# SCIENCE & CREATIVITY TO INVENT A SUSTAINABLE WORLD

## Post-Doctoral Candidate

## SAACD Project - Complex Autonomous and Self-Adaptive Defence Systems

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| Institution : | IMT Mines Alès (Ecole nationale supérieure des mines d'Alès) |
| Main assignment : | Teaching and Research Centre in Computer Science and Systems/ SyCoIA |
| Administrative residence : | Alès (Gard department - Occitanie region) |
| Type of contract : | 15-month fixed-term contract - Public law contract - Full-time |
| Starting date : | 01/04/2026 |

## Presentation of our institution and the CERIS centre

### The Institut Mines-Télécom

The Institut Mines-Télécom (IMT) is a public scientific, cultural and professional establishment (EPSCP) under the primary supervision of the ministers for industry and digital technology. It is the largest group of engineering schools in France, with 11 public engineering schools throughout the country, training 13,500 engineers and PhDs. The ITM employs 4,500 people and has an annual budget of €400 million, 40% of which comes from its own resources. The ITM has 2 Carnot institutes, 35 industrial chairs, produces 2,100 A-rank publications annually, 60 patents and carries out €110M of contract research.

### IMT Mines Alès

The school's raison d'être: "Strengthened by its membership of the IMT and its local roots, IMT Mines Alès gives its students the best opportunities for professional fulfilment so that they can play a responsible role in the development of the nation while preserving the planet's resources. The values that drive us: boldness, commitment, sharing and excellence.

Founded more than 180 years ago, IMT Mines Alès currently has 1,400 students (including 250 foreign students) and 380 staff. It has two campuses in Alès and is also present in Montpellier and Pau. Its students include general engineers, specialised engineers (through apprenticeships), doctoral students and students studying for masters or specialised masters degrees. It also hosts more than 500 continuing professional education trainees.

The school has 3 research and teaching centres of a high scientific and technological level, working in the fields of materials and civil engineering (C2MA), the environment and risks (CREER), artificial intelligence and industrial and digital engineering (CERIS). These entities bring together around 85 permanent teacher-researchers (half of whom are HDR), 40 research support staff and 100 doctoral and post-doctoral students, who produce more than 130 A-rank publications and €3M in research contracts each year, a third of which are direct contracts with companies. These research staff contribute to 6 research units, including 4 UMRs. IMT Mines Alès is accredited to award doctorates in 4 doctoral schools.

It has 12 technology platforms and 1,600 partner companies. Creativity is a strong feature of all its activities. The school was the first to create an incubator in 1984 (200 companies created to date, 1,000 jobs). The school offers rich and varied career paths: teacher-researchers have opportunities for professional mobility within the various ITM schools and can also, if they wish, take on responsibilities within the school's functional departments (studies, research, international, economic development, etc.) for part of their time.

At IMT Mines Alès, everyone is a key player in our Sustainable Development and Corporate Social Responsibility (SDRS) approach. We are committed to promoting environmentally friendly practices, fostering diversity and inclusion, and ensuring ethics in our activities. We encourage all our employees to adopt a responsible approach in their daily actions and to propose innovative ideas that strengthen our positive impact on society and the environment.

## Description of the Centre d'Enseignement et de Recherche en Informatique et Systèmes (CERIS)

CERIS is home to two research units: the SyCoIA unit (Complex Systems and Artificial Intelligence), which aims to master complex systems in the context of the changes brought about by the rise of digital technology, and the EuroMov Digital Health in Motion unit, jointly run by IMT Mines Alès and the University of Montpellier, which focuses on human sensorimotor performance, mainly with applications in health and sport. Two teaching departments are attached to CERIS: 2IA for Computer Science and Artificial Intelligence and PRISM for PeRformance Industrielle et Systèmes Mécatroniques, as well as 2 technology platforms AIHM for Alès Imaging and Human Metrology and PFM for Plateforme Mécatronique.

The Industry of the Future field of excellence is a new way of thinking about and organising business, based on key principles, resources and technologies that have an organisational, methodological and technological impact. The PRISM department offers students the opportunity to specialise in the engineering of industrial and mechatronic systems to meet the challenges of the digital transition and enhance performance. Among other things, it focuses on strong skills in complex systems engineering.

Our organisations (industrial, educational, medical, governmental, administrative or financial) are undergoing major technological change, and are becoming increasingly connected, using IT tools and solutions in which artificial intelligence plays an increasingly important role. The 2IA department offers students the chance to specialise in the development of software applications to meet the challenges posed by these changes. There are two options: an initial training course and an apprenticeship course.

