

Addressing Challenges in Applied Mechanics through Artificial Intelligence

EUROMECH Colloquium 650

ORGANIZED BY:



European Society of Mechanics
(EUROMECH)



Faculty of Mechanical Engineering,
University of Belgrade

SUPPORTED BY:

- Ministry of Science, Technological Development and Innovation of the Republic of Serbia (MNTRI)
- Springer
- Serbian Society of Mechanics (SSM)
- Tim-Invest Ltd.
- Smart Steel Innovation Ltd.
- GIR Ltd.
- Radijator Inženjering Ltd.
- Aqua crystal Ltd.

Location of the Colloquium:

University of Belgrade, Faculty of Mechanical Engineering, Kraljice Marije 16, 11120 Belgrade,
coordinates: 44°48'24.7"N, 20°28'38.5"E

All presentations will be held in **Room 211** on the second floor, while all coffee breaks will take place in the adjacent **Room 210**.

Instructions for Speakers and Session Chairs

1. Keynote speakers are allocated **35 minutes** for their presentation, followed by **5 minutes** for Q&A and transition to the next speaker.
2. Contributed talks are allocated **17 minutes** for presentation and **3 minutes** for Q&A and transition.
3. Session chairs are kindly requested to **strictly adhere to the schedule**, even in the case of a no-show.
4. The conference room will be equipped with a **PC (supporting PDF and PowerPoint formats)** and an **LCD projector**. **Laser pointers** will be available upon request, subject to availability.
5. Speakers may use their own laptops; however, to avoid technical issues, we kindly ask that presentations be **uploaded in advance to the conference PC** and tested prior to the session.

Tuesday, August 26

18:00	Welcome cocktail and Registration, Room 210, Second Floor

Wednesday, August 27

7:30 - 8:00	Arrival and Registration with Coffee
8:00 – 8:45	Opening and Welcome Ceremony, Room 211, second floor
	Opening Addresses: Prof. Nataša Trišović, Chair of the Colloquium Prof. Tamás Mantkovits, Co-Chair Dr. Petar Dimitrov, Co-Chair Prof. Zoltán Major, Co-Chair Prof. Ana Petrović, Co-Chair Guest Speakers: 8:15 Prof. Samuel Forest, Secretary General of EUROMECH (online participation) Prof. Vladimir Popović, Dean, Faculty of Mechanical Engineering, University of Belgrade Prof. Srboľjub Simić, President, Serbian Society of Mechanics Prof. Nenad Filipović, Director, Science Fund of the Republic of Serbia
8:50 – 10:30	Technical Session, Room 211 AI for Material Characterization & Design Chair: Tamas Mantkovits
8:50 – 9:30	Keynote Talk AI-driven experimentation: designing experiments and extracting insights from complex engineering data Runar Unnthorsson
9:30 – 9:50	Deep symbolic regression: challenges and potential in application to constitutive modeling of soft materials <u>Mikhail Itskov</u> and Rasul Abdusalamov
9:50 – 10:10	Foundation models in engineering & hard sciences Ana Trišović
10:10 – 10:30	Heart failure modeling <u>Nenad Filipović</u>, Tijana Geroski, Smiljana Tomašević, Bogdan Milićević, Miloš Kojić
10:30 – 11:00	Coffee Break, Room 210

