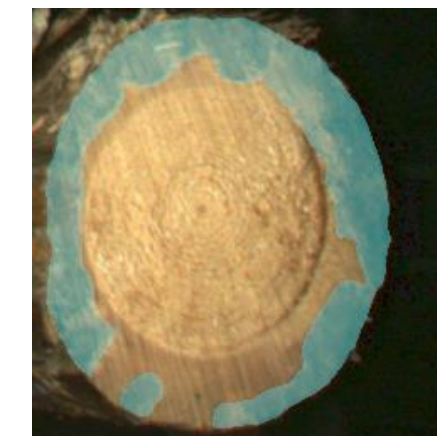
Example 1
Blue stain



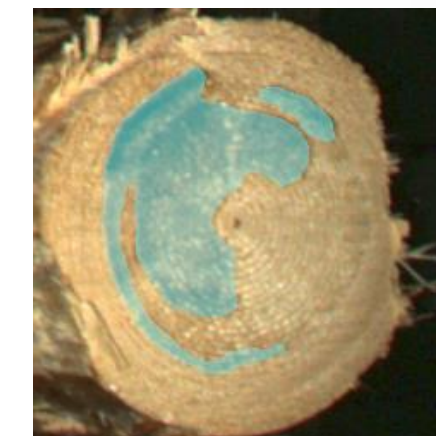
Example 2
Rotten area



Output data



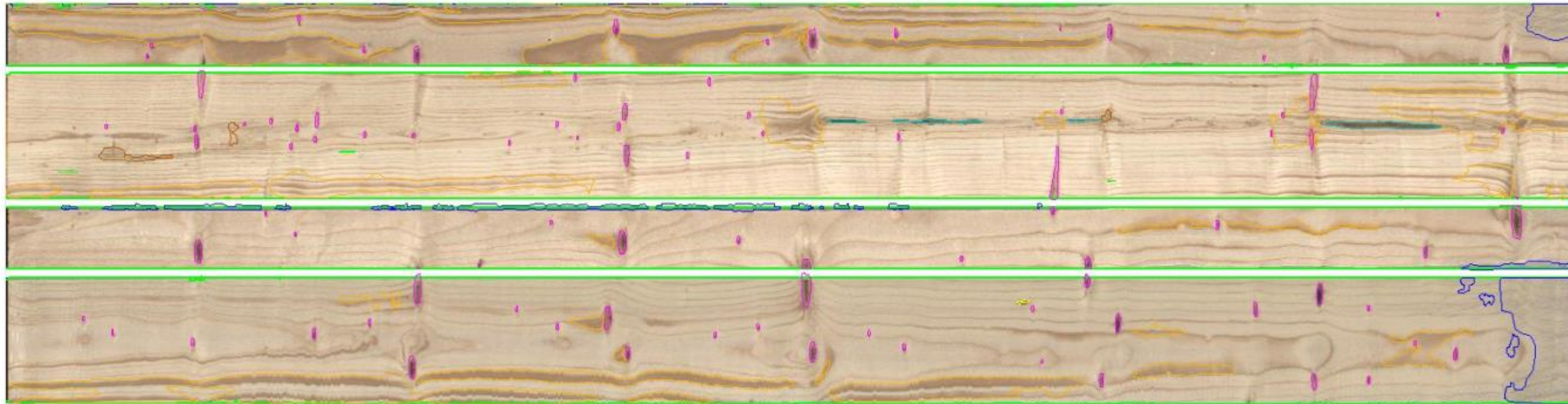
Detection 1
Percentage of blue



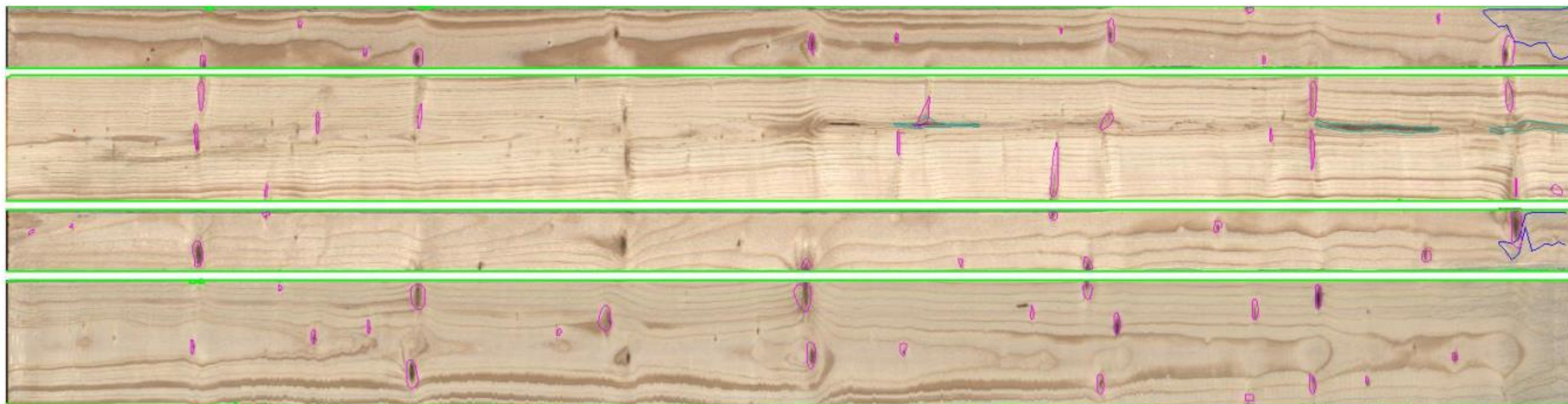
Detection 2
Percentage of rot

Defects detection with Semantic Segmentation

Board 2294 – AI:

