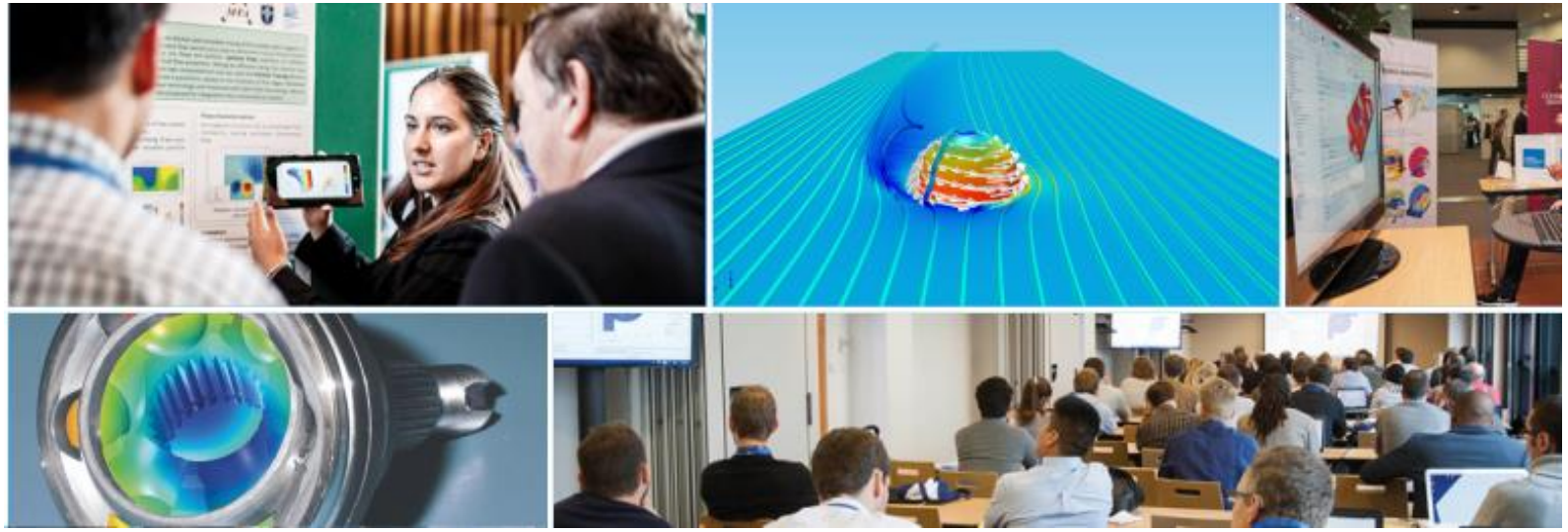
HUMUSOFT®

COMSOL Multiphysics 2025

9th annual conference

Lednice 22. - 23. 5. 2025



Keynote Speakers

Nancy Bannach
Developer, COMSOL Germany

Porous Media Flow and Transport, CFD, Chemical Engineering

Gavin Friedman
Head of Optical Modeling, Focused Energy Germany

Thermo-Mechanical Modeling, Cooling of Laser Systems

Giuseppe Petrone
Co-founder and CEO, BE CAE & Test, Italy

Numerical Modeling, Structural Mechanics, Fluid Flow, Heat Transfer

Frédéric Viry **on-line**
Modelling Expert, SIMTEC, France

Numerical Modeling, Heat Transfer, Multi-scale Modeling

Our Team

Martin Kožíšek
Product Manager
HUMUSOFT s.r.o.

Martin Foltin
Country Manager SK
HUMUSOFT s.r.o.

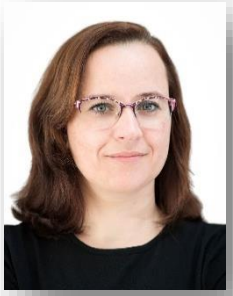
Tomáš Vrbata
Application Engineer
HUMUSOFT s.r.o.

Matouš Lorenc
Application Engineer
HUMUSOFT s.r.o.

Our Team

Jaroslav Jirkovský
Application Engineer Manager
HUMUSOFT s.r.o.

