Postdoc in physics-informed neural networks for solid mechanics

Are you passionate about solid mechanics and intrigued by machine learning? We are seeking a qualified candidate who can merge expertise from both fields to develop innovative tools for analyzing deformation and fracture in solid materials.

Expected start date and duration of employment

This is a 1-year position starting on 15 August 2025 or as soon possible thereafter.

Job description

Physics-informed machine learning is emerging as a promising avenue for solving problems in physics and engineering. Particularly, physics-informed neural networks (PINNs) have shown remarkable potential to solve problems governed by differential equations while accounting for measured experimental data. While a strong limitation of PINNs was their low speed, recent research has shown that efficiency and accuracy can be significantly improved by leveraging domain-specific knowledge of the problem at hand. The present project aims to further explore this research direction with a focus on 2D problems involving deformation and fracture in solid materials. Specific tasks will include:

- Contributing to developing efficient PINN-based models for deformation and fracture of solid materials
- Combining the developed theoretical models with full-field measurement techniques like digital image correlation
- Collaborating with key partners at other EU academic institutions

The candidate will be affiliated with the Damage and Fracture research group, and the research activities will be carried out in close collaboration with two larger projects: “Strength-of-materials informed neural networks” and “Network-inspired models to predict the strength of heterogeneous materials”.

Your profile

You hold a PhD in engineering, mathematical modelling or similar. Scientific challenges excite you and you feel comfortable talking to people with different backgrounds. You have expertise in both of the following areas

- Mechanics of materials
- Machine learning

and are ready to deepen your knowledge in the area you are less familiar with. Preferably, you have also experience with at least two of the following:

- Digital image correlation
- Fracture mechanics
- Python coding

Publication experience and excellent English communication skills are required.

Who we are

Aarhus University is the largest academic institution in Denmark and is consistently ranked among the Top 100 universities worldwide across various global rankings. The Mechanical and Production Engineering Department at Aarhus University has a strong research profile, leading both fundamental and applied research projects across multiple disciplines.

The Damage and Fracture research group focuses on achieving mechanistic understanding of the structure-properties relations for complex heterogeneous materials by exploiting synergistic combinations of computational, experimental and machine learning methods. A key theme is the development of efficient computational models for the prediction of the strength and fracture properties based on experimental data describing the size, shape and location of the defects/heterogeneities at the micro-scale. Applications range from additive manufactured metals to cast materials and composites.

Application Deadline:
15 May 2025

Faculty:
Faculty of Technical Sciences

Institute/Faculty:
Department of Mechanical and Production Engineering

Academic contact person:
Tito Andriollo
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Vacant positions:
1

Hours per week:
37

Number of months:
12

Expected date of accession:
15/08/2025

What we offer

The Department of Mechanical and Production Engineering at Aarhus University offers:

- A well-developed research infrastructure, laboratories and access to shared equipment
- An exciting interdisciplinary environment with many national, international and industrial collaborators
- A research climate encouraging lively, open and critical discussion within and across different fields of research
- A work environment with close working relationships, networking and social activities
- A workplace characterised by professionalism, equality and a healthy work-life balance.

Place of work and area of employment

The place of work is Katrinebjergvej 89, 8200 Aarhus N, Denmark, and the area of employment is Aarhus University with affiliated institutions.

Contact information

For further information, please contact: Assistant Prof. Tito Andriollo, titoan@mpe.au.dk.

Deadline

Applications must be received no later than 15 May 2025.

Application procedure

Shortlisting is used. This means that after the deadline for applications – and with the assistance from the assessment committee chairman, and the appointment committee if necessary, – the head of department selects the candidates to be evaluated. All applicants will be notified whether or not their applications have been sent to an expert assessment committee for evaluation. The selected applicants will be informed about the composition of the committee, and each applicant is given the opportunity to comment on the part of the assessment that concerns him/her self. Once the recruitment process is completed a final letter of rejection is sent to the deselected applicants.

Letter of reference

If you want a referee to upload a letter of reference on your behalf, please state the referee's contact information when you submit your application. We strongly recommend that you make an agreement with the person in question before you enter the referee's contact information, and that you ensure that the referee has enough time to write the letter of reference before the application deadline.
Unfortunately, it is not possible to ensure that letters of reference received after the application deadline will be taken into consideration.

If you wish to add a referee **after** you have submitted your application, you must send this person's details (name, job title, place of work, and email address) as well as the name of the position you have applied for to: HR.Nattech@au.dk

Formalities and salary range

Technical Sciences refers to the Ministerial Order on the Appointment of Academic Staff at Danish Universities under the Danish Ministry of Science, Technology and Innovation.

The application must be in English and include a curriculum vitae, degree certificate, a complete list of publications, a statement of future research plans and information about research activities, teaching portfolio and verified information on previous teaching experience (if any). Guidelines for applicants can be found here.

Appointment shall be in accordance with the collective labour agreement between the Danish Ministry of Taxation and the Danish Confederation of Professional Associations. Further information on qualification requirements and job content may be found in the Memorandum on Job Structure for Academic Staff at Danish Universities.

Salary depends on seniority as agreed between the Danish Ministry of Taxation and the Confederation of Professional Associations.

Aarhus University's ambition is to be an attractive and inspiring workplace for all and to foster a culture in which each individual has opportunities to thrive, achieve and develop. We view equality and diversity as assets, and we welcome all applicants.

Research activities will be evaluated in relation to actual research time. Thus, we encourage applicants to specify periods of leave without research activities, in order to be able to subtract these periods from the span of the scientific career during the evaluation of scientific productivity.

Aarhus University offers a broad variety of services for international researchers and accompanying families, including relocation service and career counselling to expat partners. Read more here. Please find more information about entering and working in Denmark here.

Aarhus University also offers a Junior Researcher Development Programme targeted at career development for postdocs at AU. You can read more about it here.

The application must be submitted via Aarhus University's recruitment system, which can be accessed under the job advertisement on Aarhus University's website.

Aarhus University

Aarhus University is an academically diverse and research-intensive university with a strong commitment to high-quality research and education and the development of society nationally and globally. The university offers an inspiring research and teaching environment to its 38,000 students (FTEs) and 8,300 employees, and has an annual revenues of EUR 935 million. Learn more at www.international.au.dk/