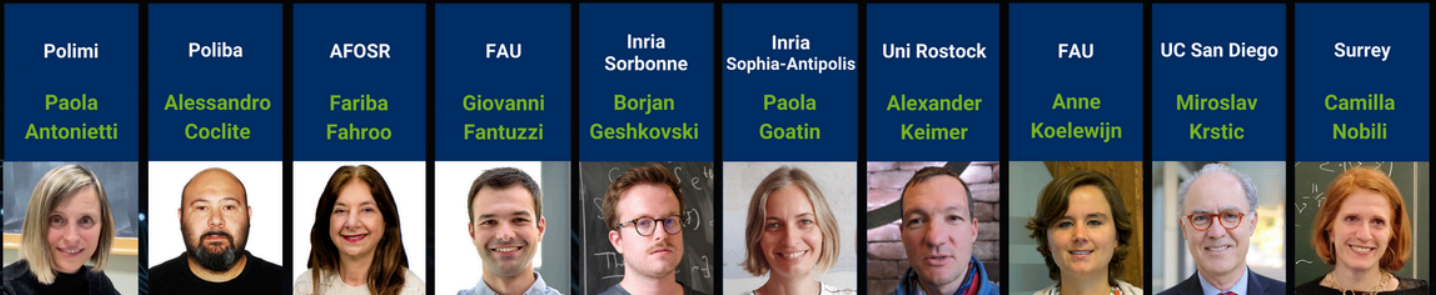




Hosted by our FAU MoD, the #MLPDES25 workshop is an international event that brings together researchers from Europe and the United States to explore the deepening connection between Machine Learning (ML) and Partial Differential Equations (PDEs). With participants from diverse backgrounds, this event aims to establish a collaborative platform for experts to network, share insights, and drive progress in these exciting fields.

We will dive into recent theoretical advancements and applications, while also discussing ongoing challenges in areas such as:

- Control and PDE methods for universal approximation and data classification
- Mean field analysis of Neural Networks
- ML applications in traffic flow modeling and autonomous driving
- ML and numerical simulation in bio-mechanics and micro-fluidics



Machine Learning and PDEs

#MLPDES25 WORKSHOP

April 28 - 30, 2025

ERLANGEN - BAVARIA, GERMANY



WHEN

Mon.-Wed. April 28 - 30, 2025

09:00H - 17:00H

WHERE

Onsite. FAU, Friedrich-Alexander-Universität Erlangen-Nürnberg
Senatssaal (Senate Hall) im Kollegienhaus
Universitätsstraße 15, 91054 Erlangen - Bavaria, Germany

Online. Live streaming (link on website)

REGISTRATION

Free but mandatory.

Registration form: www.dcn.nat.fau.eu/mlpdes25-registration



www.mod.fau.eu/mlpdes25

SCIENTIFIC COMMITTEE

- Giuseppe Maria Coclite. Politecnico di Bari
- Enrique Zuazua. FAU, Friedrich-Alexander-Universität Erlangen-Nürnberg

ORGANIZING COMMITTEE

- Darlis Bracho Tudares. FAU, Friedrich-Alexander-Universität Erlangen-Nürnberg
- Nicola De Nitti. EPFL, École Polytechnique Fédérale de Lausanne
- Lorenzo Liverani. FAU, Friedrich-Alexander-Universität Erlangen-Nürnberg

AUDIENCE

This international workshop is open to: Public, Students, Postdocs, Professors, Faculty, Alumni and the scientific community all around the world.

