OROBIX

WE MAKE AI HAPPEN

AI gets to work
OUR SOLUTIONS

1

AI solutions

Ready-to-use AI solutions with a shorter and consolidated time-to value.
Flexible, but focused on solving well-identified problems.

Data solutions
detectiv.ai Real-time AI solution for anomaly detection

Vision solutions
AI-go Vision inspection platform: classification, segmentation, OCR

2

AI engineering

Tailor-made AI models, solving a wider variety of problems.
Leverage a team of experts in cross-industry AI applications. Wider range of applications (e.g. Vision inspection and Deep learning, Time series, Bayesian models, Reinforcement learning).

3

AI managed services*

We take care of all the AI of a company ensuring trust, compliance and reliability once in production.
We take care of: putting models in production, keeping them monitored, introducing the procedures to accelerate AI adoption, for continuous improvement and compliance.

invariant.ai®

Platform for the deployment, governance, monitoring and lifecycle management of AI systems in critical processes.

invariant.ai® EDGE	invariant.ai® CLOUD

*Oròbix named in the **2021 Gartner "Market Guide for Artificial Intelligence Service Providers"** - 26 July 2021 - ID G00732756

Detectiv.ai

Real-time AI solution for anomaly detection.

Using artificial intelligence for real-time **detection of anomalies (outliers) in time series** from sensors placed in the field and other structured data.

1 DETECT ANOMALIES

Identify anomalies overlooked by traditional threshold system, through machine learning techniques, considering the interaction between all input variables.

2 CUSTOMIZE DASHBOARDS AND ALERTS

Display the outliers through customized monitoring dashboards and configurable alerts, in order **to have full observability on their evolution over time and the gravity of potential process drift.** With an API for easy integration with existing systems.

3 GENERATE BUSINESS VALUE RIGHT AWAY

Effortlessly switch to best model for the ongoing production, automatically creating a new one on specific data if needed, **reducing the time spent collecting data and minimizing the system configuration**.
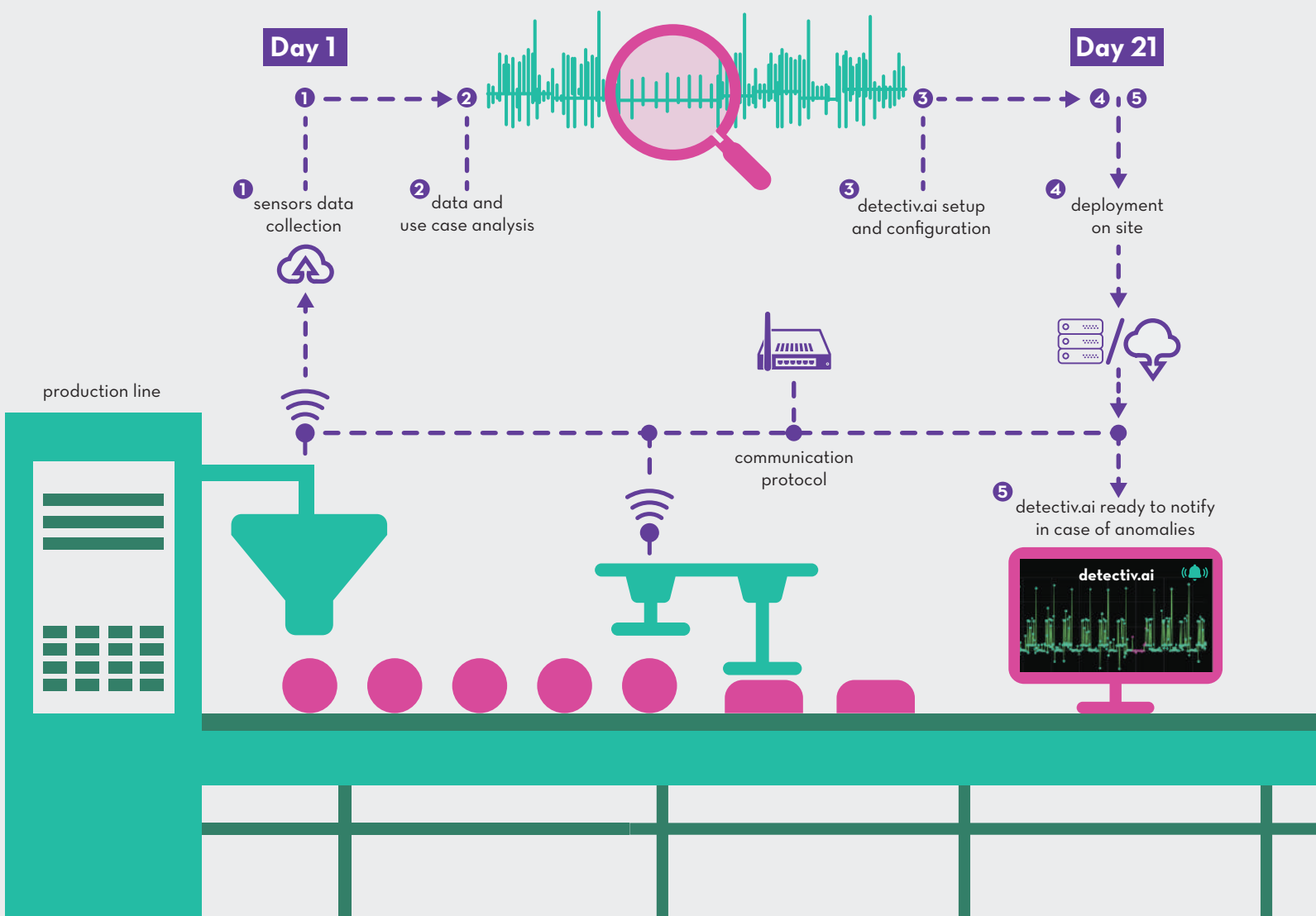
4 IMPROVE PERFORMANCE OVER TIME

Support for continuous training, to keep improving performances as more data becomes available.