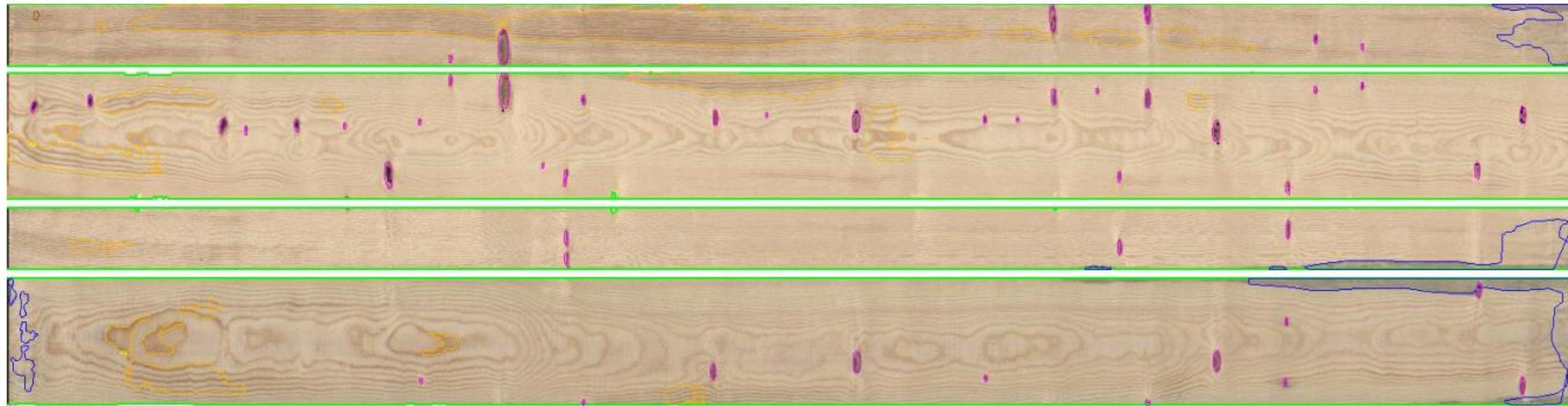


Board 2294 – Legacy:



Defects detection with Semantic Segmentation

Board 2291 – AI:



Board 2291 – Legacy:



Defects detection with Semantic Segmentation

Advantages for Customers

- From 50 to 80% less over detection of defects → Higher yield in output
- Close to eliminated under detection of defects → Higher quality assurance

