Workshop on Industrial and Applied Mathematics: Gdańsk Tech Joins ECMI

Gdańsk University of Technology, May 5–7, 2025

Scope of the Workshop
The workshop will focus on the role of applied mathematics in science and industry, emphasizing the opportunities created by the inclusion of Gdańsk University of Technology (Gdańsk Tech) in the European Consortium for Mathematics in Industry (ECMI). Key topics will include:

- **Mathematical Methods in Industry** — Exploring the use of various advanced mathematical tools such as Optimization Methods, Statistical and Probabilistic Models, Machine Learning & AI, Graph Theory & Network Analysis, Differential Equations & Dynamical Systems, Topological Data Analysis, Stochastic Processes & Time Series Analysis to solve real-world industrial challenges, including complex data analysis, pattern recognition, modeling and simulation in engineering, biomedicine, and other applied sciences.
- **Collaboration Between Academia and Industry** — Discussing ECMI's role in fostering partnerships through Study Groups with Industry, conferences and Research Groups with the participation of Gdańsk University of Technology, reviewing ECMI's educational standards and the certification process.
- **Developing Applied Mathematics in Poland** — Discussing the potential impact of cooperating with ECMI on expanding and reinforcing Poland's national network for industrial mathematics.

Invited Speakers
Prof. Alessandra Micheletti (University of Milan, President of ECMI)
Prof. Cláudia Nunes (University of Lisbon, Executive Director and Secretary of ECMI)
Prof. Krzysztof Burnecki (Hugo Steinhaus Center & Wroclaw University of Science and Technology, Member of Council of ECMI)
Prof. Sergio Alonso Muñoz (Universitat Politècnica de Catalunya – BarcelonaTech)

Organizing Committee
Grzegorz Graff, Paweł Pilarczyk, Beata Jackowska-Zduniak

Location
All the talks and discussions will take place at Gdańsk University of Technology in the Faculty Council room no. 2/07 in the Nanotechnology Center, building no. 4 on the Campus Map.

Day One: Monday, May 5, 2025
9:15–9:30 – Grzegorz Graff (Vice-Dean for Research, Gdańsk University of Technology, Faculty of Applied Physics and Mathematics): Opening of the Workshop
9:30–10:00 – Alessandra Micheletti (University of Milan, President of ECMI): *The European Consortium for Mathematics in Industry: structure and activities*
10:00–10:30 – Paweł Możejko (Dean of the Faculty, Gdańsk University of Technology, Faculty of Applied Physics and Mathematics): *Faculty of Applied Physics and Mathematics of the Gdańsk University of Technology – from history through the present to the future*
10:30–11:00 – Cláudia Nunes (University of Lisbon, Executive Director and Secretary of ECMI): *Educational activities of ECMI*
11:00–11:30 – coffee break
11:30–12:00 – Krzysztof Burnecki (Hugo Steinhaus Center & Wroclaw University of Science and Technology, Member of Council of ECMI): *Wrocław ECMI node: past, present and future*
12:00–12:30 – Sergio Alonso Muñoz (Universitat Politècnica de Catalunya, Department of Physics): *Fibrosis-induced arrhythmias: A computational approach to micro-reentries and ectopic foci*
12:30–12:45 – break
12:45–13:15 – Ireneusz Czarnowski (Dean of the Faculty of Computer Science, Gdynia Maritime University): *Processing challenging data for machine learning*
13:15–13:45 – Paweł Pilarczyk (Gdańsk University of Technology, Faculty of Applied Physics and Mathematics): *Quantification of coupling between heart rate and blood pressure by means of entropy-based indices*
13:45–15:00 – lunch break
15:00–17:30 – informal meetings and discussions

Day Two: Tuesday, May 6, 2025
9:30–9:40 – Józef Sienkiewicz (Vice-Rector for Cooperation, Gdańsk University of Technology): Address to Participants
9:40–10:00 – Alessandra Micheletti (University of Milan, President of ECMI): *GENEOnet: a transparent AI method for drug design based on Group Equivariant Non Expansive Operators*
10:00–10:20 – Cláudia Nunes (University of Lisbon, Executive Director and Secretary of ECMI): *Innovation and product positioning: When to add or replace*
10:20–10:40 – Agnieszka Wyłomańska (Wroclaw University of Science and Technology, Faculty of Pure and Applied Mathematics): *Detection of hidden periodicity in signals disturbed by additive non-Gaussian noise. Application to machine condition monitoring*
10:40–11:00 – Janusz Szwabiński (Wroclaw University of Science and Technology, Faculty of Pure and Applied Mathematics): *ML-driven analysis of anomalous diffusion*
11:00–11:40 – coffee break
11:40–12:00 – Paweł Dłotko (Dioscuri Centre in Topological Data Analysis): *Presentation of Dioscuri Centre in Topological Data Analysis*
12:00–12:20 – Patryk Jasik (Gdańsk University of Technology, Faculty of Applied Physics and Mathematics): *Application of AI methods in predicting the likelihood of intracranial aneurysm rupture*
12:20–12:40 – Jacek Gulgowski (University of Gdańsk, Faculty of Mathematics, Physics and Informatics): *Fractional calculus in mathematical modeling*
12:40–13:00 – Anna Szafrańska (Gdańsk University of Technology, Faculty of Applied Physics and Mathematics): *Fractional modelling and physics-informed neural networks in epidemiology*
13:00–14:30 – lunch break
14:30–14:50 – Justyna Signerska-Rynkowska (Gdańsk University of Technology, Faculty of Applied Physics and Mathematics): *Topological data analysis enhances investigation of dynamical systems*
14:50–15:10 – Piotr Bartłomiejczyk (Gdańsk University of Technology, Faculty of Applied Physics and Mathematics): *Why computers like Lorenz maps*
15:10–15:30 – Beata Jackowska-Zduniak (Gdańsk University of Technology, Faculty of Applied Physics and Mathematics): *When heart fibrosis becomes a disease*
15:30–17:30 – informal meetings and discussions

Day Three: Wednesday, May 7, 2025
9:30–13:00 – informal meetings and discussions
13:00–14:30 – lunch break