Anomaly detection
Predictive maintenance

Day 1

Day 21

1 sensors data collection

2 data and use case analysis

3 detectiv.ai setup and configuration

4 deployment on site

production line

communication protocol

5 detectiv.ai ready to notify in case of anomalies
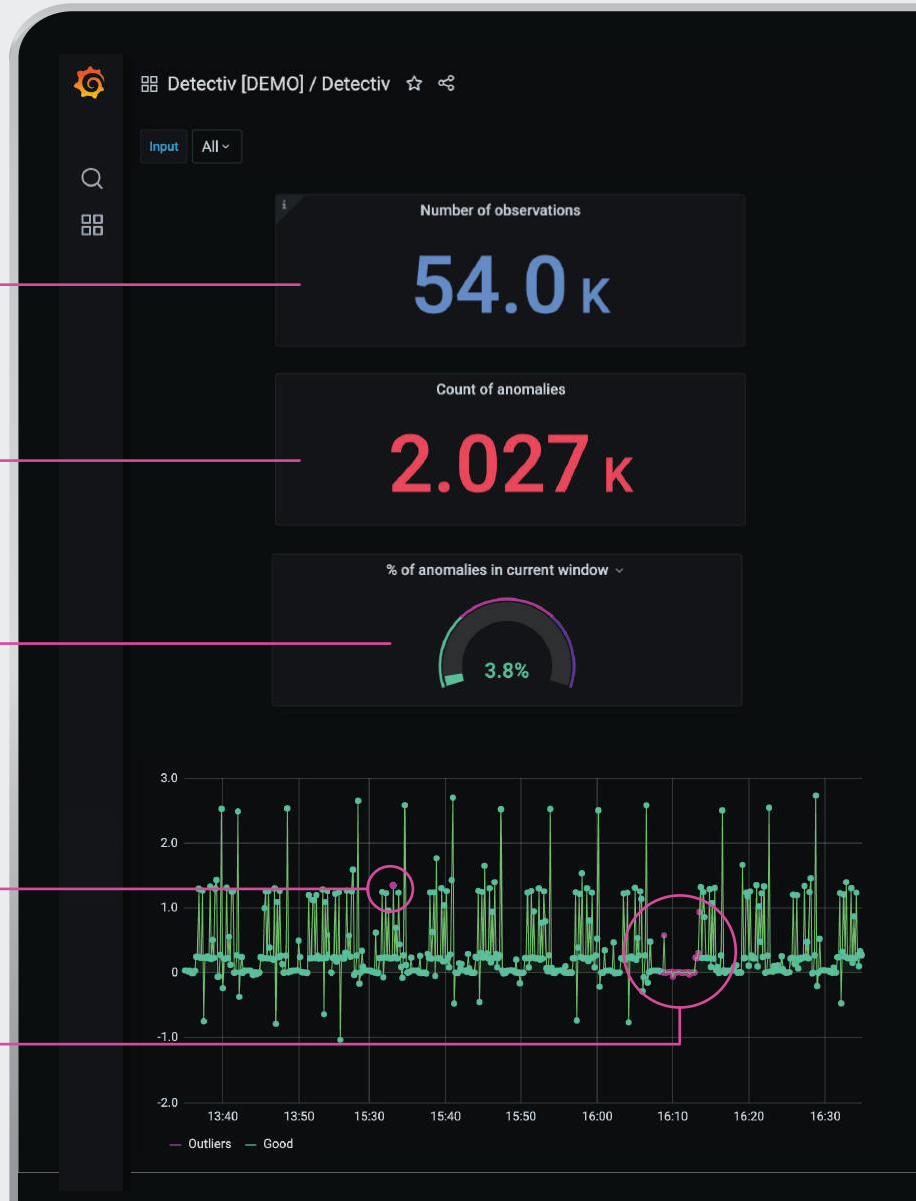
detectiv.ai

ORÒBIX //O5

Total number of observations in the time window selected.

Total number of anomalies encountered in the time window selected.

Percentage of anomalies in the time window selected.

Input data. Anomalous observations are marked with a dot.

Anomalous pattern detected.

Detectiv [DEMO] / Detectiv

Input   All

Number of observations

54.0 K

Count of anomalies

2.027 K

% of anomalies in current window

3.8%

Outliers — Good

Similarity finder

Event (start timestamp)	Label
11/09 16:08	No anomaly (88.0%)
11/09 12:22	Tool failure (96.4%)
01/09 14:25	No anomaly (92.3%)
01/09 12:29	No anomaly (80.0%)
24/08 18:43	Excessive vibration (98.2%)
24/08 15:11	No anomaly (95.0%)
09/06 10:34	Excessive power (88.0%)
08/06 14:21	No anomaly (87.5%)
05/05 12:51	No anomaly (81.2%)
15/04 11:11	Bearing failure (96.4%)

Current number of input sensors

1

Alarm

Anomaly Score alert
OK for 21 minutes

Latest Anomaly Score ∨

0.29

Overall number of input signals currently ingested in Detectiv.ai.

Current alert evaluation on overall Anomaly Score. If the Anomaly Score goes above the user selected threshold, this alarm is triggered.

Current Anomaly Score evaluation.

Identification of the most similar anomalous event already faced, proposing a solution on the basis of past experiences. Automatic calculation of a similarity measure.

User-defined alarm threshold.

Anomaly Score value on the selected time interval.

Latest alarm triggered.

01 //
Predictive quality and maintenance Food & Beverage

TASKS
Data analysis
Anomaly detection
Prediction

INDUSTRY
Food and beverage
OEM original equipment manufacturer

TECHNOLOGIES
detectiv.ai
Invariant.ai®

REQUEST
To realize an **anomaly detection system on data coming from heterogeneous sensors** placed on the electric motors of the fans used to dry the pasta and subject to failures. **Predict the quality** (final moisture level) of pasta at the end of production process, **with only the machine's input parameters available.**

STARTING POINT
Currently maintenance is carried out when a fault is detected (i.e. after a downtime on the production line). Interpreting the data collected by the sensors in not easy because **the anomaly and the final quality of the product is not detectable using a single sensor but only through the interaction between some variables.** Moreover, the frequent production changes (pasta format) make the data non homogeneous.

