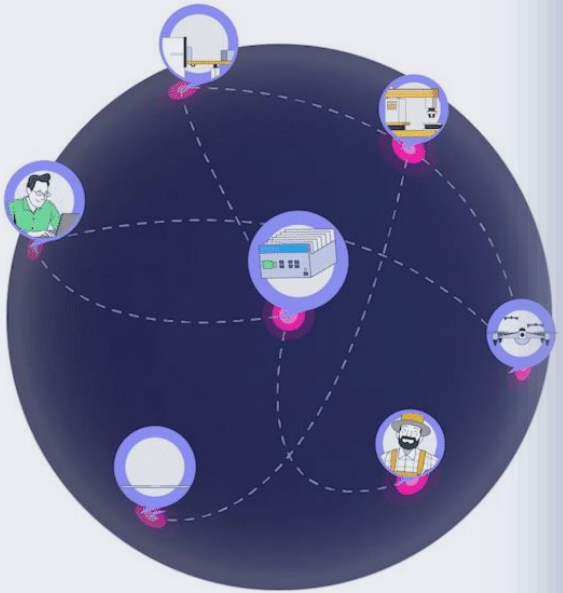
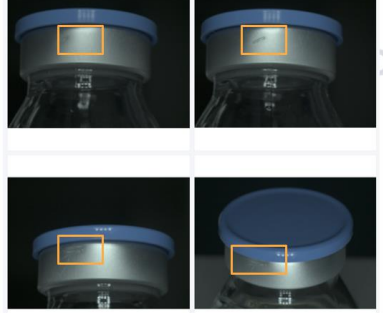
How Dynamic Vision will revolutionise the Pharma industry

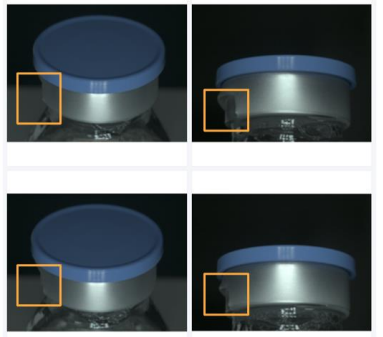


Jonathan Berte - *Founder*

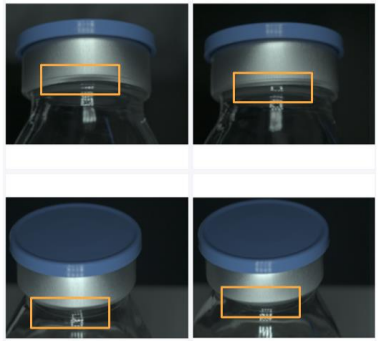
Scratch



Cut crimping



Partial crimp



Global traction in 4 focus verticals

ROBOVISION

Ag-& Foodtech - *Robotics*

Thanks to the Robovision platform powering every machine, our planters now manage and re-train the robots. This allows us to capture, copy and **scale the intelligence inside.**

— Edwin Kodde, Florensis

Manufacturing QC - incl. Semicon

Thanks to Robovision our operators feel in control of a dynamic AI system used for quality inspection with beyond - human capabilities. Plus we can easily deploy to other manufacturing plants.

— Klaus Lozie, Unilin Group

Life Sciences

AI is completely redefining our profession. As radiologists, **Robovision gives us the tools to collaborate** on easily creating algorithms by ourselves, **without the need of coding knowledge**

— Dr. Erik Ranschaert, Radiologist

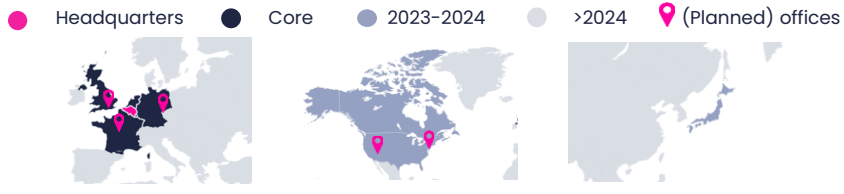
Retail

Retail can use vision AI across the entire value chain, but everything is constantly changing and most of it is out of our hands. **The Robovision is critical to move from a POC to the real-world.**

- , Retail Innovation Leader

Other Industries - *candidates for next focus vertical*

Geo - *Live in 40 countries, BE HQ & focus on high-tech regions*



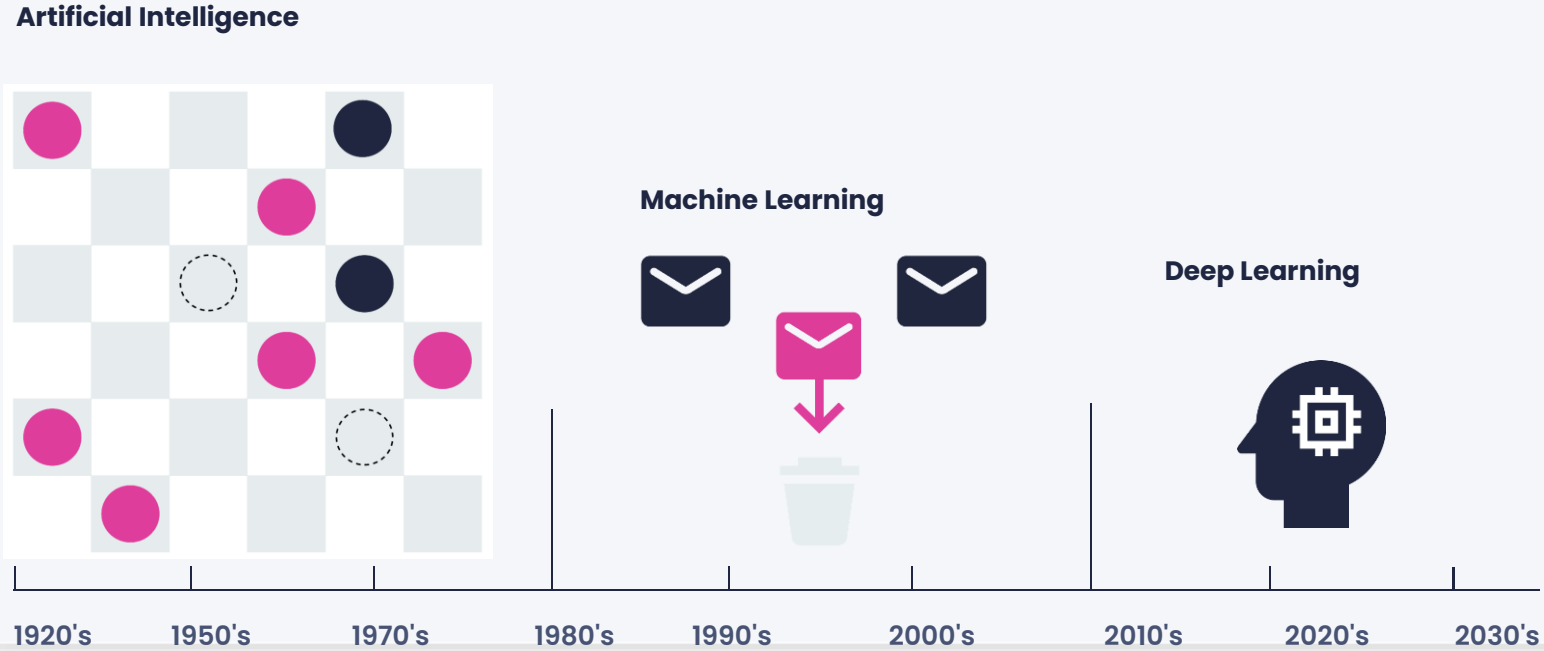
Our Vision is to be the **central backbone of AI vision** that businesses use to operate **intelligent machines at scale.**

Our Mission is to empower partners to **unlock vision AI at scale** in an ever-changing environment

https://robovision.ai

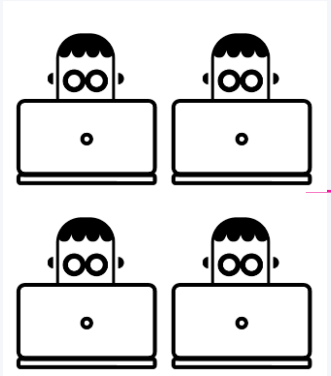
What is AI?

HISTORY AI » DL

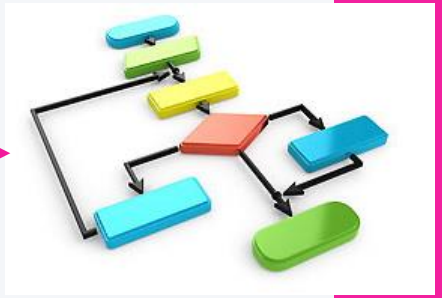


SOFTWARE 1.0

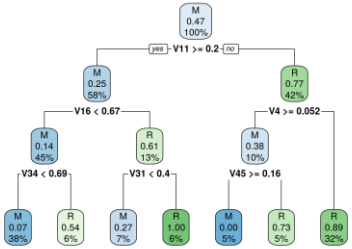
Artificial Intelligence



```
if x1 >= x2:
    if x1 >= x3:
        maxval = x1
    else:
        maxval = x3
else:
    if x2 >= x3:
        maxval = x2
    else
        maxval = x3
```

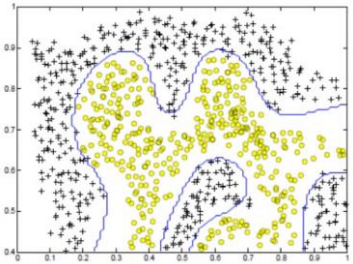


1920's 1950's 1970's 1980's 1990's 2000's 2010's 2020's 2030's



Artificial Intelligence

Any technique which enables computers to mimic human behavior.

