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University *of Ljubljana*
Faculty *of Mechanical Engineering*
Laboratory for Dynamics of Machines and Structures

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OpenSD2023: Open-source Scientific Computing in Structural Dynamics

Conference, June 26th -27th 2023

Monday, 26th of June

8:00 – 8:40	Coffee and registration
8:40 – 9:00	Conference opening
9:00 – 9:45	Keynote: Gunnstein Frøseth, Strategies and tactics for a sustainable open source project (chair: Janko Slavič)
9:45 – 10:45	Session 1: Rotordynamics and Applications (chair: Tiago A. N. Silva) • Quankun Li, Ruixian Ma, Mingfu Liao and Xingjian Jing, ***Matlab based Finite Element Method for Rotor Dynamics*** • Vinicius Teixeira da Costa, Marcus Filipe Sousa Reis, Raphael Timbo Silva, Andre Albuquerque Thomas E Brandao, Thiago Gamboa Ritto and Aldemir Aparecido Cavallini Junior, ***ROSS: An Open-Source Python Package for Rotordynamic*** • Martijn Vermaut and Frank Naets, ***Development of a multibody simulation framework with an emphasis on extensibility*** • Ana S. A. Pereira, Andreia Mendes and Tiago A. N. Silva, ***An open-source vibration based structural health monitoring approach***
10:45 – 11:05	Coffee break
11:05 – 12:20	Session 2: Vibration fatigue (chair: Gunnstein Frøseth) • Pietro D'Antuono and Wout Weijtjens, ***py-Fatigue: Efficiently process, store and analyse load data for fatigue assessments*** • Arvid Trapp and Peter Wolfsteiner, ***Assessing non-stationary vibration loading in structural dynamics: Python package for random time series analysis*** • Martin Česnik, Aleš Zorman and Janko Slavič, ***FLife - Obtaining vibration fatigue life in the spectral domain*** • Massimiliano Palmieri, Claudio Braccesi and Filippo Cianetti, ***Development of an Open-Source device for the real time monitoring of fatigue life of mechanical components subjected to dynamic loads*** • Ward Rottiers, Babak Bozorgmehri and Frank Naets, ***Python tool to simulate thermo-mechanically induced interface stress in the solder connections of chips***
12:20 – 13:50	Lunch
13:50 – 15:20	Session 3: Experimental and Operational Modal Analysis (chair: Ivan Tomac) • Ivan Tomac and Janko Slavič, ***MorletWaveModal: Python package for modal identification using Morlet-wave integral*** • Uroš Bohinc, ***Operational modal analysis of a footbrige using open source Python library pyOMA*** • Dag Pasca, Angelo Aloisio, Marco Martino Rosso and Stefanos Sotiropoulos, ***PyOMA and PyOMA GUI: A Python module and software for Operational Modal Analysis***

	• Klemen Zaletelj, Janko Slavič and Miha Boltežar, ***EMA and UFF: Fundamental Tools in Structural Dynamics*** • Domen Gorjup, Aleš Zorman, Janko Slavič and Miha Boltežar, ***PyExSi: Excitation signals for structural dynamics and vibration fatigue*** • Elvio Bonisoli, Carlo Rosso, Fabio Bruzzone, Simone Venturini and Salvatore Paolo Cavallaro, ***Accurate finite elements for 2D and 3D structural analysis***
15:20 – 15:40	Coffee break
15:40 – 16:40	Session 4: Substructuring, Transfer Path Analysis (chair: Paolo Gardonio) • Gianluca Guernieri, Paolo Gardonio and Marius Stücheli, ***Digital twin of washing machine tub-drum oscillations*** • Domen Ocepek, Blaž Starc, Tomaž Bregar, Gregor Čepon and Miha Boltežar, ***Addressing NVH Challenges with Open-Source Tools - Transfer Path Analysis and pyFBS*** • Miha Pogačar, Tomaž Bregar, Gregor Čepon and Miha Boltežar, ***Component Mode Synthesis through pyFBS: Estimating Dynamic Properties of Assemblies with Component Models*** • Miha Kodrič, Tomaž Bregar, Gregor Čepon and Miha Boltežar, ***System Equivalent Model Mixing with pyFBS: Accurately Estimating Dynamic Properties at Unmeasurable Locations***
19:30	Conference dinner