RESULTS

Increased OEE from 5% to 15%
(availability, performance, quality)

Reduced Unplanned Downtime from 15% to 30%
Improved forecasting of planned shut-downs
Reduce time for maintenance (by helping users to
understand what is happening)

Improved Quality from 10% to 35%
Increased customer satisfaction with improved ability
to make deliveries on-time and to improve quality

Reduced Maintenance Costs from 20% to 30%
Enhanced spares planning and inventory optimization

Increased Throughput and OTD from 10% to 20%
Reduced buffer WIP due to increased reliability

Source: Deloitte, "Asset Monitoring & Predictive Maintenance"

AI-go

Vision inspection platform.

Using Artificial Intelligence to create AI classifiers from limited examples in minutes. **AI-GO aims at making performance of AI in quality inspection tasks accessible to everybody**, allowing clients to autonomously and easily develop their own models to **solve the most common vision inspection problems in the manufacturing industry.**
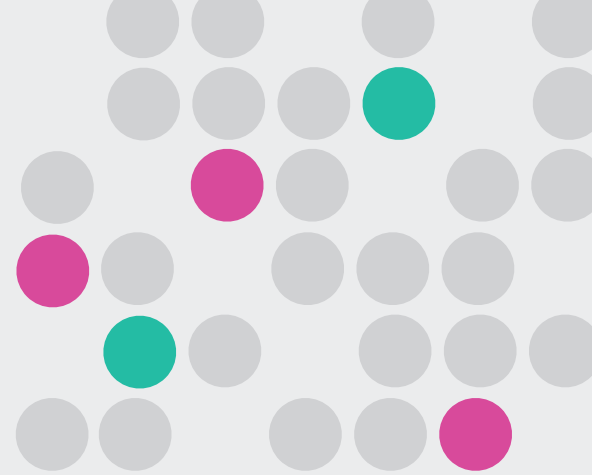
1 AI READY TO USE

Solve simple computer vision problems: presence/absence, classification of defects without any particular criticality, optimising the system's time to value.
Allow the customers to develop on their own AI models for a wide variety of problems:
- classification: both binary (e.g. good vs bad) and multi-class (e.g. defect1 vs difect2 vs difect3)
- segmentation
- OCR

2 PERFORMANCE IMPROVEMENT

Automatically select the most suitable pre-trained model for solving the specific problem, train it on a few examples and put it into production in complete safety.
Run models even on devices with reduced computing power (IIoT, edge computing). Remotely check the models to ensure they are working correctly and start automatic re-training to improve their performance over time.
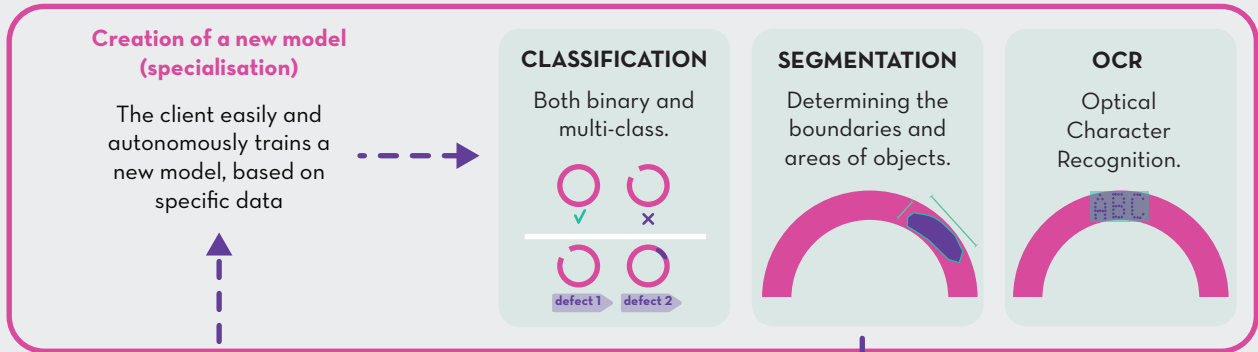
3 SIMPLIFICATION OF SETUP OPERATIONS

Training a model using few examples (10-40) to realize a custom model, in order to reduce the set-up effort (time and skill needed) enhancing a highly replicable approach based on providing examples. More intuitive configuration and setup, thanks also to the **user friendly interface**, less experience and time is needed to achieve good performance.

4 INDUSTRIAL RELIABILITY

Have a solution designed to **operate in industrial contexts**, considering the aspects left out by generalist solutions (e.g. cycle times, inference speed, reliability, unstable connectivity in production sites, employee training on the line). **Easily integrated into pre existing systems** it does not require the use of a specific camera.
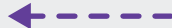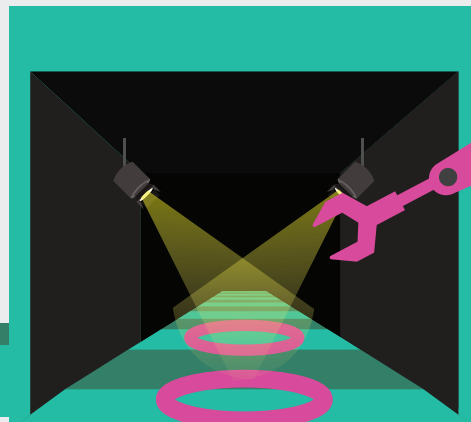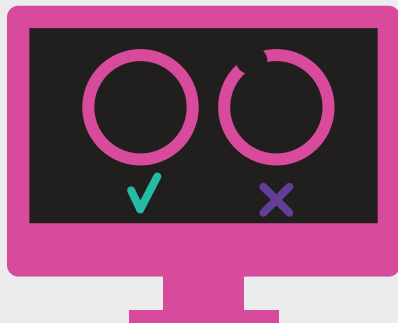
Vision Inspection

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OFF LINE

Creation of a new model (specialisation)

The client easily and autonomously trains a new model, based on specific data

CLASSIFICATION

Both binary and multi-class.

defect 1   defect 2

SEGMENTATION

Determining the boundaries and areas of objects.

