AI-POWERED ROBOT

A CASE STUDY IN THE PICK & PLACE REVOLUTION

Collaboration: ONESTEP AI and FANUC

Presented at: VISION fair, Stuttgart, October 2024

Key Technology: ONESTEP AI and FANUC Revolutionize Industrial Automation

ONESTEP AI **FANUC**

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Overview

At **ONESTEP AI**, our mission is to **bring artificial intelligence to the heart of the manufacturing industry**. The collaboration with FANUC represents a crucial step towards this goal. By combining our expertise in AI with FANUC's leadership in robotics, we are **redefining the possibilities of industrial automation**. This project demonstrates how **AI can transform robots from simple executors to intelligent and adaptive systems**, opening new frontiers for Industry 4.0.

Mariusz Prószyński, ONESTEP AI CEO

What is ONESTEP AI?

ONESTEP AI, powered by Intratel, is an innovative company with a strong focus on AI solutions forindustrial applications. Since 2018, we have consistently demonstrated our leadership incomputer vision and machine learning for industrial automation. Our expertise in developingcustom **AI solutions that seamlessly integrate with existing robotic systems is a testament to ourcommitment to excellence**.

AI stands out for its ability to create custom AI solutions that seamlessly integrate with existing robotic systems.
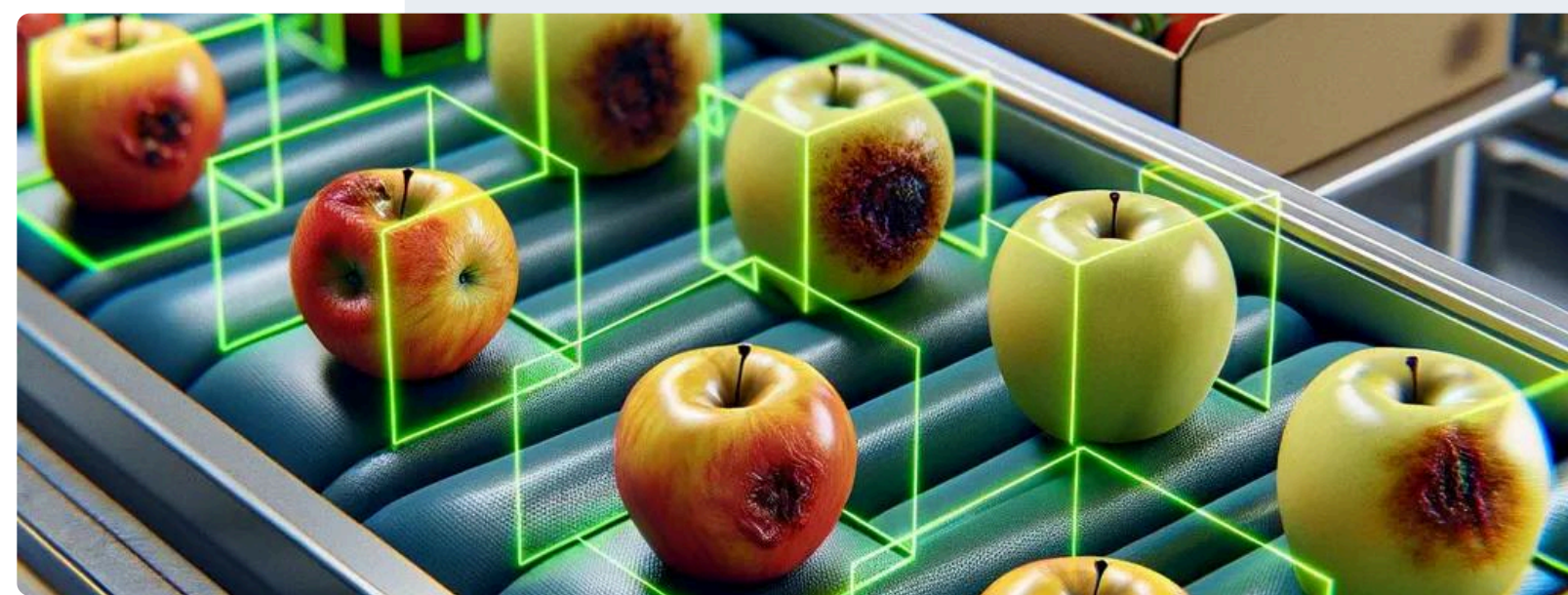
What is FANUC?

