



Tobias Hagl

Sales Manager



Why AI means the end of **optical quality inspection processes that are difficult to automate**



AI.SEE™
Software

ML Professional
Services

Integration in
Production

System-
integration



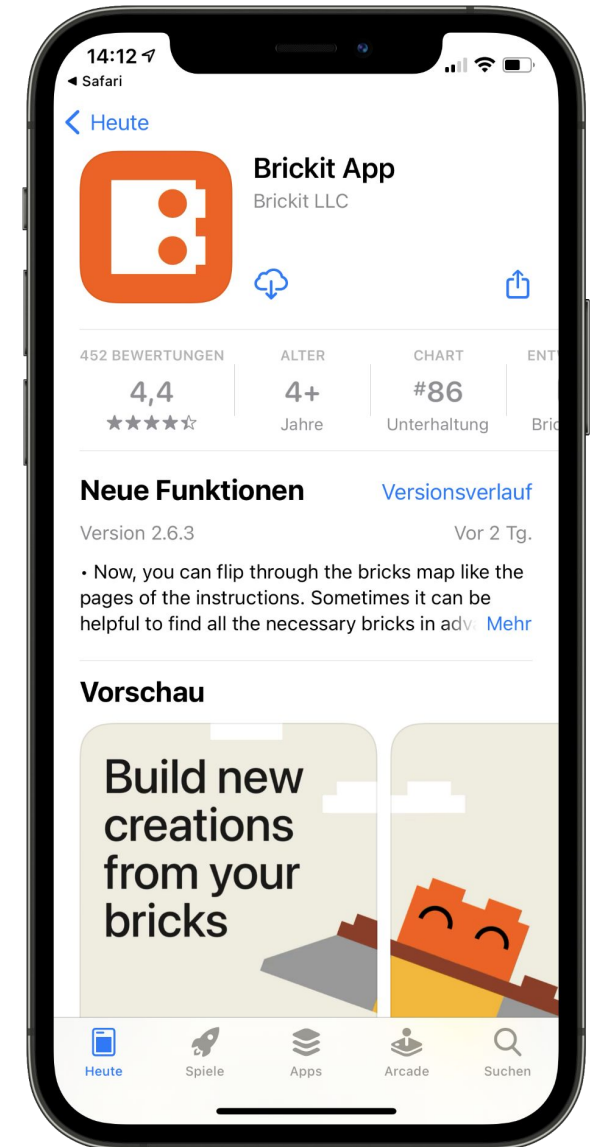
Optical
ML-Inspection
solution

AI-Model-
development &
solution

Camera,
lightning &
Infrastruktur

QMS, MES, ...

Contact with
artificial intelligence?





Google Maps



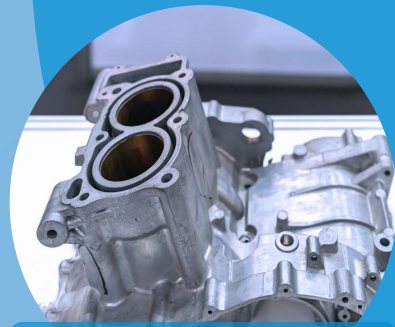


Maturity level assessment

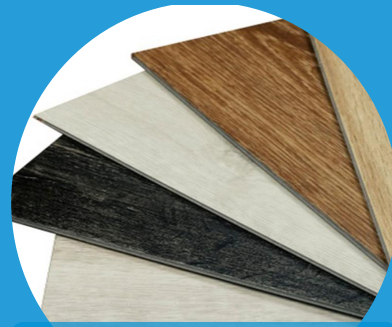


Why is it still checked **manually**?

Computer-Vision limitations:



