EUROPEAN MECHANICS SOCIETY

COLLOQUIUM 629

DATA-DRIVEN FLUID MECHANICS

2 April — 4 April 2025, London,UK

ERCOFTAC

European Research Community On Flow, Turbulence And Combustion

Joint event
"Euromech Colloquium on Data-Driven Fluid Dynamics"
&
"2nd ERCOFTAC Workshop on Machine Learning for Fluid Dynamics"

Detailed Conference Programme

Conference webpage with latest updates: https://629.euromech.org/629/

Conference Organizers:

- **Prof. Luca Magri** – *Imperial College London*, *The Alan Turing Institute, Politecnico di Torino* (EUROMECH), chair
- **Dr. Georgios Rigas** – *Imperial College London* (ERCOFTAC)

Scientific Committee:

- **Prof. Ricardo Vinuesa** – *KTH Royal Institute of Technology* (EUROMECH)
- **Prof. Peter Schmid** – *King Abdullah University of Science and Technology (KAUST)* (EUROMECH)
- **Prof. Luca Biferale** – *University of Rome Tor Vergata* (EUROMECH)
- **Prof. Taraneh Sayadi** – *Conservatoire National Arts et Metiers (le CNAM)* (EUROMECH)
- **Prof. Paola Cinnella** – *Sorbonne University* (ERCOFTAC)
- **Prof. Maria Vittoria Salvetti** – *University of Pisa* (ERCOFTAC)

Local organizing committee:

- **Dr. Andrea Novoa Martinez** , *Imperial College London*
- **Dr. Antonio Colanera**, *Politecnico di Torino*
- **Elise Özalp**, *Imperial College London*
- **Defne Ozan**, *Imperial College London*

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DATA-CENTRIC ENGINEERING

Day 1 (Wednesday, 2nd April 2025)

08:00 — 09:00 **Arrival and Registration with Coffee**
Room: Mary Ward Reception

09:00 — 09:10 **Conference Opening**
Prof. Luca Magri (chair, Imperial College London, The Alan Turing Institute, Politecnico di Torino)
Room: Mary Ward Hall

09:10 — 09:30 **Inaugural Keynote Talk:**
"Engineering the Future and the Future of Engineering"
Prof. Mark Girolami (The Alan Turing Institute & Cambridge University)
Room: Mary Ward Hall

09:30 — 10:30 **Keynote Talk:**
"AI and Scientific Computing: There is Plenty of Room in the Middle"
Prof. Petros Koumoutsakos (Harvard University)
Room: Mary Ward Hall

10:30 — 11:00 **Coffee Break**
Room: Arnold, Morris, Martineau

11:00 — 12:30 **Talks: Parallel Sessions D1S1**

Note: the affiliation within brackets is associated with the presenting author.

Time	**Session D1S1A (Mary Ward Hall) ROM** **Session chair: Gianluca Iaccarino**	**Session D1S1B (Brewer & Smith) RL/Control** **Session chair: Anh Khoa Doan**	**Session D1S1C (Lethaby) Applications** **Session chair: Elise Özalp**
11:00	"Goal-oriented Feature Extraction: a novel approach to enhance data-driven aerodynamic surrogate models"Hui Tang, Xu Wang (The Hong Kong Polytechnic University)	"Reinforcement-learning -based active control of wall-bounded turbulent flows at high Reynolds numbers"Xiaojue Zhu, Zisong Zhou (Max Planck Institute)	"Data-Driven Modelling of Transient Airfoil and Flyer Aerodynamics"Olaf Marxen, Simao Marques, Giovanni Iacobello (University of Surrey)
11:15	"Fast flow reconstruction using physics-informed	"REINFORCEMENT LEARNING TO ENHANCE CFD	"Exploring Transformer AI Models as CFD Substitutes for Efficient

	wavelets"Alexandros Kontogiannis(University of Cambridge)	SIMULATIONS FOR ACOUSTICS APPLICATIONS"David Huergo, Martín de Frutos, Óscar Mariño, Eduardo Jané, Gonzalo Rubio, Esteban Ferrer (Universidad Politécnica de Madrid)	Airfoil Optimization"Georgios Goinis, Macel Aulich, Sutharsan Satcunanathan, Christian Voß (German Aerospace Center)
11:30	"Autoencoders for Lagrangian Computational Fluid Dynamics"Joseph O'Connor(University of Edinburgh)	"Manifold of manifolds for simple models of flows under control"Guy Y. Cornejo Maceda, Qihong L. Li-Hu, Andrea Ianiro, Stefano Discetti (Universidad Carlos III de Madrid)	"Aerodynamic Knowledge Reimagined: A Large Experimental Database Powering Rapid Aerodynamic Assessments"Howon Lee, Pranay Seshadri, Juergen Rauleder (Georgia Institute of Technology)
11:45	"Multi-fidelity Autoencoders: RANS-LES nozzle jet predictions"Ettore Saetta, Michele Massa, Renato Tognaccini, Gianluca Iaccarino (University of Naples Federico II)	"Real-Time Adaptive Control of Tollmien-Schlichting Waves: Comparison between Machine Learning and Classical Control"Babak Mohammadikalakoo, Marios Kotsonis, Nguyen Anh Khoa Doan (Delft University of Technology)	"Blade design optimisation Using Physics-Informed Neural Networks"Muting Hao, Jiajun Cao (University of Oxford) WITHDRAWN
12:00	"A Framework for Meshless Data-Driven Decompositions with RBF-Based Inner Products"Manuel Ratz, Samuel Ahizi, Alessandro Parente, Miguel A. Mendez (von Karman Institute for Fluid Dynamics)	"Efficient control of dynamical systems via Model Predictive Control and Reinforcement Learning"Luigi Marra, Onofrio Semeraro, Lionel Mathelin, Andrea Meilán-Vila, Stefano Discetti (Universidad Carlos III de Madrid)	"Uncertainty Quantification for Deep Learning: application to Fluid Mechanics"Enrico Foglia, Benjamin Bobbia, Michael Bauerheim, Thierry Jardin, Stephane Moreau (ISAE-Supaero and Université de Sherbrooke)
12:15	"Nonlinear frequency-domain reduced-order modelling for turbulent flows"Xiaodong Li, Davide Lasagna (University of Southampton)	"Manipulation of the turbulent wall cycle via multi-agent deep reinforcement learning"Giorgio M. Cavallazzi, Luca Guastoni, Ricardo Vinuesa, Alfredo Pinelli (City St George's, University of London)	"Learning the shape: streamlining data needs in 2D irregular contour parameterization"Ana Larrañaga, Steven L. Brunton, Jacobo Porteiro (University of Washington)

