



Job offer
Royal Military Academy - Patrimony



Researcher in Vehicle mechanics, Vibrations, and AI (M/F/X)
Department of Mechanics
project "GRiTA"
Publication: 15/03/2024

Job description and associated tasks

In the framework of the study GRiTA (**G**round Vehicle **R**ide Quality Testing and **A**nalysis with Complex Terrain) on the development of simulations and a prototype to analyze the ride quality on complex terrain, we are looking for a full-time researcher with a master's degree in Applied sciences / Engineering / Physics and experience in the field of Artificial Intelligence (AI). This study can also lead to a PhD. 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 research unit 'Structures and Materials' (<https://www.rma.ac.be/en/information-for/research-at-the-rma/research-departments/mechanics>) of the department of Mechanical Engineering of the Royal Military Academy and in close collaboration with the NATO AVT-380 group. You conduct scientific research at university level on a project entitled 'GRiTA'.

Study:

The project GRiTA is integrated to the NATO's AVT-380 working group. The NATO's AVT-380 is developing a new mobility analysis for wheeled vehicles. It is building on the "STANREC 4813" simulation structure to identify maneuver corridors for military vehicles. However, there is a need to improve methods to measure the topography and its impact on vehicle speed while considering ride quality. The project GRiTA aims to fill this gap by using its vibration analysis expertise on vehicle systems and developing a method that can measure the intricate response of vehicles in terms of ride quality.

This involves two parallel developments:

On one side, the design of terramechanic simulations will be used for comparison with available data. The project aims to examine how vehicle dynamics affect overall system mobility, as measured by speed-made-good metrics, when driving over 3D terrain. It also seeks to evaluate the impact of speed variations on ride quality to establish the necessary requirements for modeling data and validation tests.

On the other side, the building and instrumentation of a prototype used to produce data. The gathered data's will be connected to the simulation results, allowing to link the vehicle dynamics measurements with the ride quality metrics. In a later stage, machine learning could be used to better correlate experimental and simulation data.

The challenges will reside in gathering data on multiple platforms, in a consistent way between the partners, and in identifying coinciding signal responses. However, performing vibration analysis will provide the research group a better monitoring on both the human's and the vehicle's health. In addition, it can help to optimize the machinery's design by identifying the root cause of vibrations, and therefore, reduce the energy consumption and extend the equipment's life.

Main Tasks

- Develop the operational and technical user requirements for the project.
- Develop a terramechanic simulation based on AVT-380 and produce data for topographies according to Belgian Defense's application. The latter will be acquired through satellite imaging.
- Develop a prototype (with vibrational analysis instrumentation) that enables to understand the environment using its sensing data. These data will be used to correlate with the topography (mapping), ride quality assessment, and if possible, for autonomous navigation.
- Produce an experimental result database, based on a known topography, to train a model (cf. machine learning) and correlate with the simulation results.
- Apply the methodology to a new terrain obtained via satellite imaging and interpret/forecast those data for ride quality awareness.
- Integrate the RMA developments into the AVT-380 (with partners), such that the simulations can be validated.

Required skills

Technical skills

The applicant shall have a master's degree in Applied sciences / Mechanical Engineering / Physics. This study requires a mix of numerical skills (software Adams and machine learning) and more practical skills (prototyping, applied vibration analysis, and field validation).

- Knowledge in land vehicle mechanics and vibrational analysis is required;
- Experience in numerical simulations is required;
- Training or experience in the software Adams (https://nexus.hexagon.com/documentationcenter/bundle/adams_2023.2/page/adams_main.htm) is an added value;
- Training or experience in Sensor integration is an added value;
- Knowledge of deep learning algorithms and robotics is an added value;
- Training or experience in programming, geodesy, and control engineering is an added value;

Personal skills

- You conduct scientific research in an independent and upright way within a multidisciplinary environment that can lead you to a PhD.
- You think in an innovative and creative way. You take initiative, 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 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 good knowledge of English (oral / written).
- Minimum knowledge of French or Dutch is an added value for collaboration with peers.

Specific requirement

- The researcher may be exposed to classified information and will therefore have to obtain the required security clearances. You will be working in a military environment. That is why everyone is expected to undergo a safety verification. The candidate must consent with the background checks required to obtain these clearances.
- Working for the Patrimony requires living in Belgium for the duration of the study.
- Due to limitations with the security clearance and confidentiality applications will be limited to those with a nationality of a country that is an EU member state or NATO member state.

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;
- your CV ;
- the transcript of records of your last Master degree;
- a scan of your ID card (both sides);
- and the filled out and signed request for security check.

to Mr Yoshiyuki NISHIO (yoshiyuki.nishio@mil.be), Mr Kristof HARRI (kristof.harri@mil.be), and to Mrs Helena BRUYNINCKX (erm-deao-rsw@mil.be).

Please mention clearly the reference of the project: “GRiTA”.

Application deadline: 15/04/2024.

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: from 01/06/2024 or later, according to the candidate's availability.
- 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).

Wage scale: class A1 (holder of a Master's degree in Science or equivalent), class A2 (holder of an Ir degree or equivalent Master's in Engineering Sciences, doctor's degree in the same area of expertise).

Please do note that the financing of your contract is tied to the "GRiTA" project (which lasts 4 years).

RMA-Patrimony applies a merit-based research career track, allowing researchers to advance in wage scale based upon annual evaluations.

- 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);
- Meal vouchers (6€ / day);
- 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 with allowance ;
- Holidays:
 - 29 days holiday / year from the 1st year of contract (then from 45 years: +1 day holiday every 5 years)
 - + 1 week OFF every year between Christmas and New year's Eve (independent of the annual balance of holidays).
- 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 travels abroad for scientific conferences, etc.

Points of contact

- Concerning the research project: to Mr Yoshiyuki NISHIO (yoshiyuki.nishio@mil.be)
- Concerning the recruitment modalities: Mrs Helena Bruyninckx (erm-deao-rsw@mil.be)
- For more information about:
 - the Royal Military Academy, see [Homepage | RMA](#)
 - the research cell 'Structures and Materials', see <https://www.rma.ac.be/en/information-for/research-at-the-rma/research-departments/mechanics>