OCR

Optical Character Recognition.

The client collects a few (10-40) examples of good/bad parts.

The specialized model is downloaded and made available for installation.

O2 //
Defects detection
Automotive

TASKS
Image analysis
Defects detection
Segmentation
Classification
Measurement
Annotation
Computer vision

INDUSTRY
Manufacturing
Automotive

TECHNOLOGIES
AI-go
Invariant.ai®

REQUEST
Automatically detect various types and sizes of surface defects on a small metal part (a component of motorcycle motors) and measure them when found.

STARTING POINT
Quality control was being carried out through traditional computer vision systems that were inadequate at managing the variability of the analyzed components. In fact, the parts inspected were often dirty or presented hard-to-manage stains (or other markings) that raised the need for a complete inspections by specialized operators. This activity is absolutely critical both because of both the time required and the ergonomics implied for the operator, who was performing the task with the help of magnification systems (indispensable to finding such minute defects.).

RESULTS

Increased OEE
Maintaining the same quality assurance, but reducing false rejects

Fast return of investment
The system testing phase was performed double-checking 10.000 pieces previously marked as scrap by operators. The AI system was able to detect 8.000 false wrong.
The sale of those pieces paid for the entire project.

Most reliable output
Better detectability of anomalies - even in suboptimal visual conditions - with a significant decrease of components **misidentified as scrap.** There were no cases in which the system missed large, glaring defects.

Data-driven approach
To keep track of defects in order to review the process and/or the supply chain for continuous improvement.
Operator-independent approach.

Improved Quality
Increased customer satisfaction with improved ability to make on-time deliveries and to improve quality

NeuralOCR

AI solution for Optical Character Recognition.

A new generation of **faster and more efficient OCR, solving complex industrial problems** and improving quality control processes.

1 PERFORMANCE IMPROVEMENT

Address problems which cannot be tackled using traditional OCR technologies (or outperform the existing solutions) in case of:
- texts on **curved surfaces** (vials, flasks, bottles, jars);
- texts on **uneven surfaces** (bags, blister after application of the film, tubes);
- **unregular print quality;**
- embossed writings (on cases or blisters);
- texts on pads;
- dotted and industrial.

2 INDUSTRIAL RELIABILITY

Have a solution designed to **operate in industrial contexts**, considering the aspects left out by generalist solutions (e.g. **cycle times, inference speed, reliability, unstable connectivity in production sites, employee training on the line**). More intuitive configuration and setup, **less experience and time is needed to achieve good performance**.
Easily integrated into pre existing systems it does not require the use of a specific camera.

3 SIMPLIFIED MODELS CUSTOMIZATION

Achieve a **simple, easy to configure solution** that removes current barriers to OCR adoption.
Create **customized models with only few examples (about 10-40 images),** reducing the time required to configure a new format. With a single model it is possible to: **manage a large number of formats** with little effort, add a new format in few time and be completely autonomous in configuring new models.
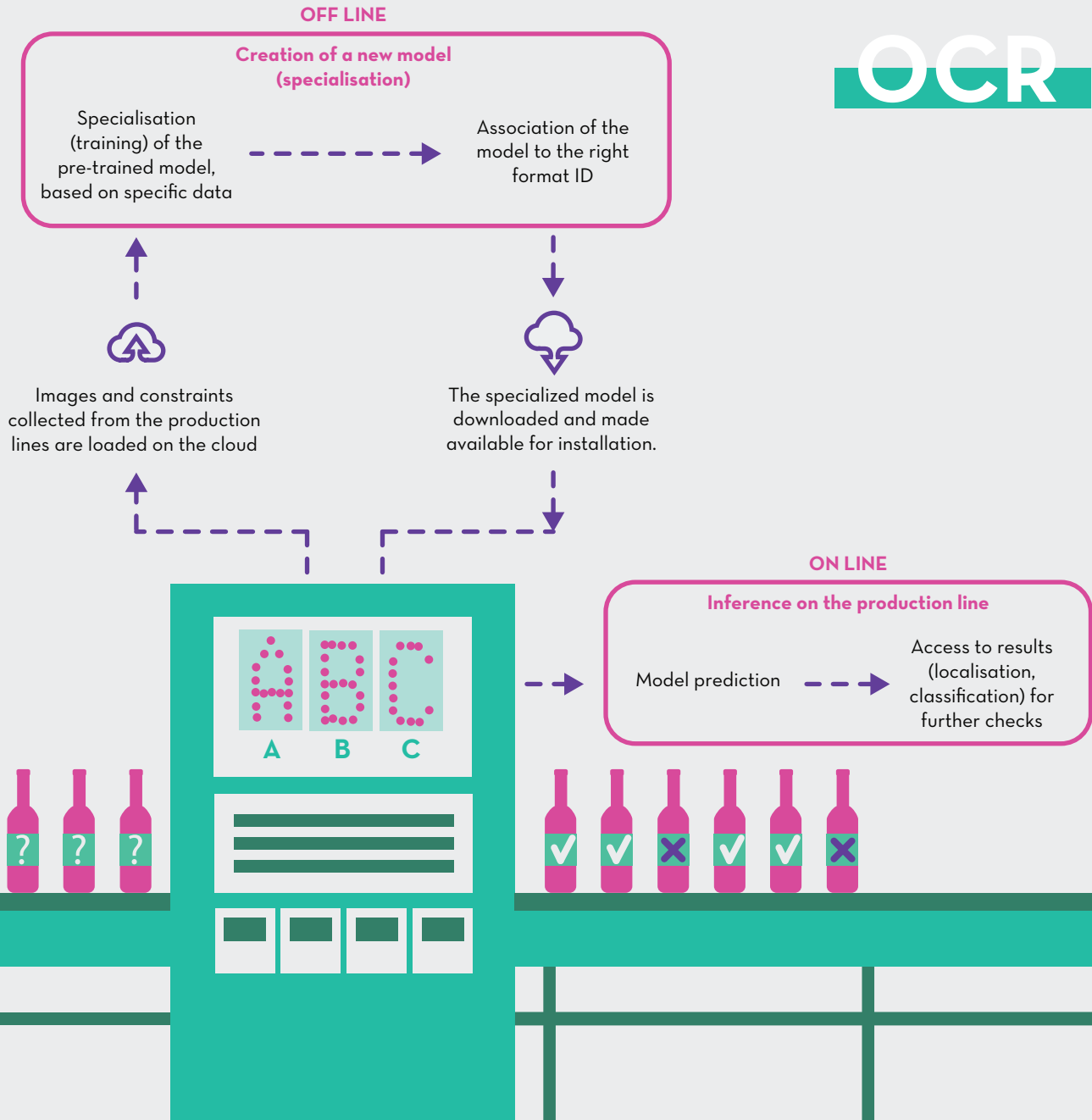
4 ADDITIONAL QUALITY CONTROL