12:30 — 13:30 **Lunch Break**
Room: Arnold, Morris, Martineau

13:30 — 15:30 **Talks: Parallel Sessions D1S2**

Note: the affiliation within brackets is associated with the presenting author.

Time	**Session D1S2A (Mary Ward Hall) ROM** **Session chair: Gianluigi Rozza**	**Session D1S2B (Brewer & Smith) Turbulence** **Session chair: Paola Cinnella**	**Session D1S2C (Lethaby) Applications** **Session chair: Tianning Tang**
13:30	"Data-driven model reduction via non-intrusive optimization of projection operators and reduced-order dynamics"Alberto Padovan, Daniel J. Bodony (University of Illinois at Urbana-Champaign)	"Non-Linear Super-Stencils for Turbulence Model Corrections"Patrick Jenny, Jonas Luther (Swiss Federal Institute of Technology)	"Echo State Networks for Nowcasting a Simplified Model of Atmospheric Convection"Kasia Nowakowska, Douglas Parker, Steven Tobias, Lorenzo Tomassini (University of Leeds)
13:45	"Hybrid Autoencoder/Galerkin approach for nonlinear reduced order modelling"Nicolas Lepage, Samir Beneddine, Camilla Fiorini, Iraj Mortazavi, Denis Sipp, Nicolas Thome (Conservatoire national des arts et métiers)	"Machine learning augmented RANS modeling: application to rectangular cylinder flows"Matteo Rosellini, Giovanni Stabile, Alessandro Mariotti, Maria Vittoria Salvetti (University of Pisa)	"Operational Storm Surge Forecasting Using Physics-Informed Deep Learning"Thomas Monahan, Tianning Tang, Stephen Roberts, Thomas Adcock (University of Oxford)
14:00	"Reconstruction of the flow over a thick airfoil from sparse measurements"Quentin Bucquet, Bérengère Podvin, Emmanuel Guilmineau, Caroline Braud (CentraleSupélec, Université Paris-Saclay)	"Graph-Based clustering for data-driven discovery of local RANS model corrections"Mourad Oulghelou, Xavier Merle, Paola Cinnella (Sorbonne University)	"Bayesian inference for geophysical fluid dynamics using generative models"Alex Lobbe, Dan Crisan, Oana Lang (Imperial College London)
14:15	"Accelerating Numerical Simulations in CFD by Model Reduction with Scientific and	"Online optimization of RANS models with embedded DNS data generation"Daniel	"Spectral proper orthogonal decomposition of street canyon flow dynamics

	Physics-Informed Machine Learning"Gianluigi Rozza(SISSA Trieste)	Dehtyriov, Jonathan F. MacArt, Justin Sirignano (University of Oxford)	and its application to time-domain reconstruction"Nishant Kumar, Franck Kerhervé, Lionel Agostini, Laurent Cordier (Institut Pprime, CNRS, Université de Poitiers)
14:30	"Dynamic Mode Decomposition (DMD) for the Inverse Design of Complex Fluids"Yunpeng Zhu, Liangliang Cheng, J. Nathan Kutz (Queen Mary University of London)	"Data-Driven Turbulence Models using High-Fidelity Experimental and Numerical Data"Daniele Petronio, Andrea Carlucci, Pawel Przytarski, Davide Lengani, Daniele Simoni (University of Genova)	"Performance Benchmarking of Multi-Objective Surrogate-Assisted Evolutionary Algorithms on a Novel Computational Fluid Dynamics Test Case"Ben Moore, Andrew Roberts, Daniel Jarman, Alma Rahat, Jonathan Fieldsend, Gavin Tabor (University of Exeter)
14:45	"Stochastic Convolutional Koopman Model for Turbulence"Oliver T. Schmidt, Tianyi Chu (University of California San Diego)	"New low-dimensional data-driven closure models for turbulence "Rik Hoekstra, Daan Crommelin, Wouter Edeling (Centrum Wiskunde & Informatica)	"Analysis on latent space representation of a bushfire analogy using variational autoencoders"Kevin Liu, Julio Soria, Callum Atkinson (Monash University)
15:00	"Space-time model reduction using Fourier and Legendre bases"Aaron Towne, Peter Frame, Henry Tukel (University of Michigan)	"Bi-Fidelity Gene Expression Programming for a posteriori RANS model discovery"Renzhi Tian, Richard Dwight, Stefan Hickel (Delft University of Technology)	"Differentiable Physics Programs at Scale"Andrei Paleyes, Dion Haefner, Andrin Rehmann, Alexander Lavin (Pasteur Labs; University of Cambridge)
15:15	"Nonlinearity-subtracted dynamic mode decomposition"Benjamin Herrmann, Katherine Cao, Carlos A. Gonzalez, Steven L. Brunton, Beverley J. McKeon (University of Chile)		Data-driven modeling of active nematics via sparse identification of nonlinear dynamics, Anand Oza, Connor Robertson, Travis Askham (New Jersey Institute of Technology)

15:30 — 16:00 **Coffee Break**

Room: Arnold, Morris, Martineau

16:00 — 17:15 **Talks: Parallel Sessions D1S3**

Note: the affiliation within brackets is associated with the presenting author.