FANUC Corporation is a **global leader in producing industrial robots** with computerized numerical control (CNC) systems and machine tools.

With over 60 years of experience, **FANUC is synonymous with innovation and reliability in the industrial automation sector**. Their products are used in various industries, from automotive manufacturing to consumer electronics. FANUC has approximately 9,970 employees globally, and its revenue is around USD 5.5 billions.

FANUC robots intended for a variety of applications

Implemented solutions

The collaboration between ONESTEP AI and FANUC Poland resulted in the development of an external AI vision system for industrial robots, which was showcased at the VISION 2024 fair in Stuttgart. The ONESTEP AI platform has enabled the independent development of an information flow — from the camera (information source), through the training of product models, the creation of a flow graph (AI'GORITHM) running on a standalone edge device, and finally, integration with the robot as the executing unit.

Pick and place robots are widely used across industries such as manufacturing, logistics, and quality control, delivering higher productivity and handling repetitive or hazardous tasks that humans avoid. By integrating a robot with a 2D or 3D camera, it becomes possible to achieve greater precision, flexibility, and significant savings in both time and cost.

With ONESTEP AI platform, a no-code solution, creating and programming robotic processes becomes more straightforward and efficient, eliminating the need for requiring no IT or AI expertise while ensuring significantly higher levels of precision and flexibility.

How do you build such a solution? We will demonstrate this with **an example of a simple snack bar sorting process**:

01

The foundation of the entire process is building models of the snack bars.

For this purpose, we used around 100 images taken with a camera mounted above the station. As you can easily see, this process can be used not only for anomaly detection in objects but also, unlike other systems, on the classification of these anomalies.

By training a model of a correct product, we can assume that any items differing in appearance indicate a defect. With this prepared dataset, we can upload it to the ONESTEP AI platform and then use the available tools there to create a training dataset.

02

The next step is training the model using the available predefined collection of frameworks and models.

If you do not have experience with neural network training, you can use the predefined settings. If you do have that expertise, you can select Advanced Mode to manually configure the parameters.

03

With a trained model of products, you can test its accuracy using the hardware resources available on the platform.

If you already have a specific type of graphics accelerator, you can convert it to match your existing architecture. In our case, we used the Nvidia Orin NX device.

04

Since even the most advanced model is useless without proper production deployment, we invite you to explore our next tool — AI'GORITHM.

Here, using predefined blocks and trained models, you can create your own information flow graph, which will then be converted into a program that runs on your own edge device.

05

With a complete system ready to run on your edge device, only one step remains: integration with the robot.

