



April 2025

STORE newsletter #2:

Welcome to our second newsletter

Dear members of the STORE community,

We are delighted to introduce the second edition of our newsletter and are excited to share the progress and accomplishments we've achieved so far.

Initiated in late 2023, the European FED STORE (Shared Database for Optronics Image Recognition and Evaluation) project seeks to create AI-based image recognition algorithms to enhance the understanding of land combat situations. This initiative involves the expansion and dissemination of an image database designed to train and assess these algorithms, with the diversity and relevance of threat images within the database being crucial for enhancing systems' performances.

We are nearing the midpoint of the project, and progresses have been consistently intense and steady. The collaboration among partners has been both productive and supportive. We are beginning to see initial results, including high-quality scientific publications. Additionally, significant efforts have gone into acquisition campaigns and images annotation that support the distributed database, which has just delivered in its initial version.

The milestones have been successfully reached, and the required documents were submitted to the EC punctually. The next CGA will take place at GMV in Spain on June 26th and 27th.

Strategic Acquisition Campaigns for Diverse Data Collection Under Realistic Conditions

According to the defined military use cases, acquisition sequences were defined for the campaigns to gather the necessary data for populating the database with images across various spectral regions, including visible and infrared wavelengths. Two acquisition campaigns were executed in different countries: France and Norway.

The first campaign occurred at the Fontevraud military camp, associated with the Saumur Cavalry School, from September 23 to 27, 2024. The second campaign recently took place in Kongsberg, Norway, from March 5 to 14, 2025. We had diversity in weather conditions (snow, fog and sunshine) for well balanced acquisitions scenarios between ground vehicles, drones and pedestrians.



Acquisition campaign team @ the Kongsberg military camp, from March 10 to 14, 2025

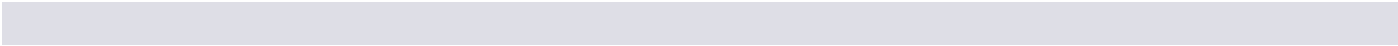
Various Optronics systems, deployed during the acquisition campaigns, are equipped with advanced sensors and systems that allow them to gather extensive data in diverse and challenging environments, including terrain analysis, enemy movement scenarios, and environmental conditions. Optronic sensors, which include electro-optical and infrared technologies, add another layer of richness to the data landscape. These sensors can detect and identify objects in various conditions, including low visibility and nighttime operations. They can capture detailed imagery and thermal signatures, allowing for precise targeting and assessment of the operational environment. By using drones (killer drones, civilian drones), both as target and sensor carrier, on the other hand, provide a versatile aerial perspective.

These recorded data are linked to observation and sensor specification attributes, useful as filter tags for the database, and annotation (bounding box around targets on each image), to be able to train efficiently new AI algorithms.

Over 5 million images will be soon available to train, test and demonstrate the efficiency of new AI algorithms in ATDR and semantic segmentation feature.

In summary, the combination of military tanks, drones, and varied optronic sensors not only underscores the diversity of data collected but also highlights the richness of that data. This synergy empowers military operations with enhanced situational awareness, facilitating effective strategies and informed tactical decisions in complex operational environments.

It's great to hear that the annotated data is becoming available for AI teams! The availability of high-quality annotated data is crucial for developing effective threat detection, identification, and recognition models. AI teams can leverage this annotated data to its fullest potential, enabling them to build robust models for detecting and recognizing threats.



Unified European Distributed Data Base: Ensuring Secure Access to Restricted Data

The advancement and ongoing enhancement of AI-driven image recognition technologies necessitate substantial volumes of image data for the training, testing, and certification of AI systems. The 'Database Framework' (DBF) is designed to offer the necessary structure and tools for establishing and sustaining a collaborative and distributed repository of both raw and annotated image datasets and AI Modules.



The DBF platform

The STORE database entails the development of a database framework based on the principles of interoperability and extensibility. The initial version of the Data Management Framework is now ready, with a ready to use open specification, and considering different software implementations to demonstrate interoperability for data exchange, complemented with the DB Sharing Tools to interact with the data for meeting the STORE purposes. Data governance, including management of EU-R data, will be addressed in the subsequent version.

The DBF prototype highlights several key features that emphasize its robustness and adaptability in data management and sharing. Here are the notable aspects:

- Scalable Framework:** The prototype is built on a scalable framework that adheres to established standards. This ensures that users can perform data querying, publication, and downloading seamlessly, facilitating easy access and management of data.