Time	**Session D1S3A (Mary Ward Hall) Fundamental ML** **Session chair: Taraneh Sayadi**	**Session D1S3B (Brewer & Smith) RL/Control** **Session chair: Urban Fasel**	**Session D1S3C (Lethaby) Turbulence** **Session chair: Richard Dwight**
16:00	"Learning Distributions of Complex Fluid Simulations with Diffusion Graph Networks"Mario Lino, Tobias Pfaff, Nils Thuerey (Technical University of Munich)	"Actuation manifolds in unsteady conditions"Alicia Rodríguez-Asensio, Guy Y. Cornejo Maceda, Andrea Ianiro, Stefano Discetti (Universidad Carlos III de Madrid)	"Data Assimilation and Uncertainty Quantification of RANS Modeling"Maxime Casanova, Vincent Mons, Pedro Stefanin Volpiani, Olivier Marquet, Lutz Lesshafft, Denis Sipp (ONERA)
16:15	"Equation-informed data-driven identification of flow budgets and dynamics"Taraneh Sayadi, Nataliya Sevryugina, Serena Costanzo, Stephen de Bruyn Kops, Colm-cille Caulfield, Iraj Mortazavi (Conservatoire National Arts et Métiers)	"Multi-Agent Reinforcement Learning for Control of Parametric Partial Differential Equations"Nicolò Botteghi, Matteo Tomasetto, Urban Fasel, Francesco Braghin, Andrea Manzoni (University of Twente)	"Invariant risk minimization in RANS turbulence modelling"Richard P. Dwight(TU Delft)
16:30	"Correlation-preserving Forecasting of Turbulence Time Series Using Autoregressive Models"Saleh Rezaeiravesh, Daniele Massaro, Philipp Schlatter (The University of Manchester)	"Control of chaotic flows from noisy partial measurements: A data assimilated reinforcement learning approach"Defne E. Ozan, Luca Magri (Imperial College London)	"A Data-Driven Turbulence Modelling Framework based on Machine Learning for Industrial Aero-Engine Design "George Klavaris, Andreas Gantner, Tobias Danninger, Wolfgang Bauer (Ansys UK Ltd)
16:45	"On rotational equivariance as an inductive bias in machine learning for fluids"Ryley	"Reinforcement Learning Controlled Wind Farms"Andrew Mole, Max Weissenbacher,	"Improving numerical simulation accuracy of a turbulent mixing layer with neural operators"B. Zang, Zhuofei Wang,

	McConkey, Jigyasa Nigam, Elyssa Hofgard, Julia Balla, Tess Smidt (Massachusetts Institute of Technology)	Georgios Rigas, Sylvain Laizet (Imperial College London)	Zhong-Nan Wang (University of Bristol)
17:00	“On the use of entropy-based metrics for data-driven modeling and reinforcement learning control” Onofrio Semeraro, Michele Alessandro Bucci, Remy, Hosseinkhan-Boucher, Sergio Chibbaro, Alexandre Allauzen, Lionel Mathelin (LISN-CNRS, Universite' Paris Saclay)	"Gradient-enhanced Bayesian optimization for flow instability control using resolvent and adjoint theory"Simon Demange, Moritz Reumschüssel, Jens Müller, Sophie Knetchel, Kilian Oberleithner (Technische Universität Berlin)	

17:30 **End of Day 1**

Day 2 (Thursday, 3rd April 2025)

08:00 — 09:00 **Arrival and Registration with Coffee**
Room: Mary Ward Reception

09:00 — 10:00 **Keynote Talk:**
"Information from Data: Eliciting Underlying Physics from Data-Driven Studies of Turbulence"
Prof. Beverley McKeon (Stanford University)
Room: Mary Ward Hall

10:00 — 10:30 **Coffee Break**
Room: Arnold, Morris, Martineau

10:30 — 12:15 **Talks: Parallel Sessions D2S1**

Note: the affiliation within brackets is associated with the presenting author.

Time	**Session D2S1A (Mary Ward Hall) ROM/DA** **Session chair: George Papadakis**	**Session D2S1B (Brewer & Smith) RL/Control** **Session chair: Andrea Novoa**	**Session D2S1C (Lethaby) Applications** **Session chair: Maria Vittoria Salvetti**
10:30	"Interpretable data-driven decomposition strategy based on Fourier Neural Operators -- application to turbulent flows"Marco Cayuela, Vincent Le Chenadec, Peter Schmidt, Taraneh Sayadi (Sorbonne University)	"Multi-Task Gaussian Process Regression for Active Drag Reduction in Turbulent Boundary Layer Flows"Fabian Hübenthal, Xiao Shao, Wolfgang Schröder (Chair of Fluid Mechanics and Institute of Aerodynamics)	"Ensemble Kalman Filter for Data Assimilation coupled with low-resolution computations techniques applied in Fluid Dynamics"Paul Jeanney, Ashton Hetherington, Shady E. Ahmed, David Lanceta, Susana Saiz, José Miguel Pérez, Soledad Le Clainche (Universidad Politécnica de Madrid; Arup)
10:45	"Towards real-time prediction with autoencoders"Elise Özalp, Luca Magri (Imperial College London)	"Embedding Physical Invariances in Machine Learning based PDE Methods using Graph-Nets"Rohan Kaushik, Marius Kurz,	"Rapid Aerodynamic Development using CFD and Machine Learning"Faron Hesse, John Higgins, Anirudh Rajagopal, Nicolas

