CASE STUDY

jetraw
by dotphoton

How Life Science Teams Accelerate AI with Jetraw's Synthetic Data Engine

Key results

Generates images at any resolution from a model trained on small patches only

+10% per segmentation improvement when augmenting real data with synthetic images

Synthetic data alone matched or outperformed real data on 2 of 6 datasets

The Challenge

Life-science imaging teams face several interconnected challenges that slow the adoption of AI and reduce the reliability of deployed models. High-quality datasets covering diverse experimental conditions are costly and time-intensive to acquire, often leaving models undertrained.

At the same time, manual annotation of scientific images is slow and expensive and introduces human variability that affects model performance. Models trained on a specific imaging device or experimental setup frequently struggle to generalize to new environments, while differences between training data and real-world acquisition conditions introduce distribution shifts that reduce accuracy over time.

The Outcome

With Jetraw AI, imaging teams can generate physically plausible synthetic data that mirrors the original pixel distribution — eliminating data scarcity and cutting annotation costs. The optimisation engine reduces distribution shift between training and deployment, while the quality control engine flags deviations in AI/ML inputs in real time. The result is more resilient models, faster AI development cycles, and data workflows that scale without ballooning storage costs.

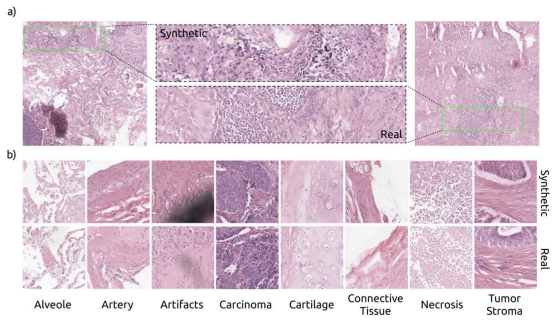

Figure 1: a) Examples of synthetic and real 2048 × 2048 images. b) Pairs of 512 × 512 synthetic tiles (top) with the closest real images found with Inception-v3 near-neighbour (bottom).

USE CASE LIFE SCIENCES AND IMAGING AI TEAMS

Imaging techniques: Generate arbitrarily large synthetic images. Avoid tiling artefacts, preserve long-range correlations. Create image-label pairs from a single acquisition . Adversarial blind-spot detection. Real-time QC flagging at deployment

Instruments: Light-sheet microscopy, Lattice light-sheet microscopy, Digital Pathology, High Throughput Screening

Read full Neurips paper

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Synthetic Data Engine

Generates data that mirrors the original pixel distribution, producing physically plausible output. Addresses data scarcity and costly manual annotation.

- Generate arbitrarily large images, preserving long-range correlations & avoiding tiling artefacts.

- Create multiple image-label pairs from a single collection, emulating acquisition device variation to enhance model resilience and accuracy.

Optimisation Engine

Custom image processing that enhances model accuracy in object detection and controls for data deviations, reducing uncertainty from differences between training and real data.

- Run adversarial searches on the data-generating process to identify blind spots.

- Detect and flag deviations in AI/ML inputs during deployment or certification.

Quality Control Engine

Monitors AI/ML inputs during deployment or certification, detecting and flagging deviations to maintain model performance across varying acquisition conditions.

- Detect and flag deviations in AI/ML inputs during deployment or certification workflows.

- Maintain model performance standards across varying devices and conditions.

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