Thanks to the collaboration and support from FANUC Poland, we developed a turnkey solution using their robot. Now, with your system set up, start it and put it into production. Remember, you can change the objects being transferred, the destination, or the process at any time. Thanks to our platform, building solutions like this has never been easier.
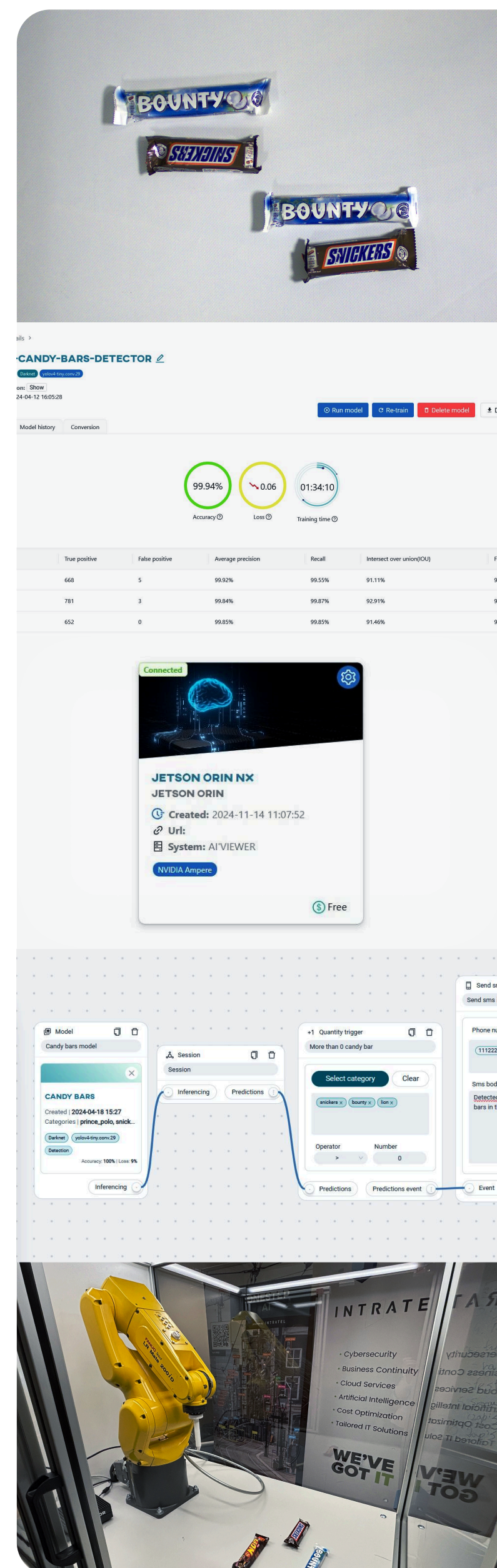
Conclusions
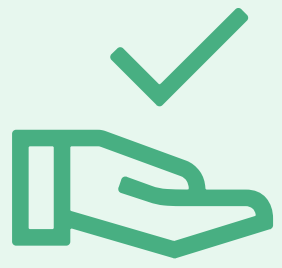
Results and Benefits

Operational Flexibility: reduction in building the application and reconfiguration times for new tasks, from days to hours.

Productive Efficiency: Adaptive robotic movements and real-time object recognition boost production throughput by 30%, enabling continuous operation with minimal downtime. The system's core strength is its adaptability to variable products and on-the-fly algorithm replacement, ensuring efficient, uninterrupted production as product specifications change

Application Expansion: This technology's versatility positions it well for diverse applications, from contamination management to precision handling tasks in specialized industrial environments.

Quality Control: "Combating the Challenges of False Positives in Al-Driven Anomaly Detection Systems and Enhancing Data Security in the Cloud" from Asian Journal of Research in Computer Science the 97% was the highest score.
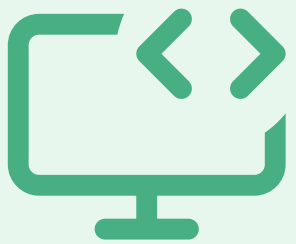
Overcome Challenges

Latency: Optimization of algorithms and use of dedicated hardware to ensure real-time analysis and reaction.

Precision: Implementation of simple calibration techniques and sensor fusion to ensure movements with high precision.

Portability: Development of a modular software architecture adaptable to different Fanuc product lines.

Robustness: Intensive testing in variable lighting conditions and industrial environments to ensure consistent performance.

