softserve

GEN AI-POWERED SYNTHETIC DATA GENERATION

In Robotics

TRANSFORMING AI AND ROBOTICS

Innovation in robotics and AI can face significant obstacles: high costs, time-intensive data collection, and safety risks. **Synthetic data generation (SDG)** helps address some of those challenges. It offers a scalable, cost-effective alternative, transforming AI model training and robotic simulations.

By leveraging **NVIDIA tools like NVIDIA Omniverse Replicator and NVIDIA Isaac Sim, combined with Generative AI and multimodal data capabilities**, researchers can create photorealistic, physics-based visualizations that mimic real-world conditions, enhancing the development of robust AI models and innovative robotics solutions.

WHY CHOOSE SYNTHETIC DATA GENERATION?

Physical AI Enablement

Empowers dynamical systems to make real-world decisions with precision while significantly reducing the dependency on extensive real-world data collection. Enhances generalization across diverse environments. Prepares for rare scenarios. Ensures faster deployment of robotics and autonomous systems.

Data Privacy and Security

Ensures GDPR compliance by generating realistic data without using personal information.

Data Augmentation

Simulates various conditions, such as weather and lighting, to create diverse datasets.

Balancing Datasets

Creates balanced datasets to avoid bias and ensure equitable AI model performance.

Customizable Scenarios

Tailors data to specific needs, such as factory floors or lunar surfaces.

ENHANCING AI MODEL TRAINING AND ROBOTIC SIMULATIONS

SDG significantly enhances AI model training by providing diverse, high-quality datasets, crucial for industries where real-world data is challenging to obtain. For instance:

- **Automotive**: Obstacle detection in self-driving cars by simulating various driving conditions.
- **Healthcare**: Synthetic medical images for anomaly detection.
- **Agriculture**: Robot control in vertical farms, streamlining production and quality control.
- **Manufacturing and Warehousing**: Optimized processes and boosted efficiency through simulations.
- **Space**: Trained and validated autonomous space exploration systems, like lunar drones or spacecraft-maintenance robots.

Robotic simulations validate and test robots, ensuring performance and safety before deployment.
Cloud-based simulations offer:

Cost Efficiency
Minimize real-world data collection and reduce the number of physical tests.

Scalability
Enables rapid iteration and testing without physical constraints.

Flexibility
Flexibility in experimentation enables diverse testing scenarios.

Collaboration
Supports multi-team access and real-time data sharing.

SYNTHETIC DATA GENERATION APPLICATIONS

1. **Augmentation of Real Training Data**: Enhances datasets with synthetic examples, improving model robustness and diversity.
2. **Model Training Without Real Data**: Generates realistic datasets to replace real-world data during initial training stages.
3. **SDG for Complex Objects**: High-fidelity modelling of interactions between soft and rigid bodies, capturing dynamics and material properties, enhanced by NVIDIA Warp, MATLAB, and ANSYS.
4. **Robotic Simulation for Validation/Tests**: Uses high-fidelity simulations with SIL and HIL to validate and test robotic systems in virtual environments.
5. **Digital Container**: Provides precise simulations of real-world systems, supporting multi-team collaboration and parallel testing.
6. **Boosting SDG with Generative AI**: Combines NVIDIA Omniverse Replicator, NVIDIA Isaac Sim, and USD Search NVIDIA NIM microservices to automate and enhance synthetic data pipelines.

BOOSTING SDG WITH NVIDIA TECHNOLOGIES

NVIDIA Omniverse Replicator:
Generates diverse, high-fidelity datasets

NVIDIA Isaac Sim:
Provides realistic, physics-based simulations

Enhanced NVIDIA Omniverse ecosystem:
Enables co-simulated high-fidelity models in MATLAB and ANSYS

NVIDIA Warp:
Python framework for GPU-accelerated simulations

PARTNER NVIDIA

WHY SOFTSERVE

SoftServe is committed to leveraging cutting-edge technologies to enhance AI and robotics.

As a Premier Consulting Partner in the Amazon Web Services (AWS) Partner Network (APN), we simplify cloud migration and build advanced solutions on AWS.

STABILITY	EXPERTISE
31 YEAR	**Sc.D. & Ph.D.**
Award-winning service, across multiple industries	30% of the team are Sc.D. & Ph.D. holders in robotics & advanced automation

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