2. **Independent Implementations:** The involvement of multiple organizations—GMV, Kongsberg, and STAM—demonstrates the prototype's interoperability. Each organization utilizes different technologies for their implementations, showcasing the adaptability of the framework across various platforms and systems.
3. **Integrated Data Management Solution:** The DBF prototype marks the initial efforts toward creating a cohesive data management and sharing system. This solution is specifically designed to address the requirements of the STORE AI Teams, ensuring that it aligns with European standards for data handling and sharing. STORE AI Software Factory integrates their pipelines through the DBF.

These features collectively indicate that the DBF prototype is set to provide a robust foundation for future developments in data management, with an emphasis on interoperability, scalability, extensibility and compliance with European standards.

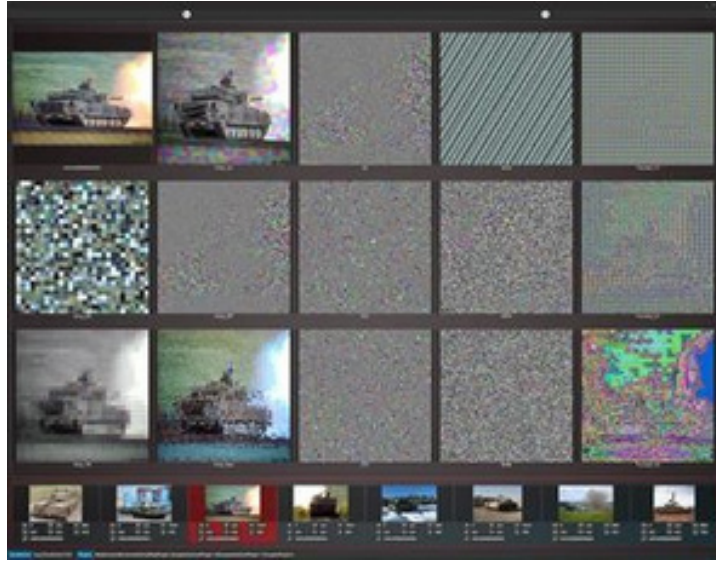
Building an Intelligent Solutions: AI functions, learning strategies and future technologies for data sharing

Research and development into intelligent AI solutions for STORE is split into two parallel strategies: investigations into future technologies for data sharing and machine learning (WP6) and investigations into AI functions and learning strategies (WP8).

Machine Learning and AI technologies are rapidly evolving research fields. Even during a three-year project, new application opportunities consistently arise. To stay abreast of this rapid development, WP6 focuses on future technologies that demonstrate significant application potential but have not yet reached a deployment-ready TRL level.

The pursuit of this goal began with the creation of a comprehensive overview of the state-of-the-art in three key areas: "Model Generation and Maintenance," "Trustworthiness and Security," and "Data Generation Techniques." These areas form the foundational pillars of the AI development cycle. The technologies identified are designed to support a wide variety of AI models, which will be further detailed in work package 8 (WP8).

A workshop held on March, 31st, facilitated robust discussions and collaborative brainstorming sessions, leading to the identification of several promising use cases. Participants agreed on a framework for the sandbox environment, which will serve as a testing ground for innovative solutions. The insights gained and partnerships formed are expected to accelerate the development of technologies that address the research gaps, ultimately enhancing the effectiveness and security of AI systems. Follow-up actions include the establishment of a shared platform for continuous collaboration and feedback. The outcomes of this work will be summarized in the D6.2 deliverable, scheduled for release in January 2026.



Screenshot of a toolbox used to assess the effectiveness of image encryption techniques. Encryption techniques are used to establish secure communication protocols, protect databases against malicious access and further build the basis to securely train, update and deploy AI models.

A comprehensive review was made on current AI methodologies for military image and video analysis. This report (D8.1) reviews the state-of-the-art in the scientific literature on object detection based on temporal information, detection and classification of object based on spatial information, change detection, semantic segmentation as well as suitable learning strategies to achieve these tasks. Existing approaches and models are discussed against the background of military applications and capability gaps as well as promising research directions are identified to guide the development of intelligent AI solutions in STORE.