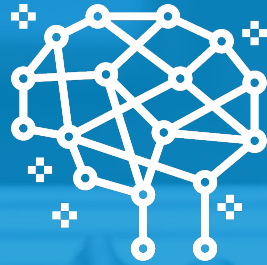
Automotive



Laminate



Solar

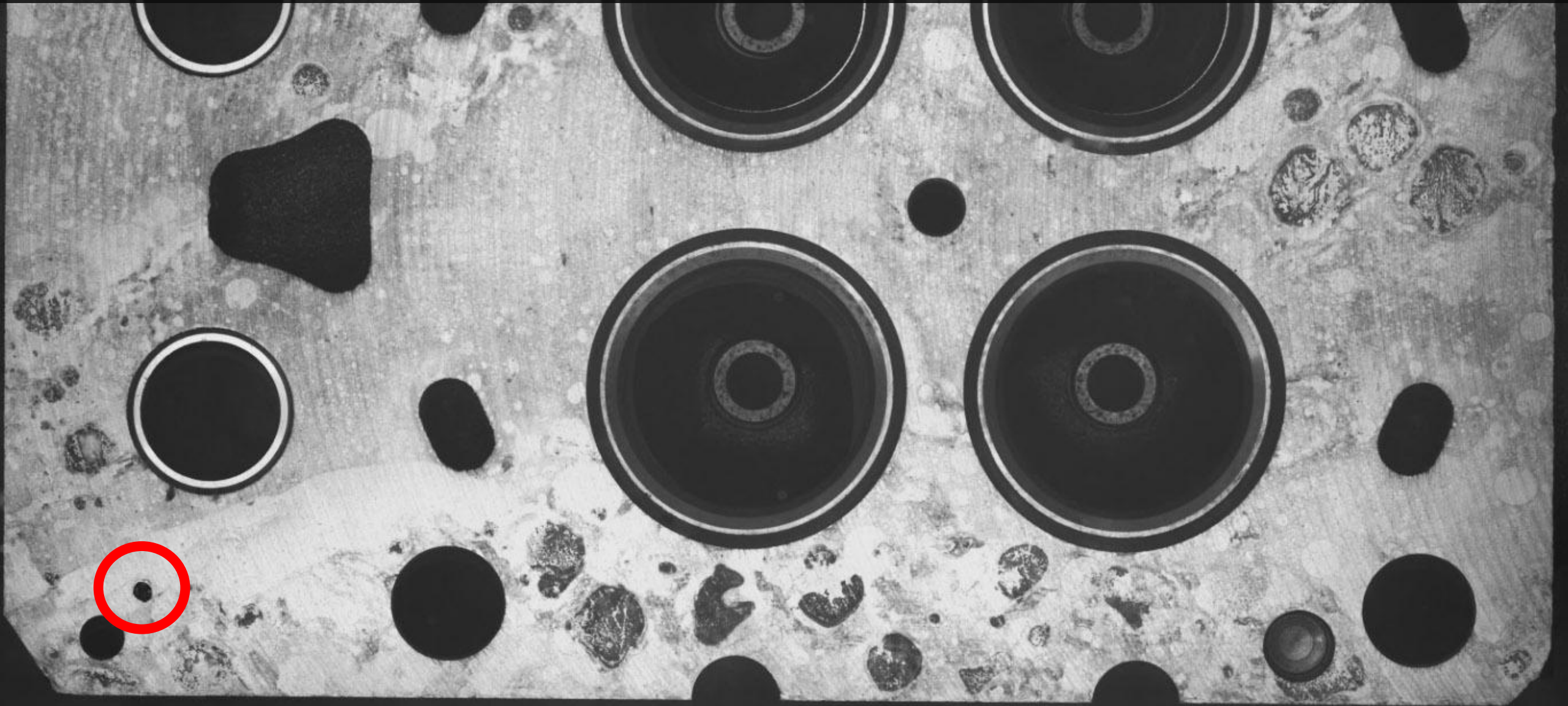


Computer-Vision limitations
Automotive industry



Computer-Vision

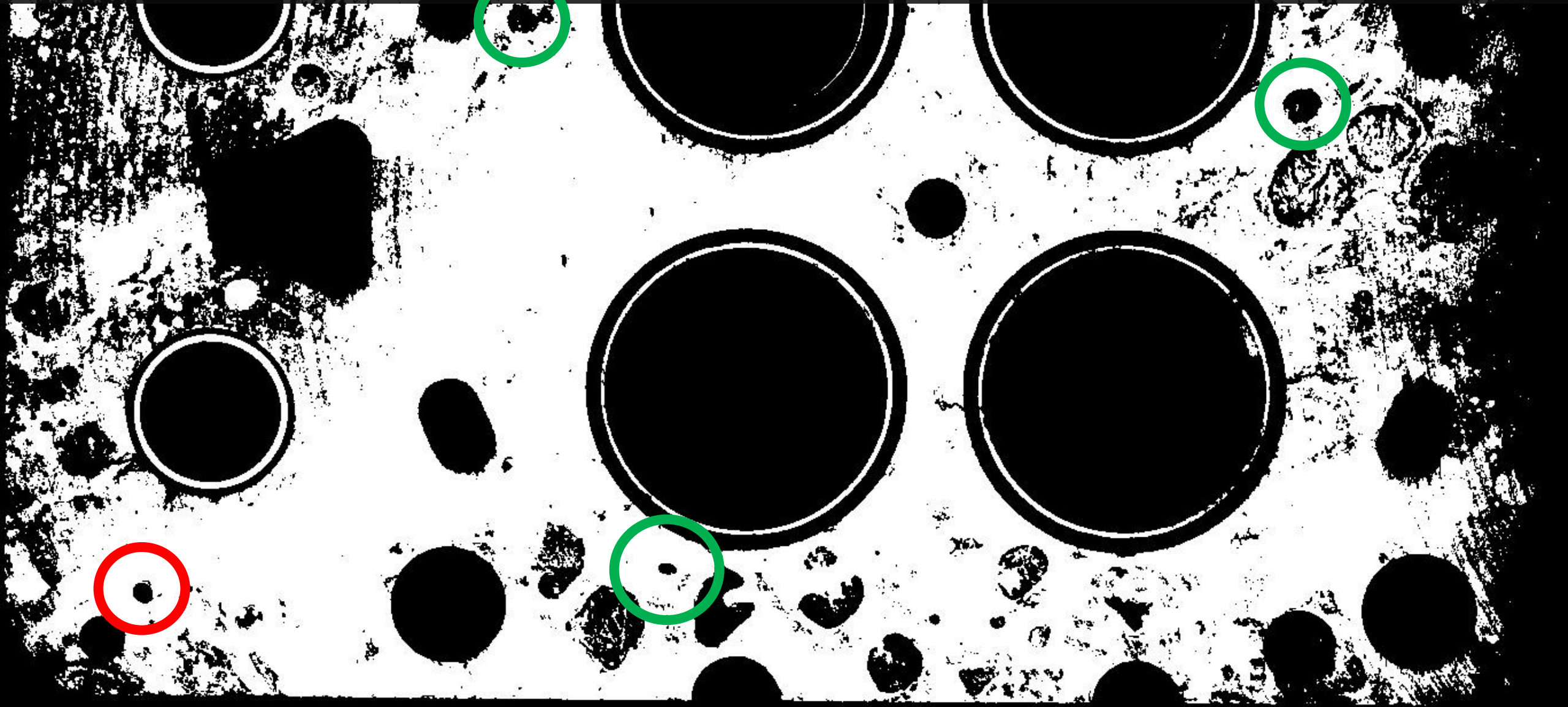
Threshold calculation





Computer-Vision

Threshold calculation





Computer-Vision limitations **Laminate industry**



Computer-Vision

practical limitations

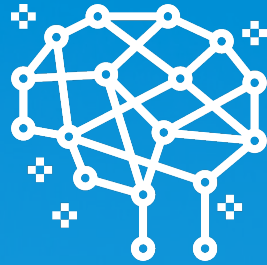




Computer-Vision

practical limitations





Computer-Vision limitations
Solar industry



Computer-Vision

practical limitations





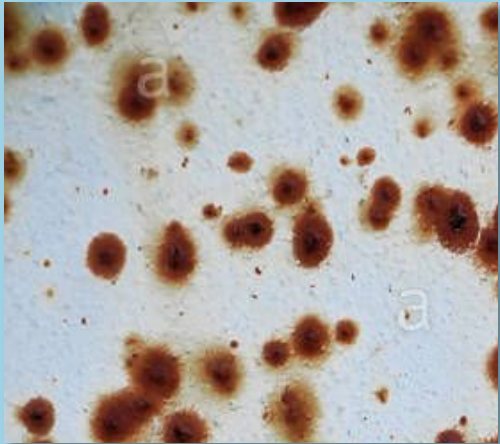
Computer vision systems