11:00 – 13:00	Technical Session, Room 211 AI in Vibration Analysis & Wavelet Transform Chair: Zdenek Hadas
11:00 - 11:40	Keynote Talk On the use of machine learning for vibration control purposes: benefits and challenges Ivana Kovačić
11:40 – 12:00	Physics-informed neural networks for intelligent railway sensing system assessment <u>Petr Hadraba</u> , Martin Rytíř
12:00 – 12:20	Theoretical and numerical studies on the perfect one-way longitudinal wave absorption in rods <u>Kacper Rydzon</u> , Pawel Packo
12:20 – 12:40	Wavelet-based feature extraction and AI techniques for acoustic event detection in urban environments <u>Simona Domazetovska Markovska</u> , Viktor Gavriloski, Maja Anachkova, Anastasija Ignjatovska, Dejan Shishkovski, Damjan Pecioski
12:40 – 13:00	Guided waves and artificial neural networks in classification of discontinuity location on the steel plate surface. Michał Jurek
13:00 – 13:10	Group Photo, on the stairs in front of the Faculty's main entrance
13:10 – 14:20	Lunch, Faculty of Mechanical Engineering, Restaurant, 5th floor, room 521 & Networking with Supporters
14:20 – 16:00	Technical Session, Room 211 AI in Vibration Analysis & Stochastic Systems Chair: Nataša Trišović
14:20 – 15:00	Keynote Talk An intelligent algorithm to study the response of stochastic dynamical systems Wei Li
15:00 – 15:20	Neuro-fuzzy clustering of lateral and vertical acceleration of railway track: an AI-enhanced approach Miloš Milovančević
15:20 – 15:40	Stochastic reconstruction and simulation of heterophasic microstructures using random field models <u>Florian Wolfbauer-Kiehas</u> , Zoltán Major
15:40 – 16:00	Periodic and stochastic transversal excitation on the elastically connected nano-plate and nano-shell Marija Stamenković Atanasov, <u>Iulijana Simonović</u> , Ivan Pavlović
16:00 – 16:30	Coffee break, Room 210

16:30 – 18:30	Technical Session, Room 211 AI Optimization in Mechanical Systems Chair: Ivana Kovačić
16:30 – 17:10	Keynote Talk Artificial Intelligence - supported shape optimization of an automotive rubber bumper David Huri
17:10 – 17:30	Data-driven multiscale simulation of two-phase flows with non-spherical particles Konstantin Volkov
17:30 – 17:50	Multi-robot collaboration through AI-powered prompts <u>Malik Čabaravdić</u> and Amer Sarajlić
17:50 – 18:10	Real-time simulation of combustion processes using artificial neural networks Redha Benhadj-Djilali, Arturas Gulevskis, <u>Konstantin Volkov</u>
18:10 – 18:30	Review of CAD/CAE softwares used in AI optimization of mechanical systems Lamija Mešeljević, <u>Fuad Hadžikadunić</u>
20:00 – 21:30	Boat Tour on the Danube and Sava River, precise location to be announced

Thursday, August 28

8:10 – 10:30	Technical Session, Room 211 AI for Material Characterization & Design Chair: Zoltan Major, Sándor Manó
8:10 – 8:50	Keynote Talk Physics informed neural network for estimation of physiological models Aleksandar Jeremić
8:50 – 9:10	Design of metamaterials for ultrafast imaging <u>Pawel Packo</u> , Daniel Torrent
9:10 – 9:30	Influence of defects on sheet molding compounds – a hybrid ICME approach <u>Andreas Kapshammer</u> , Zoltan Major
9:30 – 9:50	Development of an internal pressure test setup for multi-mode monotonic and cyclic testing of polymers <u>Michael Lackner</u> , Zoltan Major
9:50 – 10:10	Finite element analysis and machine learning based design of latticed hip implant stem <u>Tamás Mankovits</u> , Rashwan Alkentar, Nataša Trišović, Ana Petrović, Sándor Manó, Dávid Huri
10:10 – 10:30	Application of deep symbolic regression for approximation problems in statistical mechanics <u>Alina Popova</u> , Rasul Abdusalamov, Mikhail Itskov
10:30 – 11:00	Coffee Break, Room 210
11:00 – 12:40	Technical Session, Room 211 Energy Harvesting & Conversion Chair: Petar Dimitrov, Wei Li
11:00 – 11:40	Keynote Talk Perspectives and opportunities for vibration energy harvesting technologies in industrial applications <u>Zdeněk Hadaš</u> , Petr Sosna, Ondřej Rubeš
11:40 – 12:00	Theoretical analysis of galloping energy harvesters Dongmei Huang
12:00 – 12:20	Modeling and simulation of a hybrid piezoelectric–electromagnetic system for vibration energy harvesting <u>Dejan Shishkovski</u> , Zlatko Petreski, Simona Domazetovska Markovska, Damjan Pecioski, Maja Anachkova, Anastasija Angjusheva Ignjatovska
12:20 – 12:40	AI-based maturity detection system for field-grown melons: towards automated harvesting decisions <u>István Domokos</u> , Péter Szilágyi