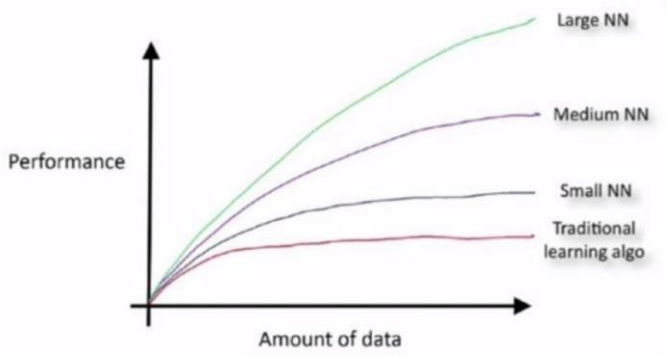


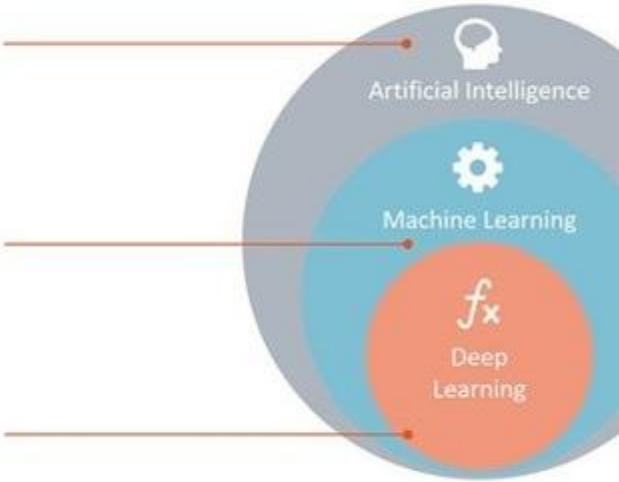
Machine Learning

Subset of AI techniques which use statistical methods to enable machines to improve with experiences.

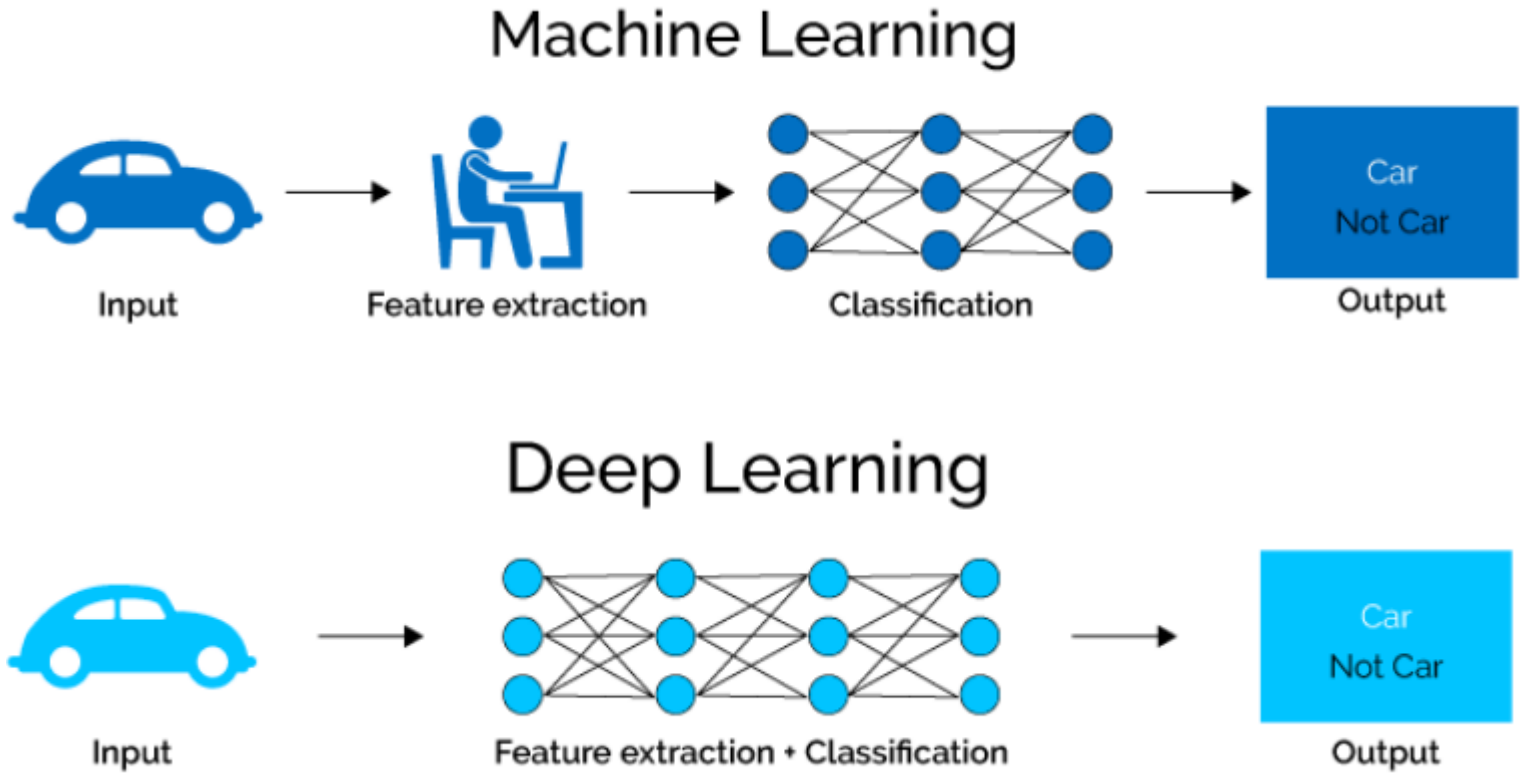
Deep Learning

Subset of ML which make the computation of multi-layer neural networks feasible.





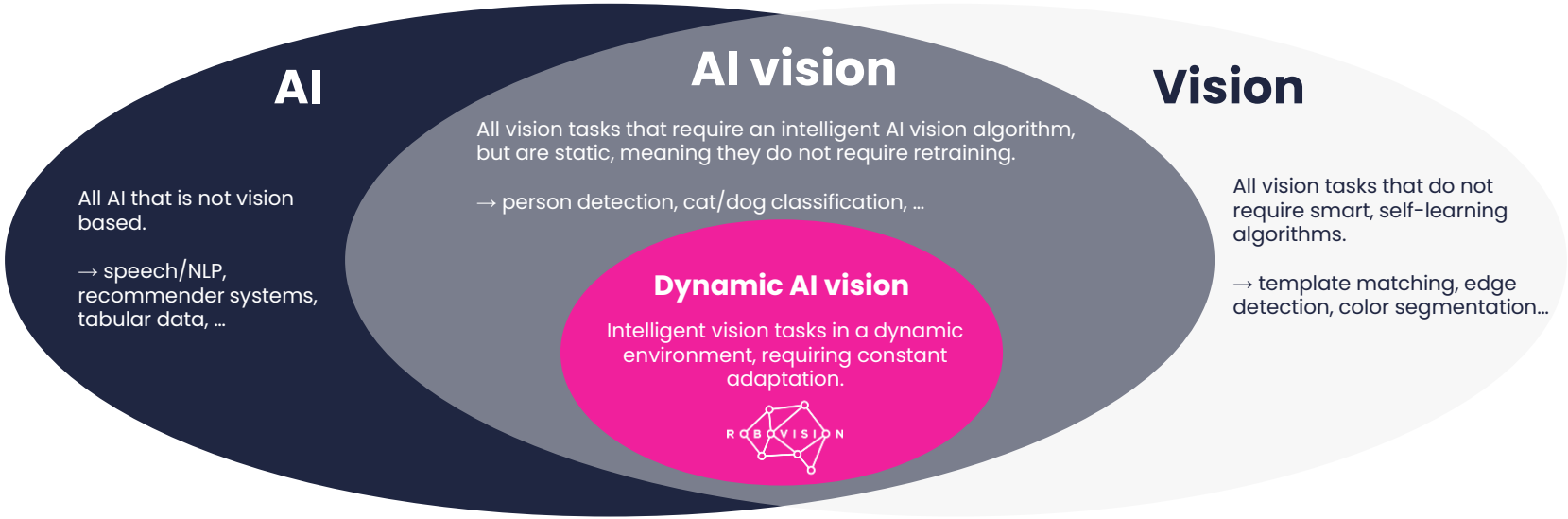
Software 2.0


Machine Learning
Input
Feature extraction
Classification
Car
Not Car
Output
Deep Learning
Input
Feature extraction + Classification
Car
Not Car
Output