work rule-based



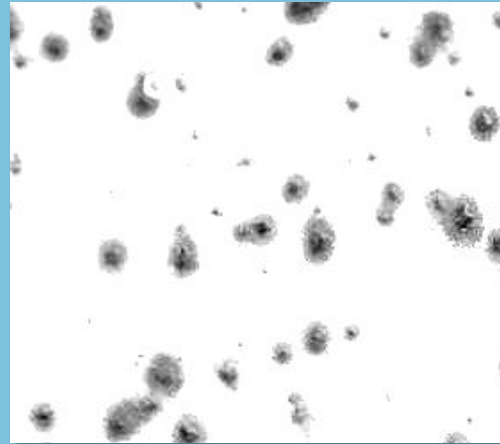
Computer-Vision

Algorithmik Example process

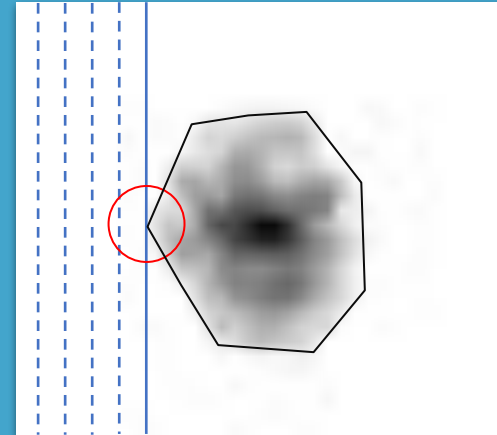
Original image



pre-processing



Edge detection



Domain specific decisions

1. Find edges and circle
2. Calculate surface of circle
3. If the surface is $> 1\text{cm}^2 = \text{Error}$



Computer-Vision

Threshold calculation





What is changing through
artificial intelligence?

How does deep learning work?

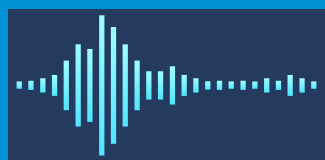
Input
layer

Hidden
layer 1

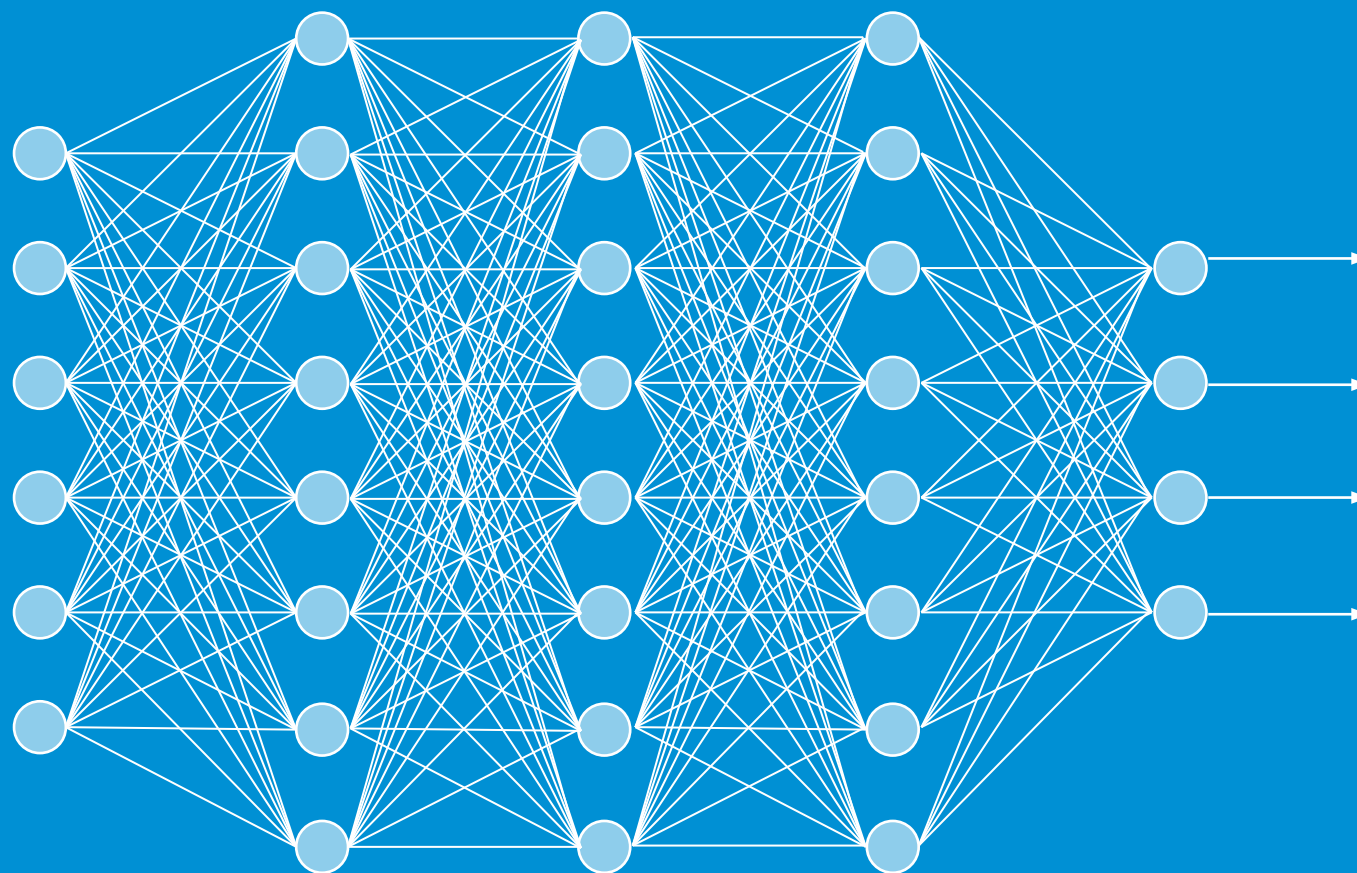
Hidden
layer 2

Hidden
layer 3

Output
layer



Typing!