The person recruited will carry out his/her research in the SyCoIA Proprietary Research Unit (UPR) in collaboration with the members of the PFM.

## SyCoIA

In a context marked by the acceleration of digital transformations, the emergence of complex cyber-physical systems and the widespread use of artificial intelligence in decision-making processes, engineers and researchers are facing new scientific challenges: designing resilient, adaptive, explainable and interoperable systems capable of operating in uncertain environments while respecting human, ethical and regulatory constraints. This complexity calls for an integrated approach, combining modelling, simulation, systems and software engineering, trusted AI, process optimisation and human decision-making.

This is the background to the SyCoIA unit. Drawing on its multi-disciplinary skills, the SyCoIA research unit has defined a manifesto in the form of a research project: designing and controlling intelligent systems using approaches that integrate artificial intelligence, software engineering, systems engineering, modelling and simulation, for a trusted digital transformation, centred on humans and adapted to dynamic and uncertain environments. In particular, it will focus on complex systems capable of learning, adapting and deciding in a reliable, explainable and interoperable way in dynamic and constrained environments, by proposing theoretical and methodological frameworks to guarantee performance, robustness, traceability and trust in these intelligent systems.

More specifically, the person recruited will work at the interface between the E/Cs of the COPS and CORTEX themes:

- COPS is an interdisciplinary theme aimed at designing, optimising and controlling complex systems using systems engineering, simulation, artificial intelligence and digital twins. It applies to a wide range of fields, including industry, health and territories, with a strong focus on Industry 5.0.

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- CORTEX (COntext-aware, RobusT and EXplainable AI - trusted, adaptive and human-centred AI) offers a technical and original look at the study of trusted AI systems that are both robust and human-centred. The increasing improvements and adoption of AI require in-depth reflection and work on the trust that can be attributed to AI systems. How can we ensure that the AI models we develop are both robust, i.e. perform well despite significant variations in conditions of use or environmental disturbances, and human-centred, i.e. at the service of humans, in accordance with an established value system?

## PFM

The Mechatronics Platform brings together a multi-disciplinary team and the equipment needed to develop complex mechatronic systems on a single platform (460 m2), covering all the engineering phases from expression of need to physical prototyping. Its workshops are equipped with numerically controlled machine tools, electronic card manufacturing processes, additive manufacturing, cobots...

## Job description:

**The person recruited will be involved in the Trusted Autonomous and Self-Adaptive Systems for Defence (SAACD) project.** This project aims to overhaul the engineering and development of this type of complex system.

A SAACD can be defined at two levels:
- *SAACD Component*: This is a UAV made up of hardware and software sub-systems, capable of observing, predicting, deciding and reconfiguring itself to fulfil its mission (e.g. surveillance, detection, tracking, control, etc.). The integration of on-board AI requires new engineering methods, which are still poorly supported by digital twins.
- *SAACD System of Systems (SdS)*: this corresponds to the assembly of several SAACD Components, in homogeneous swarms or heterogeneous packs to fulfil a common mission, e.g. monitoring a critical infrastructure.

Both must be designed to promote these autonomy and self-adaptation capabilities. Three major challenges have been identified:
- (P1) modelling uncertain environments where robust, weakly supervised machine learning algorithms can be deployed to irrigate engineering processes and validate this design as early as possible;
- (P2) integrate a reliable and frugal embedded AI (limited to inference and/or also capable of learning, e.g. reinforcement learning) as one of the components of a SAACD. A component that facilitates, again with a demonstrable level of confidence, observation, prediction and the decision to adapt or partially reconfigure;
- (P3) Ultimately, aim for SAACD certification based on proof of validity and reproducibility.

The R&D questions concern :
- (For P1) "*AI as a service"* to enrich engineering: modelling of the changing, complex and uncertain environment (essentially for the purposes of assisting understanding, verification and validation) of the uncertain environment in which the SAACD Component or the SAACD SoS evolves;
- (For P2) "*AI as a component"* as a component in its own right of the SAACD, but which must reconcile frugality and reliability of the actions envisaged according to the situation encountered in this moving and unpredictable environment;
- (For P3) Exploit the Digital Twin Systems, integrating the AI contributions developed in P1 and P2, to optimise the simulations, certification, maintenance, training and piloting of the two types of SAACD.