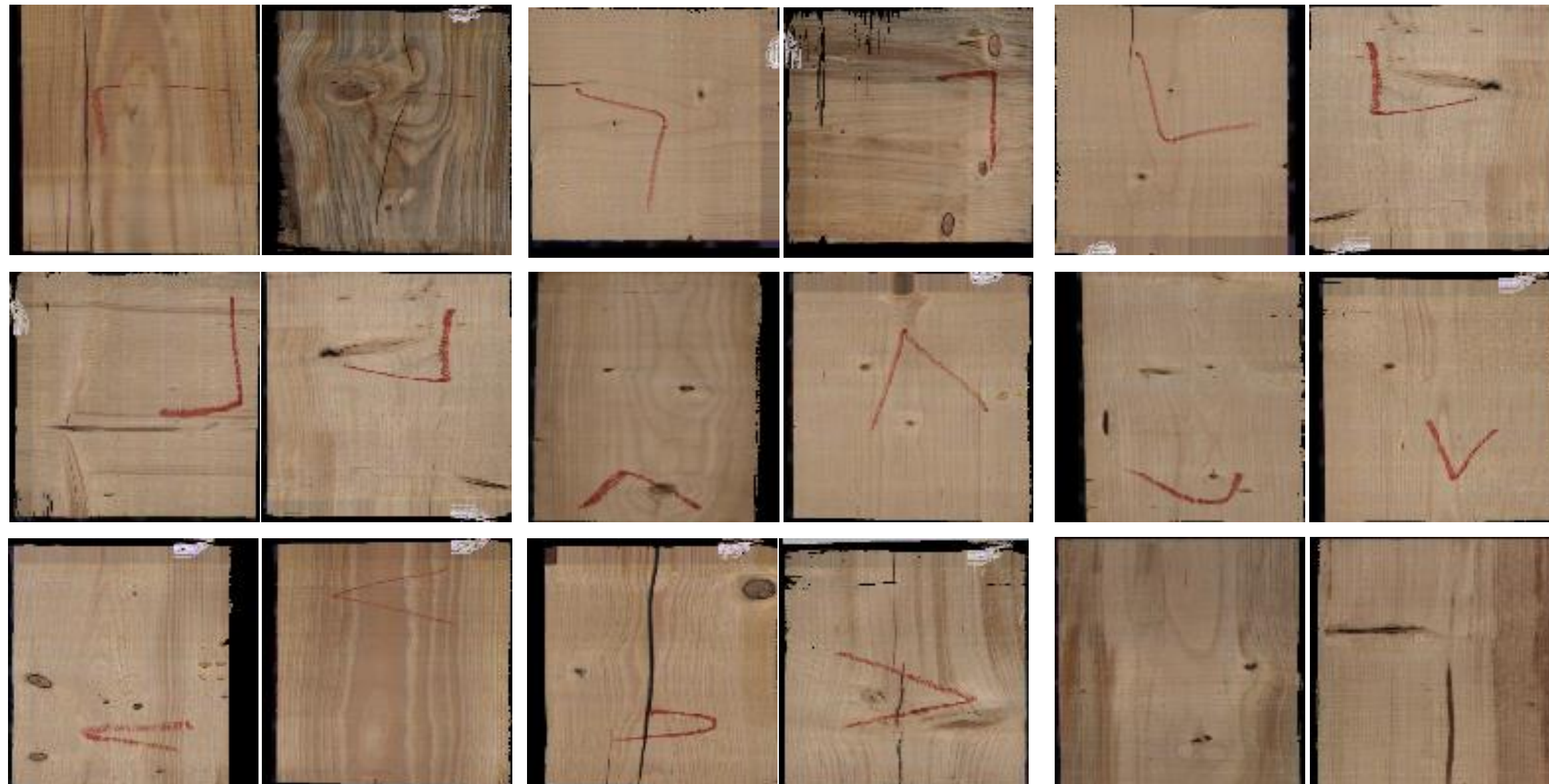
Advantages on the Product

- Reductions of sensors needed to guarantee performance, X-Ray is not needed on specific applications

General Classification of Images

Marker detection and classification

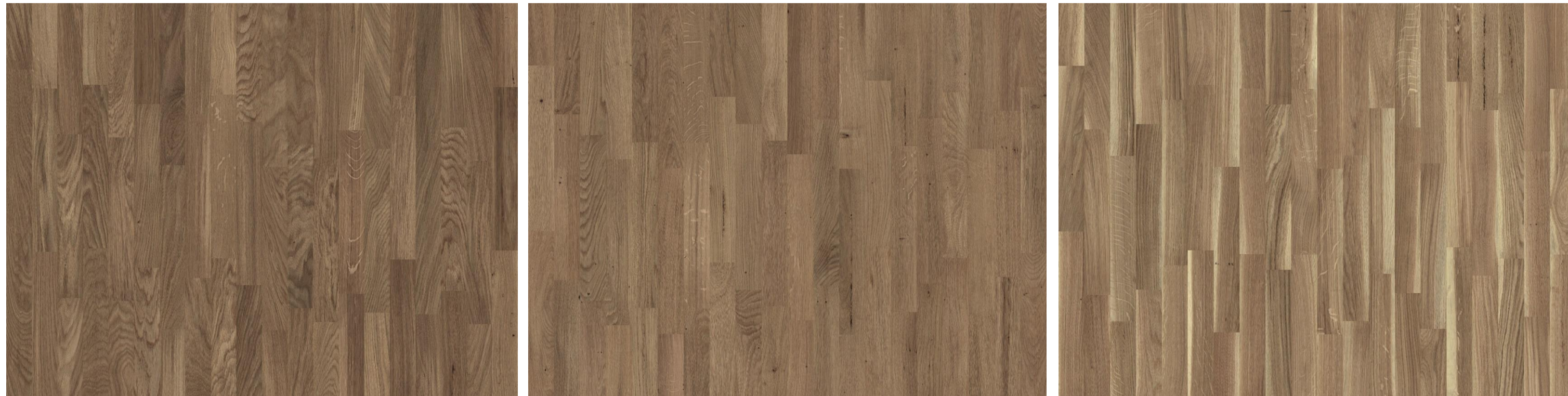
- Hand-drawn marker detection to infer manual grade accuracy on test set: 99.95+%
- Customer can train by it self