Class "Cat"

Class "Dog"

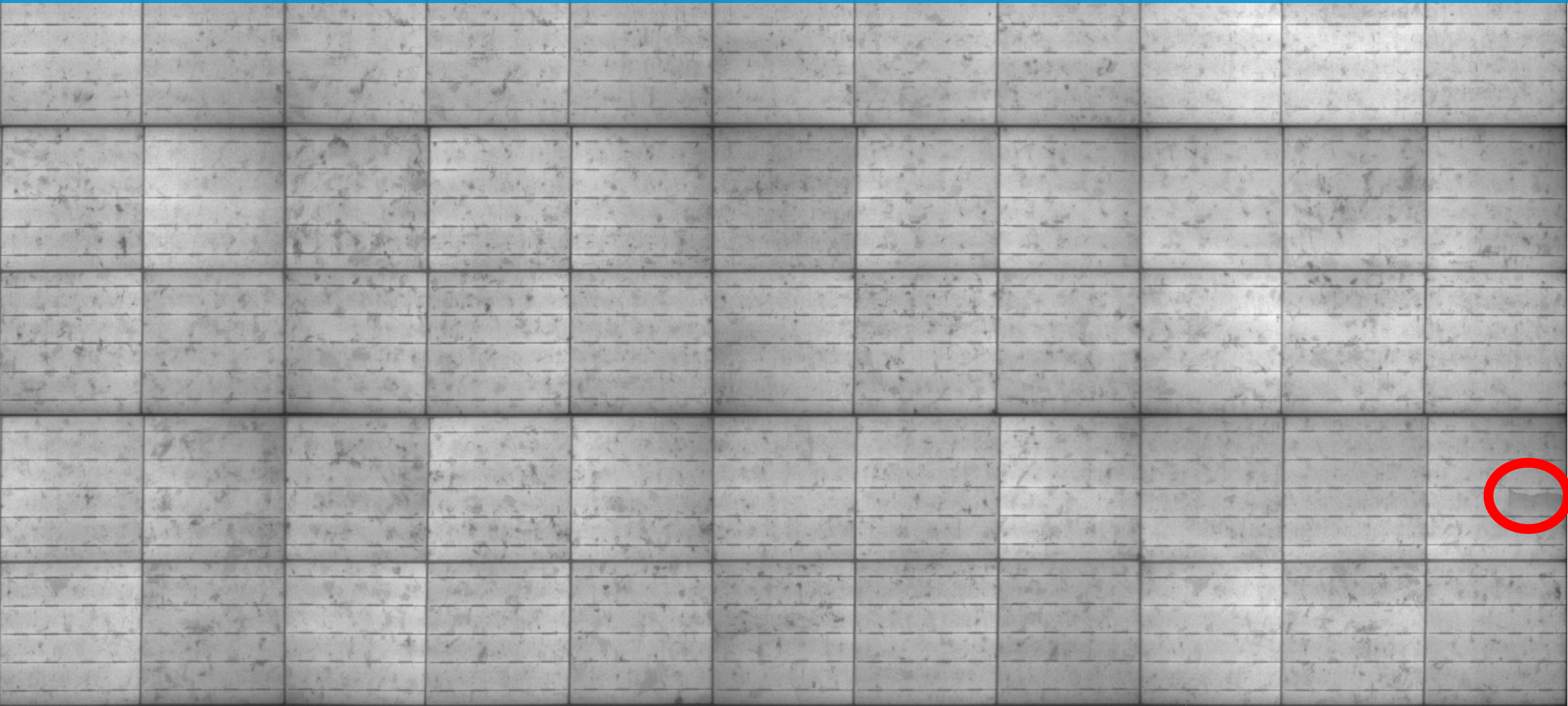
Play sound





Deep Learning

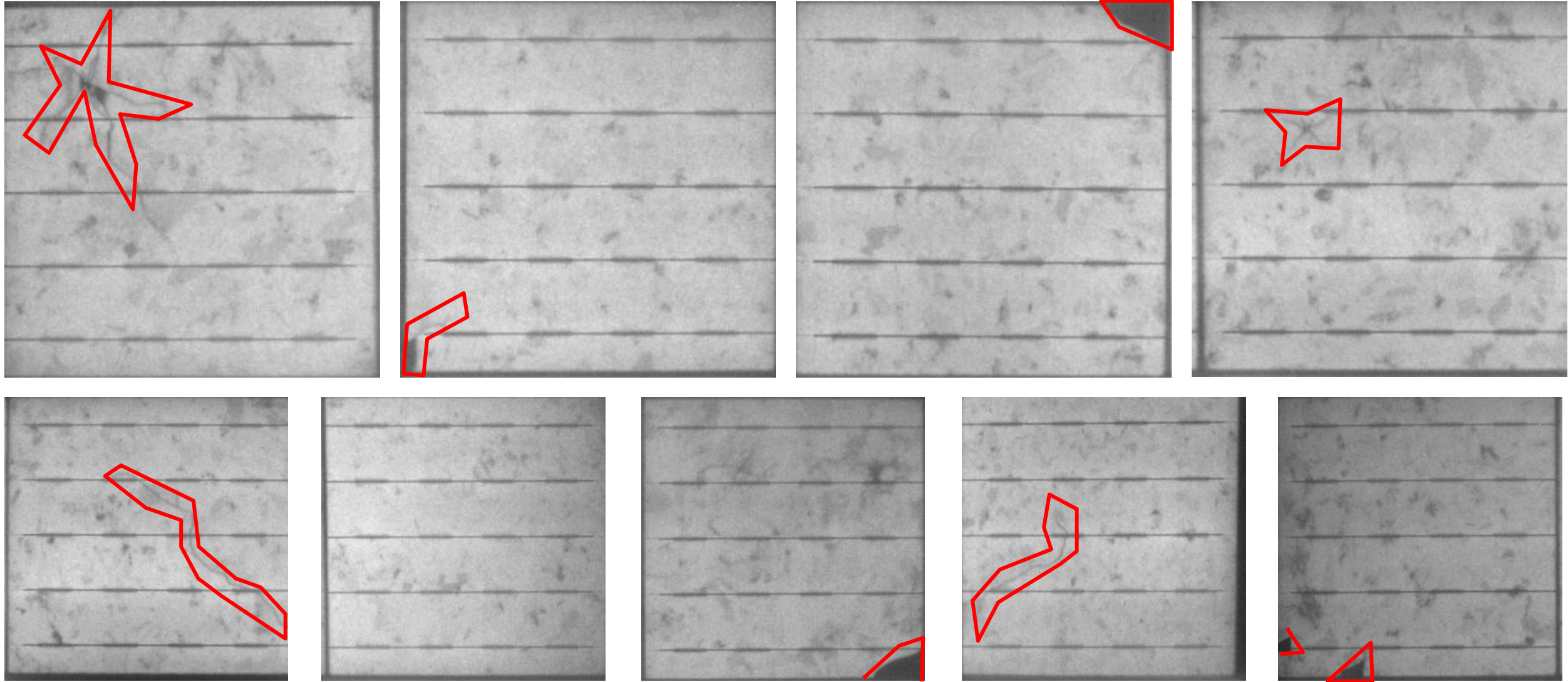
for solar cell inspection





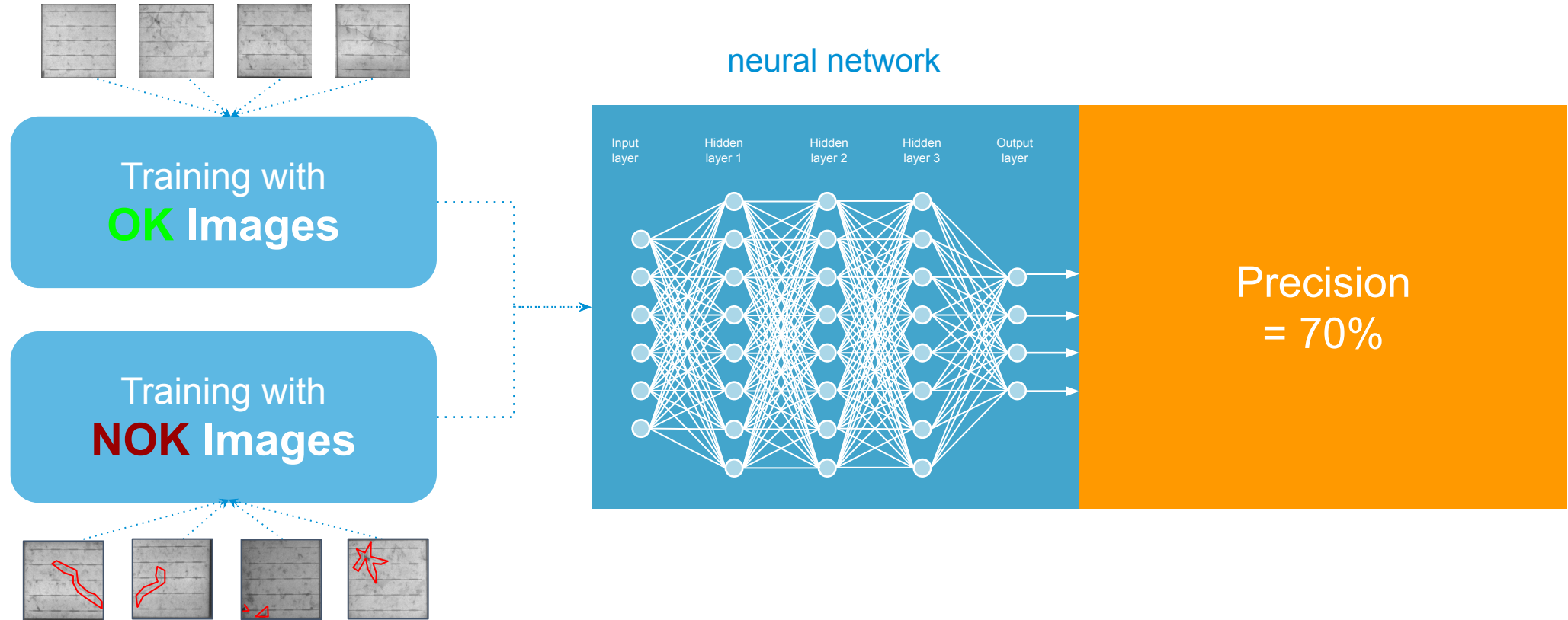
Deep Learning

training based on images of defects



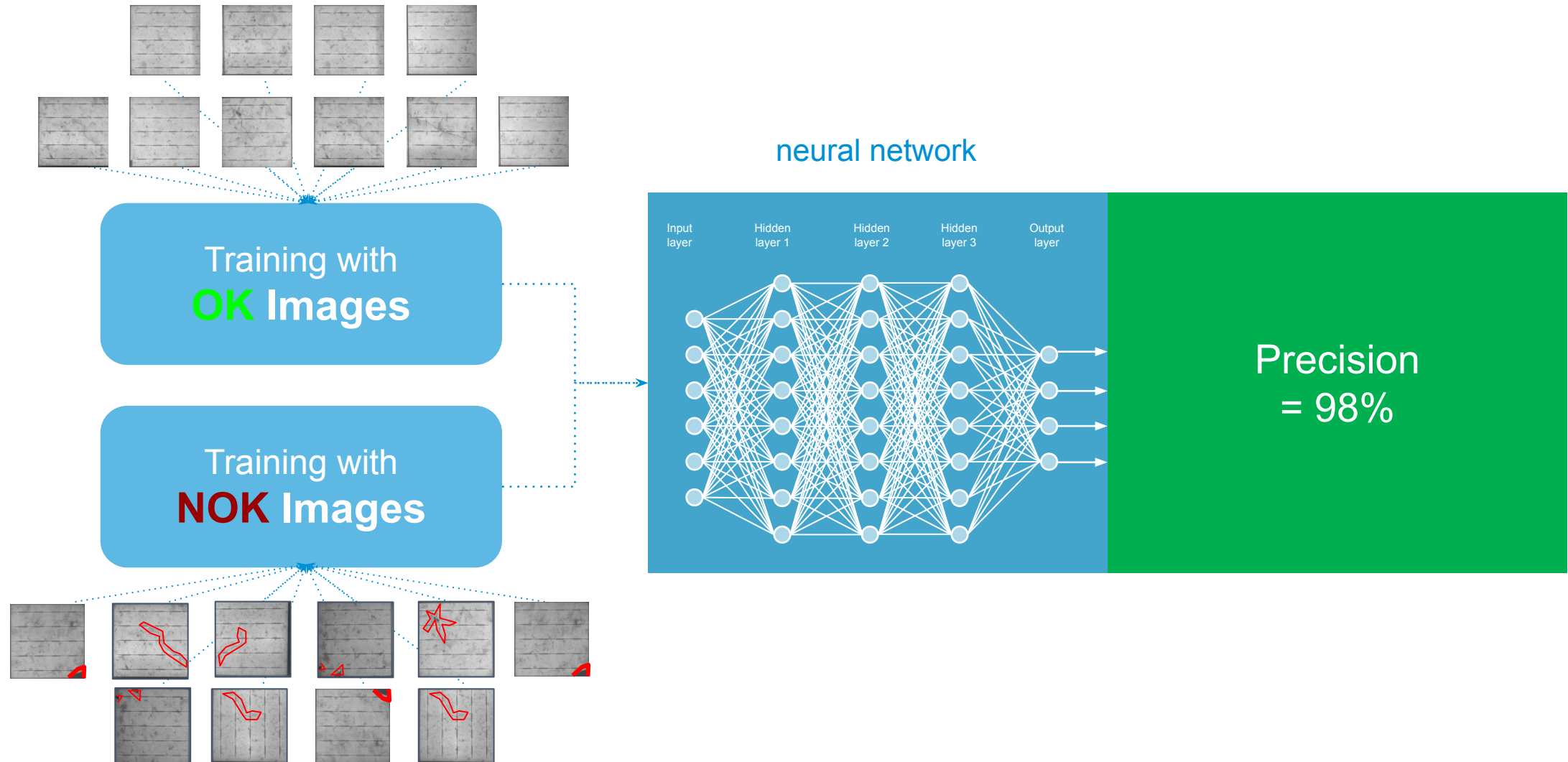


