



Job offer Royal Military Academy - Patrimony



Researcher (M/F/X) on AI for developing AI-Resistant Camouflage Departement of Mechanics Research engineer AI & optimization (DAP/23-03-ARC) Publication date: 24/02/2023

Job description and associated tasks

We are looking for a research engineer to support the implementation of a Belgian Defence project called ARC (AI-Resistant Camouflage). The position is in the department of Mechanics in the Robotics & Autonomous Systems (RAS) unit (<https://mecatron.rma.ac.be/>). The candidate should have experience with AI and computer vision and be willing to pursue a PhD in the framework of the study. For this reason, we are looking for a full-time researcher with a master degree in Mathematics / Informatics / Computer Science / Applied Sciences / Engineering / Physics. The Royal Military Academy (RMA) is strongly committed to promoting diversity and gender equality. Therefore, women candidates are strongly encouraged to apply.

Context:

The Royal Military Academy of Belgium (RMA) is a military institution responsible for the basic academic, military and physical training of future officers, and for the continuing advanced training of officers during their active career in the Belgian Defense department (www.rma.ac.be). It is fully recognized as a university, fulfilling the same criteria as civilian universities. The Royal Military Academy is also conducting scientific research at university level for projects funded by the Belgian Defense department or external sources.

You work within the multi-national research cell 'Robotics & Autonomous Systems' (<https://mecatron.rma.ac.be/>) of the department of Mechanical Engineering of the Royal Military Academy. You conduct scientific research at university level.

Study:

The importance of automated detection, tracking, classification and identification (DTCI) of military assets is growing rapidly. This evolution has a direct influence on military operations relying on conventional camouflage techniques, as the probability of camouflaged object detection increases with improved DTCI solutions. Therefore, the need for innovative camouflage solutions is growing. This is sharply underlined by the figure below, taken on April 1st 2022, when Belgian Defence proudly presented its new future camouflage clothing. The bounding boxes on the figure present the result of the famous YOLO5 detector on this image and clearly show that – in the 'eyes' of the AI – the military soldiers are as clearly visible (similar confidence level) as the MoD, meaning that the obfuscation effect of the military clothing is totally negligible for the AI.

The ARC study will provide Belgian Defence with an advanced know-how on the vulnerabilities of present-day camouflage against modern AI-based DTCI techniques. Furthermore, ARC will propose new camouflage designs that will better protect soldiers and equipment against detection by enemy AI tools. This is invaluable knowledge, as AI is more and more present on the battlefield.

In a first phase of the study, the researcher will focus on visual sensing and investigate the static use case, developing techniques for the obfuscation of non-moving targets. A state-of-the-art study of DTCl AI techniques will be performed to highlight the main techniques that are in use (currently and expected in the near future) on the battlefield. For each of these techniques, the network architecture will be analyzed to find weaknesses in the DTCl accuracy that could be exploited. The main focus will be on concealed object detection AI techniques, as camouflaged object tracking, classification and identification rely on a detection phase. Based on this, physical obfuscation mechanisms (e.g. prints) will be proposed and field-tested under varying illumination conditions.

In a second phase, the study will investigate the dynamic use case, as multiple threat detection tools make use of the analysis of motion patterns for discerning between different types of objects (a typical example are DTCl AI solutions that detect the human gait or that target drones, while discerning birds).

Similar to the first use case, weaknesses in the DTCl network architecture will be sought in order to propose novel camouflage for mobile ground, aerial or maritime systems.

In a third phase, the research will be extended to the non-visual domain. It is obviously impossible to incorporate an in-depth investigation over all possible sensing methodologies. Therefore, we will focus in the first place on thermal imaging as an extra sensor and assess in close collaboration with the military end users whether it is useful to integrate even more perception tools.

The ARC developments will be field-validated using trials in close collaboration of the LAND component, who will be responsible for the evaluation of the ARC tools.



Main Tasks

The main task of the candidate will be to implement the RAS study and to perform a PhD in the framework of this study. Main tasks are:

- Leading the organization of user engagement activities for the ARC study
- Leading the architectures definition and AI component design for the ARC study
- Leading the development of obfuscation solutions for non-moving and moving targets in the visual domain
- Leading the development of obfuscation solutions for targets observed through thermal imaging
- Supporting the implementation of project-specific AI & optimization software
- Ensuring the timely release and delivery of projects, with required quality level
- Producing required documentation.

Required skills

Technical skills

The applicant shall have a master degree in Mathematics / Informatics / Computer Science / Applied Sciences / Engineering / Physics.. This is a multi-disciplinary study, requiring a mix of theoretical skills (conception & study of novel AI approaches) and more practical skills (design of obfuscation methods that fool AI algorithms).