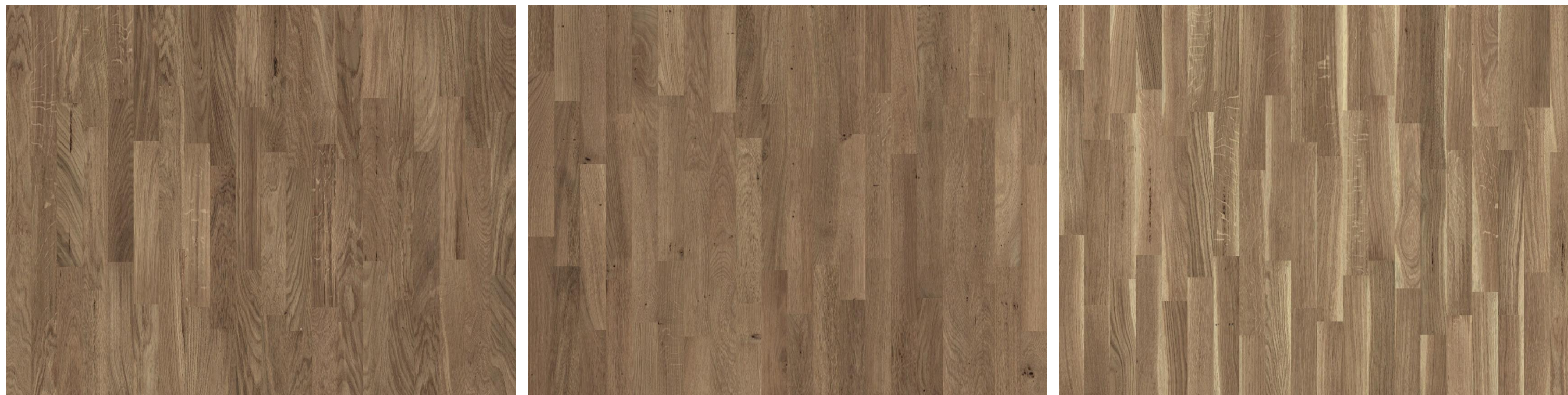
Defects detection with Semantic Segmentation

Aesthetic sorting in flooring products

Manually
sorted:

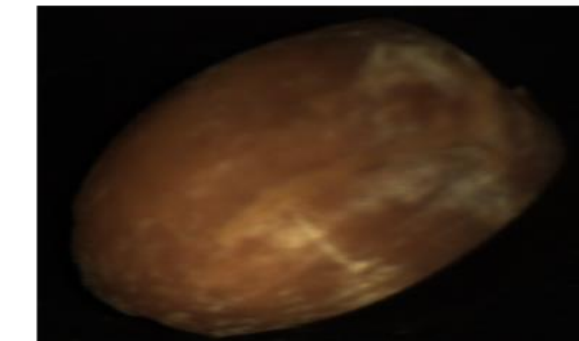
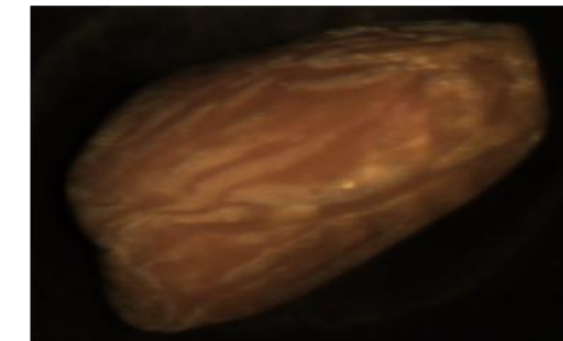
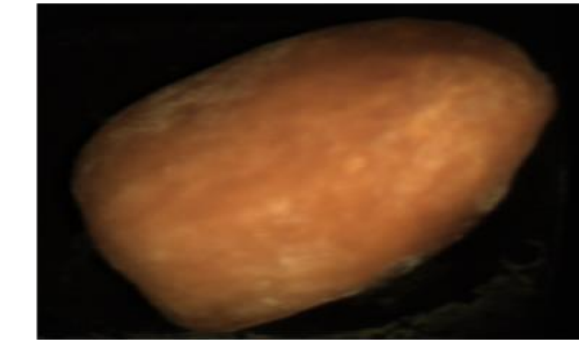
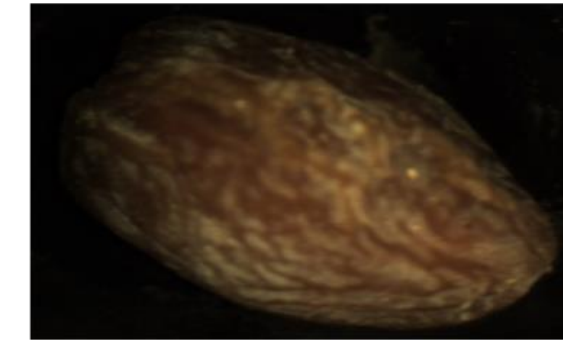
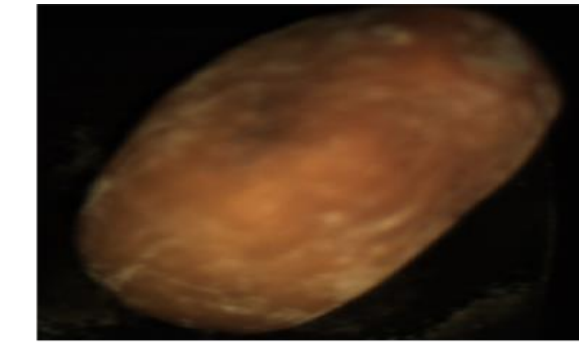
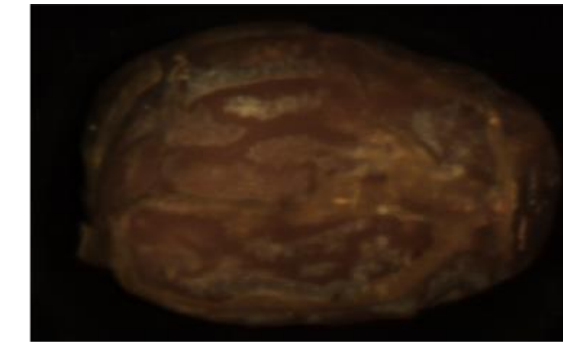


