

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

(tentative programme, latest update 20.2.2025)

The location of the event is

Mary Ward House, 5 - 7 Tavistock Place, London, WC1H 9SN, United Kingdom

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*

With thanks to



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

Time	Session D1S1A (Mary Ward Hall) ROM	Session D1S1B (Brewer & Smith) RL/Control	Session D1S1C (Lethaby) Applications
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"Xiaoju 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	"Learning the discrete dynamics for the incompressible velocity gradient tensor: A complex network approach"Chris J. Keylock, Maurizio Carbone (Loughborough University)	"REINFORCEMENT LEARNING TO ENHANCE CFD SIMULATIONS FOR ACOUSTICS APPLICATIONS"David Huergo, Martín de Frutos, Óscar Mariño, Eduardo Jané, Gonzalo Rubio, Esteban Ferrer (Universidad Politécnica de Madrid)	"Exploring Transformer AI Models as CFD Substitutes for Efficient Airfoil Optimization"Georgios Goinis, Macel Aulich, Sutharsan Satcunanathan, Christian Voß (German Aerospace Center)
11:30	"Autoencoders for	"Manifold of manifolds	"Aerodynamic

	Lagrangian Computational Fluid Dynamics"Joseph O'Connor(University of Edinburgh)	for simple models of flows under control"Guy Y. Cornejo Maceda, Qihong L. Li-Hu, Andrea Ianiro, Stefano Discetti (Universidad Carlos III de Madrid)	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)
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	"Fast flow reconstruction using physics-informed wavelets"Alexandros Kontogiannis(University of Cambridge)	"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 — 15:45

Talks: Parallel Sessions D1S2

Time	Session D1S2A (Mary Ward Hall) ROM	Session D1S2B (Brewer & Smith) Turbulence	Session D1S2C (Lethaby) Applications
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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)	"Correcting Differential Reynolds Stress Models Using Data-Assimilation"Gianmarco Farro, Pedro Stefanin Volpiani, Cédric Content, Denis Sipp (ONERA)	"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 Physics-Informed Machine Learning"Gianluigi Rozza(SISSA Trieste)	"Reinforcement Learning for Non-Ideal Gas Turbulence Modeling"Isa B. I. Helal, Alexis Giauque, Christophe Corre (Ecole Centrale de Lyon)	"Spectral proper orthogonal decomposition of street canyon flow dynamics 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)	"Data-driven statistical state-space modelling for turbulent flows" Yongyun Hwang, Jacob Holford, Yuxin Jiao, Zecheng Zou, Myoungkyu Lee (Imperial College London)	"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)	"Reduced order model for efficient prediction of dynamics of urban boundary layer in Paris" Konstantin Kuznetsov, Oleg Dubovik, Elena Alekseenko (GRASP Earth)
15:15	"Nonlinearity-subtracted dynamic mode decomposition" Benjamin Herrmann, Katherine Cao, Carlos A. Gonzalez, Steven L. Brunton, Beverley J. McKeon (University of Chile)	"Online optimization of RANS models with embedded DNS data generation" Daniel Dehtyriov, Jonathan F. MacArt, Justin Sirignano (University of Oxford)	"A Novel Multi-Linear Reduced-order Model Framework: Application in Atmospheric Boundary Layer Flows" Haoyan Li, Alessandro Gambale, Alessandro Parente (Universite Libre de Bruxelles)
15:30	"Nonlinear frequency-domain reduced-order modelling for turbulent flows" Xiaodong Li, Davide Lasagna (University of Southampton)	"Graph-Based clustering for data-driven discovery of local RANS model corrections" Mourad Oulghelou, Xavier Merle, Paola Cinnella (Sorbonne University)	"Statistical inversion of surface tracers to infer fine-scale near-surface ocean currents" Rick de Kreij, Andrew Zammit Mangion, Matt Rayson, Nicole Jones, Andrew Zulberti (The University of Western Australia)

15:45 — 16:15

Coffee Break

Room: Arnold, Morris, Martineau

16:15 — 17:30

Talks: Parallel Sessions D1S3

Time	Session D1S3A (Mary Ward Hall) Fundamental ML	Session D1S3B (Brewer & Smith) Turbulence	Session D1S3C (Lethaby) RL/Control
16:15	"Learning Distributions of Complex Fluid Simulations with	"Data Assimilation and Uncertainty Quantification of	"Actuation manifolds in unsteady conditions" Alicia