Access to characters segmentation (position) and classification (identification) information, making it **easy to integrate additional quality controls** (e.g. OCV).
Configure the sensitivity of the quality control system to align inspection logic with production needs.
Manage the validation of new models before putting them into production, to ensure that the performance is always in line with the business expectations.

OCR

OFF LINE

Creation of a new model (specialisation)

Specialisation (training) of the pre-trained model, based on specific data

Association of the model to the right format ID

Images and constraints collected from the production lines are loaded on the cloud

The specialized model is downloaded and made available for installation.

A   B   C

ON LINE

Inference on the production line

Model prediction

Access to results (localisation, classification) for further checks

03 //
OCR - crimp printing Pharma

TASKS
OCR
Segmentation
Classification
Image analysis
Annotation
Computer vision

INDUSTRY
Pharma
OEM original equipment manufacturer

TECHNOLOGIES
Ai-go
NeuralOCR
Invariant.ai®

REQUEST
Automatically perform OCR control to read the lot number, printed with dotted font, on the metallic curved surface of vials necks.

STARTING POINT
Quality control was being carried out through traditional machine vision approaches that were inadequate at managing the bad printing quality and distortions on the image due to the curved printing surface.
The consequence was a high rate of false scrap since the system discard all the vial in which the lot number was not well printed (ca 10% of the total production was incorrectly rejected).

RESULTS

Increased OEE
Maintaining the same quality assurance, but reducing false rejects.

Reduction of the time required for format change operations. Thanks to the user friendly interface, less experience and time is needed to achieve good performance.

Most reliable output
Better recognition of characters - even if badly printed and in suboptimal visual conditions - with a significant decrease of components **misidentified as scrap: the amount of false reject decreases to 0.5% on the total production.**

test*	competitor 1		competitor 2		Neural OCR	
	% false rejects VS rejects	% false rejects VS total	% false rejects VS rejects	% false rejects VS total	% false rejects VS rejects	% false rejects VS total
#01	93%	30%	83%	12%	0%	0%
#02	100%	34%	100%	21%	0%	0%
#03	42%	17%	22%	5%	0%	0%
#04	92%	24%	83%	12%	75%	7%
#05	92%	32%	80%	9%	0%	0%
#06	88%	16%	60%	7%	0%	0%
#07	58%	16%	45%	12%	33%	7%
#08	50%	2%	86%	14%	0%	0%
#09	90%	20%	50%	2%	0%	0%

*Tests performed on 5000 pieces from 7 different batches

Improved Quality
Reduction of the time required to add extra quality controls already present on the line (e.g. OCV)

invariant.ai

Lifecycle management of AI systems.

Platform for the deployment, governance, monitoring and lifecycle management of AI systems in critical processes. Indispensable for the management of our algorithms and open to third-party development systems.

Oròbix named in the **2021 Gartner "Market Guide for Artificial Intelligence Service Providers"**, published 26 July 2021 - ID G00732756
Gartner defines the market for external AI service providers as a subset of the broader market for data and analytics (D&A) service providers. It covers consulting, implementation and managed services for AI techniques. Services span multiple phases of AI execution (i.e. strategy, design, deployment and ongoing management) and may also include AI governance, security, audit and monitoring.

1 DEPLOY MODELS

Take models to production with **guaranteed cycle times**, providing **complete observability and traceability of models and data** through time.

2 MONITOR MODELS AND DATA

Identify anomalies in the data or during model execution and evaluate the actions needed to ensure model performance through time. **Monitor performance and drift**, and identify what data to collect to improve said performance following an **active learning approach**.