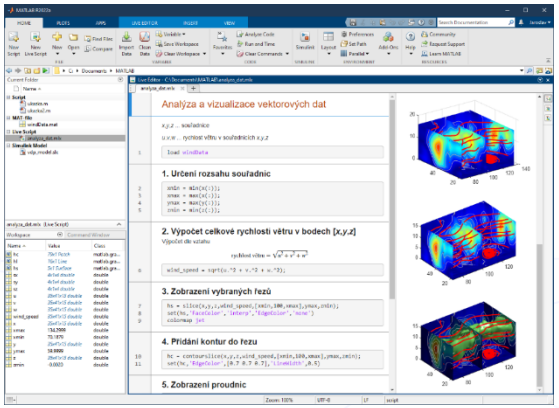
Jiří Šusta
HeavyHorse Specialist
HUMUSOFT s.r.o.



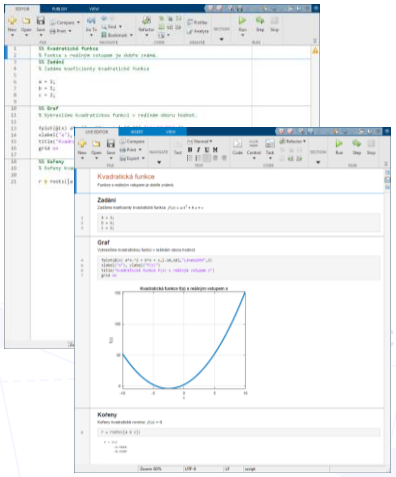
Markéta Šimurdová
Sales Assistant
HUMUSOFT s.r.o.

Petr Byron
Director
HUMUSOFT s.r.o.

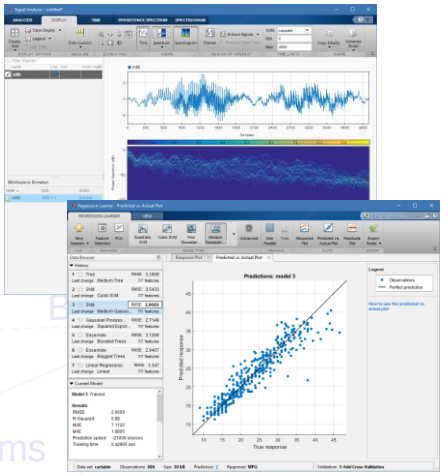
About MATLAB



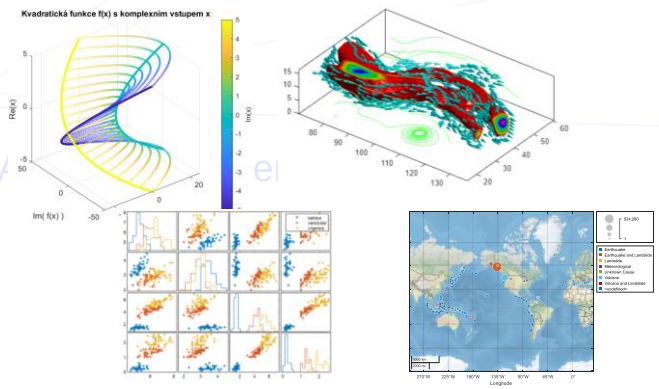
- engineering tool
- interactive environment
- technical and scientific computing



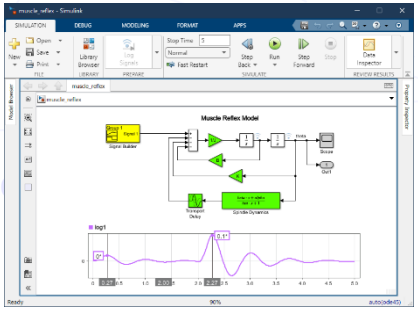
- set of programming tools
- open system



- apps (built-in, custom)