Ongoing research is focusing on the development and delivery of baseline AI modules, which cover a wide range of potential applications within STORE. These baseline modules mainly demonstrate that our intelligent AI solutions can be integrated within the framework that is established by the STORE project, linking data, compute resources, and benchmarking. A substantial number of baseline AI solutions (15+) is scheduled for delivery in the next few months. These cover important use-cases such as small moving object detection, vehicle recognition, and change detection.



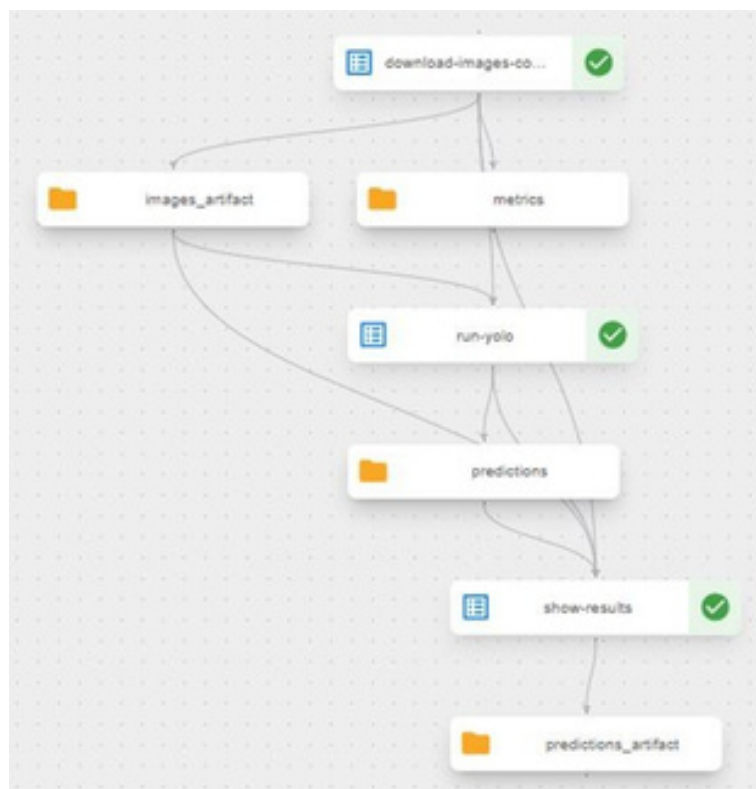
(left) small moving object detection technology is able to detect a drone at large distance (source: T8.1, C. Marchili et al.); (right) an Operational Readiness Score indicates when AI results can be trusted (source: T8.2, Becker et al.).

Next steps will focus on the development and delivery of improved AI modules, with the aim to create beyond-state-of-the-art solutions. These will be trained and evaluated on relevant datasets acquired in the STORE project. In addition, innovative machine learning strategies will support optimal performance in settings with a small amount of example data or limited annotations.

In WP6 the paper “Closed-Form Merging of Parameter-Efficient Modules for Federated-Continual Learning” by Salami et.al, has been accepted for presentation at the Thirteenth International Conference on Learning Representations (ICLR), 2025. A preprint of the paper is available at <https://arxiv.org/abs/2410.17961>.

The AI Software Factory and Benchmarking for Excellence

WP7's main activity consists in the creation and deployment of the AI Software Factory, an MLOps framework that offers a development environment for utilizing AI modules to conduct training, inference, and experimental workflows. This framework facilitates the execution, monitoring and inter-operability of ML modules and pipelines coming from different partners while ensuring the reproducibility of experiments through effective model tracking and comparison. The first version of the AI software factory was successfully deployed on a node at FlySight's premises and is now accessible to all STORE partners upon request. A dedicated workshop was held on 19/02/2025 to present the factory's features, including a live demonstration of module integration into the registry and pipeline execution (see figures below). During the session, a pipeline performing inference on sample images from Fontevraud's campaign, retrieved via the GMV DBF instance, was showcased.



Example of a pipeline for vehicle detection as seen from AI SW factory dashboard.

The event saw high participation and generated valuable feedbacks in the following weeks, helping in defining the first draft of the AI module integration guidelines for integrating partners modules. The first set of AI modules from WP8 are currently undergoing integration. Integration guidelines are currently being refined in collaboration with WP8 and WP9 to align with AI users and benchmarking requirements.



Example of inference performed by the vehicle detection AI module

Upcoming Events and Activities

- Next newsletter with AI Software Factory and Benchmarking for Excellence
- Next CGA will take place at GMV in Spain on end of June

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