3 GUARANTEE COMPLIANCE

Manage risks deriving from the adoption of automated decision systems by integrating AI solutions into operational processes **ensuring traceability and interpretability.**

4 DEFINE ROAD TO PRODUCTION

Define the procedures for the adoption of AI systems in production, from validation to monitoring. Foster **interoperability** and enable **cross-compatibility between different environments** (e.g. Linux & Windows), by standardizing the messaging protocols between distributed functions, leveraging state-of-the-art stream-messaging technologies.
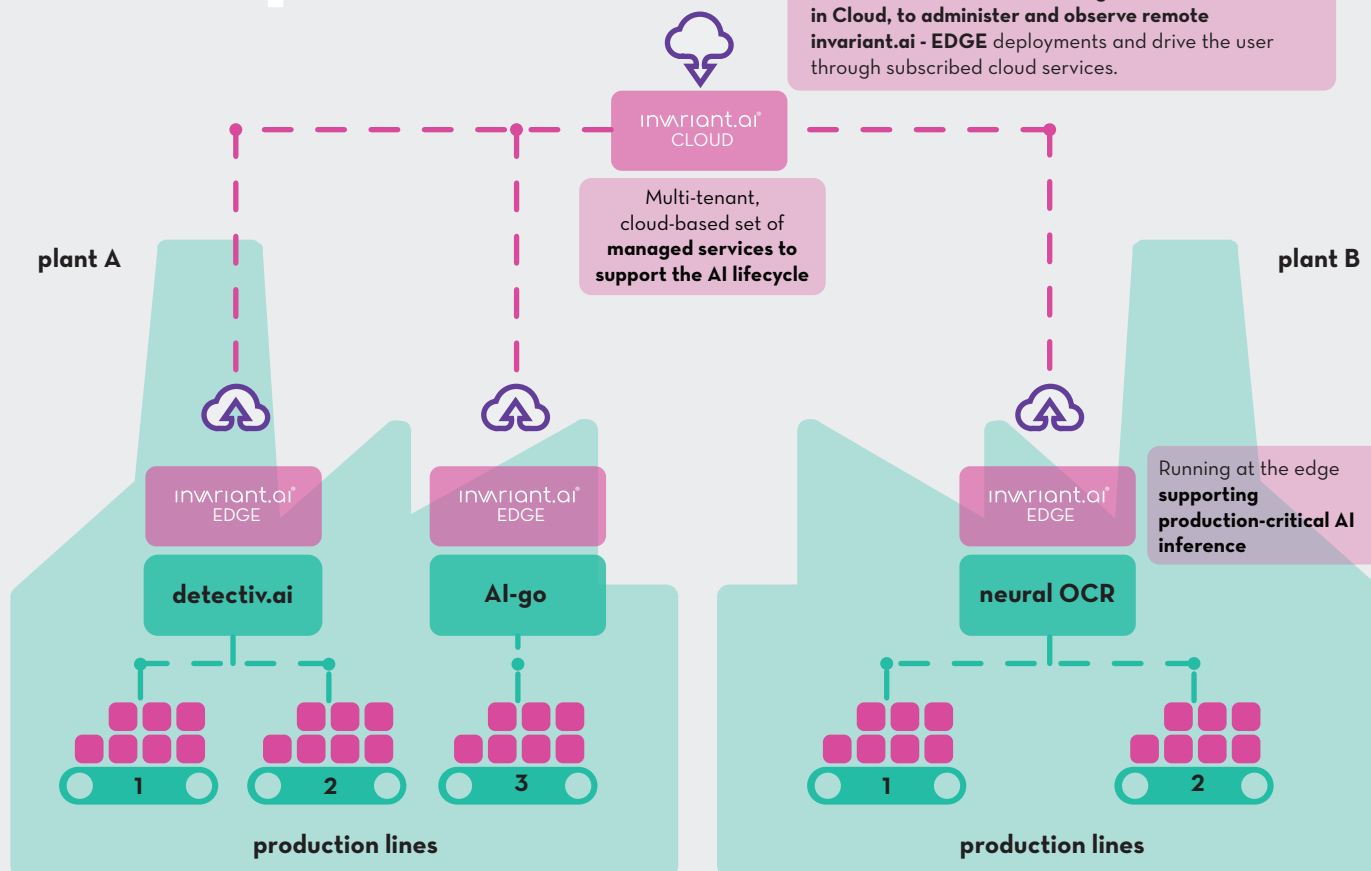
Monitoring Governance Compliance

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1. AI FRAMEWORK: track ML models evolution from the very first training through every improved production deployment.

2. DATA PLATFORM: big data management solution working behind the scenes to feed cloud services with qualified data harvested from the field.

3. MONITORING PLATFORM: dashboarding, alerting and reporting to support near-real-time telemetry and process analytics.
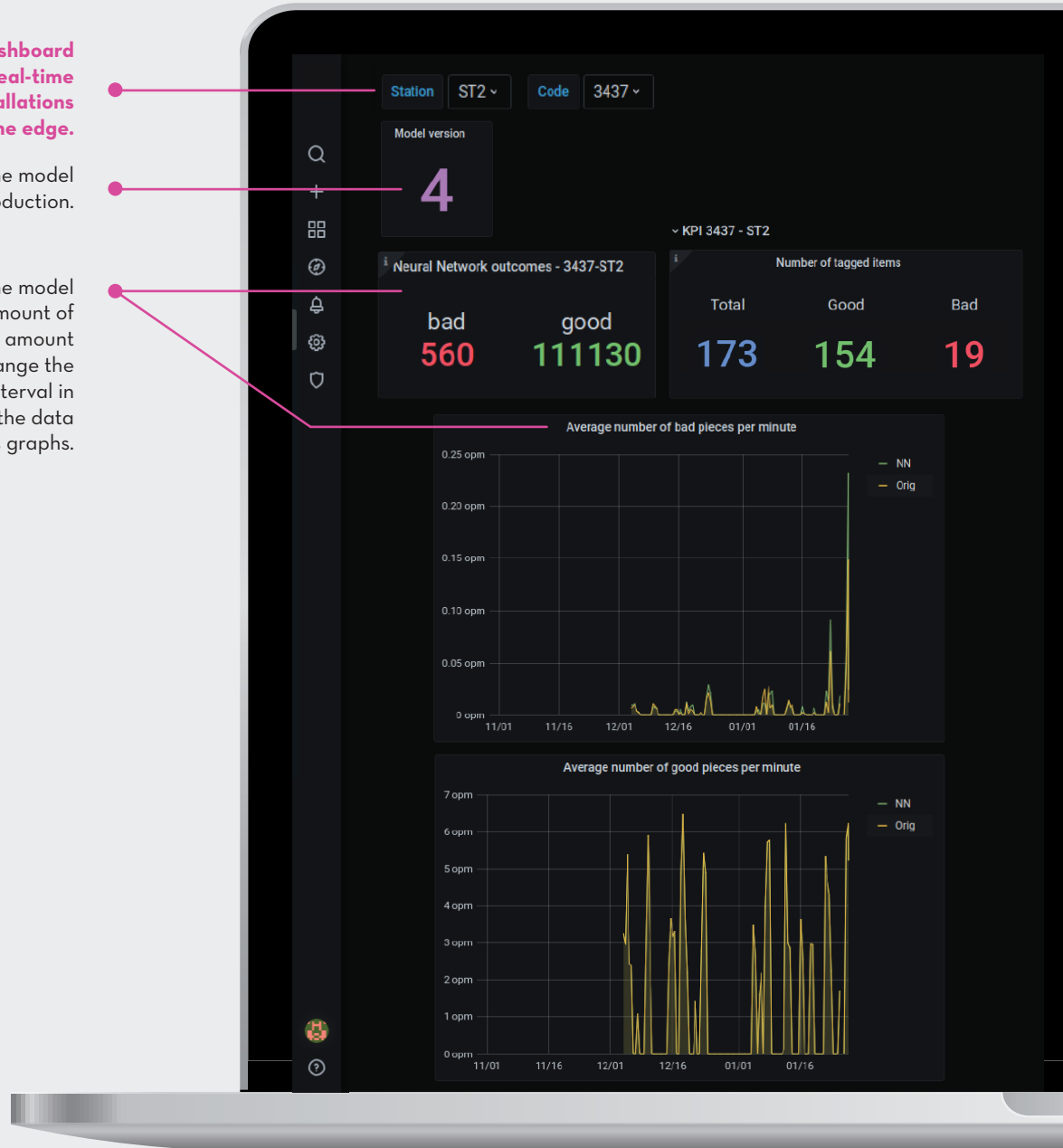
4. SERVICE PORTAL: Use a single control dashboard in Cloud, to administer and observe remote invariant.ai - EDGE deployments and drive the user through subscribed cloud services.

