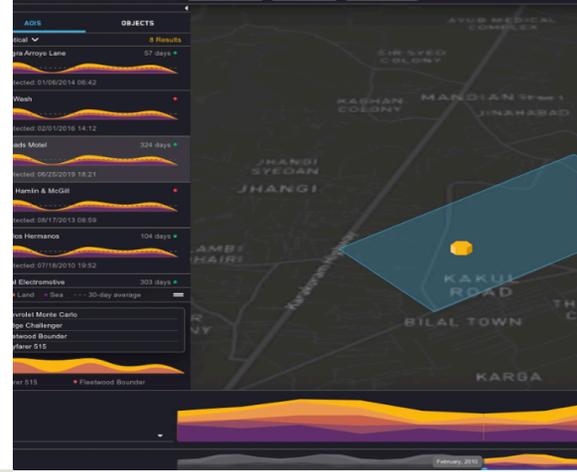




DEEPCORE SUITE

DATA SHEET



What does it do?

The DeepCore Suite, developed by Maxar, is an end-to-end artificial intelligence and machine learning (AI/ML) pipeline for self-service computer vision (CV) analytics. It evolved from Maxar’s direct experience as an industry leader developing automated computer vision techniques for commercial and national technical means imagery. The U.S. government has Small Business Innovative Research (SBIR) data rights for DeepCore Suite, allowing cost-free and scalable use.

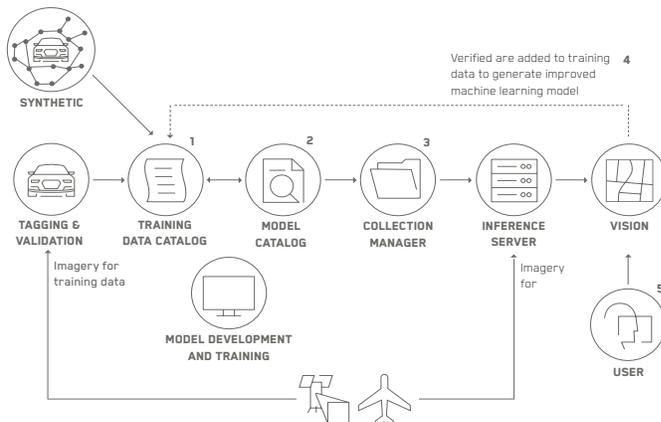
What can DeepCore offer you and your team?

DeepCore Suite augments data scientists’ and analysts’ workflows by allowing them to train, deploy and run CV models at scale and at the edge to deliver meaningful insights against some of our nation’s hardest challenges.

AI accessibility for anyone. Maxar data science teams worked with government and industry to build easy-access, mission-sensitive operational models. Customers don’t need extensive data science experience to create training data, deploy models and manage large-scale CV model runs. The DeepCore Suite includes components to assist in these tasks.

Capabilities with compatibility. DeepCore has deployed more than 100 models to detect 130+ object types using multiple machine learning models, frameworks and networks against multiple satellite, airborne, drone and terrestrial sources. It has also been deployed in commercial and government clouds, as well as bare metal and hybrid environments scaling from a machine with a Nvidia GPU that supports CUDA to an infinitely scalable cluster.

With DeepCore, users can leverage the services and experience of the Maxar team or mix and match training data, models and visualization capabilities within DeepCore or other repositories and tools.



FEATURES

- Powerful inference engine that can be miniaturized and scaled to address speed, size and complex use cases
 - Deployed on one GPU box at the edge (laptop, drone, Worldview Legion satellite) and scales infinitely with minimal performance degradation across cloud, hybrid and on-premise GPU clusters
 - Inference for speed size or complexity, including sensor to shooter, satellite to RGT, thousands of daily 50+ GB imagery strips, different imagery repositories, and such algorithm types and analysis use cases as broad area search and rare object detection
- 100+ CV and ML models deployed in DeepCore to date via
 - Frameworks including Caffe, Caffe2 via an Open Neural Network (ONNX) packaging format, TensorFlow and PyTorch via Torch Script
 - Network types like canonical classifiers (Resnet), segmenters (Mask-RCNN) and object detectors (RetinaNet, Faster-RCNN, Yolo)
- Broad support and interoperability with other external frameworks
 - Broad direct framework support
 - Improvements to interpret additional model types
 - Ability to upload and deploy third-party models as zip files or ONNX



What does DeepCore provide?