- graphics and visualization

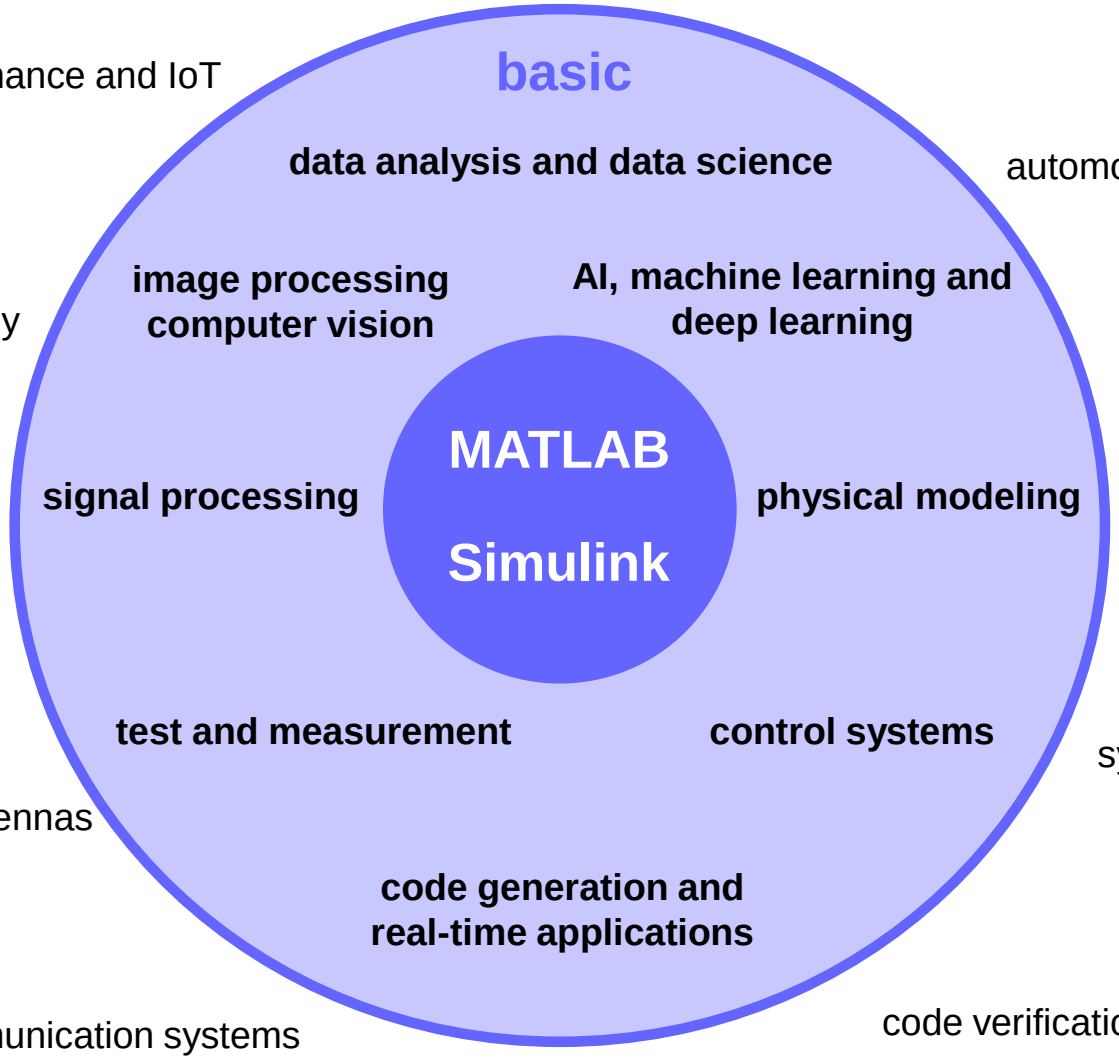


- systems modeling
- simulation and analysis
- Model-Based Design

- 100+ application libraries
- 10 000+ built-in functions
- unified documentation