AI sorted:



DATES SCANNING

Detection through single or multiple views and classification into 3 status classes based on the appearance of the date



Dry

Ripe

Wet

Classification Applications

Advantages for Customers

- High accuracy above 99,9%
- Customer can refine the classification by it self

Advantages on the Product

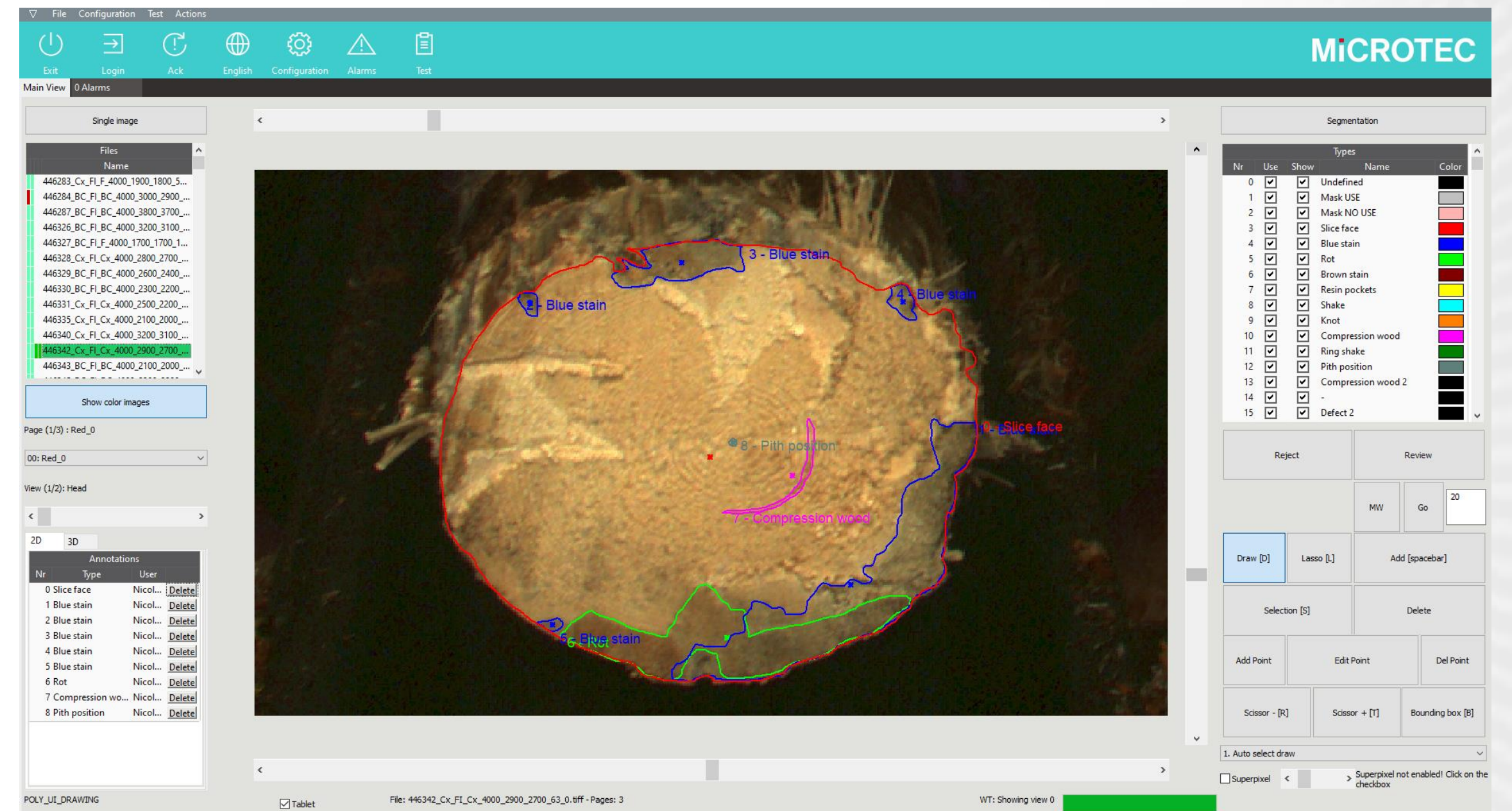
- No Computer Vision programming needed
- System controls probability distribution by it self and calls for a retraining when deviating from preset certainty levels

Challenges in Organization

Labeling

- Deep Learning AI is Data Intensive
- ~50 Man-years lumber/log labelling and rising
- 280TB of labelled data by 2023
- 100's of thousands of labeled board/log faces

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AI Lead to change our organization

- Need for wood science specialists to create Database for Training Nets
- Wood Specialists verifying the performance of the trained Nets
- Change in organization and preparation of Scanner installation
- Continuous feedback from the startup needed to improve the nets
- → All this and more **leads to changing the Delivery Process** of a Scanners

Global Network of Innovation

AI Team Worldwide:

15 ML Engineers and Data Scientists

24 Wood Science specialists



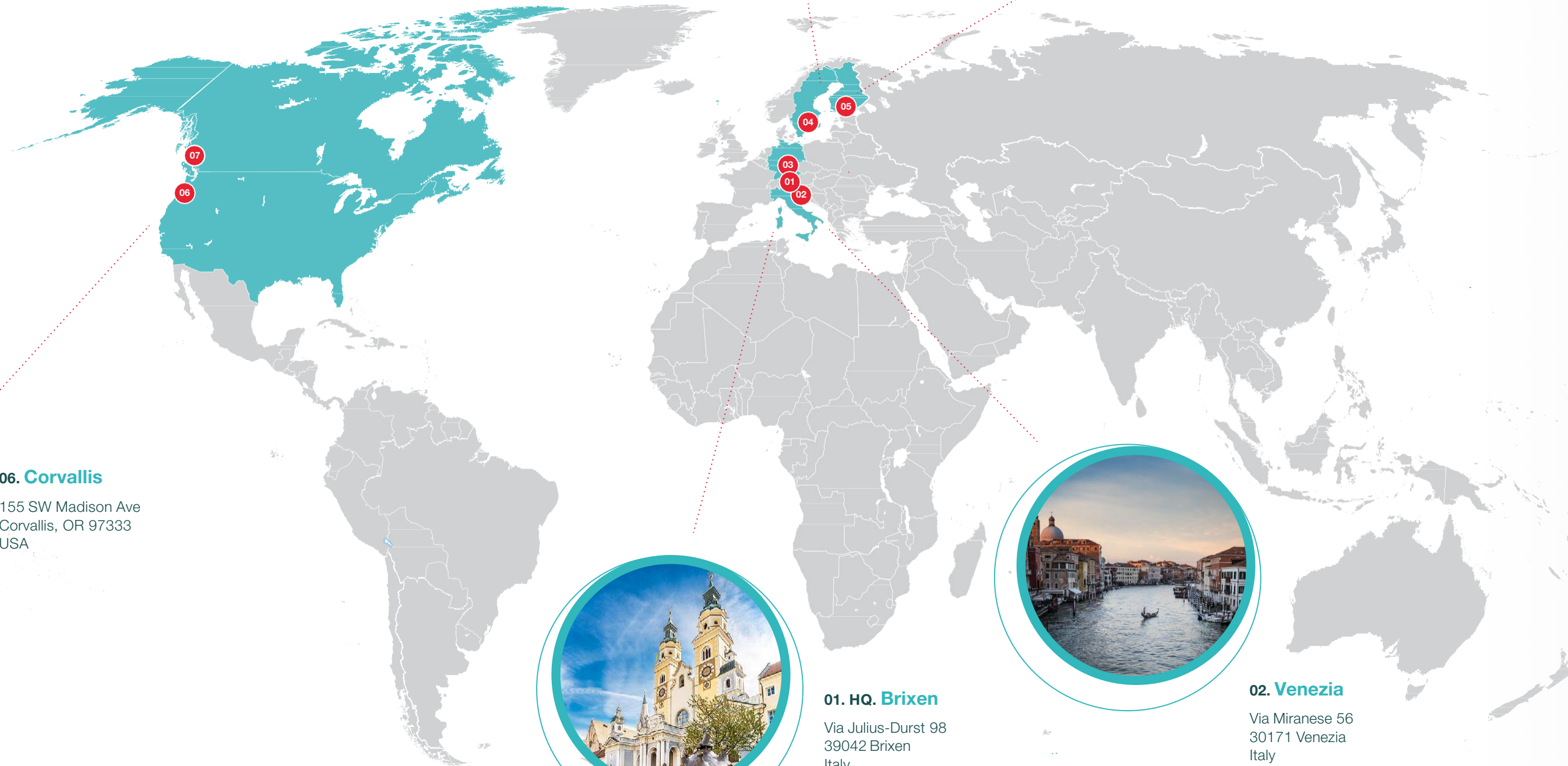
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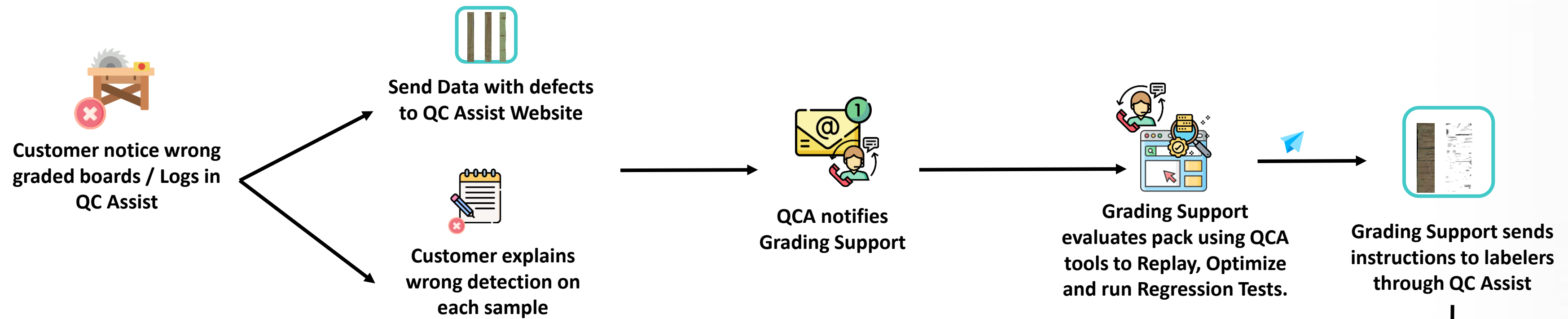
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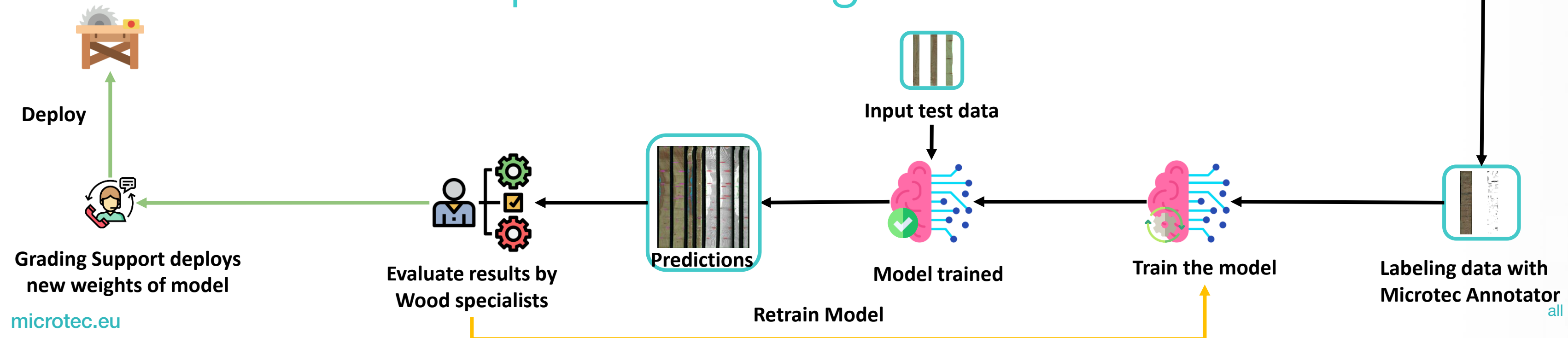
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QC Assist Website



