Production Yield Optimization

Reduce waste and optimize output with deep reinforcement learning-trained AI Agents

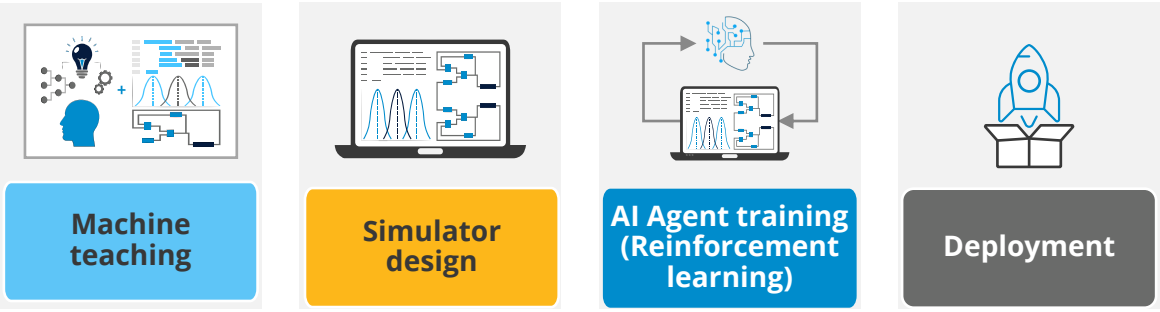
What is PYO Autonomous AI?

Production Yield Optimization (PYO) is a proven Autonomous AI solution that enables manufacturers to reduce waste and optimize manufacturing output with AI agents.

Most production control systems are built for static environments. The AI agents act as intelligent process controllers that dynamically fine-tune existing control systems parameters. The agents enable those control systems to adapt to changing manufacturing environment.

Fractal designs the AI agents using manufacturers' subject matter experts through the Machine Teaching process. The agents are trained using deep reinforcement learning techniques and custom-built AI simulator trained on real-life process data.

The PYO solution combines accelerators, best practices, and custom data science engagements to build, train, and deploy effective AI agents.



Why should you consider PYO Autonomous AI?

Optimize production with AI

Optimizing production yield is hard to automate as it often relies on subject matter experts (SME) such as experienced production line operators and supervisors.

PYO agents learn, through SME expertise transfer, to optimize production for complex and changing environments. Those agents will help with both manufacturing line-level and human-level challenges.

Real-world AI solution

PYO uses deep reinforcement learning (DRL) and simulations to train the AI agents without the need for pre-existing labelled datasets.

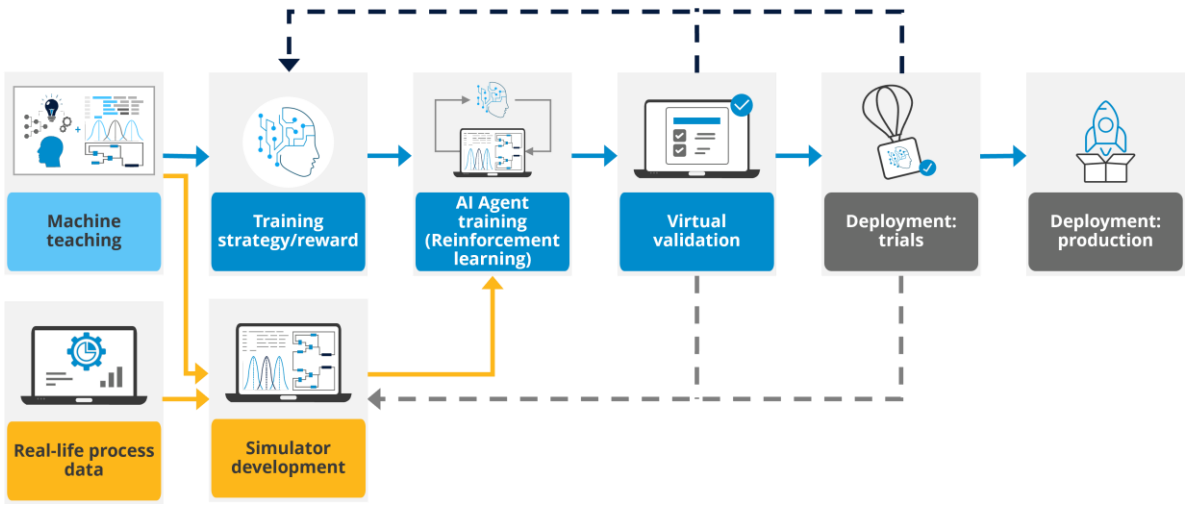
Built on Azure Machine Learning, it leverages industry-standard DRL techniques and libraries to translate SME expertise into so-called "reward functions" that allows the AI agent to self-train through the simulation. This expertise transfer is commonly referred to as "Machine Teaching".

Fractal end-to-end expertise

Bringing an AI agent from design to deployment requires a large set of data and AI skills.

Fractal end-to-end DRL experience, accelerators, and best-practices help manufacturers customize PYO to their unique needs. This is one of the reasons why companies such as PepsiCo have trusted Fractal for their PTO project.

AI agent design, training, and deployment process

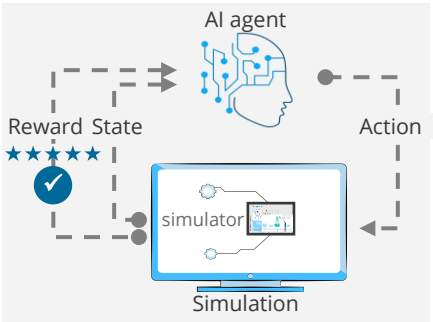


The PYO AI agent design, training, and deployment is a multi-step and iterative process. Once the initial Machine Teaching process is completed, the manufacturing SMEs expertise will help select the appropriate process training data and define the best reinforcement learning reward function. The AI agent is then trained using the new simulation.

The trained agent is then validated virtually with the simulation. However, in most cases, multiple cycles of simulation fine tuning, reward function adaptation, agent training, and virtual validation will be required to converge to a satisfactory PYO AI agent. The agent is first trialed and fully deployed in production.

> **"It's the perfect combination of human and machines"**
>
> *(Denise Lefebvre, SVP Pepsico Global Foods R&D)*

How does Deep Reinforcement Learning train an autonomous AI agent?



Deep Reinforcement Learning (DRL) uses the concept of a "reward function" to provide continuous feedback to the agent.

The agent sends control signals to the simulation. The reward function will measure the difference between the expected simulation state versus its actual state and will modify the agent's deep neural network weights accordingly.

Depending on the system controlled, this training loop will run between hundreds of thousands to millions of times.

Why Fractal?

A data, ML, and AI specialist for over 20 years, Fractal is a recognized Microsoft Solution Partner with the expertise to support you throughout your data and AI transformation journey.

Depending on the offer/product we may be able to add: "Depending on your use case or situation, your project conducted through Fractal might be eligible for Microsoft funding."

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