EU-MATHS-IN Finland

5.2.2021

EU-MATHS-IN FINLAND

Report of 2020

The Finnish National Network on Mathematical Modelling is formed by the following Finnish universities and their departments (in the alphabetical order).

- Lappeenranta-Lahti University of Technology (LUT), School of Engineering Science
- Tampere University (TAU), Faculty of Information Technology and Communication Sciences, Unit of Computing Sciences
- University of Eastern Finland (UEF), Department of Applied Physics (Kuopio)
- University of Eastern Finland (UEF), Department of Physics and Mathematics, (Joensuu)
- University of Jyväskylä (JyU), Faculty of Information Technology
- University of Oulu (OU), Faculty of Natural Sciences, Department of Mathematical Sciences

The units/ departments share their interest and experience in mathematical modelling in order to develop and use mathematical methodology to solve important problems in science, economics and industry. The main activities of the network consist of modelling, simulation, collaboration with industry and society, in terms of projects, modelling weeks, modelling education and study groups.

The Network is associated with the Finnish Centre of Excellence in Inverse Modelling and Imaging supported by Academy of Finland with Aalto University (AU), Finnish Meteorological Institute (FMI), Lappeenranta-Lahti University of Technology (LUT), Tampere University (TAU), University of Eastern Finland (UEF), University of Helsinki (UH), University of Jyväskylä (UJ), University of Oulu (UO).

Education

During fall 2020 the network organized teaching of the "Basic Course on Mathematical Modelling" both in Finnish and English. The course on “Advanced Mathematical Modelling: Discrete Models” was given in spring. The courses were taught and studied over the Internet with teachers and students from all the six nodes.

The network has participated in the ECMI SIG on virtual education lead by Prof. Thomas Götz in Koblenz.

Workshops

LUT was a co-organiser in the international webinar Mathematical Models & Analysis on COVID-19 Crisis 17-18 June, arranged by MSU-Baroda in India**.**

LUT participated in the Virtual South East Asian Study Group Meeting on Industrial Problems 12-167 October 2020, arranged by MSU-Baroda, India.

Project applications

EU-MATHS-IN Finland is a partner in Nordic Industrial Math Hub application submitted to NORDFORSK in 2019.

EU-MATHS-IN Finland participated in the preparation of MATE4IN (Mathematical Technologies for Innovation: a service network infrastructure for integrating starting communities in mathematical technologies at a European community level) in the INFRAIA program, but unfortunately the proposal was not accepted.

The network participated INNOSUP-01-2018-2020: Cluster Facilitated Projects for New Industrial Value Chains application for Horizon 2020 with Spanish and Italian Networks. LUT is the Finnish partner.

The network organized Finnish participation in the MSODE (Modelling, Simulation and Optimisation in a Data-rich Environment) eCost application. The Finnish participants are from TAU, JyU and LUT.

Ongoing projects include

EU-project: H2020-MSCA-ITN, "Smart tomographic sensors for advanced industrial process control, TOMOCON" having 12 research institutions and 15 renowned industrial companies. The Finnish partners are Department of Applied Physics (UEF) and LUT.

COST Action CA17124. Digital Forensics: Evidence Analysis via Intelligent Systems including joint research work with the Finnish Central Criminal Police (KRP) and the German Central Office for Information Technology in the Security Sector (ZITiS). Representative from TAU: Esko Turunen.

Double rotary head angle calculation with Cenic Finland Oy. Simo Ali-Löytty (TAU).

Value at Risk Modeling with Fortum Ltd, Juho Vänskä, Esko Turunen (TAU).

Data-driven Mathematical Modeling of Lead Acid batteries with Bamatos Ltd., Alexey Ryzhenkov, Esko Turunen (TAU).

Investigation and Mathematical Analysis of Avant-garde Disease Control via Mosquito Nano-Tech-Repellents' http://www.cost.eu/ COST_Actions/ca/ CA16227. (LUT)

Finnish Academy: Industrial Internet and Data Analysis in Marine Industries Researchers (IIDA-MARI). Partners (LUT, FMI, Eniram Ltd., LUT).

CFD modelling for wind forces acting on cruise ships (part of IIDA-MARI project, LUT).

Numerical study on the impact of forest density on wind turbine (LUT).

Large Eddy Simulation on impact of forest shape and density on Atmospheric Boundary Layer turbulence (LUT).

Minimizing heating from a single-cell battery by CFD modelling supported by Uncertainty Quantifications (LUT).

Sawmill industry: Sawing Optimization via Deep Learning and Multi-instrument Imaging, (cooperation with KTH, Finnos, LUT).

Custom research on dryer modelling & uncertainty quantification (Fazer Ltd., LUT)

Other

The Network is a member of Mathematics for Industry Networks (https://mi-network.org) and has a representative at COST action management committee.

The network disseminated information on ECMI modelling week 2020 and 21st European Conference on Mathematics for Industry (ECMI 2020) for its members.

Organization

The council of the network had 9 meetings in 2020. The council members were:

Esko Turunen TAU (Chair)
Matti Heiliö LUT (Vicechair)
Seppo Pohjolainen (Secretary)
Timo Tiihonen JyU
Marko Vauhkonen UEF/Physics
Jukka Tuomela UEF/Mathematics
Erkki Laitinen OU

The network has members in the following organizations:

EU-MATHS-IN
Council: Esko Turunen/Matti Heiliö
National point of contact for Dissemination and Media activities: Seppo Pohjolainen
National point of contact for Success Stories: Marko Vauhkonen
National point of contact for Job Portal: Simo Ali-Löytty
ECMI
Council: Matti Heiliö
COST

Minetwork: Matylda Jablonska-Sabuka/Simo Ali-Löytty

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Plan for 2021

The Network aims to continue its regular actions and find some new.

Education

The web-based modelling education will continue. The network will organize in the autumn teaching of the "Basic Course on Mathematical Modelling" both in Finnish and English. The course on “Advanced Mathematical Modelling: Continuous Models” will be given in English in the winter 2021.

The Network will carry on developing international eLearning and participate in ECMI SIG on virtual education.

Workshops & modelling weeks

A special workshop on Industry and Mathematics will be planned in 2021 and held in Mathematical Days in Finland, January 2022 in Tampere.

The network will disseminate information on ECMI modelling week 2021 and ECMI online conference 2021 to its members.

A virtual Study Group meeting with MSU-Baroda is planned in 2021.

Projects

COST Action CA17124. Digital Forensics: Evidence Analysis via Intelligent Systems including joint research work with the Finnish Central Criminal Police (KRP) and the German Central Office for Information Technology in the Security Sector (ZITiS). Representative from TAU is Prof. Esko Turunen.

EU-project: H2020-MSCA-ITN, “Smart tomographic sensors for advanced industrial process control, TOMOCON” having 12 research institutions and 15 renowned industrial companies. The Finnish partners are Prof. Marko Vauhkonen from Department of Applied Physics (UEF) and LUT.

Large Eddy Simulation on impact of forest shape and density on Atmospheric Boundary Layer turbulence (LUT).

Sawmill industry: Sawing Optimization via Deep Learning and Multi-instrument Imaging, (cooperation with KTH, Finnos, LUT).

In consideration: Dryer modelling & uncertainty quantification (Plywood production), Air quality in capital city downtown (LUT).

Organization

The council of the network will have about 8 meetings with the following members:

Esko Turunen TAU (chair)
Matti Heiliö LUT (vicechair)
Seppo Pohjolainen TAU (secretary)
Timo Tiihonen JYU
Marko Vauhkonen UEF/Physics
Jukka Tuomela UEF/Mathematics
Erkki Laitinen OU

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