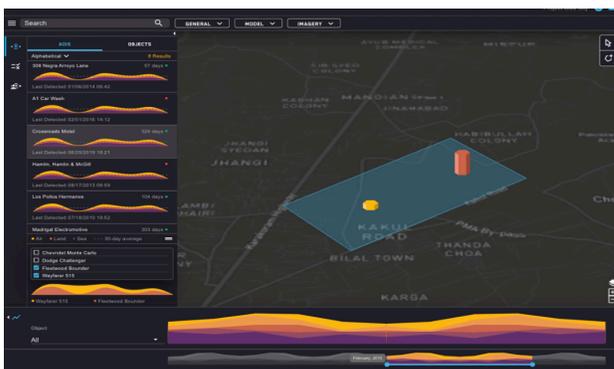
Tagging and validation. DeepCore provides a quick and efficient tagging and validation environment to build ML models. This enables customers to evaluate how a model performs against ground truth data for a given set of images and identify model performance issues.

Training data and model catalogs. DeepCore training data and model catalogs allow users to search, filter, compare, upload, export and geospatially and temporally visualize training data and models respectively. The training data catalog is mapped to the xView data schema and ontology, a database of over 3 million training samples created by Maxar. The catalog not only provides a place for users to view and compare models but will continue to be updated through a model run feedback loop. Users will be able to compare model selection, model performance and other data analysis metrics.

DeepCore Vision analytical UI. The DeepCore Vision UI visualizes object detections within a user's programs and projects plus any publicly shared detections. By showing them geospatially and temporally, users can validate model outputs, conduct basic data analysis and investigate more details about the object detected. This allows users to see what models would have detected at lower or higher precision and recall. Vision addresses broad area search, rare object and trend analysis use cases. Vision is written in React.js, a modular JavaScript framework completely compatible with today's modern browsers. Our back-end services use PostgreSQL databases with the enabled PostGIS extension for easy geospatial calculations and support. The microservices were developed on various web technologies, including Java Spring Boot, Node.js and Python.

Easy compatibility without hardware requirements. DeepCore has supported over 100 accessible algorithms available from such sources as Caffe, Caffe2 via ONNX, TensorFlow and PyTorch via Torch Script. Since the web components require no hardware, DeepCore uses standard hardware and networks that can be cloud-based, on-premise or a hybrid of the two.

Diverse imagery sources. DeepCore imagery services have connected to select AOIs for iSpy, OMAR, NCL and ODS to provide clients scalable ML processing for imagery (airborne, satellite, hand-held) and signals. DeepCore performs inferencing that allows collection managers to specify a location on Earth, objects to find and start/end dates for processing to support the CV model development process. The U.S. government retains SBIR data rights for DeepCore Suite, making it scalable and free of cost.



DeepCore vision UI.

FEATURES CONTINUED

- Ability to visualize millions of object detections in the DeepCore Vision UI, or integrate with ELT and GIS web and desktop software
 - Labeled training data in 130 object types using formatted ontology for easy ETL
 - Integration with Open Source Software Image Map orthorectification processes for high geospatial accuracy
 - Bidirectional translation between unorthorectified and orthorectified detections and visualization
- Support for satellite, airborne, drone and terrestrial sources
 - Electro-optical, synthetic aperture radar and multispectral imagery
 - Some full-motion video

DEEPCORE SUITE COMPONENTS

- Tagging and validation
- Training data catalog
- Model catalog
- Collection manager
- Inference server
- Imagery services

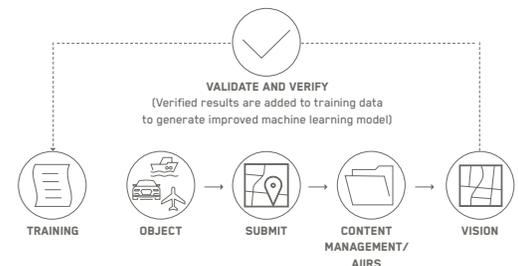
REQUIREMENTS USED BY DEEPCORE

Hardware: Cloud-based, on-premise or combination Nvidia GPUs (DeepCore Server)

Operating systems: Linux

Software: Linux, Java 8 and a compatible C++ runtime (DeepCore Server)

Back-end services: PostgreSQL databases with enabled PostGIS extension



MAXAR