Advantages and Applications

Manufacturing: Streamlines assembly and qualitycontrol.
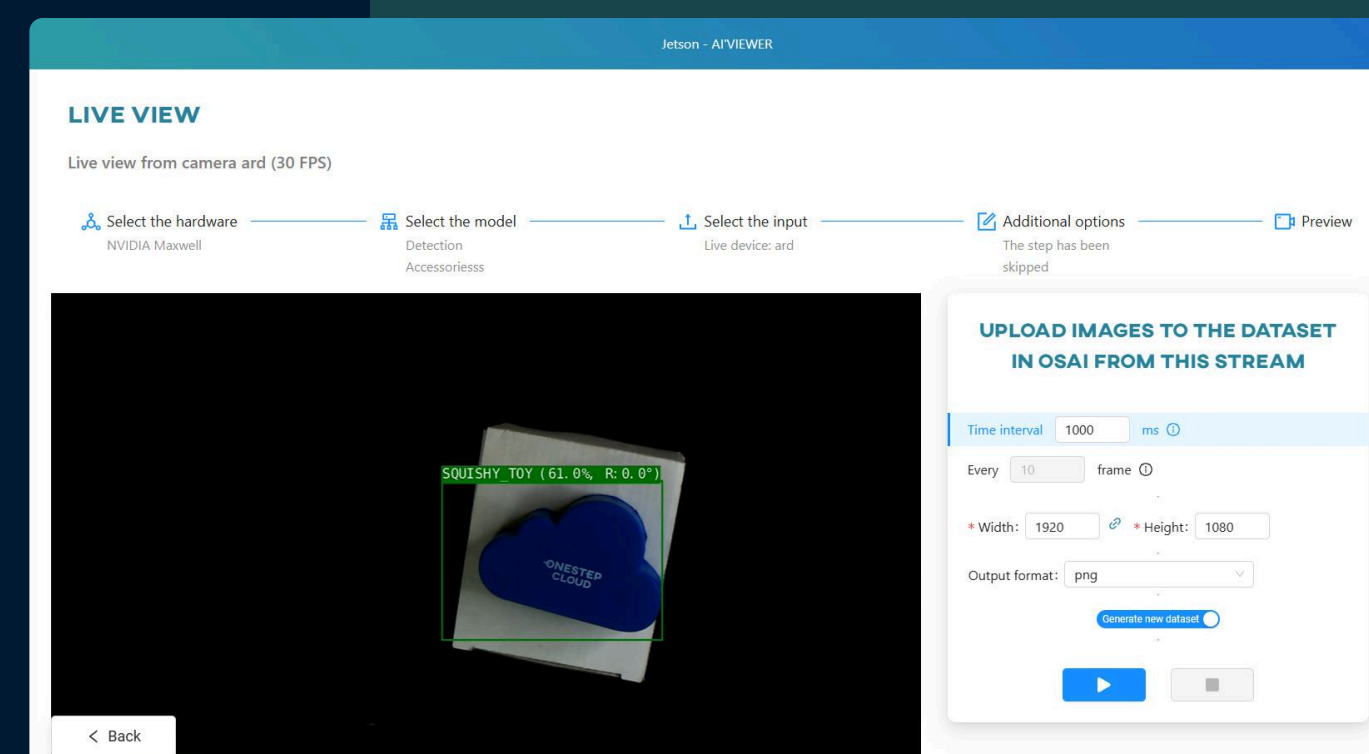
Food and Beverage: Ensures hygienic sorting andpackaging.

Logistics: Accelerates order processing and inventory management.

Electronics: Facilitates precise assembly of small components.

Automotive: Improves parts assembly and stock control.

**Recycling:** optimizes sorting for waste processing.

Future prospects

The collaboration between ONESTEP AI and FANUC is opening new frontiers in industrial automation, with a specific focus on enhancing robotic capabilities through advanced computer vision.

Pioneering a new era in industrial automation

The collaboration between ONESTEP AI and FANUC is paving the way for new frontiers in real-time precision robot control under dynamic environmental conditions.