		Marcel Blind, Anna Schwarz, Andrea Beck (University of Stuttgart)	Fougere, Jing Bi, Victor Oancea, Jens Iseler, Svetlana Jeronimo, Hamza Motiwala, Vishal Jambhekar (Dassault Systemes) WITHDRAWN
11:00	"Learning from Data vs. Data for Learning"Gianluca Iaccarino, Mark Benjamin (Stanford University)	"Reinforcement Learning for Sample-Efficient Control of Wake Dynamics in Bluff Bodies"Junjie Zhang, Isabella Fumarola, Max Weissenbacher, Chengwei Xia, Xianyang Jiang, Georgios Rigas (Imperial College London)	"Quantum Scientific Machine Learning for Fluid Dynamics on Quantum Computers"Oleksandr Kyriienko, Chelsea A. Williams, Stefano Scali, Antonio A. Gentile, Daniel Berger (University of Exeter)
11:15	"Reduced order modeling with shallow recurrent decoder networks"Matteo Tomasetto, Francesco Braghin, Andrea Manzoni, José Nathan Kutz (Politecnico di Milano)	"Exploring Deep Reinforcement Learning (DRL) for Controlling Turbulent Separated Flows in Wings"Ricard Montalà, Bernat Font, Pol Suárez, Jean Rabault, Oriol Lehmkuhl, Ricardo Vinuesa, Ivette Rodriguez (Universitat Politècnica de Catalunya)	"Bayesian Optimisation of Roof Extensions for a Simplified Vehicle"Kacper Janczuk, Aimee Morgans (Imperial College London)
11:30	"Deep Koopman Sensing"Nithin Somasekharan, Yadi Cao, Shaowu Pan (Rensselaer Polytechnic Institute)	"Reinforcement Twinning: from digital twins to model-based reinforcement learning"Lorenzo Schena, Pedro Marques, Romain Poletti, Samuel Ahizi, Jan van den Berghe, Miguel A. Mendez (von Karman Institute for Fluid Dynamics)	"Review of DrivAerML training dataset for machine learning in automotive external aerodynamics"Marian Fuchs, Neil Ashton, Louis Fliessbach, Hendrik Hetmann, Thilo Knacke, Charles Mockett, Norbert Schönwald, Vangelis Skaperdas, Astrid Walle (Upstream CFD GmbH)
11:45	"Forecasting the future evolution of three-dimensional turbulent recirculating flow from sparse data"George Papadakis, Shengqi Lu (Imperial College London)	"Flow control of a turbulent separation bubble: Information-theoretic approach"Tristan Villanueva, Gonzalo Arranz, Adrián Lozano-Durán	"Detailed assessment of a data-driven GNN approach for the AhmedML, WindsorML and DrivAerML datasets "Neil Ashton (NVIDIA)

		(California Institute of Technology)	
12:00	"Machine Learning Strategies for Accelerating Partitioned Fluid-Structure Interaction Simulations"Iraj Mortazavi, Azzeddine Tiba, Thibault Dairay, Florian De Vuyst, Juan-Pedro Ramirez (CNAM Paris)	"Actor-Critic methods for spatially evolving flows"Amine SAIBI, Lionel Mathelin, Onofrio Semeraro (Sorbonne University)	

12:15 — 13:20 **Lunch Break**
Room: Arnold, Morris, Martineau

13:20 — 14:30 **Panel Discussion, chaired by Neil Ashton (NVIDIA)**
Room: Mary Ward Hall
Panellists: Paola Cinnella (Sorbonne), Tim Colonius (Caltech), Gianluca Iaccarino (Stanford), Petros Koumoutsakos (Harvard), Luca Magri (Imperial), Beverley Mckeon (Stanford), Georgios Rigas (Imperial), Taraneh Sayadi (le CNAM)
Topic: The future of Science and Fluid Mechanics in an AI Era

14:30 — 15:45 **Punch talks: Parallel Sessions D2P1**

Note: the affiliation within brackets is associated with the presenting author.

Time	**Session D2P1A (Mary Ward Hall)** **Session chair: Jacob Page**	**Session D2P1B (Brewer & Smith)** **Session chair: Peter Jimack**	**Session D2P1C (Lethaby)** **Session chair: Matthew Juniper**
14:30	"Policy-Based Signal Shape Optimization for Drag Reduction via Spanwise Wall Oscillations"Lou Guérin, Laurent Cordier, Cédric Flageul, Stéphane Grieu, Lionel Agostini (Université de Poitiers)	"Law-of-the-wall-constrained model augmentation using Field Inverse and Machine Learning"Xiang Yang, Jiaqi Li (Penn State University)	"Spectral Adjoint-Based Assimilation of Sparse Data in Unsteady Simulations of Turbulent Flows"Justin Plogmann, Oliver Brenner, Patrick Jenny (ETH Zürich)
14:35	"Discovering Boundary Equations for Wave Breaking using	"Turbulence Model Modification by Field Inversion for	"A unified gradient-based learning framework for