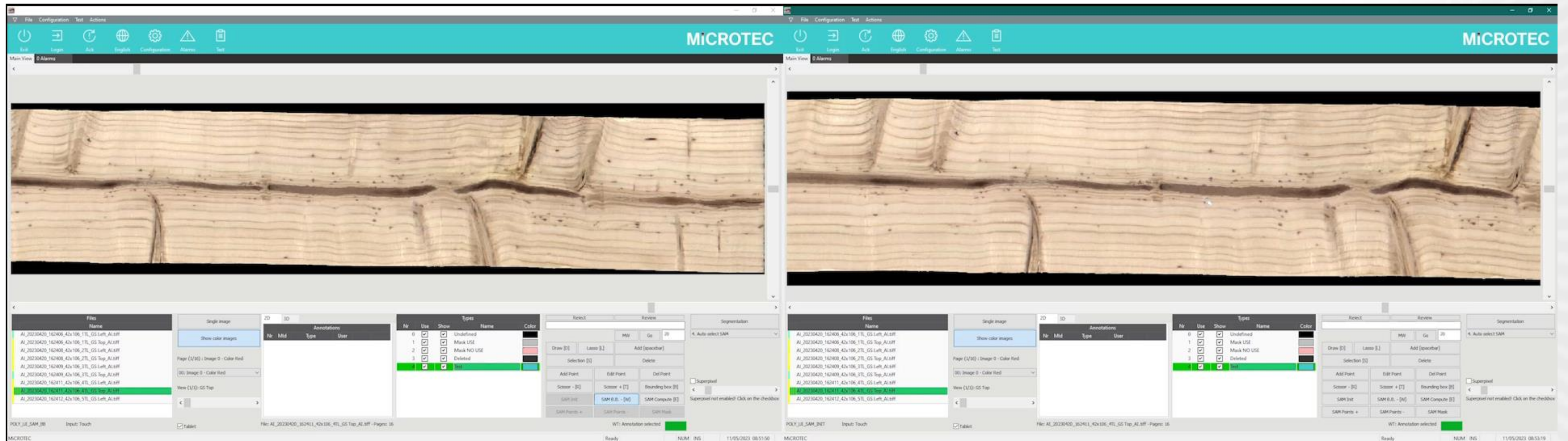
Daphne Training Framework



AI Supported Processes

AI Supported Labelling

SAM (Segment Anything Model) from Meta AI, published March 2023, integrated in April 2023 in MiCROTEC Annotator.



Reduced the annotation time by a factor of 3 including increase of accuracy!

AI Supported Processes

Cross Training for automatic labelling and unsupervised learning

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This technology improved the Cross Learning Platform, one Scanner trains the other.