invariant.ai CLOUD

Multi-tenant, cloud-based set of **managed services to support the AI lifecycle**

plant A

plant B

invariant.ai EDGE

invariant.ai EDGE

invariant.ai EDGE

Running at the edge **supporting production-critical AI inference**

detectiv.ai

AI-go

neural OCR

1

2

3

1

2

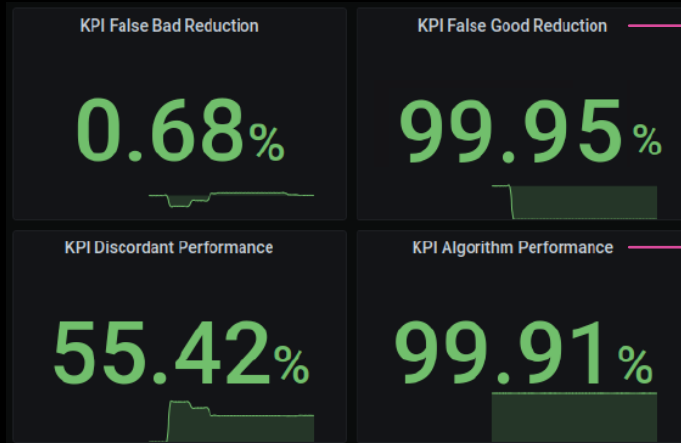**production lines**

production lines

ORÒBIX //19

Use a single control dashboard in Cloud to display real-time data, from several installations at the edge.

Identify at any time the model version currently in production.

Display an overview of the model status (e.g. the amount of good/bad parts and the amount of tagged parts). Change the data aggregation time interval in real time and visualise the data as graphs.

Station ST2 ⌄ Code 3437 ⌄

Model version

4

⌄ KPI 3437 - ST2

Neural Network outcomes - 3437-ST2

bad   good
560   111130

Number of tagged items

Total   Good   Bad
173   154   19

Average number of bad pieces per minute
— NN
— Orig

0.25 opm
0.20 opm
0.15 opm
0.10 opm
0.05 opm
0 opm
11/01   11/16   12/01   12/16   01/01   01/16

Average number of good pieces per minute
— NN
— Orig

7 opm
6 opm
5 opm
4 opm
3 opm
2 opm
1 opm
0 opm
11/01   11/16   12/01   12/16   01/01   01/16

Display custom statistics for each installations at the edge and monitor process-related KPIs (e.g. false bad reduction or the algorithm performance).
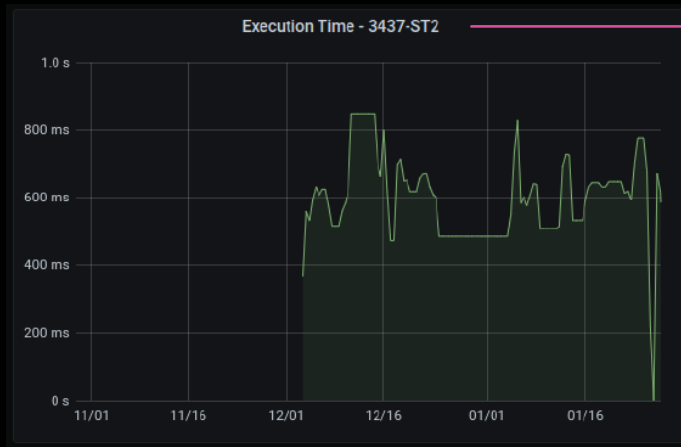
Control the algorithm response times and define alarm threshold.