UNTERSTÜTZT VON / SUPPORTED BY



Machine Learning and PDEs

#MLPDES25 WORKSHOP

#MLPDES25 Schedule • Time table

	MON. APRIL 28, 2025	TUE. APRIL 29, 2025	WED. APRIL 30, 2025
09:30H 10:00H	Registration Opening ceremony	Wei Zhu. Georgia Tech Structure-Preserving Machine Learning and Data-Driven structure discovery	Fariba Fahroo. AFOSR TBA
10:00H 10:30H	Daniel Tenbrinck. FAU Eigenvalue problems on graphs and hypergraphs	Gabriel Peyré. CNRS, ENS-PSL Transformers are universal in-context learners	Borjan Geshkovski. Inria S. Many-particle systems perspective on Transformers
10:30H	COFFEE / TEA BREAK		
11:00H 11:30H	Gianluca Orlando. Poliba A comparison between peridynamic and classical waves	Yaoyu Zhang. SJTU The condensation phenomenon of Deep Neural Networks	Daniela Tonon. UNIPD Hamilton-Jacobi equations on infinite dimensional spaces
11:30H 12:00H	Camilla Nobili. Surrey Quantification of enhanced dissipation and mixing for time-dependent shear flows	Paola Antonietti. Polimi Machine Learning enhanced polytopal finite element methods	Alessio Porretta. UNIROMA2 Diffusion effects in optimal transport and mean-field planning models
12:00H	LUNCH BREAK		
14:30H 15:00H	Alexander Keimer. Rostock Optimal control of nonlocal conservation laws and the singular limit	Francesco Regazzoni. Polimi Discovering the hidden low-dimensional dynamics of time-dependent PDEs with latent dynamics networks	Anne Koelewijn. FAU SSPINNpose: Self-supervised learning of biomechanical variables without ground truth
15:00H 15:30H	Michele Palladino. UAQ Handling uncertainty in optimal control	Giovanni Fantuzzi. FAU Data-driven system analysis: Polynomial optimization meets Koopman	Miroslav Krstic. UC San Diego Neural Operators: Implementation enablers for PDE control
15:30H	COFFEE / TEA BREAK		
16:00H 16:30H	Paola Goatin. Inria S.A. Data-driven simulation, uncertainty quantification and optimization for hyperbolic and kinetic models	Domènec Ruiz-Balet. Imperial Some remarks on matching measures with Machine Learning architectures	Closing ceremony
20:00H	Social dinner		

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- **Enrique Zuazua.** FAU MoD/DCN-AvH, Friedrich-Alexander-Universität Erlangen-Nürnberg

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- **Lorenzo Liverani.** FAU DCN-AvH, Friedrich-Alexander-Universität Erlangen-Nürnberg

Machine Learning and PDEs
#MLPDES25 WORKSHOP**DAY 1 • Mon. April 28, 2025**09:30H
10:00H**Registration****Opening ceremony**10:00H
10:30H**Daniel Tenbrinck****FAU, Friedrich-Alexander-Universität Erlangen-Nürnberg**
Eigenvalue problems on graphs and hypergraphs

10:30H

COFFEE / TEA BREAK11:00H
11:30H**Gianluca Orlando****Politecnico di Bari**

A comparison between peridynamic and classical waves

11:30H
12:00H**Camilla Nobili****University of Surrey**Quantification of enhanced dissipation and mixing for
time-dependent shear flows

12:00H

LUNCH BREAK14:30H
15:00H**Alexander Keimer****Universität Rostock**Optimal control of nonlocal conservation laws and
the singular limit15:00H
15:30H**Michele Palladino****Università degli Studi dell'Aquila**

Handling uncertainty in optimal control

15:30H

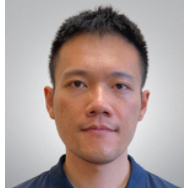
COFFEE / TEA BREAK16:00H
16:30H**Paola Goatin****Inria Sophia-Antipolis**Data-driven simulation, uncertainty quantification and
optimization for hyperbolic and kinetic models

Machine Learning and PDEs

#MLPDES25 WORKSHOP

DAY 2 • Tue. April 29, 2025

09:30H
10:00H



Wei Zhu

Georgia Institute of Technology

Structure-Preserving Machine Learning and Data-Driven structure discovery

10:00H
10:30H



Gabriel Peyré

CNRS, ENS-PSL

Transformers are universal in-context learners

10:30H

COFFEE / TEA BREAK

11:00H
11:30H



Yaoyu Zhang

Shanghai Jiao Tong University

The condensation phenomenon of Deep Neural Networks

11:30H
12:00H



Paola Antonietti

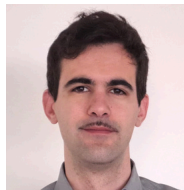
Politecnico di Milano

Machine Learning enhanced polytopal finite element methods

12:00H

LUNCH BREAK

14:30H
15:00H



Francesco Regazzoni

Politecnico di Milano

Discovering the hidden low-dimensional dynamics of time-dependent PDEs with latent dynamics networks

