

# 1st Heidelberg–Chile Workshop on Scientific Computing

March 25 to 28, 2025

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**Heidelberg Center Latin America**  
[hcla.uni-heidelberg.de/es](http://hcla.uni-heidelberg.de/es)



**Interdisciplinary Center for Scientific  
Computing Heidelberg University**  
[uni-heidelberg.de/en/study/all-subjects/scientific-computing](http://uni-heidelberg.de/en/study/all-subjects/scientific-computing)

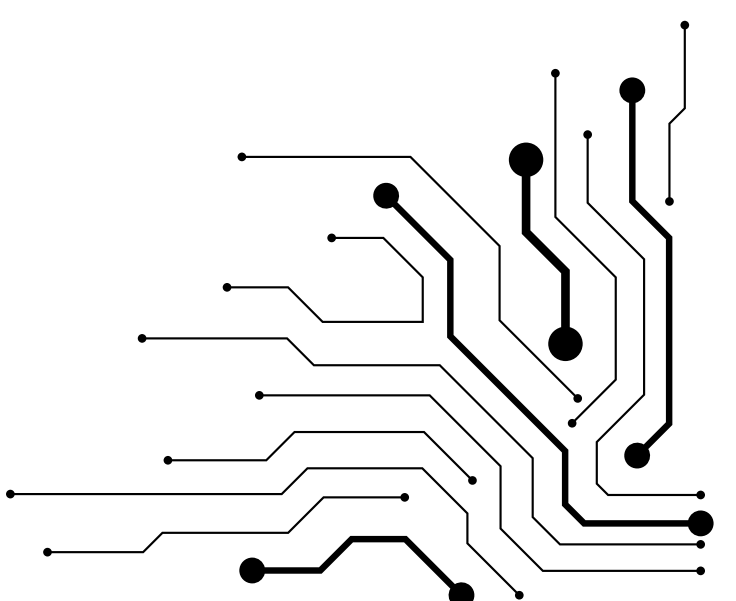


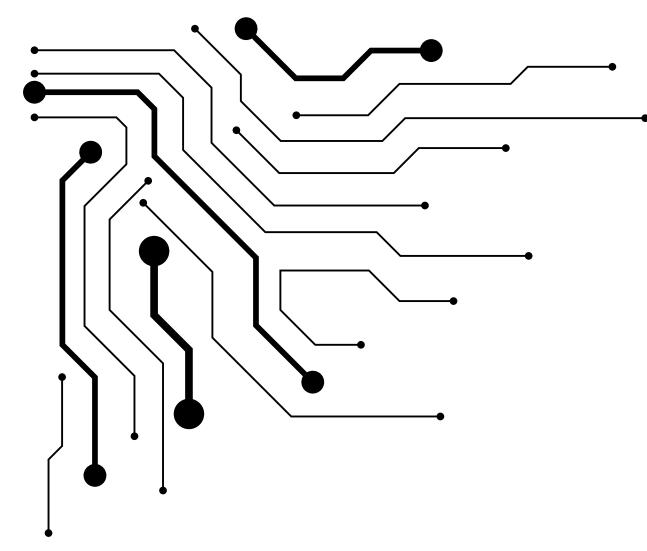
**Institute for Mathematical and  
Computational Engineering Pontificia  
Universidad Católica de Chile**  
[imc.uc.cl/](http://imc.uc.cl/)



The workshop is organised by Heidelberg University's Interdisciplinary Center for Scientific Computing and the Heidelberg Center Latin America in Santiago de Chile, jointly with the Institute for Mathematical and Computational Engineering of our strategic partner Pontificia Universidad Católica de Chile.

**Research Topics**  
Numerical Analysis  
Optimization  
Computational Biology  
Machine Learning





**The Heidelberg Center Latin America - HCLA**

Center of Excellence in Research and Teaching, is Heidelberg University's offshore campus in and for Latin America.

