TERATEC workshop

Trustworthy AI for Naval Defense-Critical Systems

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Corporate Sensitivity
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AI APPLICATIONS

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ARTIFICIAL INTELLIGENCE INTEGRATION

? Methods that aim to replicate or even surpass human cognitive functions and assist in the management and execution of activities.

Symbolic AI et OR

- Optimisation
- Planification
- Decision Aids

AI from math. models

2000

Machine Learning

- Description
- Prediction
- Prescription

Structured data

2010

Deep Learning

- identification
- Classification

Unstructured data

2020

Transformers

- Data generation
- chatbot
- Interactions

Unstructured heterogeneous data

2025

Agentic et Multi-Agents

- Processus automation
- Task delegation
- Autonomy
- Collaboration

Unstructured heterogeneous data



Data fusion



Simulation



Mission Planning



i-Maintenance





Détection, classification

Chatbots & assistants



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FROM RESEARCH TO THE FLEET



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ENGINEERING & SUPPORT

AI FOR SUPPORT FUNCTIONS

Finance, HR, procurement, legal

AI FOR ENGINEERS

Design, simulation, productivity

Products

AI FOR THE CREW

Decision support on board

AI FOR DRONES

Autonomy and perception

APPLIED AI RESEARCH

Academic-grade research, built to be used: prototypes, validation and transfer to the fleet and its support organization

PROTOTYPING

VALIDATION

TRANSFER

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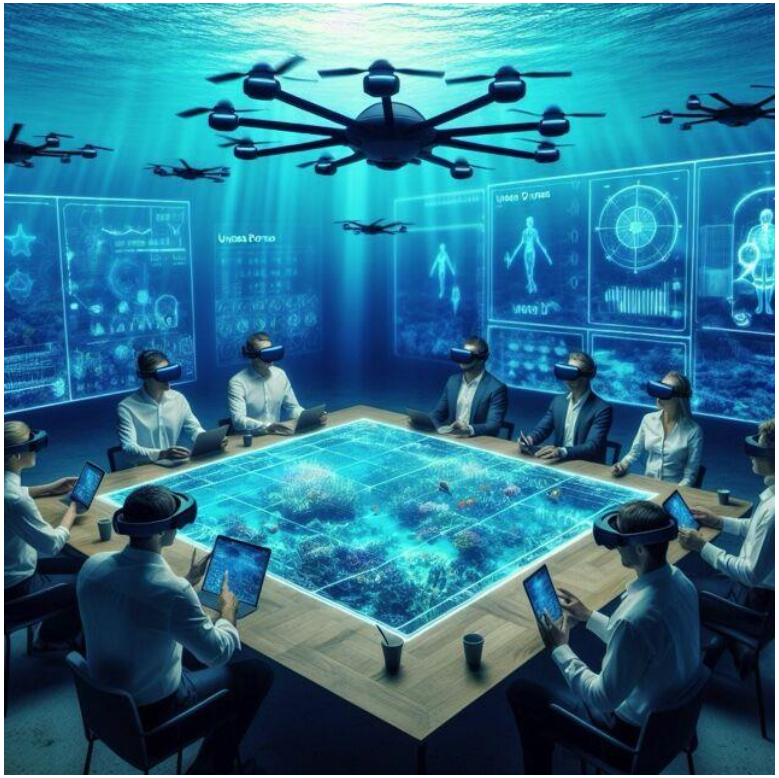
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PRODUCTS AND OPERATIONS

AI for criticial systems vision

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CHALLENGES AND VISION



Challenges :

Human cognitive capacities are limited, yet the complexity of operations and the amount of information to be processed are increasing in a high-intensity combat context.

Mission :

To design a holistic human/autonomous agents system to maintain operational superiority while adhering to Naval Defense doctrines.

