

Application of machine learning in ship structures

Summary

Taltech Estonian Maritime Academy offers a 4-year PhD position in Naval Architecture. This PhD will investigate the numerical aspects of using machine learning in the context of finite element modelling of ship structures as well as the experimental approaches that are tailored towards ANN framework.

Research field:	Mechanical engineering
Supervisor:	Mihkel Kõrgesaar
Availability:	This position is available.
Offered by:	Estonian Maritime Academy
Application deadline:	Applications are accepted between June 01, 2020 00:00 and July 03, 2020 23:59 (Europe/Zurich)

Description

Current efforts in the naval architecture are focused on reducing the overall weight to develop lighter, fuel efficient and eco-friendly structural solution that reduce carbon emission. In parallel, societal requirements to structures have not changed – structures need to be safe, reliable as well as user friendly in different operating conditions. When novel structures are developed, their compliance with existing design rules must be checked and their performance assessed to show the benefits compared with existing structures. Currently, computational tools are used for performance evaluation of structures. However, this can be a time inefficient and tedious task when nonlinear dynamic response must be assessed in the design of a complex structure where hundreds of alternatives need to be considered in the search for the optimum. Therefore, the position is related to application of machine learning in structural response modelling.

Machine learning tools (e.g., the artificial neural networks ANN) have made tremendous improvements in the last decade. Their accuracy is very high, which means that they can be used as surrogate models for optimization. For instance, the crashworthiness of complex vehicles can be optimized without the use of supercomputers, but by using machine learning models in optimization.

Responsibilities and tasks

This PhD will investigate the numerical aspects of using machine learning in the context of finite element modelling of ship structures as well as the experimental approaches that are tailored towards ANN framework.

Qualifications

The call is open for candidates with a wide range of backgrounds inside and outside of Estonia. Most importantly, high level of interest and motivation towards, and deep understanding on, solid and computational mechanics is required. During the assessment emphasis will be put on your potential for research, motivation and personal suitability for the position.

The applicants should fulfill the following requirements:

- A suitable background may come from mechanical/material engineering, marine engineering, civil engineering, engineering physics, applied or computational mechanics, or related disciplines
- Prior experience on working with FE codes LS-DYNA or ABAQUS is a significant advantage and skills with programming tools Matlab, Python or Fortran is considered as a plus as these will be used during the work
- The candidate should prove his/her capabilities in writing the technical report and scientific papers in high quality journals
- Experience in collaborative research/publication with the existing Tal-Tech staff is also a plus



- The applicant for the position must have a Master's degree and must fulfill the requirements for doctoral students at the Tallinn University of Technology



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