

Dear Colleagues, we would like to invite you to visit the lecture presented by:

Dr. Stipe Perišić
University of Split - FESB

on the topic of:

Bayesian Analysis of Mechanical System Parameters and Uncertainty: A Practical Approach

Date: November 21, 2024 (Thursday) at 15.00-15.30

Location: Room No. 623, 6th floor, FME, CTU in Prague, Technická 4, Prague 6

Abstract: *In order to control the consequences of failures and improve safety, the condition of the systems should be closely monitored to detect problems or abnormalities in the early stages. This is achieved through technical indicators that are directly or indirectly related to the degradation process. In mechanical systems, for example, damping and/or natural frequency could be used as indicators. Then, the change in indicator value over time can be an early warning signal that maintenance or replacement is required to prevent further degradation and failure of the system. Since the estimation of the indicator during the operation of the system is subject to a certain degree of uncertainty, the uncertainty must also be evaluated.*

Therefore, Bayesian analysis will be addressed in the presentation as it can be used for efficient estimation of the above-mentioned quantities, both indicators and uncertainties. In summary, Bayesian analysis is a combination of the prior distribution and the likelihood function from which the posterior distribution is obtained. The important part of Bayesian analysis is the prior distribution, which represents the belief in value to be estimated before the data have been collected. When set correctly, it allows for fast convergence to the true value, usually from a small data set. For certain combinations of prior distributions and likelihood functions, the posterior distribution has a complete analytical solution in closed form, known as conjugate priors. This is the most efficient form of Bayesian analysis, and it is desirable in the context of condition monitoring, otherwise numerical integration techniques such as Markov Chain Monte Carlo (MCMC) must be used.

Both conjugate priors and MCMC will be discussed in the presentation. In addition, the dynamic model selection technique is also discussed, which greatly speeds up the overall Bayesian analysis.



**STIPE
PERIŠIĆ**

He earned his Bachelor's degree in naval architecture at the Faculty of Electrical Engineering and Naval Architecture (FESB), University of Split in 2009. In the same year, he was employed at the Brodosplit shipyard as a designer assistant. In 2011, he ended his job and enrolled in mechanical engineering study at the FESB, University of Split, where he 2013 earned his MD in mechanical engineering. In the same year, he was employed at the Brodosplit shipyard as a designer, where he worked up to 2015. In 2015, he was employed at the FESB as an assistant, where he earned his PhD diploma in 2021. His field of interest is condition-based maintenance, signal processing, and data analysis. He is the author of several peer-reviewed scientific papers.

The lecture will be presented in English. The entry to the lecture is for free. Due to a limited number of seats, the attendants should apply to it by Jan Papuga (papuga@pragtic.com). In case too many unregistered attendants will come, the registered participants will have priority to enter the room.

On behalf of FME CTU and CSM committee:



Prof. M. Růžička

ČESKÉ VYSOKÉ UČENÍ TECHNICKÉ V PRAZE
FAKULTA STROJNÍ
12105 - Ústav mechaniky, biomechaniky
a mechatroniky
166 07 Praha 6, Technická 4