Model Training for solar cell inspection





Model Training for solar cell inspection



Augmentation of training images

Original



horiz. flipped



v+h flipped



Perspective distorted



Brightness + contrast



Blur



Cropping



Augmentation with annotations

Original



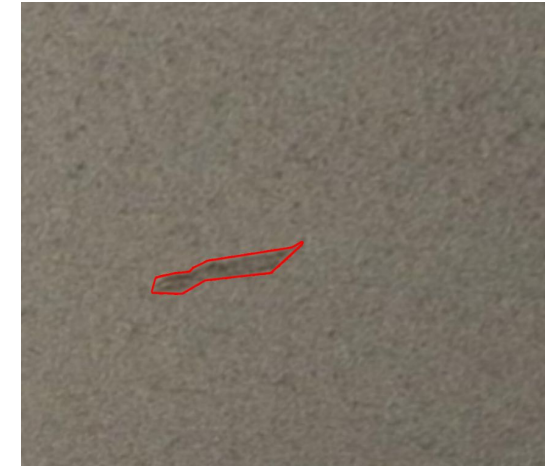
horiz. flipped



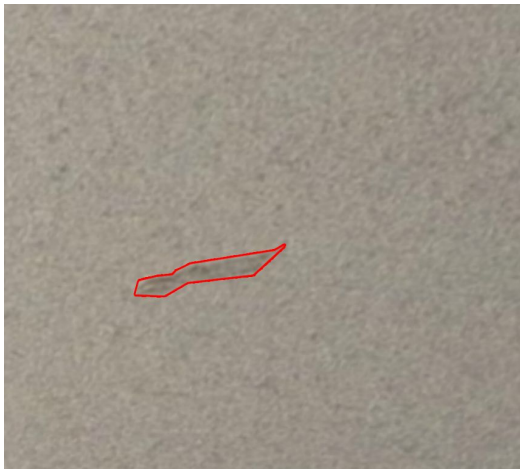
v+h flipped



Perspective distorted



Brightness + contrast



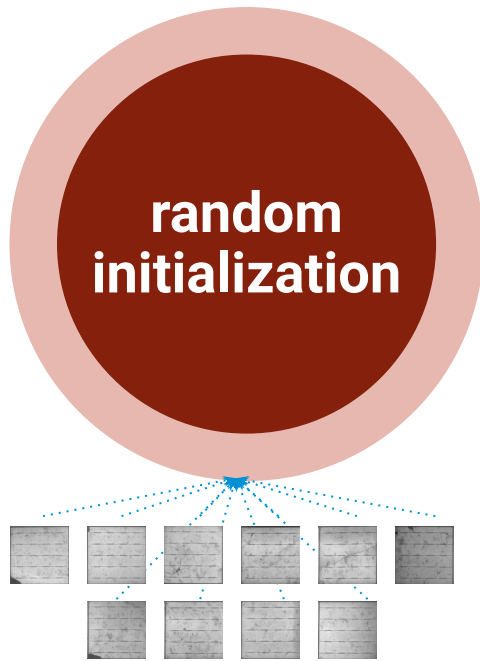
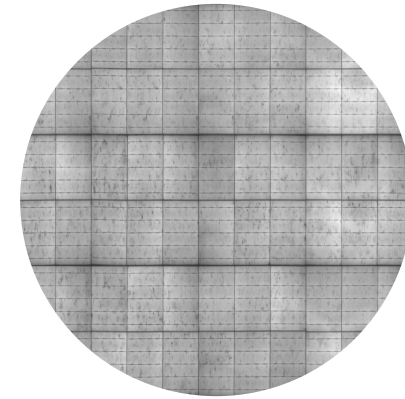
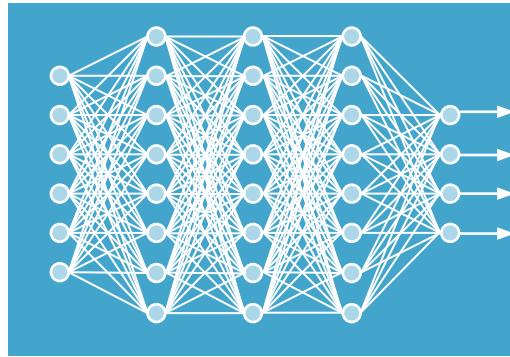
Blur



