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*10<sup>th</sup> International Conference on*

**High-Order Nonlinear numerical Methods  
for evolutionary PDEs: theory and applications**

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# Conference Program

**Main organizers:** Elena Gaburro & Maria Kazolea

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*“Behind every result is a new challenge”*



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# Sponsor

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ERC Starting Grant *ALcHyMiA* (No. 101114995) (Europe)

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Technical University of Crete (Greece)

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# Welcome to HONOM 2024!

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We are very pleased to welcome you to HONOM 2024, *the 10<sup>th</sup> International Conference on High-Order Nonlinear numerical Methods for evolutionary PDEs: theory and applications*, held at the KAM Conference Center hosted in the historical Megalo Arsenali, in front of the sea in the picturesque town of Chania, in the western part of Crete island in Greece.

HONOM 2024 builds on the success of its previous editions. Everything started in Trento (Italy) in 2005: the event was promoted by R. Abgrall, M. Dumbser, C.-D. Munz and E.F. Toro and it was repropesed there in 2007, 2009, 2011 and 2015. Then, HONOM has been organized in Bordeaux (France) in 2013, Stuttgart (Germany) in 2017, Madrid (Spain) in 2019 and Braha (Portugal) in 2022.

This year we have received 93 abstracts, which have been carefully reviewed by the members of the scientific and organizing committee. There will be 63 talks and 14 poster presentations, given by international researchers coming from *Canada, China, Czech Republic, France, Germany, Greece, Italy, Netherlands, Portugal, Slovakia, Spain, Sweden, Switzerland, the United Kingdom, and the United States of America*. Unfortunately our colleagues from *Russia*, whose abstracts were accepted, could not come.

The aim of this conference is to present new research on advanced mathematical models and advanced numerical algorithms for the robust and effective solution of evolutionary PDEs of interest in a wide range of physically relevant situations as computational fluid and solid mechanics, multiphase flows, oceanography, plasma physics, material science, mathematical biology and computational astrophysics. We will treat the design of novel algorithms, the analysis and applications of non-linear schemes of accuracy greater than two, which follows the finite difference, finite volume, finite element or residual distribution approaches; also, we will discuss structure preserving numerical methods and PDE models; moreover, we will enhance the state of the art on mesh generation, motion and adaptation taking into account their strict connection with the development of effective numerical methods.

We would really like to thank the scientific committee, the local organizers, our sponsors and in particular *all the participants* for coming to HONOM 2024.

We wish you a very pleasant stay in Crete and many enriching scientific and personal interactions during the conference!

Elena & Maria



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# Committees and Invited Speakers

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## Scientific committee:

Rémi Abgrall (*University of Zurich, Switzerland*)

Michael Dumbser (*University of Trento, Italy*)

Claus-Dieter Munz (*University of Stuttgart, Germany*)

Eleuterio F. Toro (*University of Trento, Italy*)

## International organizers:

*Chair:* Elena Gaburro (*University of Verona, Italy*)

*Co-chair:* Maria Kazolea (*Inria Bordeaux, France*)

Mario Ricchiuto (*Inria Bordeaux, France*)

Anne-Laure Gautier (*Inria Bordeaux, France*)

## Local organizers:

Anargiros Delis (*Technical University of Crete, Chania, Greece*)

Anastasios Sifalakis (*Technical University of Crete, Chania, Greece*)

## Invited keynote speakers:

Paola F. Antonietti (*Politecnico di Milano, Italy*)

Florent Renac (*Onera, France*)

Christian Rohde (*University of Stuttgart, Germany*)

Matteo Semplice (*Università dell'Insubria, Italy*)

Panagiotis Tsoutsanis (*Cranfield University, United Kingdom*)

Karen Veroy-Grepl (*Eindhoven University, The Netherlands*)



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# Conference Format and Conference Venues

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## Conference format:

**Keynote talks** are plenary, held in the **KAM** conference room and last **50 minutes** included questions.

**Contributed talks** may be plenary (**KAM** conference room), or divided into 2 parallel sections (**KAM** and **MIKIS** conference rooms).

They should last **25 minutes** included questions.

**Contributed poster** will be hung in the **KAM** center and presented on Tuesday evening.

## Registration and Welcome Reception

### Chania Sailing Club Neorio Moro

Sunday 8 of September 2024

17:30 – 20:00: **Registration**

19:15 – 22:00: **Welcome reception**

**Address:** Chania Old Town Marina, G29F+Q8 Chania, Greece



## Main Conference Venue: keynote talks, contributed talks and posters

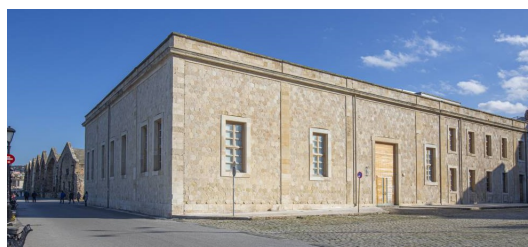
The two buildings are on the two sides of the same square; consider 5 minutes between them.