	Machine Learning"Tianning Tang, Rui Cao, Wouter Mostert, Paul H. Taylor, Mark L. McAllister, Thomas A. A. Adcock (University of Oxford)	Transitional Flow"Mir Hamed Mohafez, Seoyeon Heo, Yeji Yun, Solkeun Jee (Gwangju Institute of Science and Technology)	turbulence closure in RANS simulations"Luca Saverio, Michele Alessandro Bucci, Cédric Content, Denis Sipp (Safran Tech / Onera)
14:40	"Dynamic physical clipping for efficient Ensemble Kalman Filter implementation in urban flow simulations using OpenFOAM"Emanuele Bombardi, Alessandro Gambale, Alessandro Parente (Université Libre de Bruxelles)	"Differentiable Simulation for Inverse-like Problems"Stefan Posch(Large Engines Competence Center, Graz)	"Space-time Embedding with autoencoders"Marcial Sanchis-Agudo, Ricardo Vinuesa (KTH Royal Institute of Technology)
14:45	"A Data-informed Immersed Boundary Method Using Online Supervised Machine Learning with Streaming Data"Miguel M. Valero, Marcello Meldi (Arts et Métiers ParisTech)	"Rotation Equivariant Graph Networks via Local Eigenbasis Transformations"Bjoern List, Mario Lino, Nils Thuerey (Technical University of Munich)	"Data assimilation of the model parameters of a viscous acoustic flow"Javier Lorente-Macias, Matthew P. Juniper (University of Cambridge)
14:50	"Online Optimization for Time-Averaged Statistics of Unsteady Turbulent Flow Simulations"Tom Hickling, Jonathan MacArt, Justin Sirignano, Den Waidmann (University of Oxford)	"Combined Autoencoder-Echo State Network Approach in Unsteady Output Error Estimation"João C. Romana, Thomas Hunter, Steven Hulshoff (Delft University of Technology)	"Machine Learning for Predicting Droplet Size Distributions in Jet-in-Crossflow Atomisation"Luke Vernon, Konstantina Vogiatzaki, Steve Roberts, Giovanni Tretola (University of Oxford)
14:55	"Dynamical relevance of periodic orbits in two-dimensional turbulence and connections to Euler solutions"Andrew Cleary, Jacob Page (University of Edinburgh)	"Physics-aware Spatio-temporal Symbolic Regression Model"Alex Liberzon, Teddy Lazebnik (Tel Aviv University)	"Bayesian Inverse Periodic Stokes Problems"Thomas Cheetham, Alexandros Kontogiannis, Matthew P. Juniper (University of Cambridge)
15:00	"DRL-guided wake control behind a revolutionary bluff body"Zhao Hou, Zhaokun Wang, Wai Kin Yeung, Hui Tang	"Adaptive Collocation Point Sampling Strategies for Physics Informed Neural Networks (PINNs)"Jose Florido, Peter Jimack,	"Uncertainty Quantification in Separated Flows Leveraging Bayesian Neural Networks"Tyler Buchanan, Ali Eidi,

	(The Hong Kong Polytechnic University)	Amirul Khan, He Wang (University of Leeds)	Letian Jiang, Richard P. Dwight (TU Delft)
15:05	"HydroGym: Advancing fluid dynamics control and optimization through Reinforcement Learning"Christian Lagemann, Ludger Paehler, Jared Callaham, Sajeda Mokbel, Samuel Ahnert, Kai Lagemann, Esther Lagemann, Nikolaus A. Adams, Steven L. Brunton (University of Washington)	"A Machine Learning-Based Wall-Modeled LES approach for Turbomachinery Flows"Bjoern F. Klose, Alexander Bleh, Cedric Stricker, Christian Morsbach, Michael Bergmann, Jonas Buchmeier, Marcel Matha, Georg Geiser, Edmund Kügeler (German Aerospace Center)	"Component-based Machine Learning for Indoor Flow Prediction: Aggregation and Interaction"Shaofan Wang, Philipp Geyer (Leibniz Universität Hannover)
15:10	"Real-time digital twins of turbulent flows"Andrea Novoa, Luca Magri (Imperial College London)	"Non-equilibrium wall modeling for large-eddy simulations using modal analysis and sparse regression"Christoffer Hansen, Xiang I. A. Yang, Mahdi Abkar (Aarhus University)	"Data Assimilation as an Enabler for Resolvent Analysis on Experimental Data of High-Reynolds Number Flows: Application to the Boeing Gaussian Bump"Roman Klopsch, Lukas Fuchs, Georgios Rigas, Kilian Oberleithner and Jakob G. R. von Saldern (Technische Universität Berlin)
15:15	"Model selection by phase-space quantization of a chaotic flow"Antonio Colanera, Luca Magri (Politecnico di Torino)	"Filling multi-parametric databases using hybrid machine learning models"Arindam Sengupta, Guillermo Barragan, Rodrigo Abadía Heredia, Ashton Ian Hetherington, Jesus Garicano Mena, Soledad Le Clainche Martinez (Universidad Politécnica de Madrid)	"Addressing turbulent convection experimental data challenges in PINNs with appropriate physical sampling"Soufiane Mrini, Anne Sergent, Francesca Chillà, Julien Salort, Didier Lucor (Université Paris-Saclay)
15:20	"A meshless method to compute the proper orthogonal decomposition and its variants from scattered data"Iacopo Tirelli, Miguel Alfonso Mendez, Andrea Ianiro and Stefano Discetti	"Data-driven dynamical modelling of noise generation by a mixing layer"Dao Zhou, Zhong-Nan Wang (University of Birmingham)	"Biomedical flows and shear stress prediction using explainable deep learning"Lisa Prahl Wittberg, Andrés Cremades, Frida Nilsson, Hanna Hörwing, Ricardo Vinuesa (KTH)

	(Universidad Carlos III de Madrid)		
15:25	"An adaptive sampling strategy for multi-fidelity machine learning applied to CFD"Harshinee Goordoyal, Andrew Barnes, Andrew Cookson, Katharine Fraser (University of Bath)	"Dynamic Loss Weighting: An efficient strategy for training Neural PDE Solvers"Seun Coker, Peter Jimack, He Wang and Amirul Khan (University of Leeds)	"Advancing Thrombosis Multi-Scale Modelling with Neural Operators"Marco Laudato, Luca Manzari (KTH Royal Institute of Technology)
15:30	"Data Driven Stabilisation of Unstable Periodic Orbits of Hamiltonian Systems"Owen M. Brook, Jason J. Bramburger, Davide Amato, Urban Fasel (Imperial College London)	"Bridging Experimental Shadowgraphs and DNS in Turbulent Convection Using physically-informed U-Net"Jai Kumar, Anne Sergent, Francesca Chillà, Julien Salort, Didier Lucor (Université Paris-Saclay)	"Compartment modeling meets Deep Learning: Towards an efficient modeling approach for bioreactor gradients"Hector A. Maldonado de Leon, Victor Puig I Laborda, Jorge Carrasco Muriel, Johan le Nepvou de Carfort, Cees Haringa (Delft University of Technology)
15:35	"Inferring unsteady turbulence model corrections from sparse data through data assimilation and machine learning"Vincent Mons, Raphaël Villiers, Denis Sipp, Eric Lamballais, Marcello Meldi (ONERA)	"Mixed data-source transfer-learning for a turbulence model augmented physics-informed neural network"Christian Toma, Bharath Ganapathisubramani, Sean Symon (University of Southampton)	
15:40	"Efficient model-based reinforcement learning for chaotic flow control"Priyam Gupta, Max Weissenbacher, Georgios Rigas (Imperial College London)		

