

GAMM Activity Group on Data-driven Modeling and Numerical Simulation for Microstructured Materials

AG Data Chairs

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Local organizers

Prof. Oliver Weeger and Dominik Klein Cyber-Physical Simulation \cdot TU Darmstadt



1 Practical information

1.1 Location

The workshop will take place at **building S3**|20 (Rundeturmstr. 10, 64283 Darmstadt), in **seminar room 18** (**Friedrich-Ludwig-Weidig-Saal**) on the ground floor. From Darmstadt central station, you can either take **tram 2, 3 or 9** (alight at "Schloss") or **bus K or H** (alight at "Alexanderstr./TU").

1.2 Welcome lunch and registration

We invite all participants to join us for a welcome lunch on February 11 at the **canteen of the Fraunhofer IGD** (building S3|05, Fraunhoferstr. 5, 64283 Darmstadt). It is located a 3 minute walk from the workshop location to the canteen. To get a free lunch, at the cash desk of the canteen, please state that you are participating in our workshop. Registration for the workshop is possible from 11:00 at the workshop location. If you want to join us for lunch, please register until 12:10.

1.3 Workshop dinner

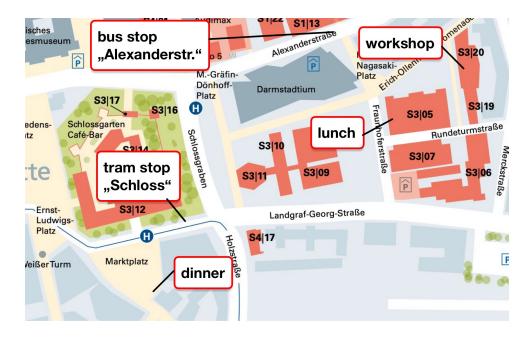
The workshop dinner on February 11 will take place in the Regenten-Stube on the first floor of the **Ratskeller Brauerei** (Marktplatz 8, 64283 Darmstadt). It is a 10 minute walk from the workshop location to Ratskeller. We can go there directly after the discussion at the end of the first day of the workshop to start with some drinks. The official dinner starts at 19:30 and is included in the registration fee.

1.4 Workshop lunch

On the second day of the workshop, lunch will again take place at the canteen of the Fraunhofer IGD.

1.5 Wifi access

Wireless network access is granted via eduroam.



2 Workshop program

	Tuesday, February 11, 2025
11:00-12:45	Registration (at building S3 20, Rundeturmstr. 10)
11:30–12:40	Welcome lunch (at the canteen of the Fraunhofer IGD, building S3 05, Fraunhoferstr. 5)
12:45-13:00	Opening
Session 1	Chair: Felix Fritzen
13:00-13:20	Karl Kalina
	Physics-augmented neural networks meet anisotropic hyperelasticity
13:20-13:40	Dominik Klein
	Neural networks meet hyperelasticity: A monotonic approach
13:40–14:00	Kian Abdolazizi
	On the role of interpretability of data-driven constitutive modelling by constitutive artificial neural networks
14:00-14:20	Marius Harnisch
	Towards two dimensional problems: A neural network-based approach for data-driven inelasticity
14:20–14:45	Coffee break
Session 2	Chair: Dominik Klein
14:45-15:05	Heinrich Roth
	Data-driven multiscale modeling of magnetorheological elastomers using physics-augmented neural networks
15:05–15:25	Jonas Fey
	Neural networks meet the Mullins effect: Discontinuous softening
15:25–15:45	Konrad Friedrichs
	Data-driven modeling of crystallizing elastomers based on physics-augmented neural networks
15:45–16:05	Antoine Benady
16.05.16.00	Unsupervised strategies for the learning of constitutive model with neural networks
16:05–16:30	Coffee break
Session 3	Chair: Oliver Weeger
16:30–16:50	Jasper Schommartz
16 50 17 10	Physics-augmented neural networks for efficient constitutive surrogate models in beam theory
16:50–17:10	Stefan Hildebrand
17:10–17:30	Coupled CANN-DEM Simulation in Solid Mechanics Lennart Linden
11.10-11.50	Physics-augmented neural networks meet data-driven identification – A two-step constitutive
	modeling framework
17:30–17:50	Felix Fritzen
	On the need of common efforts towards standardization and infrastructural challenges
17:50-18:15	Discussion
19:30-?	Workshop dinner (at Ratskeller, Marktplatz 8)

	Wednesday, February 12, 2025
Session 4	Chair: Benjamin Klusemann
09:00-09:20	Franz Dammaß
	Neural networks meet fracture phase-field: Hybrid modelling of crack propagation
09:20-09:40	Xiang-Long Peng
	Data-driven forward and inverse design of bimaterial lattice structures
09:40–10:00	Flavia Gehrig
10:00–10:20	On element-based internal variable formulations for FFT-based homogenization methods Julius Herb
10.00-10.20	FNO-CG: Accelerating Conjugate Gradient Solvers for Homogenization Problems with Fourier Neural Operators
10:20-10:45	Coffee break
Session 5	Chair: Karl Kalina
10:45–11:05	Marimuthu Kalimuthu
	Local-Global Fourier Neural Operators for Learning High Frequencies
11:05–11:25	Jonas Lendvai
	Composite voxel methods for computational micromechanics: the accuracy of interface normals for digital image data
11:25–11:45	Sanath Keshav
	Enhancing Multiscale Modelling through Physics-constrained Neural Networks for Homogenized Material Response Predictions
11:45–12:05	Balduin Katzer
	A data-driven surrogate modeling approach of continuum dislocation dynamics simulations for combining simulation and experimental data for crystalline microstructures
12:05–13:00	Lunch (at the canteen of the Fraunhofer IGD, building S3 05, Fraunhoferstr. 5)
Session 6	Chair: Jasper Schommartz
13:00-13:20	Lena Scholz
	Towards real-time exploration of grain boundary effects on diffusion in solid electrolytes
13:20–13:40	Erik Faust
	Nonlinear projection-based model order reduction for computational homogenisation using manifold learning and hyper-reduction techniques
13:40–14:00	Fabian Roth
	Stable Port-Hamiltonian Neural Networks
14:00–14:20	Yangjiwei Yang
	Virtual Manufacturing and Data-Driven Property Tailoring of Materials: A Selective Laser Sintering Example
14:20–14:40	Frederic Bock
	Techniques for incorporating physics into data-driven models to represent process-property relationships in materials mechanics and processing via off-the-shelf machine learning models
14:40-14:50	Closing
14:50-16:00	Farewell snack