- Experience in the design & implementation of AI algorithms (deep learning neural networks) is required;
- Experience in programming is required;
- Experience in computer vision (visual domain) is required;
- Experience in computer vision (thermal domain) is recommended;
- Knowledge of software engineering life cycles, Agile methodologies and Scrum experience is recommended
- Hands-on experience with Continuous Integration processes and agile software development is recommended
- Experience with complex software architectures assemblies, deployment and testing (e.g. Docker) is recommended
- Knowledge of ROS (<https://www.ros.org/>) is recommended;
- Proficiency in scientific documents production is recommended
- Training or experience in robotics is an added value;
- Training or experience in applied research and or design is an added value;

Personal skills

- You conduct scientific research in an independent and upright way within a multidisciplinary environment
- You think in an innovative and creative way. You take initiative, you are involved and result oriented.
- You communicate your results in a clear, concise and precise manner.
- You are honest, loyal toward the institution and respect confidentiality.
- You plan and manage proactively your self-development, while being critical to your own functioning and striving to your self-improvement.
- You improve the team-spirit and solve interpersonal conflicts. You are flexible for change and adapt yourself.
- You solve problems autonomously and find alternatives or solutions.
- You behave in a respectful way toward the others, their ideas and opinions as well as toward procedures.
- You are capable of writing qualitative technical reports on your work
- You are capable to manage, direct and assist with the composition of deliverables towards the funding authority
- You are capable to write and present scientific papers about your work
- You commit yourself in your job by giving the best of your aptitudes in striving toward the highest quality standards.

Other skills

- The applicant shall have excellent oral & written knowledge of English.
- Minimum knowledge of Dutch or French is an added value for collaboration with peers.

Application

You will be working in a military environment. That is why everyone is expected to undergo a security verification. Please add to your application the filled out document. The form can be downloaded from: <http://www.rma.ac.be/nl/aanvraag-veiligheidsverificatie>

Send by email:

- a motivational letter;
- a CV
- a scan of your ID card (both sides);
- the filled out security document

to Mr Geert De Cubber (geert.decubber@mil.be) and to Mrs Helena BRUYNINCKX (erm-deao-rsw@mil.be).

Please mention clearly the reference of the vacancy: **“DAP/23-03-ARC”**.

Application deadline: 31/03/2022.

The interviews will take place at the Royal Military Academy, Hobbemastraat 8, 1000 Brussels. In case of access restriction due to COVID-19 or non-Belgian application, on-line interviews will take place. The date and time of the interview will be communicated to the preselected candidates.

Miscellaneous

Contract

- Probable date of recruitment: 01/06/2023, in consultation with the applicant.
- Status: Full-time employment based on an open-ended contract with the Patrimony of the Royal Military Academy (you will not be a civil servant). Please do note that – while the contract is open-ended – the financing is secured only until 31/05/2027 (so, a 4-year period). An extension is possible subject to the availability of funding.
- Wage scale: class A1 (holders of a Master’s degree in Science) / class A2 (Ir ; holders of a Master’s degree in Engineering).
- Holiday pay.

Extra-legal benefits

- Possibility to benefit from a bilingualism allowance (Dutch/French) following a SELOR test;
- End-of-year bonus;
- Free DKV hospitalization insurance. Possibility of additional affiliation for one or more persons living under the same roof: spouse, child(ren) (50% of the price per additional member);
- Bike allowance / Free public transport (home-work commute);
- Free access to campus sports facilities outside working hours;
- On-campus restaurant and cafeteria with democratic prices (discount on the daily menu);
- Flexible working hours within the 38-hour week;

- Teleworking possible after 1 year of service at the latest;
- Additional holiday for all staff between Christmas and New Year;
- 26 days holiday / year (then from 45 years: +1 day holiday every 5 years) from the 1st year of contract + 3 days / year dispensation from service offered by the department;
- Advantages and interesting offers thanks to the Benefits@work card (discounts, vouchers...);
- Entitlement to services offered by the 'Office Central d'Action Sociale et Culturelle de la Défense' (OCASC): among others holiday centres, discount on travel organised by the tour operator...;
- Possibility of benefiting from the nursery funded by Belgian Defence (subject to availability).

Workplace

- Royal Military Academy, Avenue de la Renaissance 30, 1000 Brussels;
- Occasional travel abroad for scientific conferences, etc.

Points of contact

- Concerning the research project: to Mr Geert De Cubber (geert.decubber@mil.be)
- Concerning the recruitment modalities: Mrs Helena Bruyninckx (erm-deao-rswo@mil.be)
- For more information about:
 - the Royal Military Academy, see <http://www.rma.ac.be>
 - the research cell 'Robotics & Autonomous Systems', see <https://mecatron.rma.ac.be/>