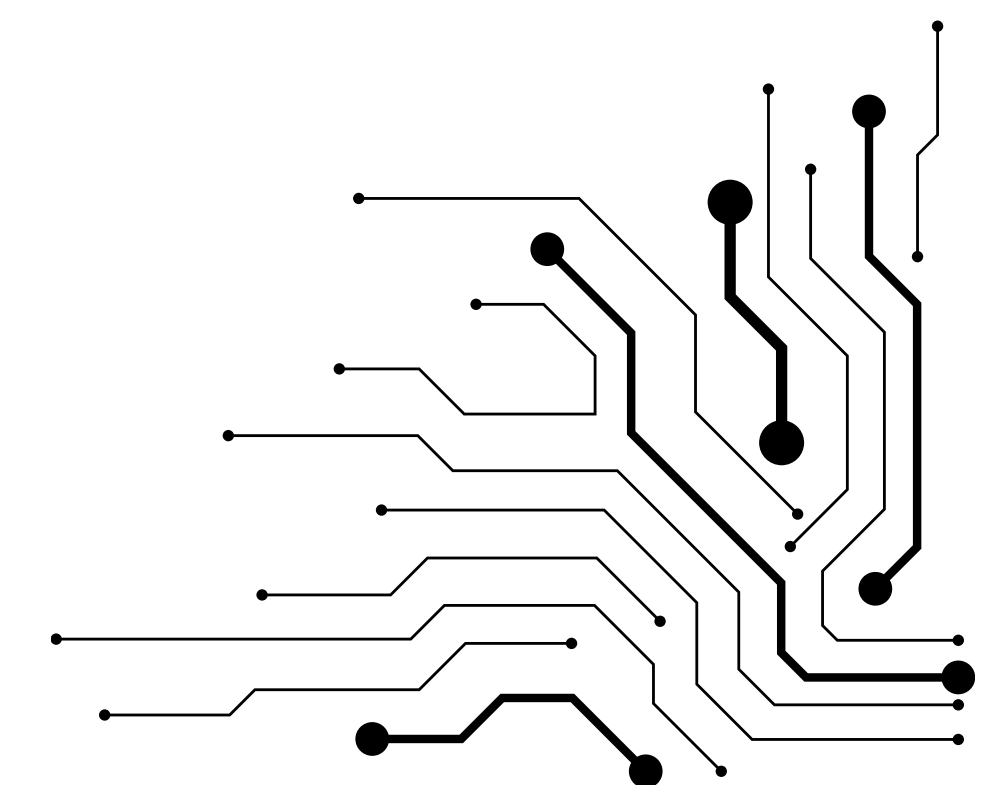
**Contact**

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Las Hortensias 2340  
Providencia, Santiago de Chile



Tuesday  
March 25  
**Optimization**

**9:00 - 9:30**  
**Registration and Welcome**

09:30 - 10:00

*A posteriori error estimates for bang-bang optimal control problems*  
Francisco Fuica Villagra, Pontificia Universidad Católica de Chile

10:00 - 10:30

*Joining prediction and optimization: prescriptive scenario generation for energy management with storage*  
Rodrigo A. Carrasco, Pontificia Universidad Católica de Chile

10:30 - 11:00

Preconditioned Solution of Structured Saddle-Point Problems in PDE-Constrained Optimization  
Roland Herzog, Heidelberg University

**11:00 - 11:30**  
**Coffee break**

11:30 - 12:00

*Optimization-based Model Validation*  
Ekaterina Kostina, Heidelberg University

12:00 - 12:30

*Nonlinear Fenchel Conjugates*  
Roland Herzog, Heidelberg University

12:30 - 13:00

*A mathematical model for the study of fracture mechanics in underground rocks*  
Jaime H. Ortega, Universidad de Chile

**13:00 - 14:00**  
**Lunch break**

14:00 - 14:30

*Numerical methods for Real-Time Optimal Control*  
Ekaterina Kostina, Heidelberg University

approx. 15:00 - 17:30

Coffee & Science  
"PhD-Fair, Posters/Talks by PhD/Master students"