15:00H
15:30H



Giovanni Fantuzzi

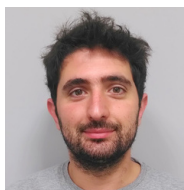
FAU, Friedrich-Alexander-Universität Erlangen-Nürnberg

Data-driven system analysis: Polynomial optimization meets Koopman

15:30H

COFFEE / TEA BREAK

16:00H
16:30H



Domènec Ruiz-Balet

Imperial College London

Some remarks on matching measures with Machine Learning architectures

20:00H

Social dinner

Machine Learning and PDEs
#MLPDES25 WORKSHOP**DAY 3 • Wed. April 30, 2025**09:30H
10:00H**Fariba Fahroo****AFOSR, Air Force Office of Scientific Research**
TBA10:00H
10:30H**Borjan Geshkovski****Inria, Sorbonne Université**

Many-particle systems perspective on Transformers

10:30H

COFFEE / TEA BREAK11:00H
11:30H**Daniela Tonon****Università di Padova**

Hamilton-Jacobi equations on infinite dimensional spaces

11:30H
12:00H**Alessio Porretta****Università di Roma Tor Vergata**

Diffusion effects in optimal transport and mean-field planning models

12:00H

LUNCH BREAK14:30H
15:00H**Anne Koelewijn****FAU, Friedrich-Alexander-Universität Erlangen-Nürnberg**

SSPINNpose: Self-supervised learning of biomechanical variables without ground truth

15:00H
15:30H**Miroslav Krstic****University of California San Diego**

Neural Operators: Implementation enablers for PDE control


15:30H
16:00H**Alessandro Coclite****Politecnico di Bari**


Replicator dynamics on a network


16:00H


Closing ceremony

Quick-info

 Cauerstraße 11, 91058 Erlangen

 Felix Klein building. 3rd. floor

 +49 9131 85-67133

 dcn-avh@fau.de

 +49 174 198-9775 (urgencies)


#MLPDES25 website


www.mod.fau.eu/events/mlpdes25

Registration #MLPDES25

www.dcn.nat.fau.eu/mlpdes25-registration


How to get to Erlangen?


 **By taxi.** The best choice. Expect to pay: 35 EUR – 40 EUR approx. for one trip (Duration: 15 mins.)

 **By bus.** Take Bus N° 30. Frequency: 20-30 mins. Expect to pay: 02 EUR – 04 EUR (Duration: 30 mins.)
Tickets for local public transportation can be purchased at the Customer Service Offices of the transportation companies or from ticket machines at major stops.


How to get to our FAU DCN-AvH Chair office?

From the main train station (in the center of Erlangen) you can get to our office at Cauerstrasse:

 **By taxi.** 15EUR–20EUR approx. (one trip, from center to the FAU's Department Mathematik
Duration: 10-15 mins.)

 **By bike/car.** Coming by bike/car? In front of the building you will find a huge parking lot available!
([gMaps directions](#))

 **By foot.** Distance: 4Kms. approx. from the downtown to our building. Expect to walk: 45 mins.

 **By bus.** Please take **bus N° 20** at the Erlangen Arcaden center (3 mins by walk from the main train station).

Go off the bus at "Technische Fakultät" stop. (11 stops later)


Frequency: 20 mins. Expect to pay: 02 EUR – 02.50 EUR (Duration: 15mins)

Other options (bus): Taking N° 287 or N° 293 from the main bus station (Bahnhofplatz 1, city center).

Frequency: 20 – 30 mins (Duration: 25 – 30mins.)

Hotels


 [Hotel Altmanns Stube](#)


 [A.B. Hotel](#)

 [NIU Cure](#)


Apartments

 [Zeitwohnhaus](#)


 [NIU Cure – Hipster Studio](#)

 [Hotel Kral – Wohnen auf Zeit](#)

Restaurants

 [Steinbachbräu \(Brewhouse\)](#)

 [Alter Simpl \(Franconian\)](#)

 [Spezerei \(Franconian\)](#)



Friedrich-Alexander-Universität
Research Center for
Mathematics of Data | MoD

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DYNAMICS, CONTROL,
MACHINE LEARNING
AND NUMERICS



Politecnico
di Bari