### KAM conference center



**Address:** Chania Old Town  
Marina, G299+CW Chania, Greece

### MIKIS Theodorakis Theatre



**Address:** Chania Old Town  
Marina, G29C+75 Chania, Greece

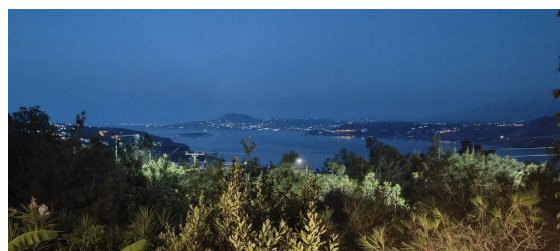
## Conference Dinner: Nykterida Restaurant Bar

Thursday 12 of September 2024

19:15 – 19:20: **Bus departure** from the opposite side w.r.t the Bank of Chania, Chania city center.

Google maps link: [here](#)

20:00 – 24:00: Conference dinner



**Address (Nykterida):** G38G+PJ Kounoupidiana, Greece (25 minutes by bus from the main event venue)

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# Monday 9 of September 2024

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08:00 – 09:15    **REGISTRATION**

09:15 – 09:25    **OPENING**

09:25    **Panagiotis Tsoutsanis**

ADDAptive Numerical Framework for iLES of Compressible Flows

10:15    **Elena Gaburro**

A primitive-conservative ADER-DG method for multiphase flows on polygonal meshes

10:40 – 11:25    **COFFEE BREAK**

**KAM**

11:25    **Thomas Izgin**

High-Order Positivity-Preserving Methods for Hyperbolic Balance Laws

11:50    **Philippe Hoch**

Arbitrary high-order [...] composite FV schemes with induced physically admissible reconstruction

12:15    **Irene Gómez-Bueno**

Preserving non-moving steady states for Euler [...] with gravitational forces and the Ripa model

**MIKIS**

**Anna Schwarz**

Entropy stable shock capturing for high-order discontinuous Galerkin schemes on moving meshes

**Vladimir Tomov**

Slip Wall BC in Curved Domains for FE ALE Hydrodynamics

**Patrick Kopper**

A Curvilinear Euler–Lagrange Code on Unstructured Moving Meshes

12:40 – 14:40    **LUNCH**

**KAM**

14:40    **Francesco Carlo Massa**

Hybrid High-Order methods with hybrid pressure and improved turbulence modelling capabilities

15:05    **Emanuele Carnevali**

Efficient Compressible Turbulent Flow Simulations: The Impact of Entropy Projection and [...]

15:30    **Ricardo Costa**

Very high-order accurate FV for the streamfunction-vorticity formulation of incompressible [...]

**MIKIS**

**Ernesto Pimentel-García**

In-cell Discontinuous Reconstruction path-conservative methods for nonconservative hyperbolic [...]

**Julie Patela**

Arbitrary-order finite volume schemes preserving positivity for diffusion

**Nikita Afanasev**

Towards a High-Order Conservative-Characteristic CABARET Scheme

15:55 – 16:35    **COFFEE BREAK**

16:35    **Per-Olof Persson**

Half-Closed Discontinuous Galerkin Discretisations

17:00    **Paola Antonietti**

High-order discontinuous polytopal methods for modeling neurodegeneration

*Chair: M. Semplice*

*Chair: J. Nordström*

*Chair: P.-O. Persson*

*Chair: V. Perrier*

*Chair: A. Kurganov*

*Chair: C.-D. Munz*



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# Tuesday 10 of September 2024

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09:00 **Dinshaw Balsara**  
General Purpose Alternative Finite Difference WENO for Conservative and Non-Conservative [...]