Through advanced integration of AI and robotics, this partnership is not only transforming traditional manufacturing but also setting new standards for quality control. As robotic systems become increasingly intelligent and adaptable, they are delivering unprecedented advancements in efficiency, quality, and flexibility to production processes.
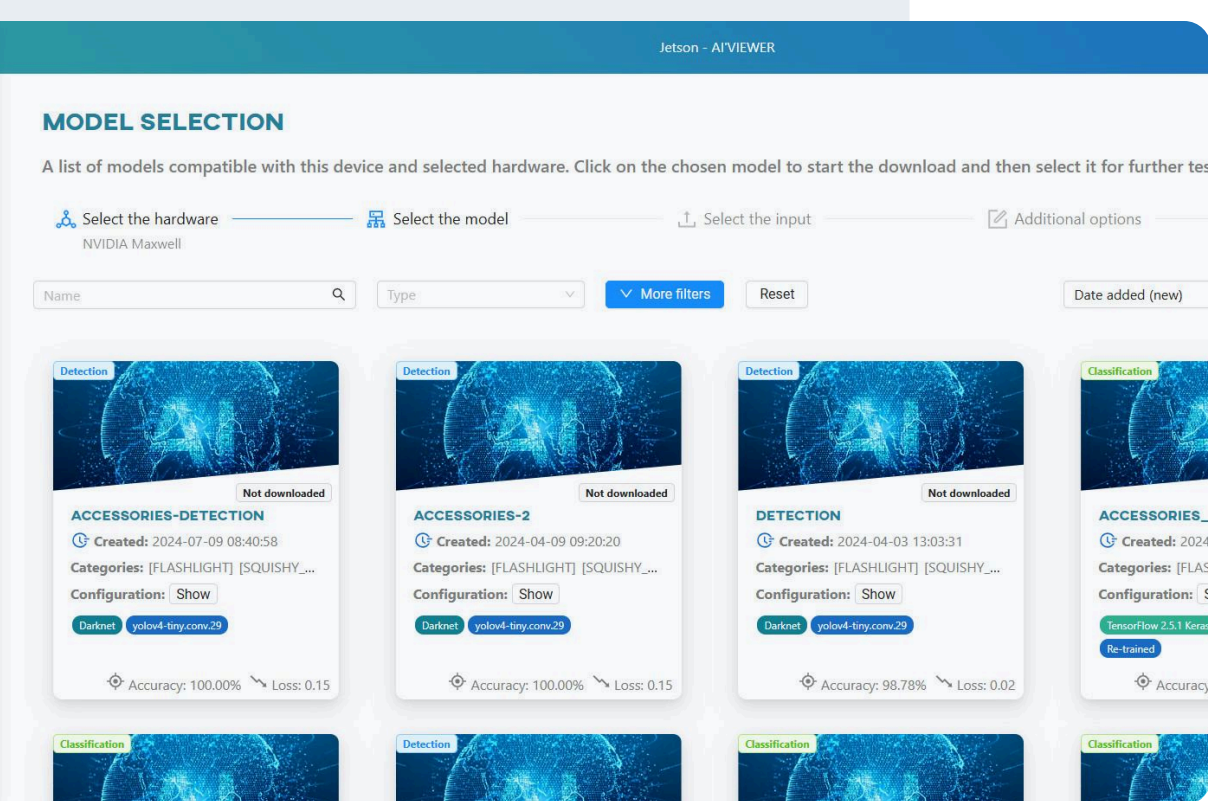
These innovations position ONESTEP AI and FANUC as leaders in Industry 4.0, with a transformative impact on sectors such as electronics, automotive, and pharmaceuticals.

Market forecasts suggest a 15% growth in the industrial robotics sector over the next five years, driven by breakthroughs in AI-robotics integration and intelligent automation. Smarter systems will allow robots to automatically adapt to the position and orientation of components, refining execution speed without compromising on precision.

This dynamic approach reduces cycle times, enabling quicker handling of diverse components while maintaining accuracy, which is critical for handling product variants.

Human-robot collaboration will also be more seamless in the future of manufacturing. Intuitive interfaces will simplify the programming of robotic movements, making the technology more accessible to operators without specialized expertise.

Real-time visualization of production and quality data will empower quicker decision-making and enhance process management, while automatic calibration of vision systems will allow robots to maintain accuracy even when adapting to new products.

Do you want to learn more?

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