

Report of 2018

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

- Lappeenranta University of Technology (LUT), School of Engineering Science.
- Tampere University, Faculty of Information Technology and Communication Sciences, Unit of Communication 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 (OY), 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

During 2018 the network organized teaching of the "Basic Course on Mathematical Modelling" both in Finnish and English. The advanced courses on data modelling, and optimization were given for Finnish students. The courses were taught and studied over the Internet with teachers and students from all the six nodes.

The language of education has been Finnish so far, but an international version of the basic course was prepared during 2018 and taught first time fall 2018.

In 2017 a Finland-China joint project, "International e-Learning of Mathematical Modeling between Finland and China" supported by CIMO in Finland, was carried out and two international 2-weeks modules for Ordinary Differential Equations Partial Differential Equations were set up and taught. Aalto University and TUT from Finland, and Shanxi University and Hunan Normal University from China, participated the project. The best student groups visited China and Finland in 2018. A paper is being written about the pilot course.

A special session on Industrial Mathematics was organized in Finnish Mathematical Days 4-5.1. 2018, University of Eastern Finland, Joensuu. The president of EU-MATHS-IN, Wil Schilders gave a presentation in this session.

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

The network disseminated information on ECMI modelling week 2018 and 19th European Conference on Mathematics for Industry (ECMI 2018) for its members.

Ongoing industrial projects include:

Savon Sellu: "Modelling of time- and moisture-dependent failure of paperboard packages" with savon Sellu (LUT).

Project with defense sector "Long-distance passive Doppler-only tracking of aircraft" (LUT).

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.

TUT has participated in many industrial projects. The industrial partners include many international companies like HERE, Nokia and Microsoft.

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

The council of the network had 8 meetings in 2018.

The network has members in the following organizations

- ECMI Council (Matti Heiliö)
- EU-Maths-In (Seppo Pohjolainen/Matti Heiliö)
- COST: Minetwork (Matylda Jablonska-Sabuka/Simo Ali-Löytty)

Plan for 2019

The Network aims to continue its regular actions and find some new. The web based modelling education will continue.

The network is associated with the Finnish Centre of Excellence in Inverse Modelling and Imaging supported by Finnish Academy, with LUT, TUT and UEF/Applied Physics as its members.

The Advanced Courses of Mathematical Modelling will be renewed, updated and translated into English so that it will be available also for foreign students.

The network will carry on developing international eLearning and participate in ECMI SIG on virtual education lead by Prof. Thomas Götz in Koblenz.

A special workshop on Industry and Mathematics will be planned and organized in 2019 or 2020 during Mathematical Days in Finland.

Workshop on university-industry cooperation in mathematical modelling and computational simulation will be organized by Lappeenranta University of Technology and EU-MATHS-IN/Finland, September-October 2019 to survey and discuss recent and ongoing cooperation and projects between mathematics departments and R&D in Finnish industry, public governance and relevant organizations.

The network will disseminate information on ECMI modelling week 2019 and ECMI conferences for its members.

The network continues to participate in the following COST networks:

Investigation and Mathematical Analysis of Avant-garde Disease Control via Mosquito Nano-Tech-Repellents' http://www.cost.eu/COST_Actions/ca/CA16227. Representatives from LUT. prof Heikki Haario, PhD student Anna Schcerbacheva.

TU1304 Wind Energy Technology Reconsideration to Enhance the Concept of Smart Cities (WINERCOST) Time period: 2014-2018 Main web pages: <http://www.wincost.com/>. Aim and objective: <http://www.wincost.com/index.php/about-wincost/aims-objectives>. Representative from LUT: Dr Ashvinkumar Chaudhari

Third COST network is MI-NET with representatives Dr Simo Ali-Löytty (TUT) and Dr Matyda Jablonska (LUT).

Finnish Academy: Meriliikenteen teollinen internet. Industrial Internet and Data Analysis in Marine Industries Researchers: Prof Heikki Haario (LUT) , Dr Marko Laine (FMI) , Dr Antti Solonen (Eniram LTd)

Project title: (MATINE/ Ministry of Defense) Kaukaisten ilmailuvälikkojen Doppler-seurannan suorituskyvyn mittauksen koelaitteisto. Instantaneous Doppler Signature Extraction from within a Spectrogram Image of a VHF Band. <http://ieeexplore.ieee.org/document/7472956/>, http://www.defmin.fi/en/tasks_and_activities/defence_policy/scientific_advisory_board_for_defence/matines_research Researchers: Miika Tolonen, Dr Tuomo Kauranne, LUT School of Engineering.

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.

The council of the network will have about 8 meetings.

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