Dynamic AI vision

ROBOVISION

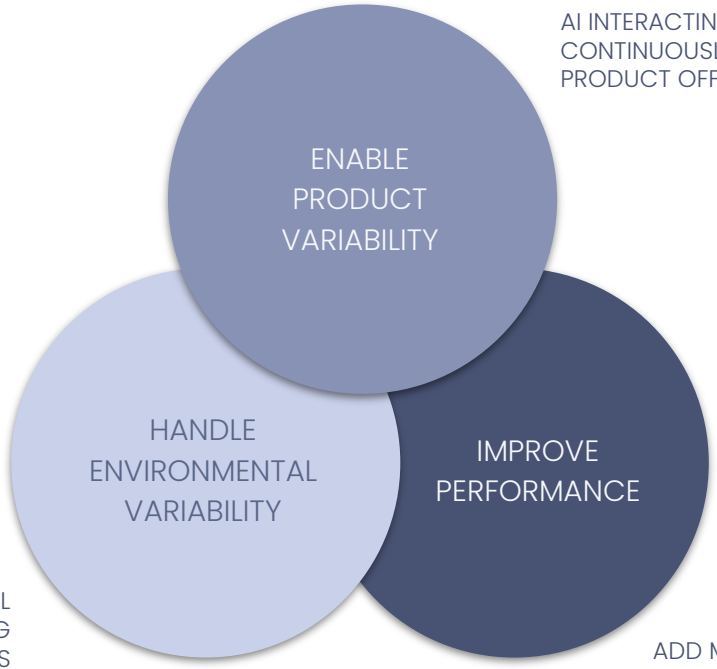
"Anyone can play with AI, only few can maintain it in production"

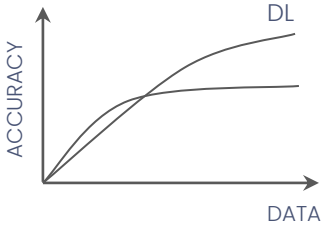


The case for Dynamic AI Vision

AI INTERACTING WITH A CONTINUOUSLY VARYING PRODUCT OFFERING

INCREASE MODEL RESILIENCE TO CHANGING CONDITIONS





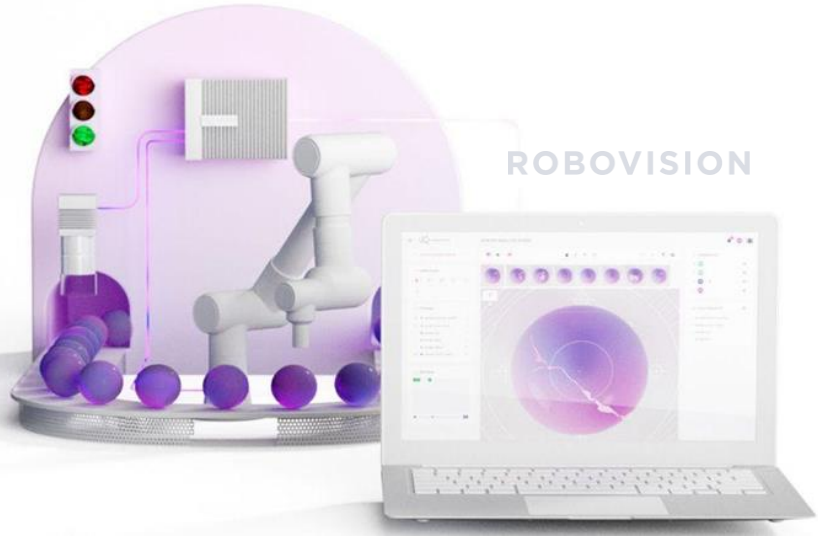
ADD MORE MEANINGFUL DATA AND INCREASE MODEL CAPABILITIES

ANYONE CAN **TRAIN** A MODEL, FEW CAN **MANAGE AND SCALE** IT

Pain

Investing in **costly never-ending AI projects** that depend on experts to maintain

Gain



Adopting vision-powered AI solutions with **the fastest time to market & no downtime**

"87% of AI projects never make it into production!"

87% OF ML PROJECTS FAIL TO SCALE LONG TERM

LANGUAGE GAP

THE LANGUAGE GAP

PRODUCT SPECIALISTS (operators)

- Undocumented expertise
- No data science knowledge
- Operates the application on a daily basis

DATA SCIENTISTS

- Data scientist, engineer, technical lead, technology specialists, development team
- Doesn't have in-depth product knowledge
- Has to fix ad-hoc issues, updates, etc.

CLOSING THE GAP

PRODUCT SPECIALISTS

+

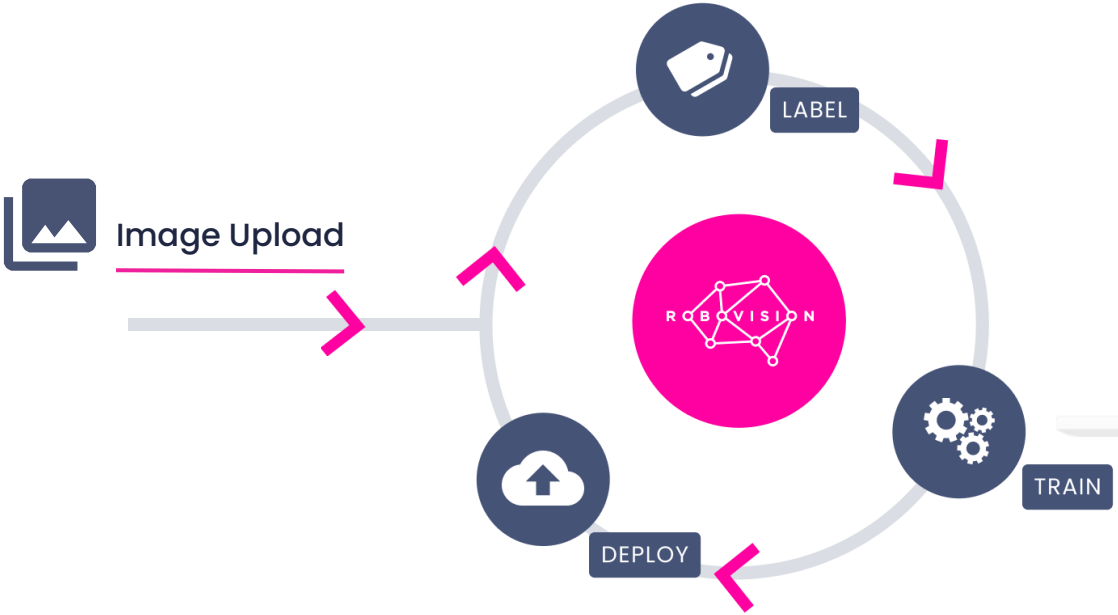
DATA SCIENTISTS

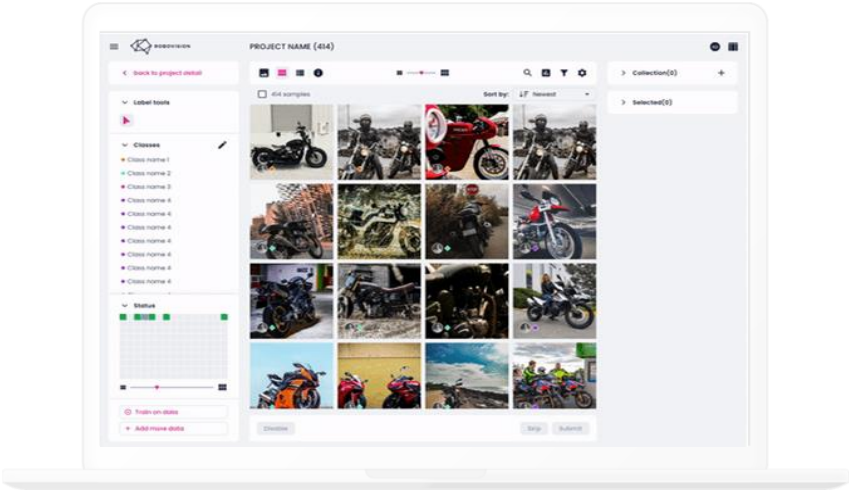
COLLABORATIVE INTELLIGENCE AND DYNAMIC VISION AI

Dynamic Vision AI Platform

ROBOVISION

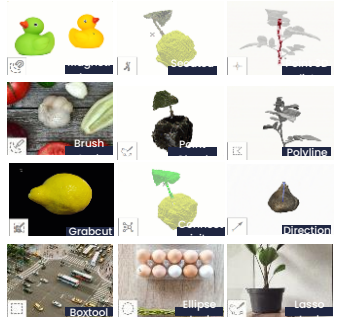
Enabling Continuous AI Creation

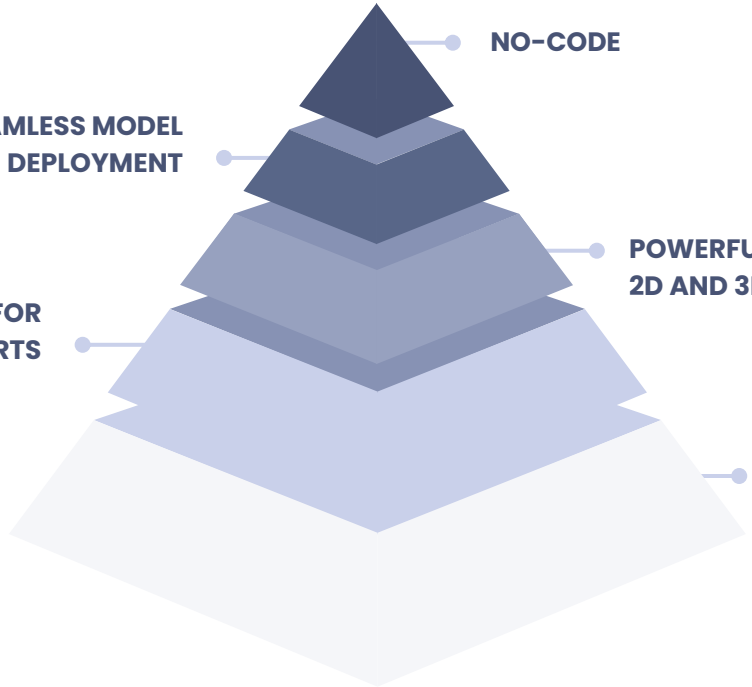


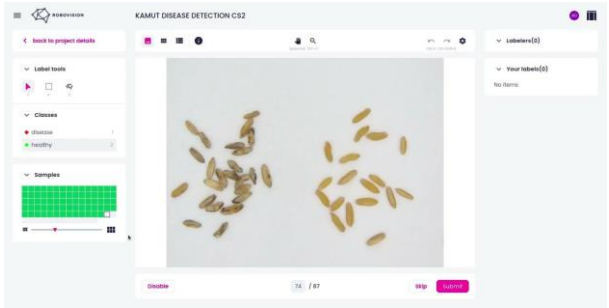


Dynamic Vision AI Platform

Speed up the AI iteration cycle







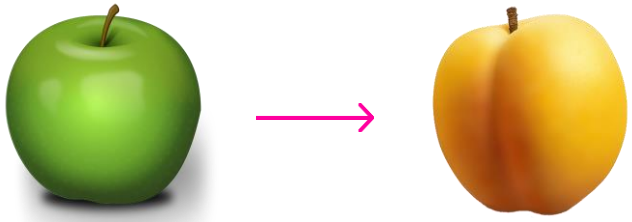
"87% of AI projects never make it into production!"