**18:00 - 18:30**  
**Opening cocktail, HCLA garden.**

Wednesday  
March 26  
**Numerical  
Analysis**

09:30 - 10:00

Fast multigrid methods on GPU  
Guido Kanschat, Heidelberg University

10:00 - 10:30

Generalized hybrid discretizations  
Norbert Heuer, Pontificia Universidad Católica de Chile

10:30 - 11:00

Numerical methods for reverse osmosis simulations in water desalination channels  
Manuel Solano, Universidad de Concepción

**11:00 - 11:30**  
**Coffee break**

11:30 - 12:00

*Multiscale Spectral Generalised Finite Elements: Efficient Localised Model Reduction*  
Robert Scheichl, Heidelberg University

**Machine  
Learning**

12:00 - 12:30

*Green Machine Learning by Accelerating Deep Neural Architectures*  
Holger Fröning, Heidelberg University

12:30 - 13:00

*Multimodal Artificial Intelligence in Radiological Report Processing and Generation*  
Denis Alejandro Parra Santander, Pontificia Universidad Católica de Chile

13:00 - 13:30

*Scientific machine learning for astrophysics*  
Dr. Tobias Buck, Heidelberg University

**13:30 - 14:00**  
**Lunch break**

14:30 - 15:00

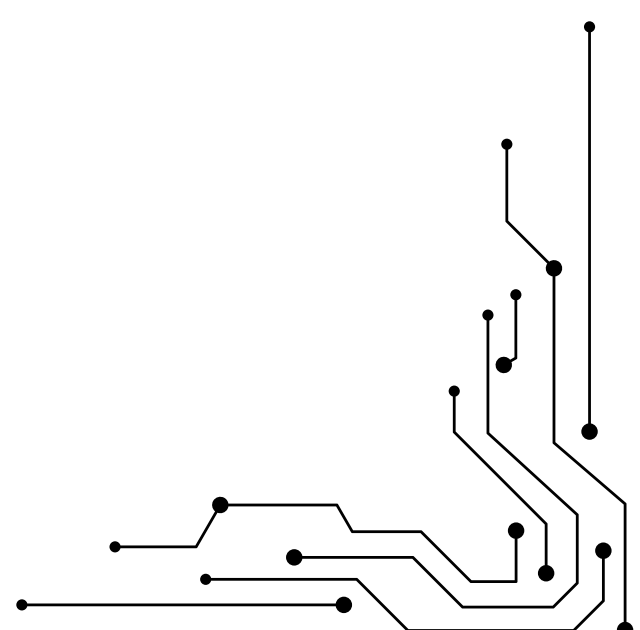
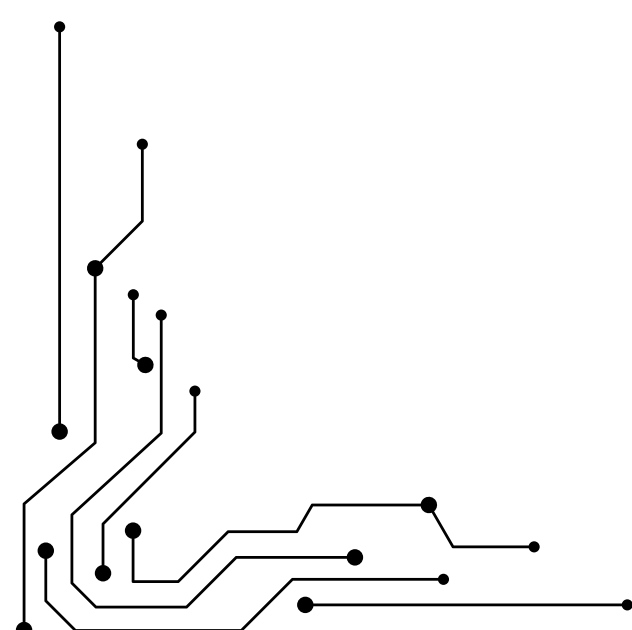
*Symmetries in Deep Learning models: from groups to types*  
Mircea Petrache, Pontificia Universidad Católica de Chile