15:45 — 16:15 **Coffee Break**
Room: Arnold, Morris, Martineau

16:15 — 17:30 **Talks: Parallel Sessions D2S2**

Note: the affiliation within brackets is associated with the presenting author.

Time	**Session D2S2A (Mary Ward Hall) ROM/Fundamental ML** **Session chair: Sam Taira**	**Session D2S2B (Brewer & Smith) Turbulence** **Session chair: Tim Colonius**	**Session D2S2C (Lethaby) Applications** **Session chair: Onofrio Semeraro**
16:15	"Super-resolution of turbulence from observations of coarse-grained dynamics"Jacob Page(University of Edinburgh)	"On the robustness of 'fake turbulence' models"Javier Jimenez(Universidad Politecnica de Madrid)	"Combining Physics-Informed Clustering and Deep Learning to Identify Pathologies and Defects from CFD Data"Riccardo Margheritti, Onofrio Semeraro, Maurizio Quadrio, Giacomo Boracchi (Politecnico di Milano)
16:30	"β-Variational autoencoder and transformer-based data-driven modeling of near-wall turbulence"Niccolò Tonioni, Mohammad Umair, Lionel Agostini, Franck Kerhervé, Laurent Cordier (Université de Poitiers)	"Data-driven statistical state-space modelling for turbulent flows"Yongyun Hwang, Jacob Holford, Yuxin Jiao, Zecheng Zou, Myoungkyu Lee (Imperial College London)	"Time-dependent wall shear stress prediction in femoral arteries using reduced order models and machine learning"Chotirawee Chatpattanasiri, Federica Ninno, Vanessa Diaz-Zuccarini, Stavroula Balabani (University College London)
16:45	"Dynamically-aware and robust reduced-order model -- application to parametrised unsteady fluid systems"Ismaël Zighed, Nicolas Thome, Patrick Gallinari, Taraneh Sayadi (Sorbonne Université)	"A data-driven study on ILES using the spectral difference method"Niccolò Tonicello, Nicola Clinco, Gianluigi Rozza (International School for Advanced Studies)	"A Machine Learning Volume Of Fluid method for three-dimensional advection problems"Moreno Pintore, Bruno Després (Sorbonne University, Inria)
17:00	"Physical Analysis of Machine	"Dynamic mixed model based on	"Combined data-driven and model-based

	Learning-identified Precursors of Extreme Events in Turbulent Flows"Nguyen Anh Khoa Doan(Delft University of Technology)	super-resolution approach for turbulence closure modeling"Ludovico Nista, Christoph D. K. Schumann, Temistocle Grenga, Jonathan F. MacArt, Antonio Attili, Heinz Pitsch (RWTH Aachen University)	control of high intensity focused ultrasounds"Paolo Guida, William Roberts (King Abdullah University of Science and Technology)
17:15	"Data-Driven Analysis, Modeling, and Control of Extreme Aerodynamic Flows"Kunihiko Taira, Kai Fukamo, Luke Smith, Yonghong Zhong, Alec Linot, Hiroto Odaka, and Barbara Lopez-Doriga (University of California, Los Angeles)	"Neural operator-enabled closure for Burgers' turbulence"Sotiris Catsoulis, Tim Colonius (California Institute of Technology)	

17:30 — 19:30 **Drinks Reception (drinks and nibbles served until 18.30)**
Room: Arnold, Morris, Martineau

19:30 **End of Day 2 (dinner not organised by the conference)**

Day 3 (Friday, 4th April 2025)

08:00 — 09:00 **Arrival and Registration with Coffee**
Room: Mary Ward Reception

09:00 — 10:00 **Keynote Talk:**
"Machine Learning for Scientific Discovery, with Examples in Fluid Mechanics"
Prof. Steven Brunton (University of Washington)
Room: Mary Ward Hall

10:00 — 10:30 **Coffee Break**
Room: Arnold, Morris, Martineau

10:30 — 12:15 **Talks: Parallel Sessions D3S1**

Note: the affiliation within brackets is associated with the presenting author.

Time	**Session D3S1A (Mary Ward Hall) Fundamental** **Session chair: Luca Biferale**	**Session D3S1B (Brewer & Smith) Turbulence** **Session chair: Mahdi Abkar**	**Session D3S1C (Lethaby) Applications** **Session chair: Simone Hochgreb**
10:30	"Differentiable LES of Rayleigh-Bénard convection"André Freitas, Kiwon Um, Mathieu Desbrun, Michele Buzzicotti, Luca Biferale (University of Rome "Tor Vergata" & Télécom Paris)	"Spatiotemporal tiling of exact solutions in 2D Kolmogorov flow"Dmitriy Zhigunov, Jacob Page (University of Edinburgh)	"Unsupervised feature learning from laser-induced grating spectroscopy of turbulent reacting flows"Oussama Chaib, Lee Weller, Simone Hochgreb (University of Cambridge)
10:45	"Hard Constraint Projection in a Physics Informed Neural Network"Miranda J. S. Horne, Peter K. Jimack, Amirul Khan, He Wang (University of Leeds)	"Progressive data-driven turbulence models: Applications to secondary flows, flow separation, and wind farms"Mahdi Abkar, Ali Amarloo, Mario J. Rincon, Navid Zehtabiyan-Rezaie (Aarhus University)	"Data Driven Modeling of the Flame Response using Universal Differential Equations"Gregor Doehner, Camilo F. Silva (Technical University of Munich)
11:00	"A Framework for Passive Scalar	"Adjoint-accelerated Bayesian data	"Hydrogen combustion system development

