

**InterCoML**  
Control Theory & Machine Learning

Cost Action 24136

# Interactions between Control Theory and Machine Learning



Working Group 3:  
**Hybrid and Data-driven modelling**

## Kick-Off Workshop

### Topics

- Introduction to Cost Action InterCoML
- Scientific talks
  - Markus Abel (Ambrosys)
  - Boumediene Hamzi (Imperial College, Caltech)
- Future Activities of WG 3

Dec 12<sup>th</sup>

11 – 14 CET

via MS Teams

Kathrin Flaßkamp &  
Lars Grüne (WG3 Leaders)



# Kick-Off Workshop WG 3: Hybrid and Data-driven Modeling

Kathrin Flaßkamp & Lars Grüne



Funded by  
the European Union

# Agenda

- 11:00 - 11:30 Welcome, Information on the cost action and on WG 3,  
getting to know each other
- 11:30 - 12:15 Scientific Talk Boumediene Hamzi (Imperial College, Caltech)
- 12:30 - 13:15 Scientific Talk Markus Abel (Ambrosys)
- 13:15 - 14:00 Discussion on future working group activities and conclusion

# Welcome

# Working group leaders



**Kathrin Flaßkamp**

Professor of Systems Modeling and Simulation

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cost action CA24136

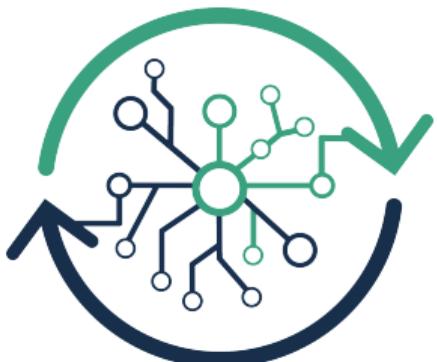
# **Interactions between Control Theory and Machine Learning (InterCoML)**



- COST (European Cooperation in Science and Technology): **funding organisation** for research and innovation networks
- **connect** research initiatives across Europe and beyond
- COST Actions are **bottom-up networks** with a duration of four years that boost research, innovation and careers.<sup>1</sup>

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<sup>1</sup>[www.cost.eu](https://www.cost.eu/actions/CA24136/)



- start date 10/10/2025
- end date 09/10/2029

## Organization

- action chair:  
Martin Lazar  
Professor of Applied Mathematics,  
University of Dubrovnik, Croatia
- Management Committee: representatives  
from countries
- Core group: handling every-day business
- Working groups
- Coordinators for Science communication,  
Grant Awarding, and Equal Opportunities

# InterCoML: Objectives

## Aim

Foster synergy between Control Theory (CT) and Machine Learning (ML)

- Strengthen control-theoretic foundations of ML
  - Apply ML tools to complex, high-dimensional CT problems
  - Develop hybrid and data-driven models for real-world applications from, e.g., energy systems, healthcare, robotics, and smart infrastructure
  - Transform theoretical results into practical solutions
  - Transfer of knowledge and ideas between academia and industry
  - Disseminate insights and findings to the research community and the general public
- for details, see our Memorandum of Understanding<sup>2</sup>

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<sup>2</sup>[https://e-services.cost.eu/files/domain\\_files/CA/Action\\_CA24136/mou/CA24136-e.pdf](https://e-services.cost.eu/files/domain_files/CA/Action_CA24136/mou/CA24136-e.pdf)

- Reduce fragmentation and communication barriers between the ML and CT
- Create common language between CT and ML communities
- Organize seminars, workshops, and training schools
- Empower young researchers through STSMs (short-term scientific missions) and internships
- Promote gender and geographical balance

# Working Groups and Structure

- WG1: Control Theory for Machine Learning
- WG2: Machine Learning for Control Theory
- WG3: Hybrid and data-driven modeling
- WG4: Transformation into practical solutions
- WG5: Dissemination and outreach

# Working Groups and Structure

- WG1: Control Theory for Machine Learning
- WG2: Machine Learning for Control Theory
- **WG3: Hybrid and data-driven modeling**
- WG4: Transformation into practical solutions
- WG5: Dissemination and outreach

# **Working group 3: Hybrid and data-driven modeling**

## Aims:

- 1 addressing control problems with observed pairs of input-output data
- 2 considering unidentified or partial knowledge of underlying model
- 3 developing efficient and reliable methods for designing controllers
- 4 focusing on application in control of power systems

(solar, wind, smart houses) and construction of digital twins in healthcare and personalised medicine  
→ connection with industry partners

# **Getting to know each other**

## **Short questionnaire**

<https://forms.cloud.microsoft/e/pq0tPv0zMP>

InterCoML: Working Group 3 --  
Kick-Off Workshop



## Scientific Talk

On Kernel-Based LMI Approaches to Solving  
the Hamilton-Jacobi Equation and Nonlinear  
Optimal Control

# On Kernel-Based LMI Approaches to Solving the Hamilton-Jacobi Equation and Nonlinear Optimal Control

## Boumediene Hamzi

- Senior Scientist at Caltech's Department of Computing and Mathematical Sciences
- Affiliate Fellow of the Data Science Institute at Imperial College London
- External Researcher at the Alan Turing Institute (London, UK)
- Research areas
  - dynamical system theory
  - machine learning
  - algorithmic information theory
- member of the management committee of InterCoML

## Scientific Talk

Traffic control by machine learning - a  
subjective perspective

## Markus Abel

- Principal CEO at ambrosys
- Private Senior Lecturer at University of Potsdam, Germany
- Expertises
  - intelligent transportation systems
  - energy systems
  - autonomous vehicles
  - technical solution design
  - agile coaching
- member of the management committee of InterCoML

## **Future working group activities**

# Future working group activities

- 1 general InterCoML Conference in Prague, Czech Republic, on April 27-30, 2026
  - plenaries, contributed talks and poster sessions
  - round table discussions
  - details will be announced in early 2026 via the Cost Action channels (= email, slack)
- 2 Scientific Workshop
  - control of/ML for energy systems
  - in-person event, venue: Saarbrücken, Germany
  - planned for September 2026
  - **Who would like to join the organizing committee?**
- 3 initiating a Special Issue
  - topic: learning control to state operators
  - initiating planned for 2026, submissions approx. in the following year

# How to actively participate

- join us at the first InterCoML conference (Prague, April 27-30, 2026), submit a contribution
- apply for WG membership (if you haven't done, yet). If your country is not represented in the management committee, you might volunteer as a national representative.
- join the organizing committee for the Energy Systems Workshop of Working Group 3 now → send an email to Kathrin or Lars
- share ideas for invited speakers, subtopics or alike for the Energy Systems Workshop
- (for young researchers, in particular,) apply for short term scientific missions (STSM) on WG 3 topics and later report your results within the group
- share further ideas for future activities of Working Group 3 :-)

*Thank you for your attendance!*

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