A Smart Computational Tool for Hydrodynamic Design of High Speed Craft

Summary

Artificial Intelligence is one of the most enabling technologies of digital transformation in the industry. The methods and processes that are carried out in Marine Technology cannot be left out of intelligent machine leaning. There are many aspects in which Artificial Intelligence (AI) can be applied in ship design because of its direct impact on generating added value, saving time, decreasing the costs and obtaining a more competitive product. The first stage of the lifecycle of high-speed craft (HSC) is designing and the main design aspect of such craft is directly related to their hydrodynamics behavior including resistance, seakeeping and maneuvering motions. Therefore, the current thesis aims to develop a computational tool based on the intelligent machine learning that is able to predict the hydrodynamic performance (resistance, seakeeping and maneuvering) of a particular kind of high-speed craft. The required dataset for creating the Smart Computational Tool (SCT) should be developed based on the validated mathematical models as well as existing experimental data. Moreover, Genetic Algorithm is another methodology that should be considered in SCT to enable the user to find the optimized solution by considering various constraints and objectives including fuel efficiency. SCT has to be developed in an open source framework in which everyone can extend its functions and capabilities.

Research field:	Mechanical engineering
Supervisor:	Abbas Dashtimanesh
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

Artificial Intelligence is one of the most enabling technologies of digital transformation in the industry. The methods and processes that are carried out in Marine Technology cannot be left out of intelligent machine leaning. There are many aspects in which Artificial Intelligence (AI) can be applied in ship design because of its direct impact on generating added value, saving time, decreasing the costs and obtaining a more competitive product. The first stage of the lifecycle of high-speed craft (HSC) is designing and the main design aspect of such craft is directly related to their hydrodynamics behavior including resistance, seakeeping and maneuvering motions.

Responsibilities and tasks

The current thesis aims to develop a computational tool based on the intelligent machine learning that is able to predict the hydrodynamic performance (resistance, seakeeping and maneuvering) of a particular kind of high-speed craft. The required dataset for creating the Smart Computational Tool (SCT) should be developed based on the validated mathematical models as well as existing experimental data. Moreover, Genetic Algorithm is another methodology that should be considered in SCT to enable the user to find the optimized solution by considering various constraints and objectives including fuel efficiency. SCT has to be developed in an open source framework in which everyone can extend its functions and capabilities.

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, artificial intelligence, machine learning, genetic algorithm and marine technology.

The applicants should fulfill the following requirements:

- A suitable background may come from naval architecture, information technology, computer engineering and mechanical engineering or related disciplines
- Prior experience on developing open source software is a significant advantage and skills with programming tools such as Matlab, Python and C++ is necessary
- The candidate should prove his/her capabilities in writing the technical report and scientific papers in high quality journals

- Priority will be given to those who got the first-class honors for his/her bachelor degree and master by coursework course with research components and/or publications
- Experience in collaborative research/publication with the existing TalTech 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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