Tuesday, 27th of June

8:30 – 9:15	Keynote: Janko Slavič, Multi-institutional collaboration in open-source structural dynamics research (chair: Wout Weijtjens)
9:15 – 10:30	Session 5: High-speed camera based Structural Dynamics (chair: Tengjiao Jiang) • Gianluca Guernieri, Paolo Gardonio, Marius Stücheli and Andrea Fusiello, ***Washing Machine Drum Oscillations Envelope From Camera Measurements*** • Sofia Baldini, Gianluca Guernieri, Domen Gorjup, Paolo Gardonio, Janko Slavič and Roberto Rinaldo, ***Closed Shell Sound Radiation Estimate From Camera Measurements*** • Tengjiao Jiang, Gunnstein Frøseth and Anders Rønnquist, ***A visual line tracking technique overcoming various noisy backgrounds*** • Thijs Willems and Frank Naets, ***Multi-scale and full-field vision-based motion tracking for flexible multibody parameter identification*** • Domen Gorjup, Janko Slavič and Miha Boltežar, ***PyIDI: Open-source image-based vibration measurement in Python***
10:30 – 10:50	Coffee break
10:50 – 12:05	Session 6: Tools in Structural Dynamics (chair: Dag Pasca) • Patrick Hippold, Johann Gross and Malte Krack, ***Nonlinear vibration analysis with NLvib*** • Edoardo Mancini, Massimiliano Palmieri and Filippo Cianetti, ***A Python toolbox for the design of composite-made structural components*** • Tilen Košir, Klemen Zaletelj, Janko Slavič and Miha Boltežar, ***LadiskDAQ: An Open-Source Python Package for Unified and Efficient Data Acquisition and Signal Generation*** • Elvio Bonisoli, Luca Dimauro, Simone Venturini and Salvatore Paolo Cavallaro, ***Investigation of nonlinear dynamics using open-source tools*** • Guillermo Reyes-Carmenaty, Josep Font-Moré and Marco A. Pérez ***A high level API for integrating vibrational data into machine learning algorithms***
12:05 – 13:30	End of Conference & Lunch
20:30	Social event and closing of the Conference

Keynote speakers

Gunnstein T. Frøseth is the author and maintainer of several popular open-source packages, including fatpack which is a python package for fatigue analysis of structures. He is also an Associate Professor at the Department of Structural Engineering, NTNU, where he teaches structural dynamics, signal processing and system identification. His research interest is rooted in condition assessment and service life estimation of structures and includes research in image processing, computer vision, fatigue of materials and load modelling.

Janko Slavič is the maintainer of several open-source packages, including pyEMA, pyUFF, pyExSi, and FLife. He is also a co-author of the 2020 Nature Methods publication on the development of Scipy. Dr. Slavič is a full professor at the Faculty of Mechanical Engineering at the University of Ljubljana; he is active in the field of structural dynamics and signal processing. Besides his open-source effort, he has been particularly active in Vibration fatigue, High-speed image-based EMA, 3D printed sensors and actuators.

Conference proceedings

You can access the full conference proceedings by following the link below.

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Summer School, June 27th -28th 2023

Tuesday, 27th of June

12:30 – 13:30	Registration and welcome coffee
13:30 – 15:00	Python distributions, programming environments, the Python ecosystem
15:00 – 15:15	Coffee break
15:15 – 16:45	Python Basics 1 (data-types, operators, ...)
16:45 – 17:00	Coffee break
17:00 – 18:00	Python Basics 2 (functions, modules, …)
20:30	Welcome reception

Wednesday, 28th of June

9:00 – 10:30	Essential numerical tools (Numpy, Scipy, Matplotlib)
10:30 – 10:45	Coffee break
10:45- 12:15	Signal processing for vibration engineers
12:15 – 13:30	Lunch
13:30 – 15:00	Track 1/2/3, Part 1
15:00-15:15	Coffee break
15:15 – 17:45	Track 1/2/3, Part 2
19:30	Summer school dinner

Map of event locations