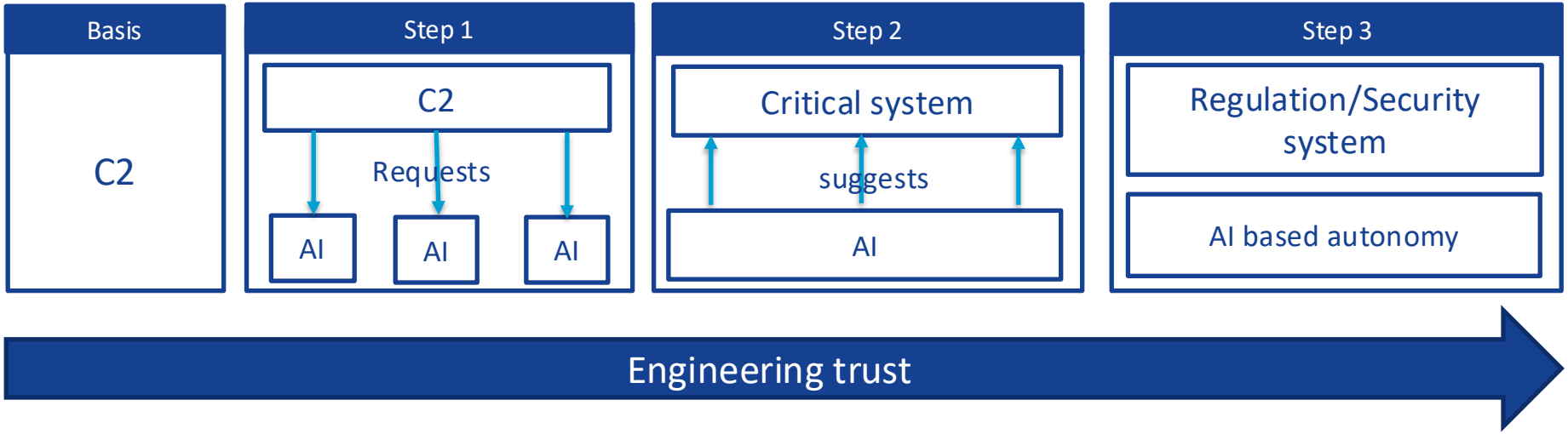
Vision :

Smart Naval force system, composed of collaborative human and artificial agents and manned or unmanned vectors, equipped with autonomy adapted to the operational context and applicable doctrines on land and at sea.

Collaborative Autonomous Agents Naval System

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TRANSFORMATION PROCESS



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WHERE DO WE START FROM ?

- **Short range detection and tracking of USV and small UAV**







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ENGINEERING & SUPPORT

AI FOR EFFICIENCY

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AI FOR EFFICIENCY

OPTIMISATION OF WARSHIP DESIGN



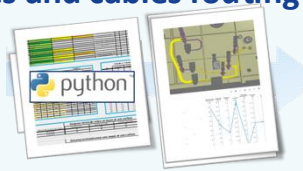
Agents orchestrator

Architect ChatBot

Accurate answers, with references, augmented with NG KB



Pipes and cables routing optimisation







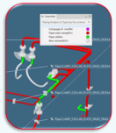
Technical rules control



Ai-je bien respecté le référentiel applicable ?

Ai-je bien pris en compte les coûts de production ?

Suis-je sûr que ce réseau puisse être monté à bord ?





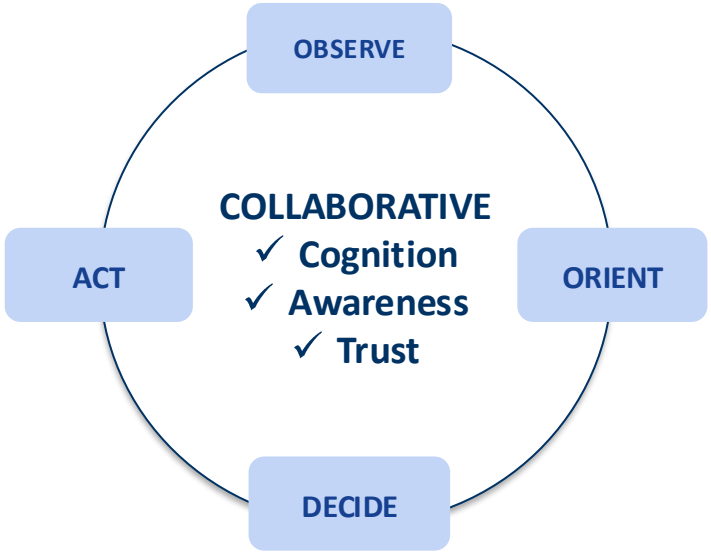
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APPLIED AI RESEARCH

Beyond the Promises: the Scientific Limits of AI in Defense

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TECHNOLOGICAL CHALLENGES



- Data and energy frugality
- Sovereignty and cyber
- Monitoring and learning strategies
- Explainability and acceptability
- Trustworthy AI design
- Socio centred design
- Bio inspired models
- Telecommunication in difficult env.

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KNOWLEDGES BOUNDARIES

How can we be responsible guardians of responsible AI?



How can we prepare to be tomorrow's managers of AI agent teams?

How can AI learn from its interactions with humans?

How can we involve users in training and educating AI?

Is anthropomorphism relevant for thinking about the human–AI relationship?

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ECOSYSTEM

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PARTERSHIP

- IRL Crossing : Man Machine Teaming
- SENI : DRL drone fault tolerance
- NAIADE Chair : Naval AI Applications
- Complex systems architecture Chair
- Underwater passive tracking common lab

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