

LABELED SYNTHETIC TRAINING DATASETS FOR ISR DEEP LEARNING ALGORITHMS

Reliable training models enabling faster analysis with greater confidence

L3Harris is automating labeled synthetic training data to create intelligence, surveillance and reconnaissance (ISR) deep learning algorithms that fuel artificial intelligence (AI) systems.

The U.S. Intelligence Community is drowning in available sensor data that may hold critical information to enhance missions. Agencies are unable to process new imagery as even newer data comes in. AI technology may offer a solution, but requires robust machine learning algorithms and industry-specific training data to enable faster, higher quality and repeatable machine learning results.

The defense industry is focusing attention on deep learning algorithms, a subset of machine learning, where the system applies an inferred “input equals output” function based on training algorithms with accurately labeled training datasets. With defense-focused content, the datasets enable robust algorithm development to refine the capabilities for ISR missions. Currently, agencies are manually building training datasets, a slow process that

consumes 80% of their time and investment in machine learning.

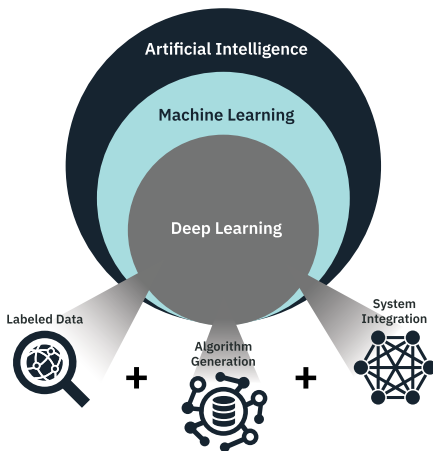
To support defense and intelligence machine learning missions and reduce this training data burden, L3Harris is providing a trusted source of labeled synthetic training data to feed algorithms. Our automated, defense-specific, synthesized, metadata-labeled training data fills the training gap, enabling the further development of deep learning algorithms.

L3Harris moves deep learning forward.

ENABLING ARTIFICIAL INTELLIGENCE

L3Harris’ autogenerated metadata-rich synthetic training data creation provides the basis for robust machine learning algorithms for use when images are otherwise unavailable. Technologies and knowledge gained from our 40-year legacy of delivering radiometrically correct, high-fidelity remote sensing solutions and system simulations yield proven synthetic training data for ISR-focused machine learning.

Today, using proprietary preflight satellite sensor simulation and modeling techniques, L3Harris is automating the development of simulated multi-sensor output specimens of defense-focused objects or systems of interest. We deliver custom made libraries of reliable, tested, metadata-labeled images.



HIGHLIGHTS

- > Automation of synthetic training data eliminates 80% of time spent collecting, managing and labeling data
- > Development and integration of new algorithms significantly reduce timelines
- > Accuracy of algorithms trained with synthetic training data has been validated against real data

BENEFITS

- > No real images of the target are required
- > New algorithms are more rapidly deployed
- > New objects of interest are identified faster
- > Performance is increased by training with robust synthetic datasets

ENGINEERING THE UNSEEN

Our engineers use 3D models combined with real satellite imagery to develop simulated, radiometrically accurate, realistic images of how objects would be viewed by different imaging sensors at different points in orbit. This method produces a wide range of images depicting the object in different settings, at different angles, and in different lighting conditions as they might be seen in actual satellite imagery.

By leveraging advanced tools and standardized labeling techniques, L3Harris automates full libraries of each synthesized object to enable deep learning algorithm training.

An example application would be the development of synthetic training data of a transfer truck that could be applied to different landscape settings to teach the computer to identify similar objects in different parts of the world. It might take years to locate real imagery of similar transfer trucks in those various settings to gather enough training data for deep learning algorithm development.

DELIVERING TRUSTED SYNTHETIC TRAINING DATA

L3Harris has invested in internal research to better understand the qualities of real data that need to be replicated in order to make synthetic data more accurate to deliver repeatable results. Applying the research findings to our approach in building synthetic data, L3Harris' labeled synthetic training data has resulted in superior substitutions for real data. In testing, our synthetic data has fooled the human eye as well as machine-trained systems.

By automating the production and labeling of this high-quality synthetic data, L3Harris can quickly deliver libraries of proven synthetic data that works, moving agencies to the next level of generating algorithms.

ENABLING ALGORITHM GENERATION

The key to successful machine learning algorithm generation is accurate, labeled, synthetic training data. Typical algorithm development combines math, science and physics to create a formula that results in data that answers a question or meets a specific requirement. In machine learning, however, the data is part of the equation to develop the algorithm.

This quandary of needing the data first to build the algorithm that identifies the data is slowing down the development of machine learning capabilities. Agencies are dedicating the majority of their investment in machine learning to simply gathering the data that is needed to develop algorithms that can find newly identified targets or hard-to-identify objects.

L3Harris' automated physics-based modeling approach to creating and labeling synthetic data can greatly increase algorithm robustness. This leads to greater automation and efficiencies and provides data more quickly to enable AI.

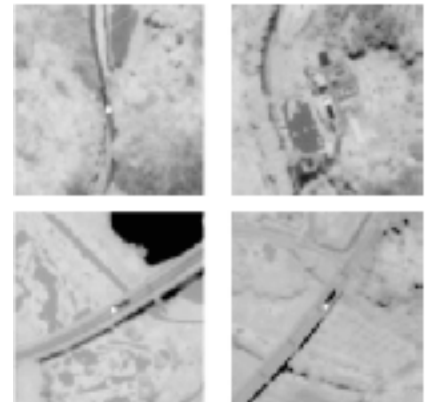
MACHINE LEARNING INTEGRATION

Time savings and more efficient data access are achieved with machine learning algorithm integration into existing systems, providing a one-stop shop for discovery and analytics.

Integration also enables algorithm alignment with appropriate datasets to get more effective results from algorithms and make machine learning a viable option to support ISR missions. L3Harris is employing this integrated approach to streamline processes for proprietary missions.

L3harris' unique mission knowledge and experience comes from decades of developing proven technologies across the remote sensing value chain, from sensor development, to automated processing systems, to development of analytics that are critical for informed decision-making.

This enables L3Harris to proactively develop tools and standardized processes that ensure our synthetic label data is trusted, quality-tested and mission ready.



Synthesized data embedded in real satellite imagery for mission confidence

Labeled Synthetic Training Datasets for ISR Deep Learning Algorithms

© 2020 L3Harris Technologies, Inc. | 02/2020 | 57988 | d1021 | EL

Nonexport-controlled Information

L3Harris Technologies is an agile global aerospace and defense technology innovator, delivering end-to-end solutions that meet customers' mission-critical needs. The company provides advanced defense and commercial technologies across air, land, sea, space and cyber domains.



L3HARRIS™
FAST. FORWARD.

1025 W. NASA Boulevard
Melbourne, FL 32919