- connection to external hw/sw
- application development

MATLAB Applications



autonomous systems and robotics

predictive maintenance and IoT

automotive systems and ADAS

computational biology

aerospace and UAV

financial analysis

systems engineering

RF systems and antennas

wireless communication systems

code verification and certification

MATLAB in the Industry

Aerospace and Defense

Automotive

Biological Sciences

Biotech and Pharmaceutical

Communications

Electronics

Energy Production

Quantitative Finance

Industrial Automation

Medical Devices

Metals and Mining

Neuroscience

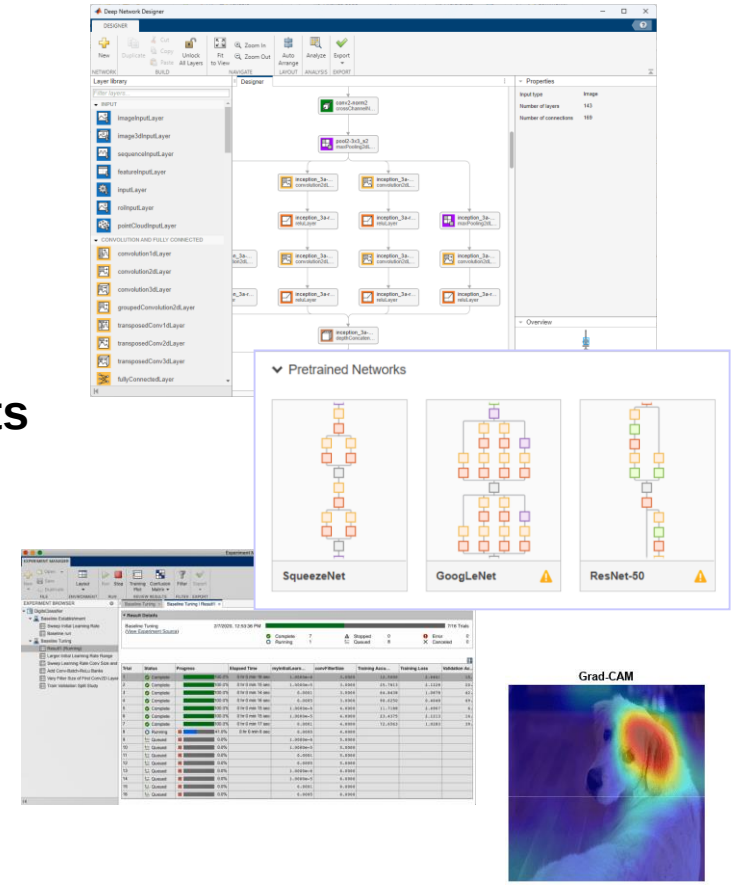
Railway Systems

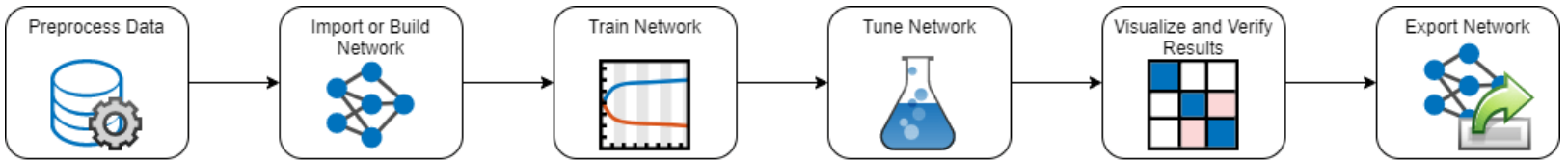
Applied Physics

Software and Internet

AI and Deep Learning in MATLAB

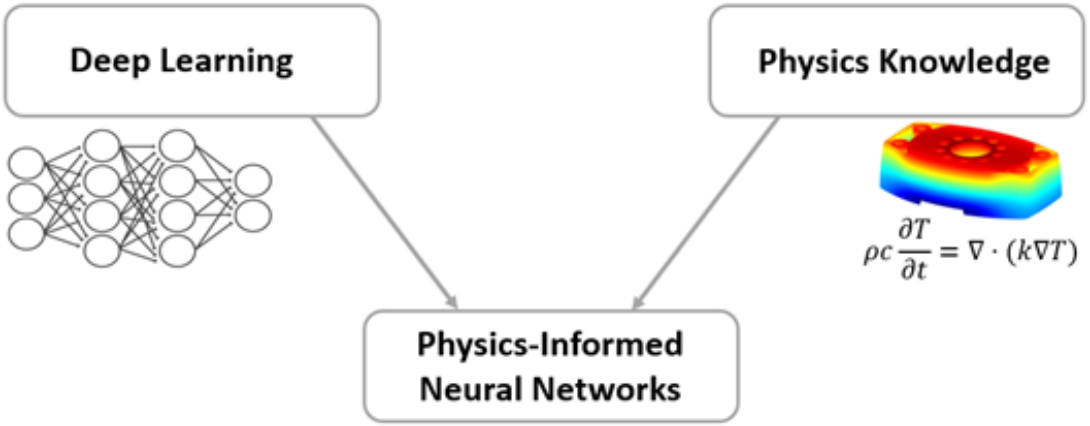
- **Create, train and deploy neural networks**
  - variety of applications
  - pre-built networks
- **Create networks in the graphical designer**
  - design network easier and faster
- **Find the optimal network using experiments**
- **Explain and visualize how networks work**
- **Interoperability with other environments**