Dynamic Vision AI Platform

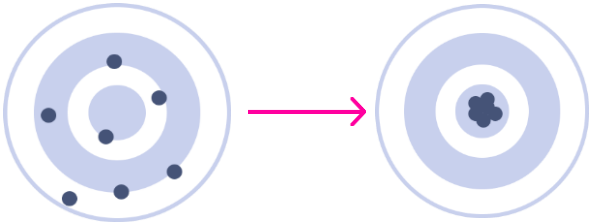
Operational autonomy to handle change

A Ensure Continuity

B Expand Use



C Improve Performance



‘everyone can play with AI, only few can scale AI’

Challenges in Pharma

Deliver highest possible Quality
- Avoid human errors
- Get to 100% Quality Control

Commit to GMP/GLP regulations
- Follow the guidelines
- Make sure everything is done by the rules

Digitalize and Automate
- Automate labor intensive processes

Improve Yield and Sustainability
- Increase throughput without compromising quality

improving Yield with AI vision

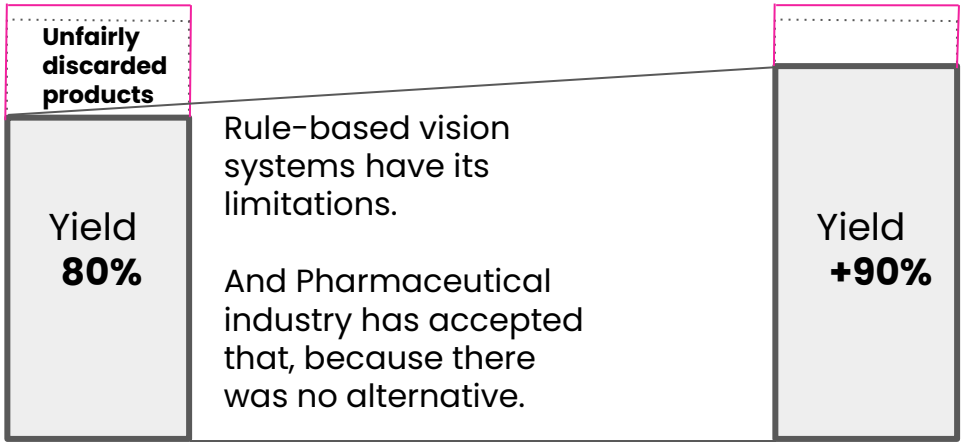
ROBOVISION

BEFORE

- Manual Control
- **100% QC** with **standard Vision systems**

2023 and beyond

- 100% **AI Vision** Quality control
- Even at increased speeds if needed



The next generation AI-software controlled Quality inspection machines are able to **reduce the Unfairly discarded products by 50%**.

AI Vision Quality control **adapts to the new types of failures** more easily.

AI Vision QC by classification will allow easier **Root Cause Analysis.**

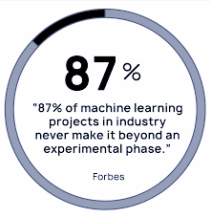
Platform vs consultancy

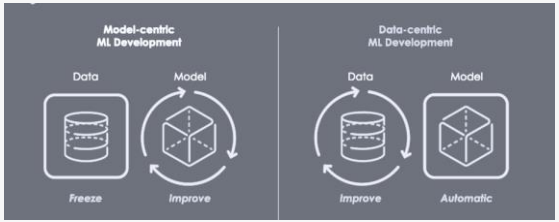
ROBOVISION

The Adaptive Engine for Image-to-Action AI

Why do your customers need one?

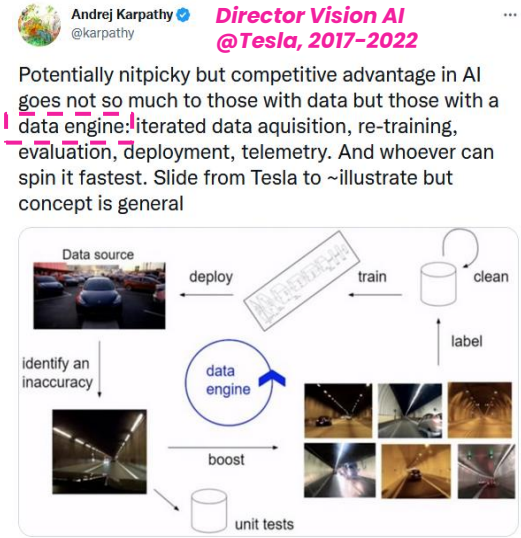
1. Reduce Poc-to-Production Gap with Data-centric ML





1. Enable Operational Autonomy for Vision AI Solutions

- **A** Ensure Continuity
- **B** Expand Use
- **C** Improve Performance

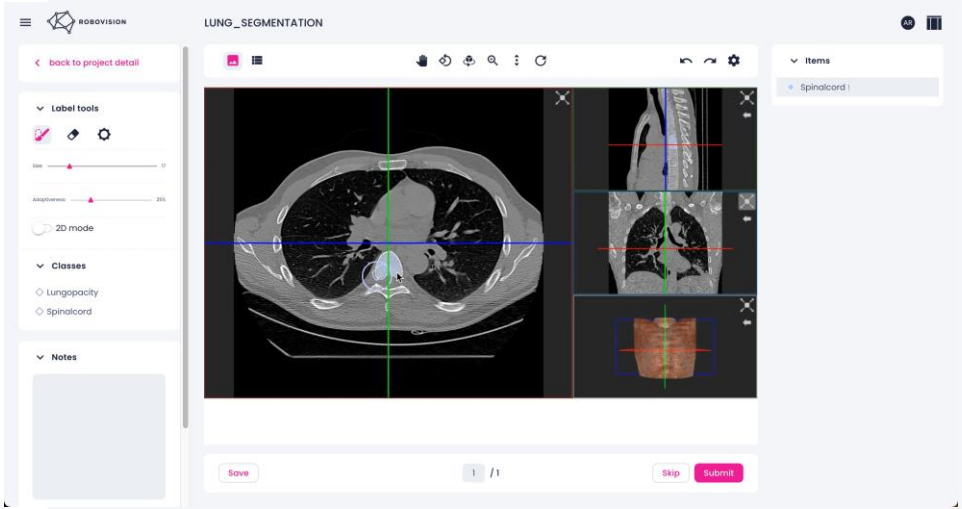


'anyone can play with AI, only few release & maintain AI at scale'

Using Dynamic Vision in Life Sciences:

Medtech Brain Mets

NETHERLANDS CANCER INSTITUTE



- The AI is used to **detect and follow-up on brain metastasis. Robovision** is used to support the **collaborative creation of AI with the input of multiple doctors.**
- The monetization towards multiple hospitals is facilitated via per-usage pricing and integration with PACS-systems is easy.
- **Procedure to request CE-approval is ongoing.** Non-CE business development is underway (eg. animal or research use).

https://robovision.ai

ROBOVISION

- Projects
  - Shoulders
  - Chest X-ray
  - Skull fractures
  - show more
- Components
- Resources
- Members
- Settings

Help

YOUR PROJECTS (5)