This project will involve formalising and integrating the contributions of : (i) model-based and data-driven systems engineering (MBSE), (ii) embedded frugal (explainable and robust) AI, and finally (iii) advanced modelling, simulation and optimisation techniques in a complex uncertain environment for the design of a SAACD.

The working approach is based on four successive and iterative phases, making it possible to demonstrate the feasibility of the SAACD project. The person recruited will therefore be involved in each phase, which combines methodological, technological and experimental aspects, drawing on the expertise of SyCoIA's Lecturers/Researchers in MBSE/MBSSE, predictive analytics, autonomous decision-making, robust and explainable AI, and interoperable digital twins. These phases are summarised below:
- Phase 1 - Definition and modelling of use cases: M1-M3
- Phase 2 - AI services for engineering (AI-as-a-Service): M4-M8
- Phase 3 - Trusted frugal embedded AI (AI-as-a-Component) : M6-M11
- Phase 4 - Integration, demonstration and proof by digital twins: M10-M16

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## Profile sought and general evaluation criteria

Your manager and the team in place will support you in developing your skills, while making the most of your experience and talents.

The person we are looking for will bring skills and experience in at least one, and preferably several, of the following R&D areas:

- Explainable AI (knowledge of the latest advances in explainability methods: intrinsic, simplification, counterfactual, etc.).

- Robust AI (knowledge of methods for quantifying uncertainty in deep learning or formal verification methods applied to deep learning)

- Embedded AI

- Reinforcement learning, supervised and unsupervised learning

- Distributed / decentralised command and control: synchronisation, coordination, adaptation, for example using multi-agent systems

- Decision support under uncertainty

- Modelling and simulation of the behaviour of complex systems

The successful candidate will need to acquire the necessary and sufficient skills for the needs of the SAACD project in the areas of Model-Based Systems Engineering and Digital Twin Engineering during the course of the project. He/she will organise, plan and trace the organisation of tasks, meetings and actions and will manage and contribute to the drafting of project deliverables.

**Minimum level of training and/or experience required :**

In addition to your degree, your personality will make the difference.

- ▶ Postgraduate doctorate in sections CNU 61 or 27
- ▶ Ability to strengthen at least one of the above research themes involved in the project
- ▶ Experience in research and development (industrial and/or academic other than related to the thesis itself)

**Technical and cross-disciplinary skills required :**

- ▶ Dynamic
- ▶ Autonomy
- ▶ Intellectual curiosity
- ▶ Ability to act as an interface between the Systems Engineering, AI and Simulation communities.
- ▶ Ability to contribute to the team's, centre's and school's project.
- ▶ Scientific output: quality and number of publications in recognised international journals
- ▶ Fluency in scientific English essential

## Application

📄 **Administrative conditions for application**

The position offered by IMT Mines Alès is a 15-month, full-time, public-law contract governed by the provisions of the management framework of the Institut Mines-Télécom, profession P, Post-doctoral fellow, category II.

This position requires national defence secret clearance. Obtaining this clearance is subject to an administrative enquiry and depends on the regulations in force. Only candidates who meet the legal requirements can be cleared and therefore recruited.

**Salary:** Your salary will be reviewed and determined on the basis of your experience and associated skills.

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## How to apply

Applications (CV and covering letter) should be sent **exclusively to** :
https://institutminestelecom.recruitee.com/o/post-doctorant-ou-post-doctorante-projet-saacd-systemes-autonomes-et-auto-adaptatifs-complexes-de-defense-cdd-15-mois-imt-mines-ales

The people in charge of recruitment will study your application carefully.

## Recruitment schedule

A panel made up of several people will meet with you and ensure that you are in the best possible condition to make a success of this meeting.

**Closing date for applications: 15/02/2026**

**Approximate date of the interview**: **26/02/2026**

**Preferred starting date**: **01/04/2026**

## People to contact

If you require further information about any aspect of your application, please do not hesitate to contact the people listed below:

**Job content :**

**Jacky MONTMAIN,** Director of CERIS
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**Vincent CHAPURLAT,** SAACD Project Manager
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Tel: +33 (0)4 34 24 62 87

**For administrative matters :**

**Géraldine BRUNEL**, Human Relations Manager
⌨ : geraldine.brunel@mines-ales.fr
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## Integration into the job

A smooth induction to ensure a successful start to your new role

As soon as you arrive, you will benefit from an induction period to help you discover your new role and working environment. You will be greeted by your HR advisor, who will guide you through all the steps you need to take to ensure a smooth transition to your new role.

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