12:40 – 13:10	Poster Session, Discussion & Networking with Supporters Chairs: Petar Mandić, Aleksandar Tomović
	Alternative ways to test components of turbojet engines and innovative, artificial intelligence approach for operation Nikola Davidović, Nenad Kolarević, Miloš Stanković, Marko Miloš
	Taguchi–AI approach for process optimization in composite manufacturing Svetlana Risteska
	2D truss optimization using FEM-PSO and generative AI Ognjen Ristić, Nataša Trišović, Dražan Kozak
	Development of a static test platform for determining the loads on an Unmanned Aerial Vehicle (UAV) Milica Milić Janković, Radoslav Radulović
	Pyro-starter procedure in expendable turbojets and elements of artificial intelligence Nikola Davidović, Nenad Kolarević, Miloš Stanković, Marko Miloš
	AI-based finger counting in viscous fingering dynamics Ivana Cvetković, Snežana Milićev
	Experimental and numerical analysis of the fatigue fracture behavior of the Ti-6Al-4V alloy Katarina Čolić, Simon Sedmak, Nenad Gubelj, Nataša Trišović, Marko Jarić, Ana Petrović, Tamás Mankovits
13:10 – 14:20	Lunch, Faculty of Mechanical Engineering, Restaurant, 5th floor, room 521 & Networking with Supporters
14:20 – 16:00	Technical Session, Room 211 Structural Health Monitoring & Damage Detection Chair: Runar Unnthorsson, Mikhail Itskov
14:20 – 15:00	Keynote Talk Application of neural networks to damage detection of beams and plates Stanislav Stoykov
15:00 – 15:20	AI-based fatigue delamination detection and classification in thermoplastic coupons using C-scan imaging <u>Konstantinos Tserpes</u> and Niki Tsivouraki
15:20 – 15:40	Predictive fatigue management in commercial aviation using AI tools: a study on the Airbus fleet Petar Dimitrov
15:40 – 16:00	Baseline-free damage detection method based on vibration with tunable resolution for composite laminates <u>Jiyue Chen</u> and Zheng Li

16:00 – 16:30	Coffee break, Room 210
16:30 – 18:30	Technical Session, Room 211 AI for Material Characterization & Design Chair: Ana Petrović, Dongmei Huang
16:30 – 17:10	Keynote Talk New trends for ML-based solution of solid mechanics tasks Sandra Klinge
17:10 – 17:30	Evaluation of the compressive properties of different 3D-printed Ti6Al4V lattice structures <u>Sándor Manó</u> , Ana Petrović, Loránd Csámer, Tamás Mankovits
17:30 – 17:50	Importance of the loss function for training model-driven neural networks in thermographic image reconstruction <u>Gergő Galiger</u> , Nazila Azadi, Bernhard Lehner, Mario Huemer, Péter Kovács
17:50 – 18:10	Generative adversarial networks for inverse design of self-deploying structures <u>Tomaz Brzin</u> , Miha Brojan
18:10 – 18:30	Effects of handling an imbalanced dataset on the accuracy of supervised machine learning classifiers <u>Anastasija Angjusheva Ignjatovska</u> , Zlatko Petreski, Damjan Pecioski, Dejan Shishkovski, Simona Domazetovska Markovska, Maja Anachkova
20:00 – 21:30	Gala Dinner, Kolubara u Šoru (the Kolubara restaurant in Šor) (https://www.malakolubara.rs/en/mala-kolubara-in-the-sor/), Žorža Klemansoa 29d, Belgrade, 44°49'26.7"N, 20°28'17.8"E

