



Royal Higher Institute for Defence

Defence-related Research Action - DEFRA

ACRONYM: SALTO

Title: Secure Active Learning for Territorial Observations

Duration of the project: 01/12/2021 - 01/12/2023

Key words: active learning, automated detections, cyclic traffic patterns, deep learning, interoperable datasets, secure architecture

Budget: 349.250 €

of which RHID contribution: 271.600 €

PROJECT DESCRIPTION

Context of the project

Satellite images track the changing human footprint on territories, including specific changing features around major infrastructures like harbours or airports. The number of images and their resolution is continuously increasing. Unfortunately, the size of the teams of analysts assessing the features changes in structured reports (e.g. following the STANAG structuration) remains most of the time constant. The emergence of Convolutional Deep Neural Networks in Artificial Intelligence (AI) is an opportunity to partly solve this issue. Automated annotations in image and automated production of structured reports has been recently proposed in the literature through static AI.

SALTO's original approach to this issue is to develop new active learning algorithms that can increase the overall volume of annotations by analysts based on an optimal selection of areas to be annotated. Moreover, SALTO provides an attribution mechanism for teams of analysts applying the same active learning model.

In practice, SALTO provides a prototype for the secure implementation of the active learning system that enables a group of analysts to annotate four times more data than without SALTO. Even in these times where data is accessible and updated fairly frequently, it remains challenging to train people, manage algorithms and methodologies for determining areas of interest and be able to evaluate a specific situation without having encountered it beforehand. For this reason, it is also planned to carry out research on how "gaming" and "artificial image development" can be integrated so that a situation and training model can be simulated based on a real scenario designed specifically for this purpose.

Expected results and how they will affect Defence

Defence will be able to benefit from this project as it provides professional reporting and takes over repetitive tasks from humans, allowing analysts to concentrate on their actual mission. With already existing elements further complemented by the results of this research, Defence will be able to understand how AI can help humans make informed choices based on operational insights in defence and surveillance missions.

This project aims to develop a dynamic system involving the analyst throughout his work. It includes the following elements:

- Automation of data loading & refreshing;
- Pre-defined indices & detection available in a common & interoperable architecture;
- Automated annotation by active learning and pass-through interface to exchange with analyst to confirm annotation;
- Mission areas will be designed to initiate the learning process and evolve by AI detection. Goal is to be STANAG compliant, to allow automation ;
- Time series detection to detect change features and save results;
- Automated report generation based on stanag feature & time evolution.

CONTACT INFORMATION

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