	Modelling Using Physics-Informed Neural Networks"Joshua Rawden, Christina Vanderwel, Sean Symon (University of Southampton)	assimilation for k − ω SST closure coefficients"Alessandro Giannotta, Stefania Cherubini, Pietro De Palma (Politecnico di Bari)	integrating simulations, experiments, and multi-fidelity low order modelling"Nicholas C. W. Treleaven, Anouck Deshons, Guillaume J. J. Fournier, Julien Leparoux, Florian Monnier, Alexis Vandal, Gilles Cabot, Frederic Grisch (Safran Tech)
11:15	"Exploring the Loss Landscape of Physics-Informed Neural Networks in Fluid Mechanics: Stiffness of Partial Differential Equation"Seohee Jang, Yasser Mahmoudi (The University of Manchester)	"Data-Driven Discovery of the Origin of Large-Scale Shear Stress and Pressure Fluctuations"Jonathan M. O. Massey, Facundo Cabrera-Booman, Beverley J. McKeon (Stanford University)	"Leverage few-shot learning in predicting thermoacoustic instability"Yazhou Shen, Aimee S. Morgans (Imperial College London)
11:30	"Can Machine Learning Bridge the Gap Between Lagrangian Mesh-Free Methods and High-Order Interpolants?"Lucas Gerken Starepravo, Jack King, Ajay Harish, Georgios Fourtakas, Steven Lind (University of Manchester)	"Unsupervised machine learning of dominant flow processes"Paola Cinnella, Cécile Roques, Grégory Dergham, Xavier Merle (Sorbonne Université)	"ChemZIP: Efficiently Modelling Aerothermochemical Interactions in Novel Turbomachines for Conducting Low-Carbon Chemical Reactions"Dylan A. Rubini, Budimir Rosic (University of Oxford)
11:45	"Investigating the Ability of PINNs To Solve Burgers' PDE Near Finite-Time BlowUp"Dibyakanti Kumar, Anirbit Mukherjee (University of Manchester)		"Machine Learning for Thermochemistry in Turbulent Reactive Flows: Enhancing Generalization"Alireza Darzi, Stelios Rigopoulos (Imperial College London)
12:00	"Deep learning closure of the Navier-Stokes equations and slip-boundary conditions for transition-continuum flows"Den Waidmann, Narendra Singh, Marco Panesi, Justin Sirignano, Jonathan F. MacArt (University of Oxford)		"Learning physics constraint loss parameters to optimise data fidelity in denoising tasks with PINNs"Viraj Patel, Katharine Fraser, Lisa Kreusser (University of Bath)

12:15 — 13:15 **Lunch Break**
Room: Arnold, Morris, Martineau

13:15 — 15:15 **Talks: Parallel Sessions D3S2**

Note: the affiliation within brackets is associated with the presenting author.

Time	**Session D3S2A (Mary Ward Hall) Fundamental/Turbulence** **Session chair: Nikos Bempedelis**	**Session D3S2B (Brewer & Smith) Data Assimilation** **Session chair: Konstantina Vogiatzaki**	**Session D3S2C (Lethaby) Applications** **Session chair: Gioacchino Cafiero**
13:15	"Extracting self-similarity from data"Nikos Bempedelis, Luca Magri, Konstantinos Steiros (Queen Mary University of London)	"A multi-fidelity Data Assimilation algorithm enhanced by Convolutional Neural Networks"Tom Moussie, Paolo Errante, Marcello Meldi (Université de Lille)	"Augmentation of planar Particle Image Velocimetry (PIV) from pore-resolved numerical results of communicating flows about porous media"Thomas P Hunter, Nguyen Anh Khoa Doan, Francesco Avallone, Serhiy Yarusevych, Daniele Ragni (Delft University of Technology)
13:30	"Turbulent Injection assisted by Generative Models for Scale Resolving Simulations"Margaux Boxho, Joachim Dominique, Tariq Benarama, Caroline Sainvitu, Lionel Salesses, Thomas Toulorge (Cenaero)	"Data assimilation for generating quantitatively accurate models of complex thermoacoustic systems"Matthew Yoko, Matthew P. Juniper (University of Cambridge)	"Integrating differentiable rendering and differentiable physics using Gaussian particles for smoke plume reconstruction from images"Lou Denis, Brice Berthelot, Simon Lacroix (LAAS-CNRS, Université de Toulouse)
13:45	"Generation and Reconstruction of Lagrangian Turbulence with Stochastic Generative Models"Michele Buzzicotti, Luca Biferale, Tianyi Li, Fabio Bonaccorso, Martino Andrea Scarpolini, Luca Centurioni (University of Rome Tor Vergata)	"Integration of Computational Fluid Dynamics and Machine Learning for Predicting Hydrogen Leak Characteristics and Hazardous Behaviour"Giovanni Tretola, Konstantina Vogiatzaki (University of Oxford)	"New insights into experimental stratified flows obtained through physics-informed neural networks"Adrien Lefauve, Lu Zhu, Xianyang Jiang, R. R. Kerswell, P. F. Linden (University of Cambridge)