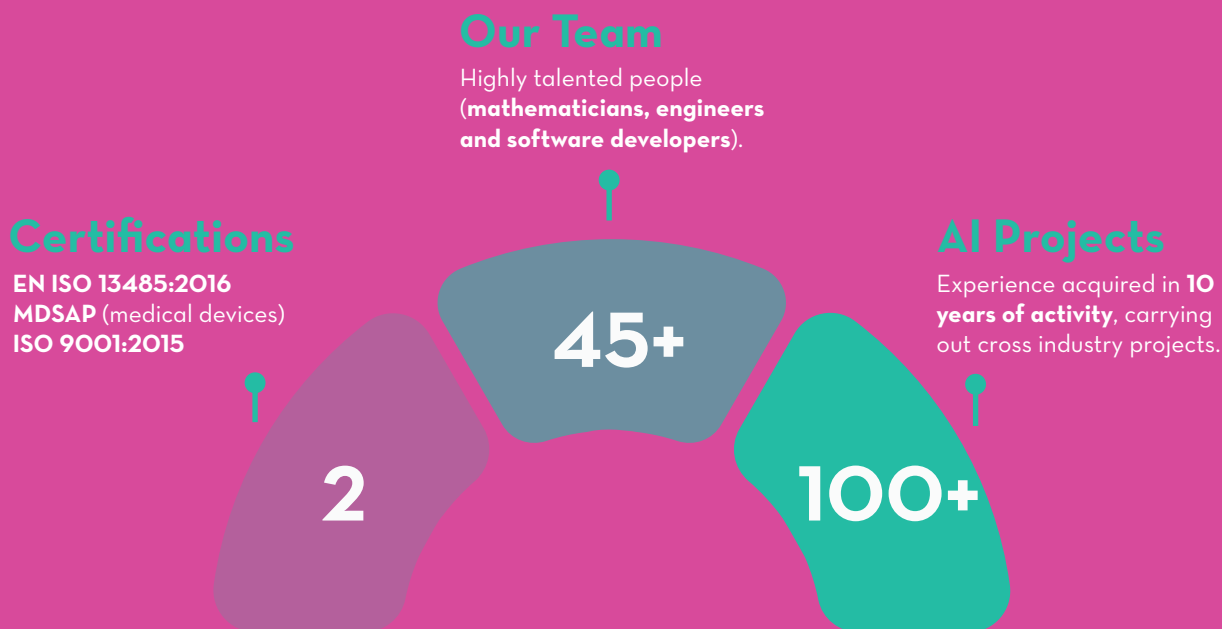# The AI Service Company
WHO WE ARE

At Oròbix, **we implement and manage the lifecycle of artificial intelligence (AI) solutions.**
They can be newly designed or integrated into existing systems, spanning a wide range of industries from healthcare to manufacturing, from gaming to energy.

As an AI service company*, we can accompany our clients throughout the entire AI lifecycle, end-to-end, from problem set-up to deployment and monitoring in production.
We have learned from our extensive experience that this integrated approach ensures optimized timelines and a quick return on investment (ROI).

Our Team
Highly talented people (**mathematicians, engineers and software developers**).

Certifications
EN ISO 13485:2016
MDSAP (medical devices)
ISO 9001:2015

AI Projects
Experience acquired in **10 years of activity**, carrying out cross industry projects.

45+

2

100+

*Oròbix named in the **2021 Gartner "Market Guide for Artificial Intelligence Service Providers"** - 26 July 2021 - ID G00732756

3 reasons to choose us:

1

AI gets to work

We manage risks deriving from the adoption of automated decision systems through an organic approach in which AI solutions are integrated into operational processes through tools for traceability and interpretability on all decision-making levels.

2

Don't say AI until you productionize

We promote early deployment of AI in production, verification of results with production data, and immediate creation of value. We manage the lifecycle of artificial intelligence (AI) solutions* through **invariant.ai®, our deployment, monitoring and governance platform for AI systems.**

3

We make AI happen

We design and develop **AI solutions** ready-to-install, with a shorter and consolidated time-to value. Flexible, but focused on solving a well-identified problems:
- **detectiv.ai: anomaly detection** for predictive maintenance;
- **AI-go: AI classifier platform** from limited examples in minutes.

*Oròbix named in the **2021 Gartner "Market Guide for Artificial Intelligence Service Providers"** - 26 July 2021 - ID G00732756

Founded in 2009 in Bergamo, Italy. **R&D company focused on the analysis of medical images** and software development for medical device. From 2014, **engineer cross-industry AI solutions.** Goal of being the **"last mile" AI company**.

2009

2019
AI gets to work

Co-founded Tensorwerk in NYC, develops **infrastructure for data-defined software development.** Partnership with Antares Vision Spa, **world-wide leader in inspection track and trace and smart data.**

While still proving engineering solutions, the new goal is to be **"the AI Service Company"**, managing AI in mission critical processes. With the launch of **Invariant.ai®**, Oròbix wants to go even beyond the "last mile" AI company.

2020
Don't say AI until you productionize

2021
We make AI happen

The **AI solutions portfolio expands: "ready-to-install" solutions** with a shorter time-to value, solving specific needs, with the possibility to scale up to complex problems.
Founded **OròbixLIFE** with the aim of specializing Oròbix offering to **Life Science industry.**

ORÒBIX //25

WE BELIEVE, WE LEARN, WE SHARE.

01.
WE WORK passionately every day to create value and shared well-being.

02.
WE IMAGINE a better collective future through AI.

03.
WE BELIEVE that AI is a tool humans can leverage to foster life, work, wealth and individual progress.

WE CODE for people, not for machines.

04.
WE ARE at our best together, when we share visions and circulate knowledge.

05.
WE VALUE the power of open-source, of collective and shared intelligence.

06.
WE LEARN by doing, we search for practical solutions to challenging problems and grow from our mistakes.

07.
WE STRIVE to make AI reliable, safe, performant and capable to operate on the field.

08.
WE INVEST in daring ideas, building upon the shoulders of those who preceded us.

09.
WE FOSTER change, growth and innovation, by constantly challenging the status quo.

10.
WE BELIEVE in changing the world BIT BY BIT, together with those who will join us along this journey.

WE MAKE AI HAPPEN.