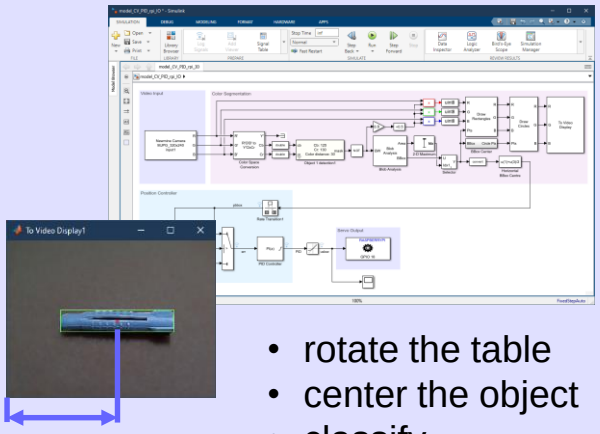
Digital Poster: PINNs

- **PINN: Physics-Informed Neural Network**
- **Neural networks that incorporate physical laws**
  - **described by differential equations in their loss functions**
- **Guide the learning process to be consistent with the underlying physics**



+ AI & Control System

Object classification and counting on a rotary table.



- rotate the table
- center the object
- classify

Schedule Thursday 22.5.

9.30 **Opening Remarks**
Petr Byron, HUMUSOFT

9.40 **News in COMSOL 6.3**
Martin Kožíšek, HUMUSOFT

10.00 ***Keynote:*** **Meshing in CFD Models**
Nancy Bannach, COMSOL

10.30 ***Keynote:*** **Curvilinear Coordinates for Anisotropic Materials**
Nancy Bannach, COMSOL

11.00 **Coffee break, Digital Poster Session, Day 1**

11.30 **Transport-Reaction Problems in the Barriers of a Deep Geological Spent Nuclear Fuel Repository**
Milan Hokr, Technical University of Liberec

11.45 **Simulations in Development of Onboard Charges**
Václav Kotek, KOSTAL Engineering CR

12.00 **Numerical Modeling of Selected Electroheat Problems**
Václav Kotlan, University of West Bohemia in Pilsen

12.15 **Simulations for Satellite Engineering and Integration**
Tomáš Tichý, HiLASE

12.30 **Lunch**

13.30 **Digital Poster Session, Day 1**

14.00 ***Keynote:*** **Heat Transfers and Solid Mechanics in Microarchitectured Materials using Periodic Homogen.**
Frédéric Viry, SIMTEC

14.30 ***Keynote:*** **Modelling the Heat Dissipation of a Head Lamp within COMSOL Multiphysics**
Frédéric Viry, SIMTEC

14.45 **Movement in Electromagnetics: Motors, Actuators and Forces**
Matouš Lorenc, HUMUSOFT

15.45 **Random Vibrations in Structural Mechanics**
Tomáš Vrbata, HUMUSOFT

16.30 **Coffee break, Digital Poster Session, Day 1**

17.00 ***Keynote:*** **From Material Characterization to Topology Optimization in Additive Manufacturing**
Giuseppe Petrone, BE CAE & Test

18.00 **Acoustic Metamaterials with Negative Stiffness: A Model of a Membrane Absorber**
Jana Vysloužilová, Brno University of Technology

18.15 **Plasmonic Enhancements In Metal-Diamond Nanoparticle Complexes**
Bohuslav Rezek, Czech Technical University in Prague

18.30 **Simulation of NV Quantum Response**
Josef Souček, Hasselt University IMO IMOMEC

18.45 **Computing Hysteresis and Coupling AC Losses in Round High-Temperature Superconductor Cable**
Mykola Soloviov, Slovak Academy of Science

19.00 **Dinner**

20.30 **Social Evening - Wine Cellar**

Schedule Friday 23.5.