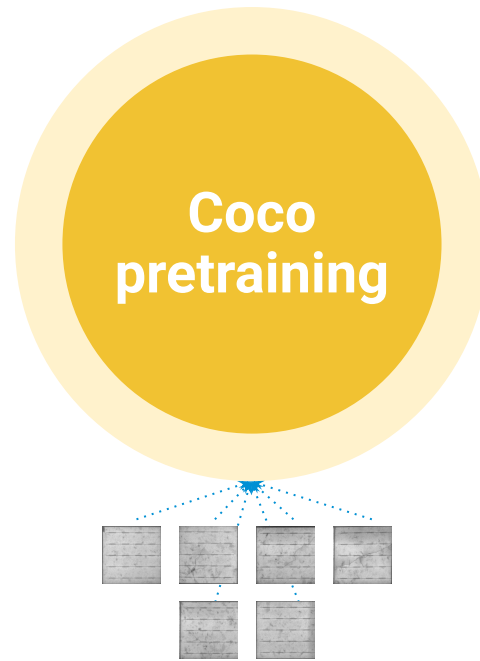
Cropping



Use less data with pre-trained models

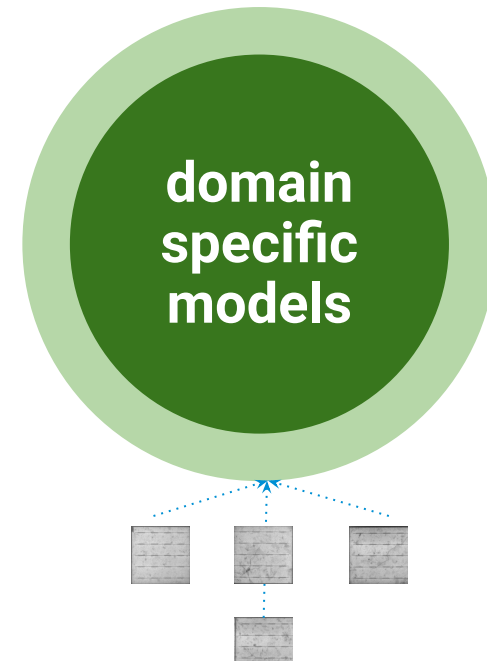


330.000 defect images



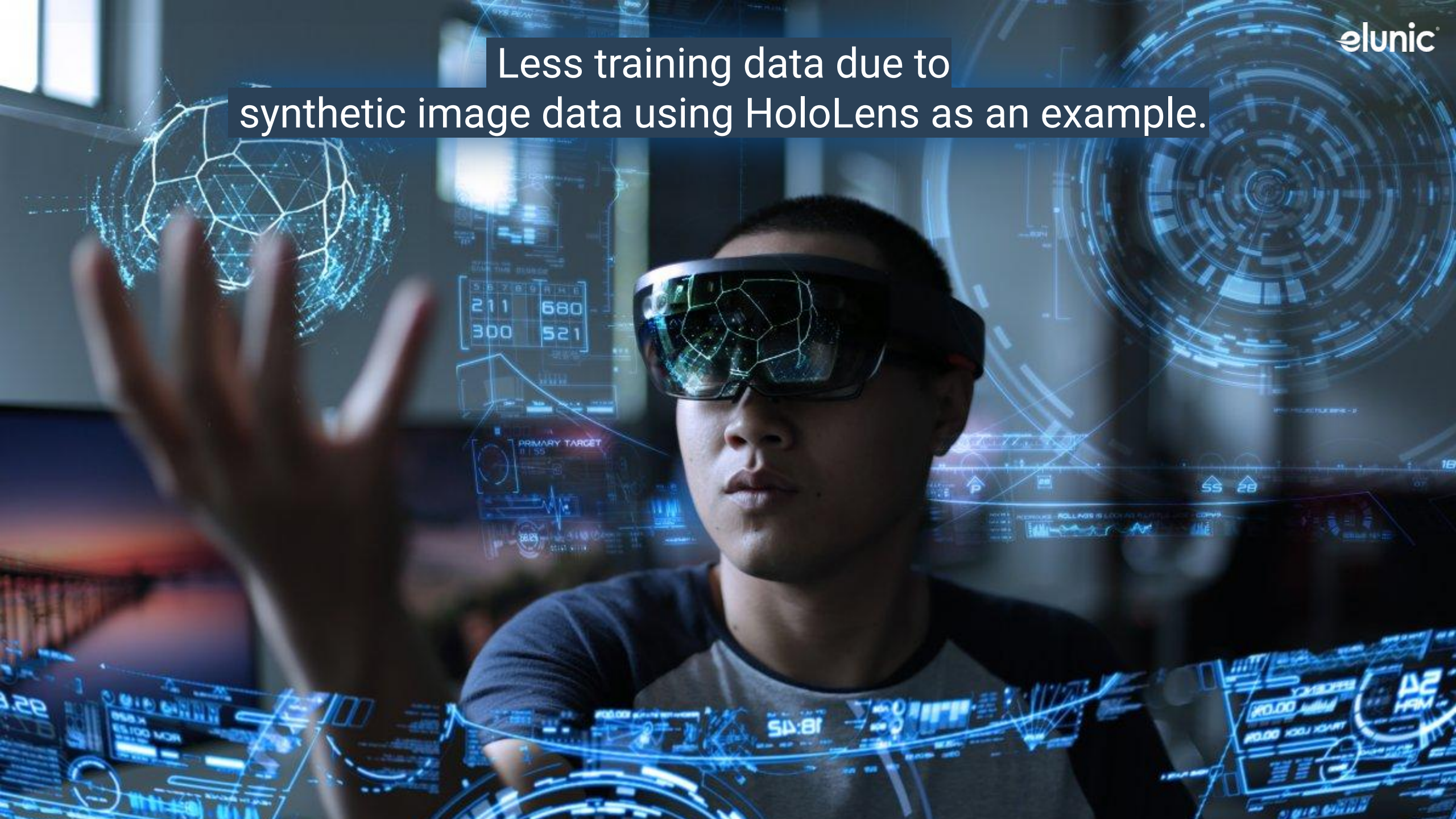
7.500 defect images

<https://cocodataset.org>



1.000 defect images

Less training data due to synthetic image data using HoloLens as an example.



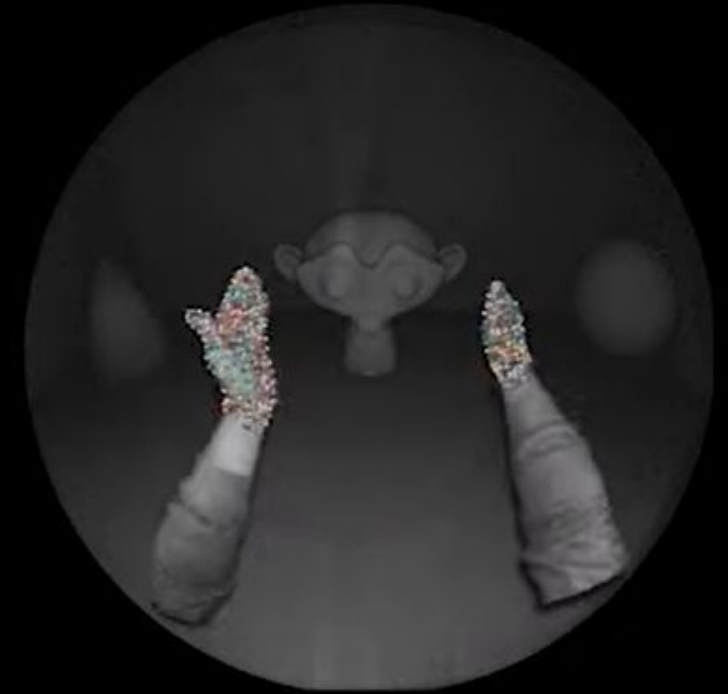
Synthetic image data using the example of HoloLens