Friday, August 29

8:10 – 10:30	Technical Session, Room 211 AI Optimization in Mechanical Systems Chair: Petar Dimitrov, Stanislav Stoykov
8:10 – 8:30	Application of artificial neural networks for aerodynamic coefficient prediction of a CST parameterized airfoil <u>Toni Ivanov</u> , Ognjen Peković, Jelena Svorcan
8:30 – 8:50	Optimization of material handling machines with a sustainability focus, using graph neural networks <u>Gábor Bohács</u> , Hizba Muhammad Sadida
8:50 – 9:10	AI-driven optimization of biomechanical models for personalized prosthetic design and performance enhancement Zlata Jelačić
9:10 – 9:30	Analysis of loss factors in passenger car motion using Artificial Intelligence Sandor Palinkas
9:30 – 9:50	A neural network framework for concrete damage plasticity modeling <u>Tonja Beerhues</u> , Stefan Hildebrand, Andrija Zorić, Sandra Klinge
9:50 – 10:10	Combining solar overproduction with pumped hydropower for settlement-scale decarbonization and electricity supply–demand balancing <u>Attila Kálmán</u> , Katalin Bene
10:10 – 10:30	Neural network based controller parameters learning for a mechanical system <u>Tamara Nestorović</u> , Amit Kumar Pal
10:30 – 11:00	Coffee Break, Room 210
11:00 – 12:40	Technical Session, Room 211 AI for Material Characterization & Design Chair: Aleksandar Jeremić, Sandra Klinge
11:00 – 11:20	Robust crack modeling with the quadrature-based Deep Energy Method (Q-DEM) <u>Stefan Hildebrand</u> , Martina Toncelli, Sandra Klinge
11:20 – 11:40	Realistic 3D design and modelling of human leg and foot for laboratory testing and FEM simulation <u>Gabor Balogh</u> , Zoltan Major, Stefan Lämmermann
11:40 – 12:00	Parameter-dependent fractal spectra in quasiperiodic metastructures with elastic and rigid segments <u>Nevena Rosić</u> , Milan Cajić, Danilo Karličić, Mihailo Lazarević

12:00 – 12:20	Machine learning-based prediction of equivalent shear modulus in AS4/Epoxy laminates <u>Mirko Dinulović</u> , Dragi Stamenković, Aleksandar Bengin, Marta Trninić
12:20 – 12:40	Application of Artificial Intelligence in testing conformity with Benford's law in chaotic dynamical systems <u>Vesna Rajić</u> , Jelena Stanojević, Nataša Trišović, Wei Li
12:40 – 14:00	Lunch, Faculty of Mechanical Engineering, Restaurant, 5th floor, room 521 & Networking with Supporters
14:00 – 16:20	Technical Session, Room 211 AI Optimization in Mechanical Systems Chair: David Huri, Konstantin Volkov
14:00 - 14:20	A quadrature-based Deep Energy Method (DEM) for heterogeneous solids <u>Pius Wichmann</u> , Stefan Hildebrand, Sandra Klinge
14:20 – 14:40	Intelligent machines in predictive maintenance processes Goran Vorotović, Jela Vorotović, <u>Miloš Januzović</u> , Aleksandra Tomić, Danilo Milićević
14:40 – 15:00	Optimal trajectory tracking of robot manipulator using resonant controller <u>Petar Mandić</u> , Mihailo Lazarević, Tomislav Šekara, Aleksandar Tomović
15:00 – 15:20	Fuzzy Lyapunov approach for adaptive system control Ksenija Ćiraković, <u>Mitra Vesović</u> , Nataša Trišović, Wei Li
15:20 – 15:40	AI-driven multi-objective optimization of a planetary gearbox: a genetic algorithm and surrogate models approach <u>Miloš Sedak</u> , Maja Rosić
15:40 – 16:00	Analysis of the effect of geometric constraints on the optimal synthesis of planar mechanisms conducted by using metaheuristic algorithms Aleksandra Nikitović, Boris Kosić, Nedeljko Dučić, <u>Zorana Jeli</u>
16:00 – 16:20	Challenges in spill out lubrication systems in expendable turbojets and elements of artificial intelligence <u>Nikola Davidović</u> , Nenad Kolarević, Miloš Stanković, Marko Miloš
16:30 – 17:00	Closing Session, Room 211 Coffee & Snacks, Awards Ceremony and Group Photo Chairs: Nataša Trišović, Tamás Mankovits, Petar Dimitrov, Zoltan Major, Ana Petrović