

Catch costly process failures before they happen.

Quantum-accelerated models detect early anomalies in continuous biomanufacturing that classical methods miss, validated on ORCA's PT-2 photonic quantum accelerator.

BIOMANUFACTURING

1. The anomaly detection lag

Continuous biomanufacturing demands early anomaly detection: even minor deviations can compromise yield and stability, disrupting scheduling and cutting weekly production. These processes are highly nonlinear, with intricate relationships between variables.

Near-boundary faults, like a subtle feedstock deviation, are the hardest to catch. They overlap almost completely with normal variability, and classical methods can miss them entirely in continuous bioprocesses.

2. The value that ORCA delivers

ORCA applied an unsupervised ensemble of generative adversarial networks (GANs) that trains on normal data alone, yet can detect anomalies it has never seen before. The result was that hybrid quantum-classical GANs outperformed the baseline classical model.

ORCA's PT-2 photonic quantum accelerator generates more varied training data, helping the model tell good from faulty with greater precision. This translates directly into catching subtle faults classical baselines miss, earlier in the process.

3. Benchmark results

Working with Novo Nordisk, SiC Systems and the Technical University of Denmark (DTU), the quantum prior achieved 2x the anomaly detection rate at zero false positives compared to the classical baseline.

“This work demonstrates how agentic AI can transform industrial processing. Our physics-informed platform, enhanced by quantum acceleration, addresses the multi-scale complexities of plant design, delivering substantial engineering time savings and enabling the rapid deployment of safe, efficient, domestic production facilities.”

Dr. Seyed Soheil Mansouri, Co-Founder
and Chief Scientist of SiC Systems

2X

anomaly detection rate at 0% false positives compared to classical baselines

+18%

better overall detection accuracy vs the classical baseline model

USE-CASE IMPLEMENTATION

Hybrid solution

PT-2 photonic quantum accelerator
(48 qumodes)

Classical HPC with NVIDIA GPUs

ORCA SDK with Python and PyTorch
compatibility

AI approach

Quantum-accelerated GANs for
unsupervised anomaly detection