The NEMO defence project, scientifically and technically coordinated by Zanasi & Partners, was funded by the European Commission within the scope of the EDF Work Programme in 2024.

With the EDF-2023-LS-RA-CHALLENGE-DIGIT-HLTP call, the European Commission called for "**agile and robust Human Language Technologies (HLTs) for defence**" with the request to build a "demonstrator" (i.e. immediately usable by the military end user, without any intervention by the developer) of these technologies.

The demonstrators will be evaluated in a series of technological challenges organized within the EDF-2023-LS-RA-CHALLENGE-DIGIT-HLTO call.
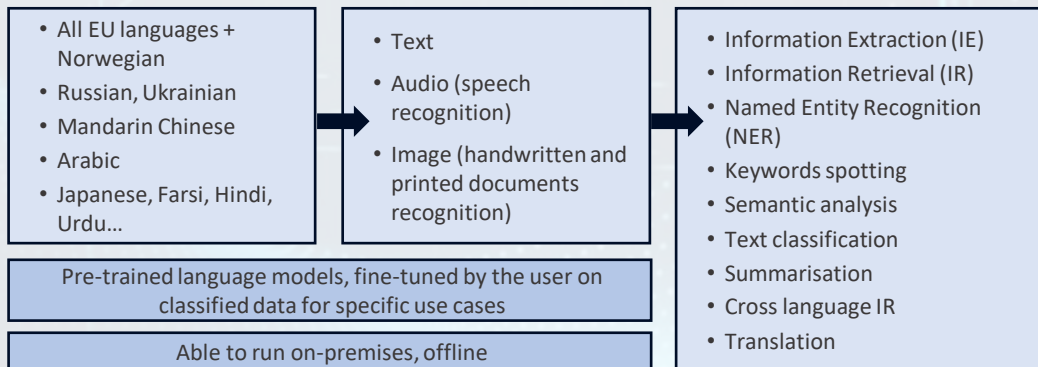
Zanasi & Partners led the development of a project, titled **NEMO (laNguagE Modules develOpment)**, which will leverage on sophisticated AI methods based on Machine Learning (ML), Deep Learning (DL) and Large Language Models (LLMs) industrialised by a multinational consortium including Norway (SINTEF), Italy (Z&P, ICSA, TECOMS), Spain (ETRA), France (Kairntech, DRI), Finland (Lingsoft, VTT), Austria (Read-Coop, University of Innsbruck), Netherlands (Transfortec), Bulgaria (BDI), and Romania (NDU).

NEMO answers the defence needs in the field of HLTs through an innovative approach based on three main pillars:

1) the exploitation of the expertise and assets from several **EU champions in the HLTs industry and academy** with already operational products. Their presence will allow NEMO to be equipped with the most advanced algorithms and expertise in the sector, to be used as starting points.

2) the adaptation of these products to the Defence domain through the training with **military-specific vocabulary and related semantics**, researched and gathered by several organisations of the European Defence (defence institutes, military academies, think-tanks) that are part of the NEMO consortium. Their presence will allow the technical partners to receive the necessary information to create military-based thesauri as well as to address the risks deriving from the "noise" in communications which characterises war scenarios.

3) the research oriented towards **user-driven adaptation**, that is "*enable users to adapt them using their own data or by interactively providing supervision*" (cfr. the call text), with an approach based on Transformer models and LLMs, fine-tuned with data provided by the end-user. This will allow the user to perform data annotation, correction and validation, as well as adaptation of the language models on specific tasks and applications.

The language models researched and developed in NEMO will be integrated into one single demonstrator, **a software prototype offering a complete range of different HLT functionalities, with an interactive and user-friendly interface for user-driven adaptation and with special attention to AI explainability and performance evaluation.**

The NEMO demonstrator will include the following functionalities:

• All EU languages + Norwegian • Russian, Ukrainian • Mandarin Chinese • Arabic • Japanese, Farsi, Hindi, Urdu…	• Text • Audio (speech recognition) • Image (handwritten and printed documents recognition)	• Information Extraction (IE) • Information Retrieval (IR) • Named Entity Recognition (NER) • Keywords spotting • Semantic analysis • Text classification • Summarisation • Cross language IR • Translation

Pre-trained language models, fine-tuned by the user on classified data for specific use cases

Able to run on-premises, offline

Coordinator

Scientific and technical coordinator

Defence partners

Technological Partners