Import | + Create

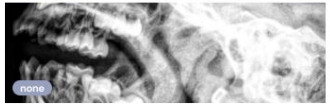
Select | Search

Shoulders
Object detection — 92% mAP

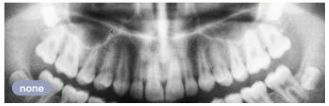

Model is trianed — 2 models, 2931 samples
Last updated — 12/29/2020

Chest X-ray
Object detection — 56% map_05

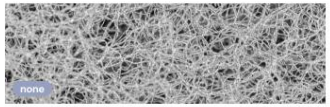

Labeling done — 2 models, 2931 samples
Last updated — 12/29/2020

Skull fractures
Object detection — 56% map_05


Labeling done — 2 models, 2931 samples
Last updated — 12/29/2020

Skull fractures 2
Object detection — 98% accuracy


Deployed — 2 models, 2931 samples
Last updated — 12/29/2020

Project MRI
Object detection — 56% map_05


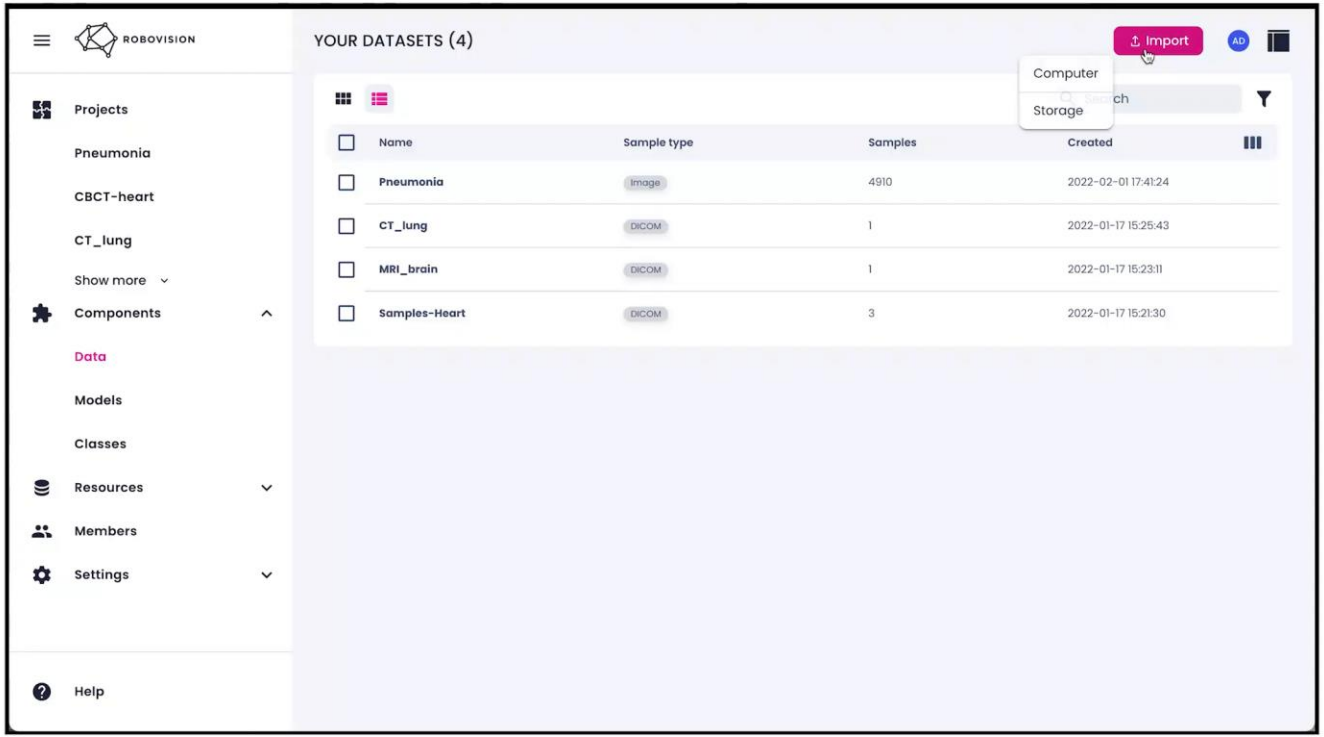
Labeling done — 2 models, 2931 samples
Last updated — 12/29/2020

FILTERS

Layout
- [ ] None
- [ ] Classification
- [ ] Object detection
- [ ] Instance segmentation

Date
Created
Start date | End date

Date
Select user



1. Upload Data

2. Manage Dataset

3. Invite Annotators

4. Annotate Date

5. Expert Reviews

6. Expert/Develop AI

Use case

QC on caps of vials

Challenge:

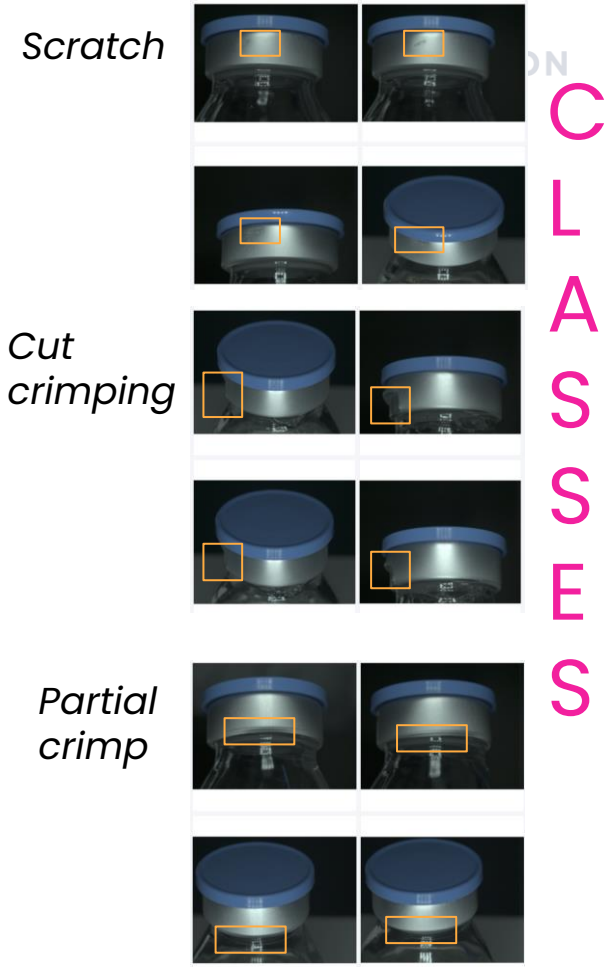
1. Standard Vision solution gives insufficient accuracy
2. Certain defects are hard to define and thus unrecognizable
3. Defects change over time and new classes arise

Solution:

- 6-camera-setup
- Classification model
- Continuous retraining on varying defects

Approach:

- Start off-line
- Implement in-line without interfering
- Qualify software and get in production, deploy new version every 12 months



Use case

QC on Plungers for syringes

ROBOVISION

Challenge:

1. QC needs to happen at high speed 1000 ppm
2. Classification of failures should link to root causes in the production process
3. Model management needs to be documented

Solution:

- Segmentation model
- Developed and maintained in a central place
- Allowing scale to multiple production sites

Results:

- No need for vision experts - customer takes control of the AI
- Yield increase by 12%

ROBOVISION

PHARMA QUALITY CONTROL (600)

+ Add to project

83 AD

Back to datasets list

Classes

- defect.contamination
- defect.deformation
- defect.fiber

Splits

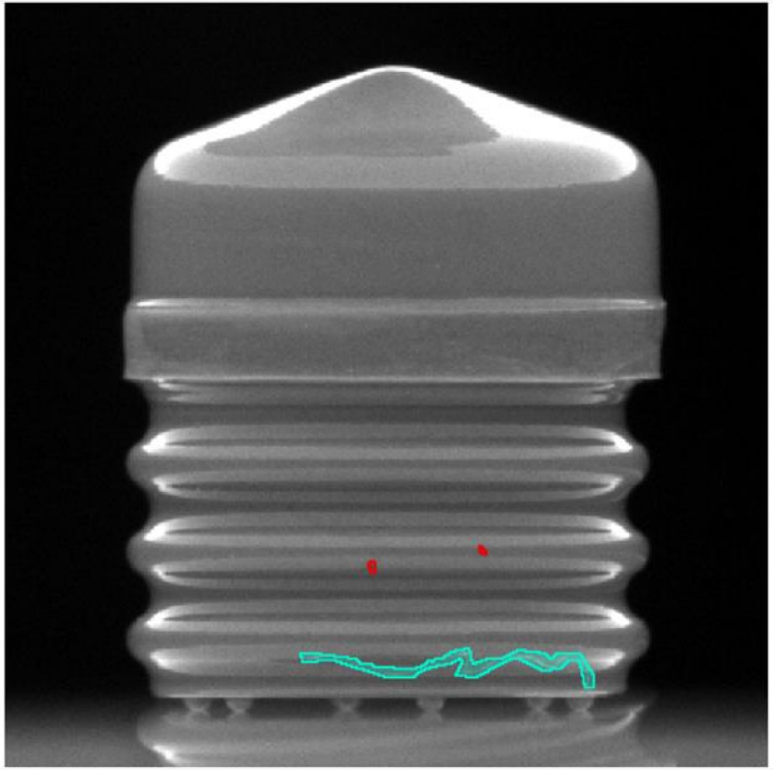
70% train • 15% validate • 15% test
2022-11-04 15:50:01

Used in

Pharma defect segmentation
solov2

Delete dataset

Space bar Ctrl +/-



Labelers(1)

IM 2 1

- defect.contamination
- defect.fiber
- defect.contamination

3 / 600

ROBOVISION

PHARMA QUALITY CONTROL (600)

+ Add to project

83 AD

Back to datasets list

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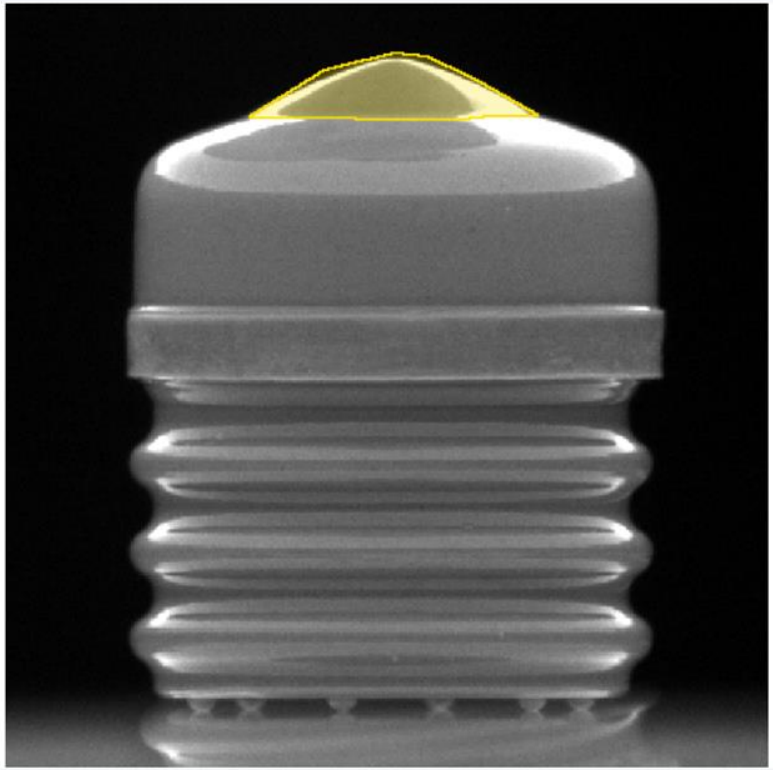