14:00	"Predicting airfoil pressure distributions using boundary graph neural networks"Sankalp Jena, Gabriel D. Weymouth, Artur K. Lidtke, Andrea Coraddu (Delft University of Technology)	"Data assimilation of planar particle image velocimetry data with divergence errors using variational method"Uttam Cadambi Padmanaban, Sean Symon, Bharathram Ganapathisubramani (University of Southampton)	"Full Steady Flow Field Predictions for Varying Scale Supersonic Projectiles using Fourier Neural Operators"Miguel A. Escudero, Karthik Depuru-Mohan, Benoît G. Marinus, Alistair J. Saddington (Royal Military Academy, Belgium and Cranfield University)
14:15	"A unified deep learning approach for experimental wall-shear stress estimation"Esther Lagemann, Christian Lagemann, Steven L. Brunton (University of Washington)	"Time-Varying State-Space VAR & VARMA Models for Turbulent Flows"Kristaps Stolarovs, Milan D. Mihajlovic, Saleh Rezaeiravesh (The University of Manchester)	"A stochastic surrogate model for unsteady airfoil flows"Giacomo Baldan, Alberto Guardone, Nils Thürey (Politecnico di Milano)
14:30	"Conditional Score-Based Diffusion Models for Data-Driven Fluid Flow Prediction"Wilfried Genuist, Eric Savin, Filippo Gatti, Didier Clouteau (ONERA & LMPS, Paris-Saclay University)	"A localized particle filter for geophysical data assimilation"Eliana Fausti, Dan Crisan (Imperial College London)	"Machine learning-explained structures in an axisymmetric turbulent jet"Enrico Amico, Lorenzo Matteucci, Jacopo Serpieri, Gaetano Iuso, Gioacchino Cafiero (Politecnico di Torino)
14:45	"Reconstruction of fluid flow fields from data using Gaussian process regression with physics--informed kernels"Adrian Padilla-Segarra, Pascal Noble, Olivier Roustant, Eric Savin (ONERA-The French Aerospace Lab, Institute of Mathematics of Toulouse and INSA Toulouse)	"Bayesian inversion of RANS turbulence models in Flow-MRI"Claire Namuroy, Alexandros Kontogiannis, Matthew P. Juniper (University of Cambridge)	"A PINN Methodology for Temperature Field Inference in the PIV Measurement Plane: Case of Rayleigh-Bénard Convection"Marie-Christine Volk, Didier Lucor, Anne Sergent, Michael Mommert, Christian Bauer, Claus Wagner (German Aerospace Center and Université Paris-Saclay)
15:00	"Advancing Geometry-Informed Deep Learning Models for Multiscale Flows"Nausheen Basha, Friedrich Hastedt, Dongda Zhang, Ehecatl Antonio	"Understanding Hypersonic Separated-flow Transition Experiments using Operator- and Data-Driven approaches"Clément	"Towards a Digital Twin of Particle-laden Turbulent Flows: Extending Measured Ultrasound Data by Physics-Informed Deep Learning and

	del Rio-Chanona and Omar K. Matar (Imperial College London)	Caillaud, Mathieu Lugrin, Sébastien Esquieu (CEA)	Reduced-Order Modeling"Ariel Espinoza-Jara, Magdalena Waclzak (Pontificia Universidad Catolica de Chile & Politecnico di Milano)

15:15 — 15:45 **Coffee Break**
Room: Mary Ward Hall

15:45 — 16:45 **Talks: Parallel Sessions D3S3**

Note: the affiliation within brackets is associated with the presenting author.

Time	**Session D3S3A (Mary Ward Hall) Control** **Session chair: Defne Ozan**	**Session D3S3B (Brewer & Smith) General** **Session chair: Antonio Colanera**	**Session D3S3C (Lethaby) ROM** **Session chair: Yoann Cheny**
15:45	"OpenFOAMGPT: A LLM agent for OpenFOAM-Based Computational Fluid Dynamics "Xu Chu, Sandeep Pandey, Ran Xu, Wenkang Wang (University of Exeter)	"Bifurcation analysis of fluid flows via deep neural networks-based reduced-order-modellin g"Alessandro Della Pia, Dimitrios Patsatzis, Lucia Russo, Constantinos Siettos (Scuola Superiore Meridionale, Naples)	"Gravity currents Reconstruction with Physics Informed Neural Networks from synthetic and experimental data"Yoann Cheny, Mickaël Delcey Sébastien Kiesgen de Richter (Université de Lorraine)
16:00	"Machine Learning Collision Models to Accelerate Direct Molecular Simulation of Rarefied Gas Flows"Nicholas Daultry Ball, Jonathan F. MacArt, Justin Sirignano (Oxford University)	"Corneal Material Characterisation via PINNs-Based Modelling of Impinging Jets"Osama Maklad, Muting Hao (University of Greenwich)	"Voxel Mixer: Deep Learning Model for 3D Wind Velocity and Pressure Estimation around Urban Structures"Adam Clarke, Knut Erik Teigen Giljarhus, Luca Oggiano, Alistair Saddington, Karthik Depuru-Mohan (Cranfield University)
16:15	"Smart Active Flow Control: Hydrodynamic Cloaking with Fluidic Pinball"Yanqi Wang, Hui Tang (The Hong	"Estimation of inter-scale transfer rates using high-fidelity data"Pawel J. Przytarski, Matteo Dellacasagrande,	"Machine learning based intelligent CFD surrogates for interactive design exploration of built environments"Usamah

	Kong Polytechnic University)	Davide Lengani (University of Genova)	Adia, Amirul Khan, Andrew Sleigh, He Wang (University of Leeds)
16:30	"Efficient Control of Fluid Flows Using Multifidelity Deep Reinforcement Learning"Saeed Salehi, Håkan Nilsson (Chalmers University of Technology)	"Data-driven MLP-Based Reduced Order Chemistry Model for Hydrogen Combustion CFD"Stijn N.J. Schepers, Jeroen A. van Oijen (Eindhoven University of Technology)	"Data-driven ANN-based surrogate modeling: Exploring power performance of dual Savonius rotors"Hossein Fatahian, Rakesh Mishra, Frankie. F. Jackson, Esmaeel Fatahian (University of Huddersfield)

17:00 **End of Conference**