

COST Action InterCoML: Working Group 2 – Kickoff Meeting

ML for CT

Working Group Leaders: Hendrik Kleikamp and Francisco Periago

5 December 2025



Funded by
the European Union

Schedule for today

Schedule for today – Morning session

- 9:00–9:15: Welcome
- *T2.1: Breaking the curse of dimensionality in some control and parametric problems for PDEs*
 - 9:15–9:45: Presentation by Francisco Periago
 - 9:45–10:00: Round table discussion
- 10:00–10:20: Coffee break
- *T2.2: Solving parameterised optimal control problems using machine learning*
 - 10:20–10:50: Presentation by Hendrik Kleikamp
 - 10:50–11:05: Round table discussion
- 11:05–11:15: Short break
- *T2.3: Computing control Lyapunov functions with neural networks*
 - 11:15–11:45: Presentation by Lars Grüne
 - 11:45–12:00: Round table discussion
- 12:00–13:30: Lunch break

Schedule for today – Afternoon session

- *T2.4: Developing ML-based approaches for the life-cycle-optimisation in materials*
 - 13:30–14:00: Presentation by Peter Kogut
 - 14:00–14:15: Round table discussion
- 14:15–14:25: Short break
- *T2.5: Exploiting PINNs for solving complex free boundary problems*
 - 14:25–14:55: Presentation by Cristina Trombetti
 - 14:55–15:10: Round table discussion
- 15:10–15:30: Closing

Introduction to the COST Action

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The COST Action InterCoML (CA24136) aims to ...

- 1 strengthen the control-theoretical foundations of ML methods,
- 2 *leverage modern ML tools to tackle complex and high-dimensional CT problems,*
- 3 develop hybrid and data-driven models for highly complex application scenarios,
- 4 transform theoretical results into software solutions and practical implementations in industry and society,
- 5 disseminate insights and findings generated within the Action to the research community and the general public.

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The Action will combine different approaches, creating synergies that will benefit both sides, and leading to progress in both theoretical investigations and applications.

Introduction to Working Group 2

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ML for CT

Applications of machine learning to
solve problems in control theory

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ML for CT

Applications of machine learning to
solve problems in control theory

Tasks within Working Group 2:

- Addressing the curse of dimensionality with ML tools
- Solving parameterised optimal control problems
- Construction of control Lyapunov functions using ML methods
- Developing ML-based approaches for the life-cycle-optimisation in materials
- Exploiting PINNs for solving complex free boundary problems

Activities planned by Working Group 2

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First year of the COST Action:

- Dedicated session related to our Working Group at a joint meeting by the Action (information on this is soon to be published!)
- Initiation of smaller subgroups tackling specific problems
- Short Term Scientific Missions – STSMs (see also the next slide)
- Preparation of a benchmark collection for control problems
- Creation of lists of open problems and questions related to WG2

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In the long run of the COST Action:

- Organization of dedicated events and minisymposia at conferences related to WG2
- Implementation of training schools for students
- Dissemination activities (for instance in the context of the European Researchers' Night)

Short term scientific missions – STSMs

Goals and format:

- Short term visit (one to two weeks) financed by the COST Action
- Joint work on a project which benefits substantially from working together in person
- **Important:** Visiting and hosting researcher should dedicate most of the time during the STSM on the joint research project

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Requirements for application:

- Before the application: Contact a potential host for the STSM and develop a working plan together indicating milestones and goals
- Before the application: Receive a confirmation by the hosting/supervising researcher
- After the STSM: Presentation of the outcomes of the STSM to WG2 (or even to the whole COST Action)

Presentations of tasks related to Working Group 2

Presentation T2.1 – Francisco Periago

**Breaking the curse of dimensionality in some control and parametric
problems for PDEs**

Round table discussion on T2.1

**Breaking the curse of dimensionality in some control and parametric
problems for PDEs**

Coffee break until 10:20

Presentation T2.2 – Hendrik Kleikamp

Solving parameterised optimal control problems using machine learning

Round table discussion on T2.2

Solving parameterised optimal control problems using machine learning

Short break until 11:15

Presentation T2.3 – Lars Grüne

Computing control Lyapunov functions with neural networks

Round table discussion on T2.3

Computing control Lyapunov functions with neural networks

Lunch break until 13:30

Presentation T2.4 – Peter Kogut

On the life-cycle-optimisation problems in materials and the deep neural network approach

Round table discussion on T2.4

On the life-cycle-optimisation problems in materials and the deep neural network approach

Short break until 14:25

Presentation T2.5 – Cristina Trombetti

Exploiting PINNs for solving complex free boundary problems

Round table discussion on T2.5

Exploiting PINNs for solving complex free boundary problems

Closing remarks

- **Working group 2 – we are officially up and running!**
- Call for STSMs will be published soon via mail and on our webpage!
- Please start connecting to a potential STSM host in the near future.
- If you are interested in working on one of the tasks for WG2, do not hesitate to contact Hendrik (hendrik.kleikamp@uni-graz.at) or Francisco (f.periago@upct.es)!
- There will be a joint conference of the Action at the end of April 2026 in Prague, Czech Republic, stay tuned!

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Thanks for participating!