4 / 600

Labelers(1)

IM 1

defect.deformation

ROBOVISION

PHARMA QUALITY CONTROL (600)

+ Add to project

83 AD

Back to datasets list

Classes

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70% train • 15% validate • 15% test
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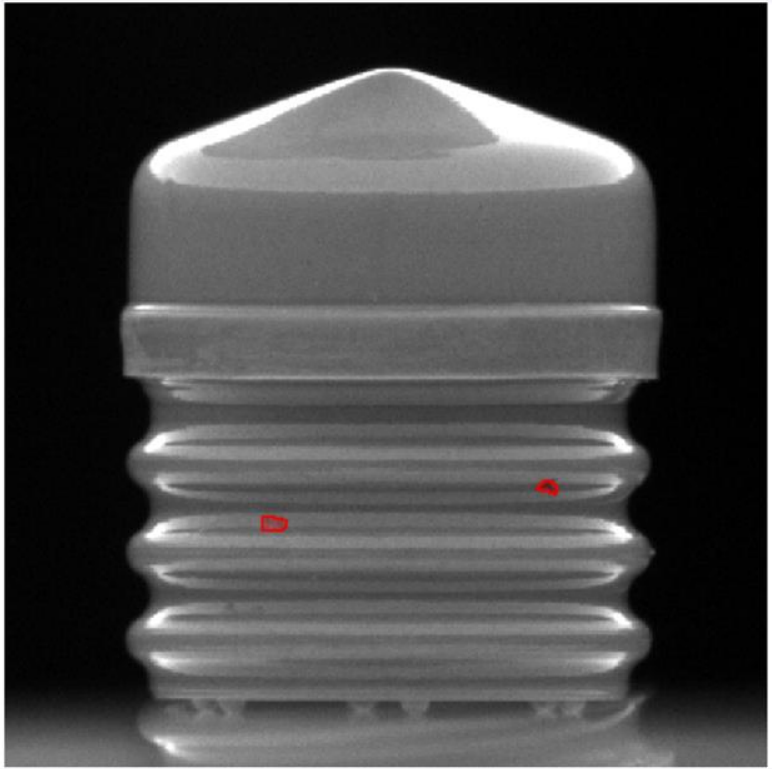


9 / 600

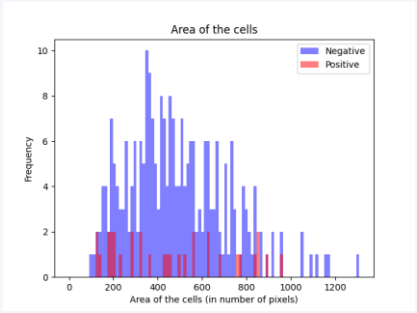
Labelers(1)

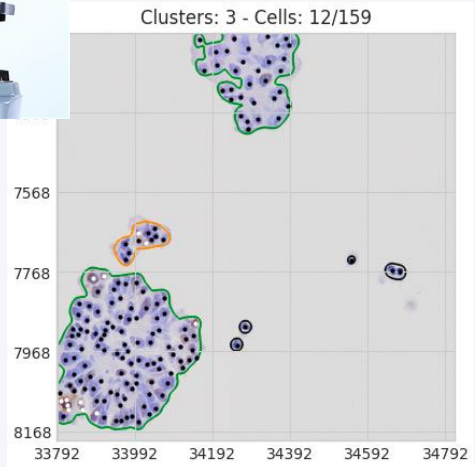
IM 2

- defect.contamination
- defect.contamination

Use case
Digital pathology

- The AI is used to **quantify cancer proliferation based on Ki-67 biomarker**
- **Follow-up & Growth analysis**
- The monetization per-usage pricing and integration with lab-systems is easy.
- **Benefits:**
  - Highly accurate
  - Repeatable results
  - Huge time gain

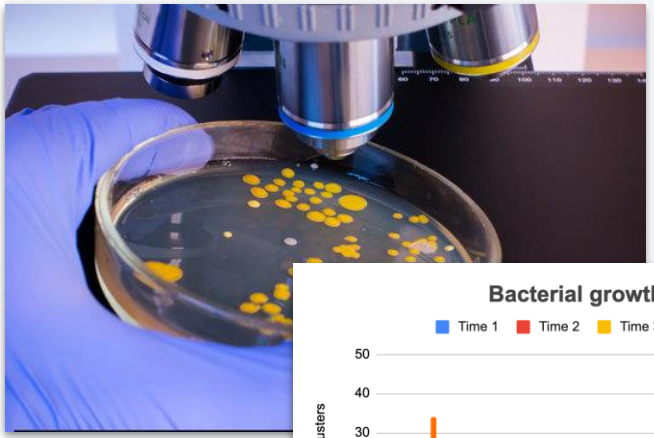


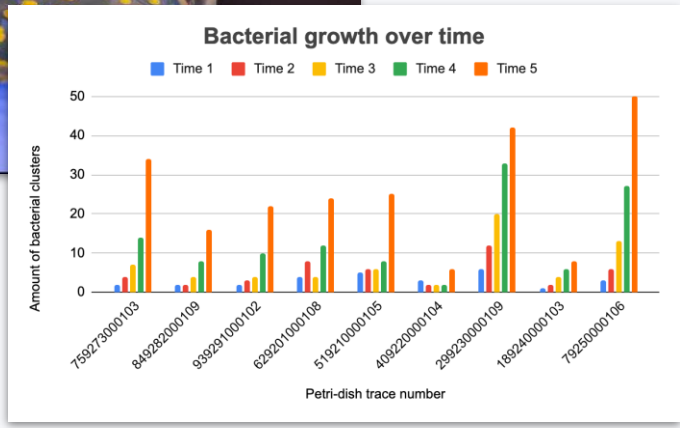


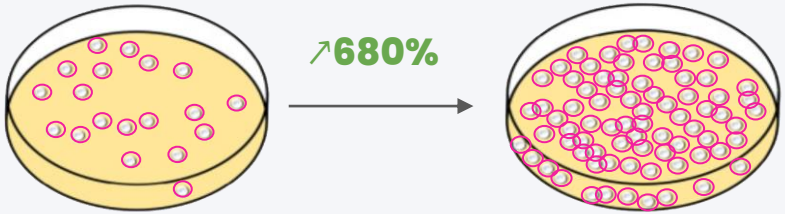
Potential use case

Bacterial growth

- The AI could be used to **quantify bacterial growth**
- **Follow-up & Growth analysis**
  - Per colony
  - Per petri-dish
- **Benefits:**
  - Highly accurate
  - Repeatable results
  - Huge time gain







Success Story
Oncology

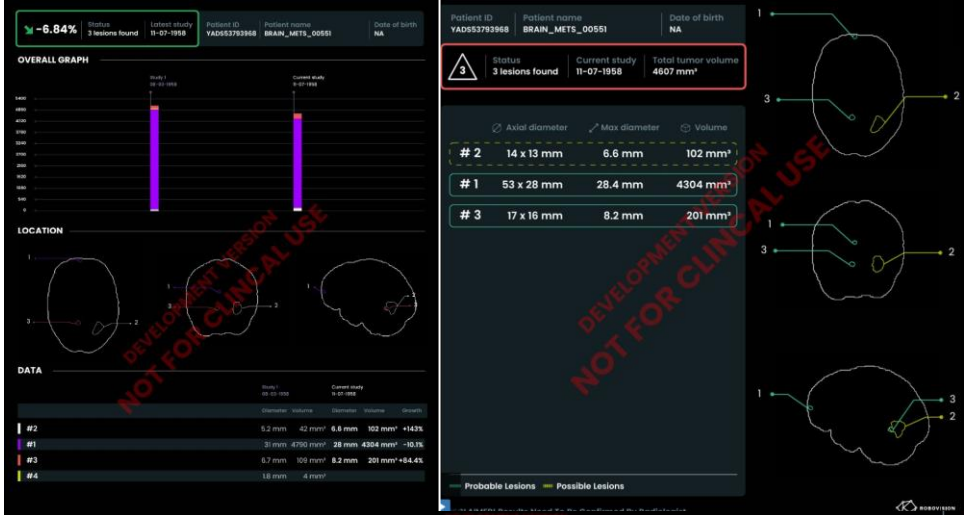
- The AI is used to **detect and follow-up on cancer lesions. Robovision** is used to support the **collaborative creation of AI with the input of multiple doctors.**
- The monetization towards multiple hospitals is facilitated via per-usage pricing and integration with PACS-systems is easy.
- **Procedure to request CE-approval is ongoing.** Non-CE business development is underway (eg. animal or research use).