09:50 **Andrés M. Rueda-Ramírez**  
A Robust Entropy-Stable Discontinuous Galerkin Scheme for the Multi-Ion MHD System

## 10:15 – 11:00 COFFEE BREAK

### KAM

11:00 **Luca Alberti**  
On the high-order implementation of hybrid RANS/LES models for flapping foils

11:25 **Alessandro Colombo**  
On the implementation of a wall model for implicit LES in an entropy-stable DG solver

11:50 **Satyvir Singh**  
DG for continuum-rarefied gas flows over aerospice blunt body based on regularized 13-moment model

12:15 **Cristian Brutto**  
A semi-implicit finite volume scheme for the simulation of floating objects

## 12:40 – 14:40 LUNCH

### KAM

14:40 **Axelle Drouard**  
Semi-implicit numerical scheme for hyperbolic problems

15:05 **Katarína Lacková**  
High-resolution compact semi-implicit level set methods for the advection equation

15:30 **Peter Frolkovic**  
Compact implicit numerical schemes for nonlinear hyperbolic systems

## 15:55 – 16:35 COFFEE BREAK

16:35 **Alexander Kurganov**  
A Well-Balanced Fifth-Order A-WENO Scheme Based on Flux Globalization

17:00 **Matteo Semplice**  
QUINPI: going implicit for nonlinear hyperbolic equations

## 18:00 – 21:00 POSTER PARTY

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Chair: C. Klingenberg

### MIKIS

**Francesco Fambri**  
Structure Preserving Hybrid Finite Element - Finite Volume for MHD

**Enrico Zampa**  
Compatible FE discretization of time-dependent magnetic advection-diffusion [...] to MHD

**José Castillo**  
Energy Preserving High Order Mimetic Methods For Hamiltonian Systems

**Tarik Dzanic**  
Towards full Boltzmann simulations of complex fluid flows via high-order discretely-conservative [...]

### MIKIS

**Catherine Mavriplis**  
Pushing the Geometrical Capabilities of High Order Galerkin Spectral Element Methods

**Jens Keim**  
An Efficient Discontinuous Galerkin Spectral Element Implementation on Heterogeneous Grids

**Ketan Mittal**  
Scalable Interpolation at Arbitrary Points in High-Order Volume and Surface Meshes on GPUs

Chair: S. Chiocchetti



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# Wednesday 11 of September 2024

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- 09:00 **Vincent Perrier**  
How to preserve a divergence or a curl constraint in a hyperbolic system with the DG method
- 09:25 **Davide Torlo**  
Divergence-free preserving schemes: how to fix stabilization terms in continuous Galerkin
- 09:50 **François Vilar**  
Monolithic local subcell DG/FV convex property preserving scheme: is entropy stability really needed?
- 10:15 **Alina Chertock**  
Adaptive High-Order A-WENO Schemes Based on a New Local Smoothness Indicator

*Chair: W. Barsukow*

## 10:40 – 11:25 COFFEE BREAK

### KAM

- 11:25 **Davide Ferrari**  
A unified SHTC multiphase model of continuum mechanics
- 11:50 **Daniel Regener Roig**  
Entropy-stable DG solution of the multicomponent Euler [...] with entropy balance enforcement
- 12:15 **Susana Serna**  
High-Order Shock-Capturing Schemes for Non-Convex Special Relativistic Hydrodynamics
- 12:40 **Juan Cheng**  
High order conservative numerical schemes for three-temperature radiation hydrodynamics

*Chair: F. Fambri*

### MIKIS

- Celia Caballero-Cárdenas**  
Semi-implicit finite volume schemes for systems of shallow flows: preserving every steady state
- A. González del Pino**  
2nd and 3rd order FV for the 2D SWE in spherical coordinates with non-constant Coriolis [...]
- Gaspar Machado**  
R-Block structural schemes for ordinary differential equations
- Alexis Tardieu**  
A class of high order ADER-DG schemes for [...] nonlinear advection-diffusion equation

*Chair: C. Klingenberg*

## FREE AFTERNOON

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# Thursday 12 of September 2024

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09:00 **Karen Veroy-Grepl**  
Challenges for Physics-Based Model Order Reduction in Data Assimilation

09:50 **Georgios Kokkinakis**  
Troubled-cell detection for high-order methods on unstructured meshes by convolution neural networks

## 10:15 – 11:00 COFFEE BREAK

11:00 **Christian Klingenberg**  
On a semi-discrete Active Flux method for multi-dimensional conservation laws

11:25 **Lisa Lechner**  
A two-dimensional Active Flux method of arbitrarily high order

11:50 **Junming Duan**  
On limiting for the Active Flux methods for hyperbolic conservation laws

12:15 **Wasilij Barsukow**  
Stability of extensions of Active Flux

## 12:40 – 14:40 LUNCH

14:40 **Jan Nordström**  
An Energy Stable Nonlinear Incompressible Multi-Phase Flow Formulation

15:05 **Firas Dhaouadi**  
A first-order hyperbolic reformulation of the Cahn-Hilliard equation

15:30 **Saray Busto**  
A semi-implicit hybrid finite volume/finite element method for continuum mechanics

## 15:55 – 16:35 COFFEE BREAK

16:35 **Simone Chiocchetti**  
Hyperbolic viscous flow using quaternion fields

17:00 **Christian Rohde**  
Numerics for compressible liquid-vapour flow: sharp-interface and diffuse-interface models

## 19:15 – 23:30 SOCIAL DINNER

### Nykterida Restaurant Bar

EO Aerodromiou Soudas 3, Kounoupidiana 73100, (G38G+PJ) Greece,  
25 minutes by bus from the main event venue.