9.30	**Introduction to Electric Discharge Module** *Matouš Lorenc, HUMUSOFT*
10.00	**Keynote: Thermo-Mechanical Optics Modelling for Laser-Driven Fusion** *Gavin Friedman, Focused Energy*
10.45	**Modeling of the Phase-Change Materials** *Richard Slávik, Mendel University in Brno, Institute of Construction and Architecture*
11.00	**Turbulent Fluid Flow in Auricula Sinistra** *Matouš Brunát, Czech Technical University in Prague*
11.15	**Simulation of Fluid Flow around Aircraft Propeller** *Jan Šimkovský, Czech Technical University in Prague*
11.30	**Coffee break, Digital Poster Session Day 2**
12.00	**Topology Optimizatio of Electric Motors** *Jan Kaska, University of West Bohemia in Pilsen*
12.15	**Eigenvalue Study for the Ignition of Self-sustaining Discharge with COMSOL Multiphysics** *Filip Zmeko, University of West Bohemia in Pilsen*
12.30	**RANS Modeling of the Influence of the Blockage Effect in the Wind Tunnel** *Blanka Ledvinková, Czech Academy of Science*
12.45	**Spin Coating Simulation of PMMA solution on the Surface of SME NiTi** *Sneha Samal, Czech Academy of Science*
13.00	**Lunch**
14.00	**Digital Poster Session, Day 2**
15.00	**Physics Informed Neural Networks: COMSOL a MATLAB** *Jaroslav Jirkovský, Martin Kožíšek, HUMUSOFT*
16.00	**Closing Remarks**

!!! AI !!!

Digital Poster Session

Day 1

Consultation Opportunity: Heat Transfer, CFD, Chemical Reactions and Making of Applications
Nancy Bannach, COMSOL

Consultation Opportunity: Neural Networks in MATLAB & Simulink
Jaroslav Jirkovský, HUMUSOFT

Comparison of Experimental Data and a Numerical Model of Diffusion in an Agarose Hydrogel
Darya Zhurauliová, Brno University of Technology

Heat Models for a Deep Geological Repository
Petr Rálek, Technical University of Liberec

Day 2

Consultation Opportunity: High-Performance Computing Workstations HeavyHorse
Jiří Šusta, HUMUSOFT

Consultation Opportunity: Neural Networks in MATLAB & Simulink
Jaroslav Jirkovský, HUMUSOFT

Optimization of Initial Condition Topologies for Enhanced Parameter Estimation in FRAP Experimental Techniques
Štěpán Papáček, Czech Academy of Sciences

GPU Computations
Cyril Fischer, Czech Academy of Sciences

- **Thursday, Day 1**
  - **11:00 – 11:30**
  - **13:30 – 14:00**
  - **16:30 – 17:00**
- **Consultation Opportunity**
  - **continues all day**
- **Friday, Day 2**
  - **11:30 – 12:00**
  - **14:00 – 15:00**
- **Consultation Opportunity**
  - **continues all day**

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Guidelines

- the conference is not being recorded
- Internet access
  - no passcode
- refreshments and drinks for conference participants free of charge
  - prove yourself with a badge
  - drinks: coffee, tea, soft drinks, beer, draft wine

Technical Computing Camp 2025

- **12. ročník letního setkání příznivců technických výpočtů a počítačových simulací**
- **Široký prostor pro neformální diskuze a výměnu názorů**
- **Setkání s lidmi z nejrůznějších oborů**
- **Informace o systémech MATLAB, COMSOL a dSPACE**
- **Interaktivní ukázky aplikací na hi-tech "hračkách"**
  - **Arduino, Raspberry Pi, kamery, roboti, mobilní aplikace, kamery,...**
- **Přednášky, demo ukázky od uživatelů**
- **Soutěž o nejlepší uživatelské projekty**

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