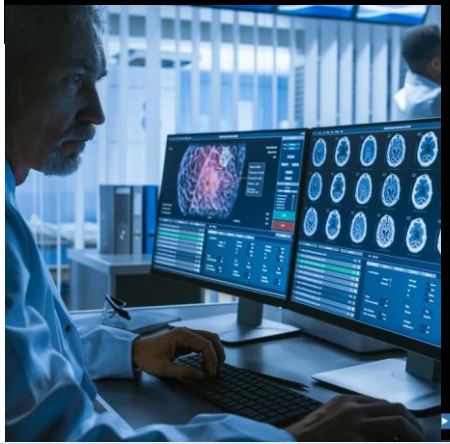
consumers

- UZ Gent / GE
- Charité / Olympus
- NKI-AVL / Philips

ROBOVISION

NETHERLANDS CANCER INSTITUTE



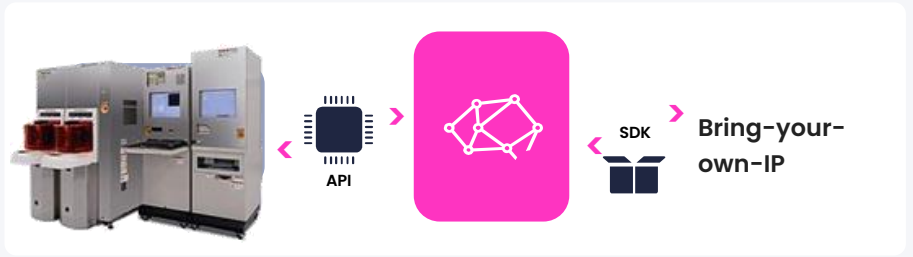


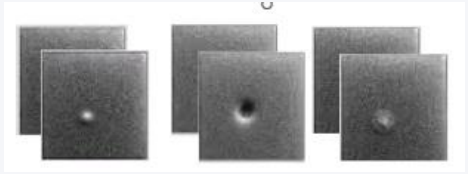
Success Story

Semicon AI-ADC

HITACHI Inspire the Next

PRODRIVE TECHNOLOGIES



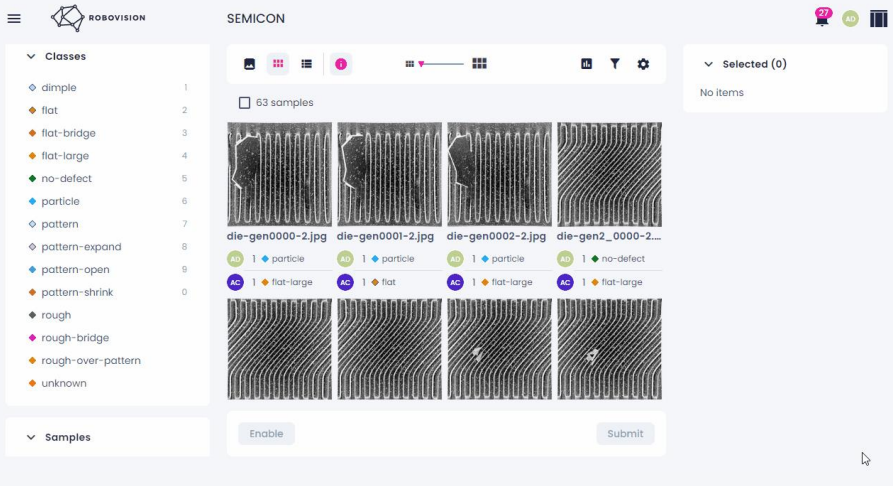


- This machine is used in **semicon wafer production** to find & classify anomalies/defects.

  ADC = Automatic Defect Classification.

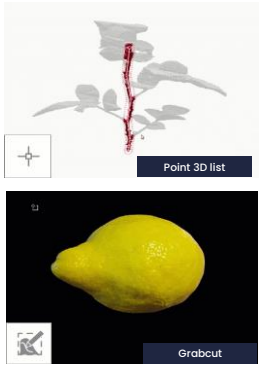
- Electron Microscopes that operate at 0.2 NM. A human hair is 100K NM. The requirements (accuracy, runtime speed, extensibility, QA, etc.) were the biggest challenge the Platform faced to date.

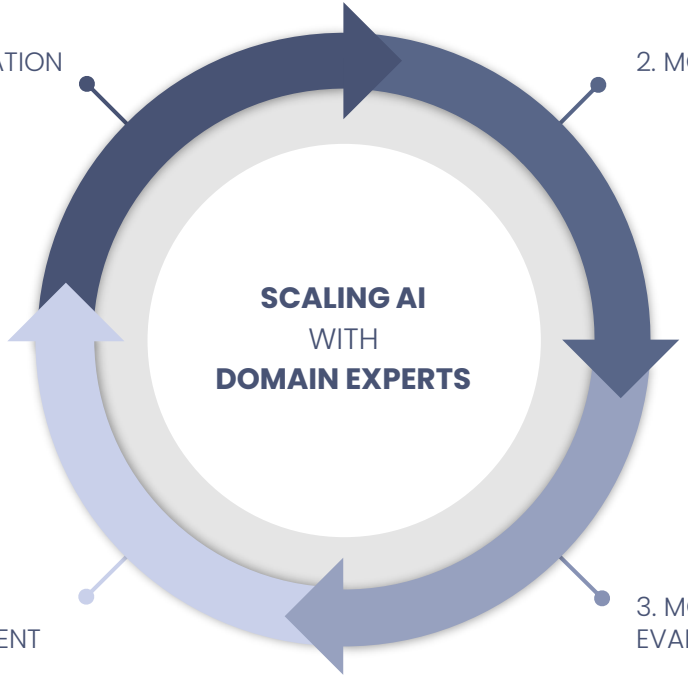
- **10 operational since Apr-22, with a prognosis of 10 more yearly**



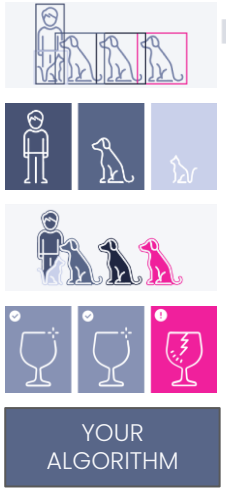
AI Lifecycle management tool

AI Lifecycle Management Tool



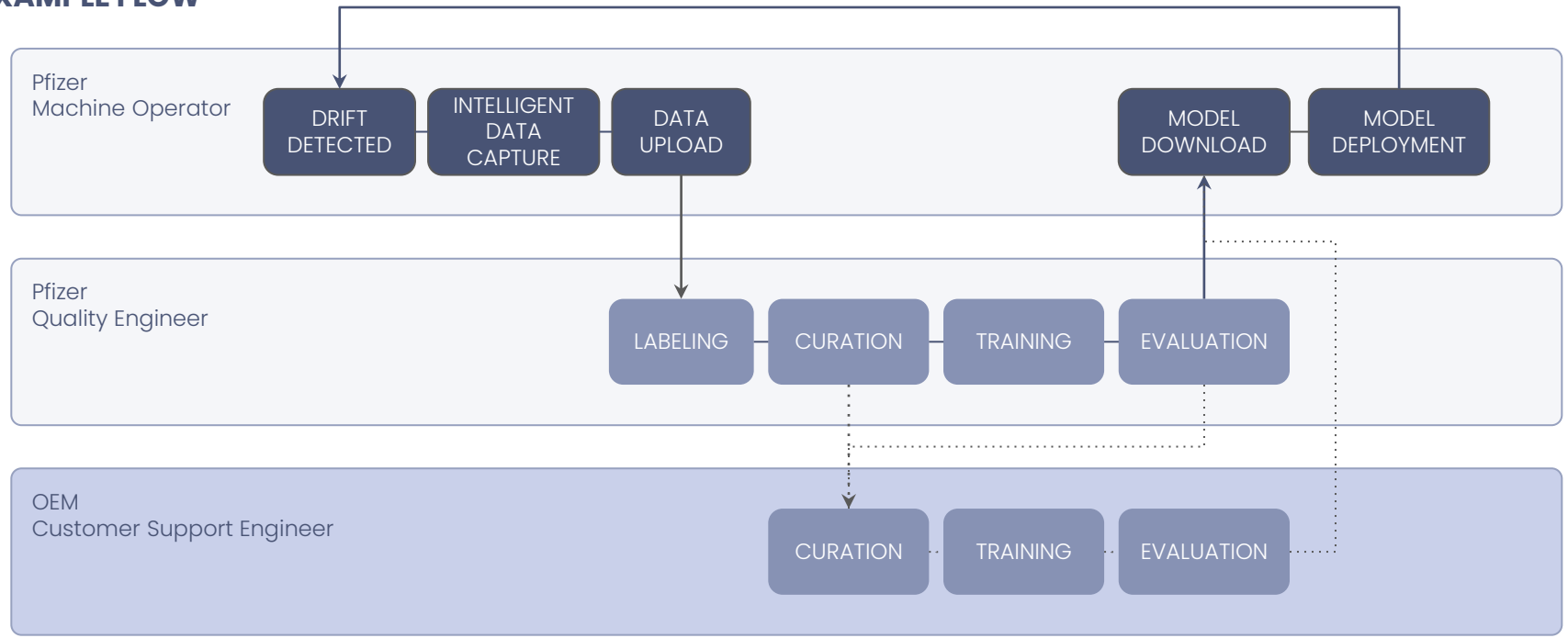


VERIFY MODEL PERFORMANCE ON TRAINING DATA OR DEPLOYMENT DATA



End-to-end Retrainability

EXAMPLE FLOW



NOTE: DEPENDING ON BUSINESS MODEL, VARIATIONS MAY BE POSSIBLE.