Visible light

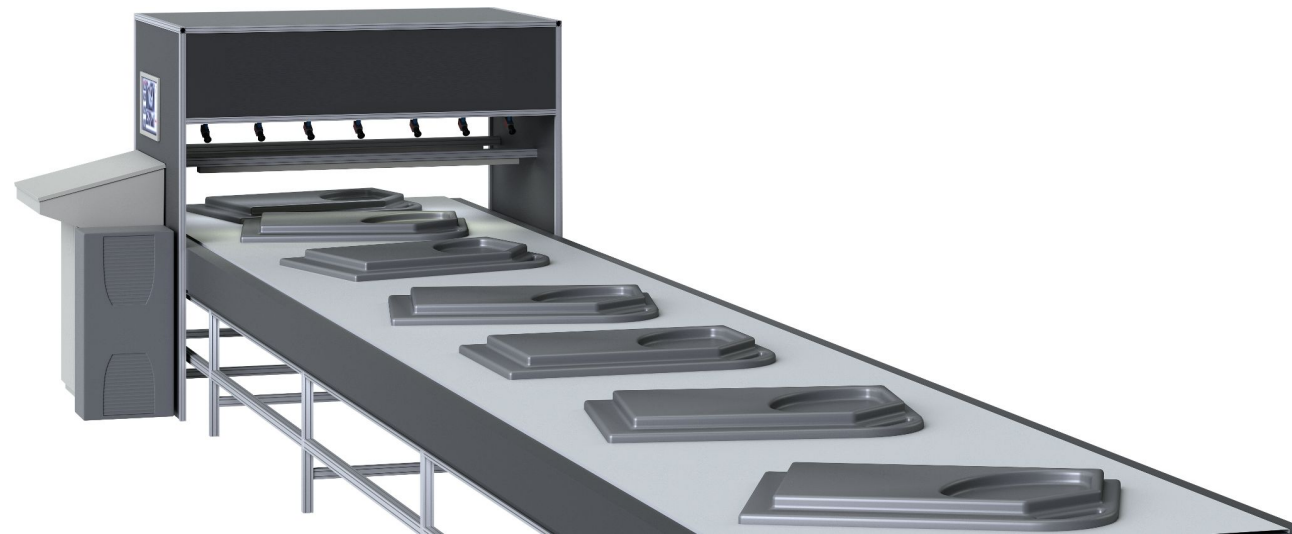


Depth camera (IR)



Synthetic labels

Challenges of automatic inspection
Game Changer Deep Learning?





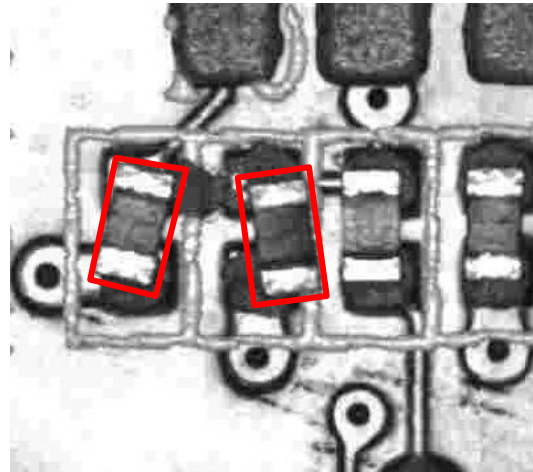
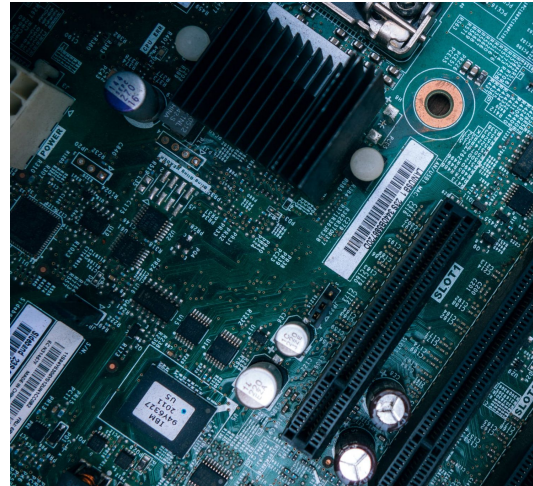
Practical example

for optical quality inspection processes with K. I.

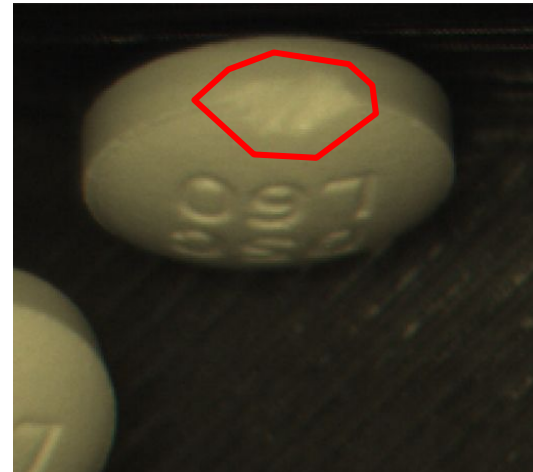
Casting production



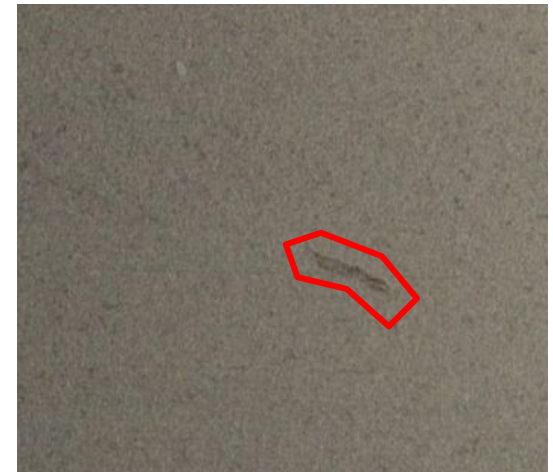
PCB



Pharma



Automotive

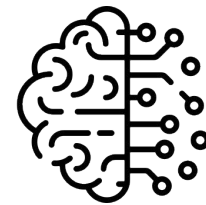


A large graphic consisting of two concentric circles. The inner circle is a solid, vibrant blue, and the outer circle is a lighter, semi-transparent blue, creating a layered effect. The text is centered within the inner circle.

Check your components with
AI now!



Many thanks for
your attention!





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