Note: buses to go to the restaurant will leave at 19:15–19:20,

from the city center of Chania, opposite side of the street w.r.t the *Bank of Chania*

Google maps link: [here](#)

*Chair: D. Torlo*

*Chair: J. Cheng*

*Chair: F. Renac*

*Chair: F. Dhaouadi*

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# Friday 13 of September 2024

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09:25 **Florent Renac**  
Positivity preserving time implicit DGSEM for hyperbolic conservation laws

**10:15 – 11:00 COFFEE BREAK**

11:00 **Lilia Krivodonova**  
Limiters for the Discontinuous Galerkin Method on Quadrilateral Meshes

11:25 **Joshua Vedral**  
Strongly consistent low-dissipation WENO schemes for finite elements

11:50 **Malte Wegener**  
P-Anisotropic H-Isotropic adaptive discontinuous Galerkin methods for turbulent flows

12:15 **Claus-Dieter Munz**  
An h-p Adaptive Strategy for Discontinuous Galerkin Schemes

**12:40 – 14:00 CONCLUSIVE APERO**

*Chair: P. Tsoutsanis*

*Chair: F. Vilar*

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# List of poster presentations

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**Duong Bella** (University of Düsseldorf, Germany)

Approximation of Moment Equations for Modeling Sedimentation in Suspensions of Rod-Like Particles

**Cristian Brutto** (University of Trento, Italy)

A semi-implicit finite volume scheme for fluid-structure interaction problems

**José Castillo** (San Diego State University, USA)

Solving Incompressible Navier-Stokes with High-Order Mimetic Methods

**Erik Chudzik** (University of Dusseldorf, Germany)

Active Flux Methods for Hyperbolic Systems using the Method of Bicharacteristics

**Alan Dawes** (AWE, UK)

SYNChronised numerical methods

**Davide Ferrari** (University of Trento, Italy)

An explicit finite volume scheme for a unified hyperbolic model for multi-phase continuum mechanics

**Thomas Izgin** (University of Kassel, Germany)

A positivity-preserving technique for hyperbolic balance laws

**Maria Kazolea** (Inria Bordeaux, France)

Introducing RESCUER: Resilient Solutions for Coastal, Urban, Estuarine and Riverine Environments

**Yanick Kiechle** (HHU Duesseldorf, Germany)

A positivity preserving Active Flux method for the Vlasov-Poisson System

**Matej Klima** (Czech Technical University in Prague, Czech Republic)

Improvements of the 3D Lagrangian Lax-Wendroff scheme with artificial dissipation

**Ralph Lteif** (Inria - Bordeaux, France)

High order ImEx method for the shallow water model

**Simon Merton** (AWE, UK)

A Multi-Threaded High-Order Lagrangian Scheme

**Ketan Mittal** (Lawrence Livermore Nat'l Lab, USA)

Recent Advances in the Target-Matrix Optimization Paradigm for High-Order Mesh Adaptivity

**Vladimir Tomov** (Lawrence Livermore Nat'l Lab, USA)

High-Order Shifted Interface Method for Lagrangian Shock Hydrodynamics

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## List of participants

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**Nikita Afanasev** (University of Zurich, Switzerland)