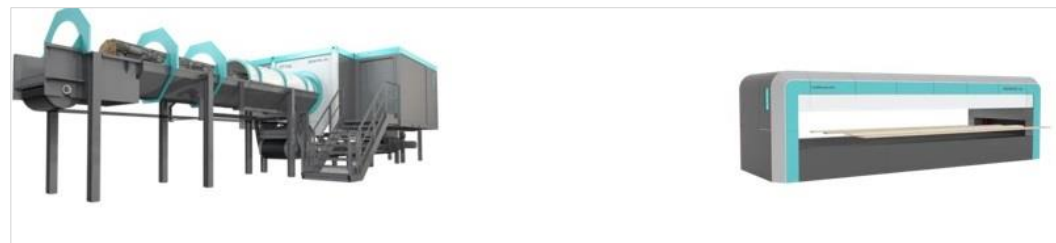
Synthetic Data cGAN will simulate the images of the scanner to be trained

CT.LOG to Logeye 302



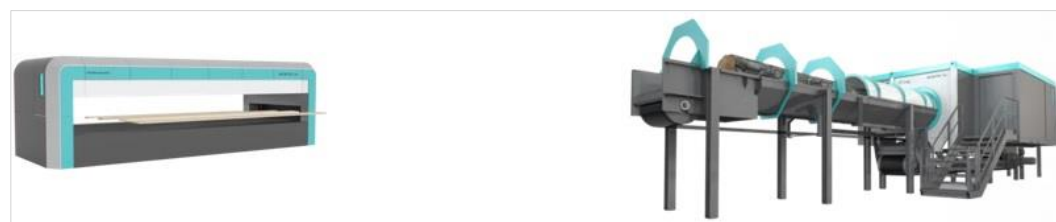
Bark thickness estimation

CT.LOG to Goldeneye 900

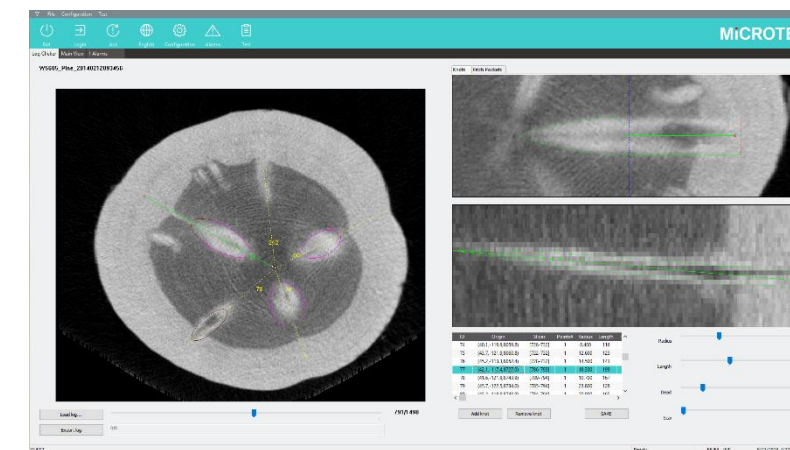
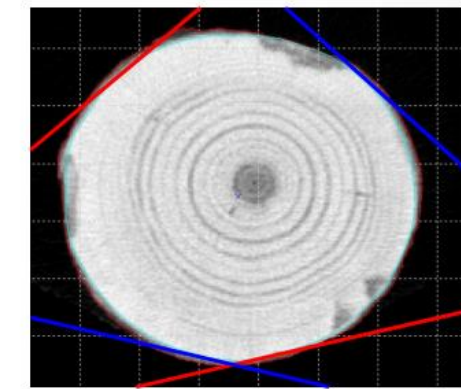
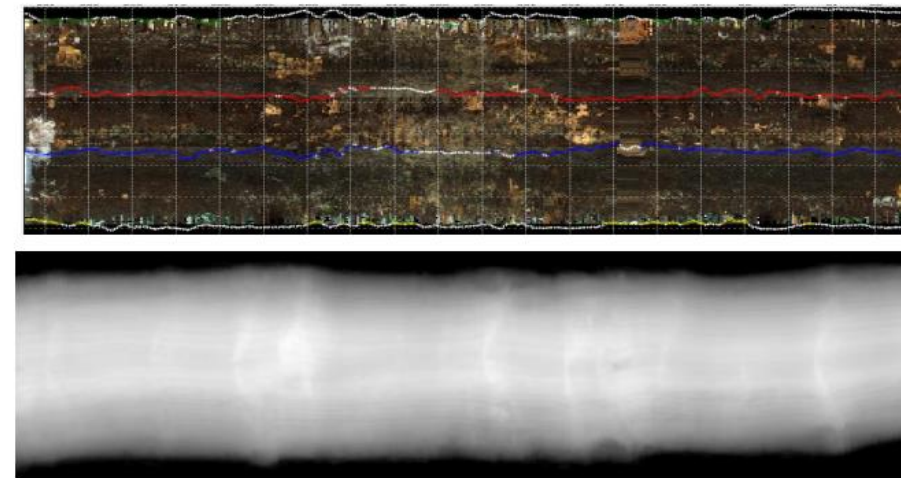


Heartwood / Sapwood Separation

Goldeneye 900 to CT.LOG



Knot Classification
Dead / Soundknot





Thank you

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