15:00 - 15:30

*Bayesian Machines: Unlocking the Potential of Bayesian Neural Networks for Enhanced Uncertainty Reasoning*  
Holger Fröning, Heidelberg University

15:30 - 16:00

*Error bounds for fixed point iterations in reinforcement learning*  
Roberto Cominetti, Pontificia Universidad Católica de Chile



Thursday  
March 27  
**Numerical  
Analysis**

09:30 - 10:00  
*Finite element tensor product complexes*  
Guido Kanschat, Heidelberg University

10:00 - 10:30  
*Boundary Element Methods for Acoustic Wave Propagation*  
Elwin van 't Wout, Pontificia Universidad Católica de Chile

10:30 - 11:00  
*Title TBC*  
Jaime H. Ortega, Universidad de Chile

**11:00 - 11:30  
Coffee break**

11:30 - 12:00  
*Algorithmic Treatment of Implicitly Switched ODEs*  
Andreas Sommer, Heidelberg University

12:00 - 12:30  
*Space-time finite element method for parabolic obstacle problems*  
Thomas Fuehrer, Pontificia Universidad Católica de Chile

12:30 - 13:00  
*Energy stability computation in fluid systems using finite element methods*  
Federico Fuentes, Pontificia Universidad Católica de Chile

13:00 - 13:30  
*HDG methods for Hamiltonian PDE systems*  
Manuel Sanchez, Pontificia Universidad Católica de Chile

**13:00 - 14:00  
Lunch break**

Time TBC  
*Framework programm*  
(outside HCLA)

Friday  
March 28  
**Computational  
Biology**

09:30 - 10:00  
*Liquid crystal modeling of the human heart's muscle fibers*  
Nicolás Alejandro Barnafi Wittwer, Pontificia Universidad Católica de Chile

10:00 - 10:30  
*Mathematical Methods in Neurostimulation*  
Eduardo Cerpa, Pontificia Universidad Católica de Chile

10:30 - 11:00  
*Stochastic homogenization of the Keller-Segel chemotaxis system*  
Anastasios Matzavinou, Pontificia Universidad Católica de Chile

**11:00 - 11:30  
Coffee break**

11:30 - 12:00  
*How do energy constraints modulate the performance of biological neurons?*  
Mircea Petrache, Pontificia Universidad Católica de Chile

12:00 - 12:30  
*Computational biomedical discovery from spatial omics data*  
Jovan Taneski, Heidelberg University

12:30 - 13:00  
*Title TBC*  
Simon Anders, Heidelberg University

**13:00 - 14:00  
Lunch break**

14:00 - 14:30  
*Machine-learning approaches in single-cell genomics*  
Carl Herrmann, Heidelberg University

14:30 - 15:00  
*Fully nonlinear poroelasticity: efficient solution and applications in biomedicine*  
Nicolás Alejandro Barnafi Wittwer, Pontificia Universidad Católica de Chile

15:00 - 15:30  
*Models to unveiling abundance-dependent metabolic phenotypes of microbial communities*  
Vicente Acuña, Universidad de Chile

15:30 - 16:00  
*Inverse Problem for some Biological Models*  
Mauricio Sepúlveda, Universidad de Concepción

16:00 - 16:30  
*From data to function: Integrative Bioinformatics and Systems Biology of non-coding RNAs*  
Vinicius Maracaja, Universidad de Chile

16:30 - 17:00  
*A recipe for enabling the exploration of conformational landscapes in AlphaFold2 while preserving high model quality*  
Cesar A. Ramirez-Sarmiento

**Wrap-up and Closing remarks**