**Luca Alberti** (Politecnica delle Marche, Italy)

**Paola Antonietti** (Politecnico di Milano, Italy)

**Ioannis Athanasakis** (Technical University of Crete, Greece)

**Dinshaw Balsara** (University of Notre Dame, USA)

**Wasilij Barsukow** (CNRS - University of Bordeaux, France)

**Lourenco Beirao da Veiga** (Università di Milano-Bicocca, Italy)

**Duong Bella** (University of Düsseldorf, Germany)

**Leonidas Bolaris** (Technical University of Crete, Greece)

**Mauro Bonafini** (University of Verona, Italy)

**Cristian Brutto** (University of Trento, Italy)

**Saray Busto** (CITMAGA - USC, Spain)

**Celia Caballero-Cárdenas** (Universidad de Málaga, Spain)

**Emanuele Carnevali** (Politecnica delle Marche, Italy)

**José Castillo** (San Diego State University, USA)

**Juan Cheng** (Institute of Applied Physics and Computational Mathematics, China)

**Alina Chertock** (North Carolina State University, USA)

**Simone Chiocchetti** (University of Cologne, Germany)

**Erik Chudzik** (University of Dusseldorf, Germany)

**Alessandro Colombo** (University of Bergamo, Italy)

**Ricardo Costa** (University of Minho, Portugal)

**Alan Dawes** (AWE, UK)

**Anargiros Delis** (Technical University of Crete, Greece)

**Firas Dhaouadi** (University of Trento, Italy)

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# List of participants

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**Axelle Drouard** (LIHPC, Université Paris Saclay - CEA, France)

**Junming Duan** (Universität Würzburg, Germany)

**Michael Dumbser** (University of Trento, Italy)

**Tarik Dzanic** (Lawrence Livermore Nat'l Lab, USA)

**Francesco Fambri** (Max-Planck für Plasmaphysik, Germany)

**Davide Ferrari** (University of Trento, Italy)

**Peter Frolkovic** (Slovak University of Technology, Slovakia)

**Elena Gaburro** (University of Verona, Italy)

**Alejandro González del Pino** (University of Málaga, Spain)

**Irene Gómez-Bueno** (Universidad de Málaga, Spain)

**Philippe Hoch** (CEA, France)

**Thomas Izgin** (University of Kassel, Germany)

**Ioannis Kavroulakis** (University of Thessaloniki (AUTH), Greece)

**Maria Kazolea** (Inria Bordeaux, France)

**Jens Keim** (University of Stuttgart, Germany)

**Yanick Kiechle** (HHU Duesseldorf, Germany)

**Matej Klima** (Czech Technical University in Prague, Czech Republic)

**Christian Klingenberg** (Wuerzburg University, Germany)

**Georgios Kokkinakis** (Technical University of Crete, Greece)

**Patrick Kopper** (University of Stuttgart, Germany)

**Lilia Krivodonova** (University of Waterloo, Canada)

**Alexander Kurganov** (SUSTech, Shenzhen, China)

**Katarína Lacková** (Slovak University of Technology, Slovakia)

**Lisa Lechner** (University of Würzburg, Germany)

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## List of participants

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**Ralph Lteif** (Inria - Bordeaux, France)

**Gaspar Machado** (University of Minho, Portugal)

**Vasilis Mandikas** (Technical University of Crete, Greece)

**Francesco Carlo Massa** (University of Bergamo, Italy)

**Catherine Mavriplis** (University of Ottawa, Canada)

**Simon Merton** (AWE, UK)

**Ketan Mittal** (Lawrence Livermore Nat'l Lab, USA)

**Claus-Dieter Munz** (University of Stuttgart, Germany)

**Ioannis Nikolos** (Technical University of Crete, Greece)

**Jan Nordström** (Linköping University, Sweden)

**Vasiliki Pandoula** (Technical University of Crete, Greece)

**Marianna Papadomanolaki** (Technical University of Crete, Greece)

**Julie Patela** (CEA, France)

**Vincent Perrier** (Inria, France)

**Per-Olof Persson** (UC Berkeley, USA)

**Ernesto Pimentel-García** (University of Málaga, Spain)

**Daniel Regener Roig** (University of Bergamo, Italy)

**Florent Renac** (Onera, France)

**Christian Rohde** (University of Stuttgart, Germany)

**Andrés M. Rueda-Ramírez** (RWTH Aachen - Uni Köln, Germany)

**Anna Schwarz** (University of Stuttgart, Germany)

**Matteo Semplice** (Università dell'Insubria, Italy)

**Susana Serna** (UAB, Barcelona, Spain)

**Anastasios Sifalakis** (Technical University of Crete, Greece)

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# List of participants

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**Satyvir Singh** (RWTH Aachen University, Germany)

**Nikolaos Spanoudakis** (Technical University of Crete, Greece)

**Alexis Tardieu** (University of Bordeaux, France)

**Vladimir Tomov** (Lawrence Livermore Nat'l Lab, USA)

**Davide Torlo** (La Sapienza, Roma, Italy)

**Panagiotis Tsoutsanis** (Cranfield University, UK)

**Joshua Vedral** (TU Dortmund University, Germany)

**Karen Veroy-Grepl** (Eindhoven University of Technology, Netherlands)

**François Vilar** (Université de Montpellier, France)

**Malte Wegener** (DLR CASE Braunschweig, Germany)

**Enrico Zampa** (University of Trento, Italy)

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# HONOLULU 2024