EDGE PLATFORM

How AI gets delivered

Bridging the last mile in AI Delivery

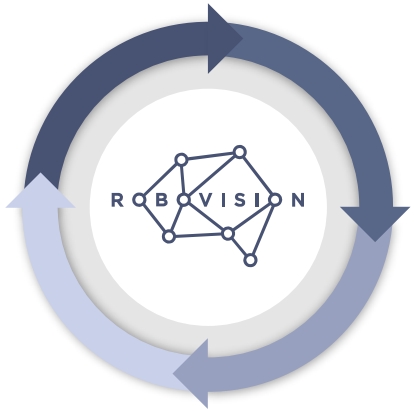
SINGLE PLATFORM FOR CENTRAL AI CREATION AND DATA MANAGEMENT

DATA

TRAINED MODELS

MULTIPLE EDGE DEVICES FOR LOW LATENCY INFERENCE

End-to-end AI Lifecycle Orchestration



DATA

TRAINED MODELS

VISION INFRASTRUCTURE

IMAGE DATA

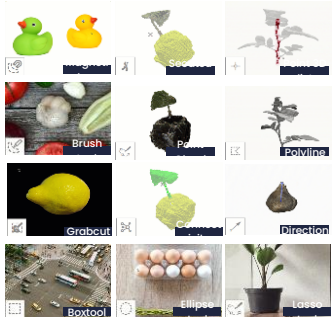
ROBOVISION EDGE

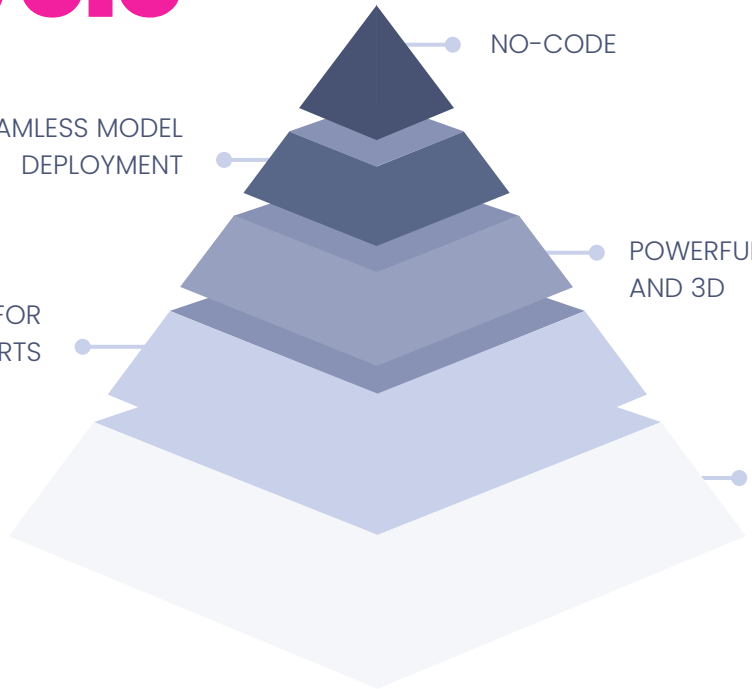
DATA CAPTURE
MODEL INFERENCE

DECISION DATA

AUTOMATION SYSTEMS

Speed up the AI
Iteration cycle





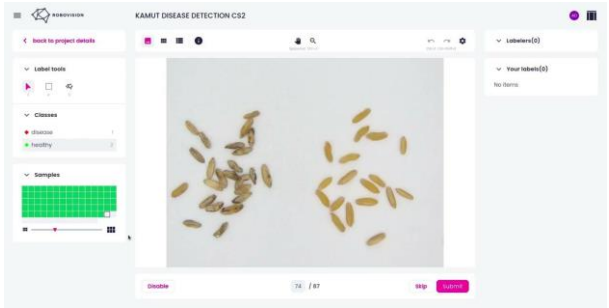
NO-CODE

SEAMLESS MODEL DEPLOYMENT

POWERFUL SET OF LABELING TOOLS, 2D AND 3D

PREDICTIVE LABELING FOR LARGE LABELING EFFORTS

WIDE RANGE OF BUILT-IN ALGORITHMS

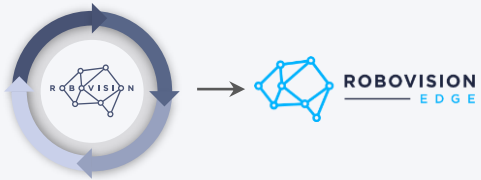


Platform Deployment

	ROBOVISION HOSTED	YOUR PUBLIC CLOUD SERVICE PROVIDER	ON PREMISES
OWN YOUR OWN DATA		☑	☑
YOUR DATA ANYWHERE, ANYTIME	☑	☑	
NO WAN CONNECTIVITY REQUIRED			☑
HIGHEST RESPONSIVITY			☑
NO CLOUD COSTS			☑
NO INFRASTRUCTURE OPEX/CAPEX	☑	☑	

Model Inference

MODEL DEPLOYMENT
ON EDGE DEVICE



WHAT

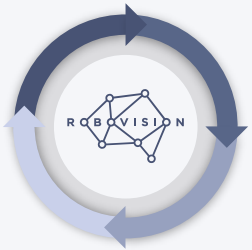
Model is downloaded from the platform by the Robovision Edge device.

For inference, images are collected from the **connected camera**, predictions are fed back to the infrastructure.

WHEN

- Low latency demands
- Algorithms supported by Robovision Edge

MODEL DEPLOYMENT
IN-PLATFORM



WHAT

Model is deployed as an **API service** inside the Robovision platform.

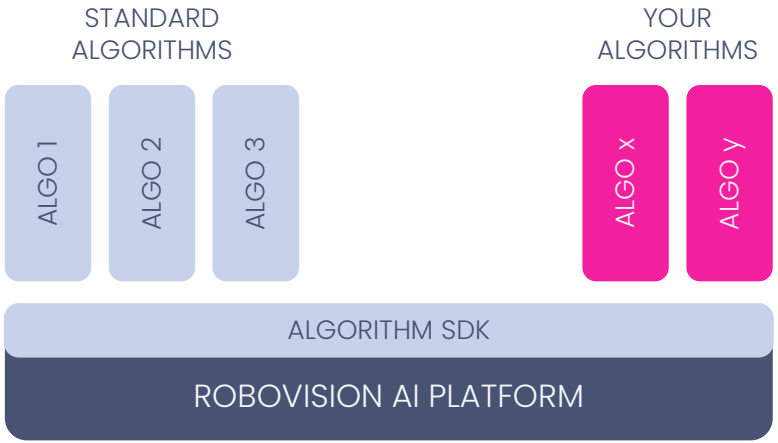
For inference, images are sent to the API service, model predictions are returned in the API response.

WHEN

- Non-stringent latency demands
- Any algorithm

Bring your own algorithm

AND OVERCOME YOUR BOTTLENECKS



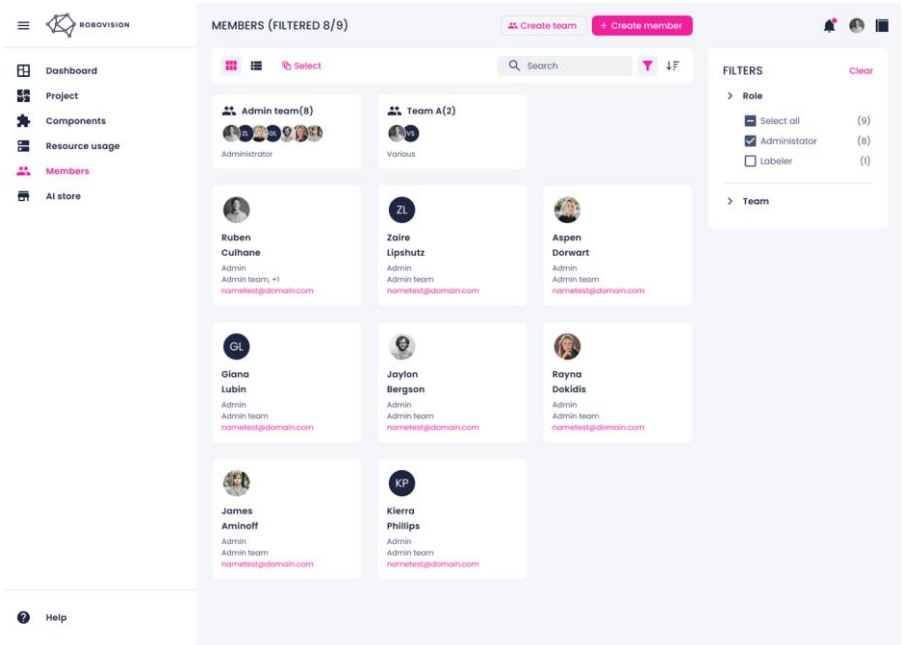
1 DATA SCIENTIST

EXTEND THE PLATFORM WITH YOUR APPLICATION- AND SECTOR-SPECIFIC **ALGORITHM IP**

2 DOMAIN EXPERTS

SCALE YOUR IP IN PRODUCTION WITHOUT RECURRING INTERACTIONS WITH DATA SCIENTISTS OR IT PERSONNEL

Platform User Management



- **Custom user roles** can be defined, allowing specific scope for specific platform actors
- **Role-Based Access Control** (RBAC) for authorization
- Users are assigned specific user roles
- Access can be project-specific or platform-wide
- Users can be created, deleted and grouped in teams
- Support for multiple labeling flows, incl. **review flows** with dedicated user profiles.