	Diffusion Graph Networks" Mario Lino, Tobias Pfaff, Nils Thuerey (Technical University of Munich)	RANS Modeling" Maxime Casanova, Vincent Mons, Pedro Stefanin Volpiani, Olivier Marquet, Lutz Lesshaft, Denis Sipp (ONERA)	Rodríguez-Asensio, Guy Y. Cornejo Maceda, Andrea Ianiro, Stefano Discetti (Universidad Carlos III de Madrid)
16:30	"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)	"Composite physics-informed neural networks for Reynolds averaged Navier-Stokes turbulence modelling" Alexis Giauque, Christophe Corre (Ecole Centrale de Lyon)	"Multi-Agent Reinforcement Learning for Control of Parametric Partial Differential Equations" Nicolò Botteghi, Matteo Tomasetto, Urban Fasel, Francesco Braghin, Andrea Manzoni (University of Twente)
16:45	"Correlation-preserving Forecasting of Turbulence Time Series Using Autoregressive Models" Saleh Rezaeiravesh, Daniele Massaro, Philipp Schlatter (The University of Manchester)	"A Machine Learning-Enhanced Workflow for Data-Driven Turbulence Modelling in Industrial Aero-Engine Design" George Klavaris, Andreas Gantner, Tobias Danninger, Wolfgang Bauer (Ansys UK Ltd)	"Control of chaotic flows from noisy partial measurements: A data assimilated reinforcement learning approach" Defne E. Ozan, Luca Magri (Imperial College London)
17:00	"On rotational equivariance as an inductive bias in machine learning for fluids" Ryley McConkey, Jigyasa Nigam, Elyssa Hofgard, Julia Balla, Tess Smidt (Massachusetts Institute of Technology)	"Reconstruction of turbulent fluctuations with linear analyses of mean-flows estimated by assimilation of limited data" Vincent Mons, Arthur Vervynck, Konstantinos Sarras, Cynthia Tayeh, Olivier Marquet (ONERA)	"Reinforcement Learning Controlled Wind Farms" Andrew Mole, Max Weissenbacher, Georgios Rigas, Sylvain Laizet (Imperial College London)
17:15	"Generating Synthetic Trajectories of Turbulence using Denoising Diffusion Probabilistic Models" Mohammed Sardar, Małgorzata J. Zimoń, Samuel Draycott, Alistair Revell, Alex Skillen (The University of Manchester)	"Invariant risk minimization in RANS turbulence modelling" Richard P. Dwight (TU Delft)	"Gradient-enhanced Bayesian optimization for flow instability control using resolvent and adjoint theory" Simon Demange, Moritz Reumschüssel, Jens Müller, Kilian Oberleithner (Technische Universität Berlin)

17:30

End of Day 1

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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**

Time	Session D2S1A (Mary Ward Hall) ROM/DA	Session D2S1B (Brewer & Smith) RL/Control	Session D2S1C (Lethaby) Applications
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, Xjao Shao, Wolfgang Schröder (Chair of Fluid Mechanics and Institute of Aerodynamics)	"Benchmarking Deep Learning Models on DrivAerNet++: A Large-Scale 3D Dataset for Aerodynamic Prediction" Mohamed Elrefaie, Qian Chen, Faez Ahmed, Angela Dai (MIT)
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, Marcel Blind, Anna Schwarz, Andrea Beck (University of Stuttgart)	"Rapid Aerodynamic Development using CFD and Machine Learning"Faron Hesse, John Higgins, Anirudh Rajagopal, Nicolas Fougere, Jing Bi, Victor Oancea, Jens Iseler, Svetlana Jeronimo, Hamza Motiwala, Vishal Jambhakar (Dassault Systemes)
11:00	"Ensemble Kalman Filter for Data Assimilation coupled with low-resolution computations techniques applied in Fluid Dynamics"Paul Jeanney, Ashton Hetherington, Shady E.	"Reinforcement Learning for Sample-Efficient Control of Wake Dynamics in Bluff Bodies"Junjie Zhang, Isabella Fumarola, Max Weissenbacher, Chengwei Xia,	"Learning from Data vs. Data for Learning"Gianluca Iaccarino, Mark Benjamin (Stanford University)

	Ahmed, David Lanceta, Susana Saiz, José Miguel Pérez, Soledad Le Clainche (Universidad Politécnica de Madrid; Arup)	Xiayang Jiang, Georgios Rigas (Imperial College London)	
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 (California Institute of Technology)	"Detailed assessment of a data-driven GNN approach for the AhmedML, WindsorML and DrivAerML datasets"Neil Ashton(Amazon Web Services)
12:00	"Machine Learning Strategies for Accelerating Partitioned Fluid-Structure Interaction Simulations"Israël 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)	"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)

12:15 — 13:15

Lunch Break

Room: Arnold, Morris, Martineau

13:15 — 14:15

Panel Discussion, chaired by Neil Ashton (NVIDIA)

Room: Mary Ward Hall

14:30 — 15:45

Punch talks: Parallel Sessions D2P1

Time	Session D2P1A (Mary Ward Hall)	Session D2P1B (Brewer & Smith)	Session D2P1C (Lethaby)
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 Machine Learning" Tianning Tang, Rui Cao, Wouter Mostert, Paul H. Taylor, Mark L. McAllister, Thomas A. A. Adcock (University of Oxford)	"Turbulence Model Modification by Field Inversion for Transitional Flow" Mir Hamed Mohafez, Seoyeon Heo, Yeji Yun, Solkeun Jee (Gwangju Institute of Science and Technology)	"A unified gradient-based learning framework for 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	"Combined Autoencoder-Echo	"Machine Learning for Predicting Droplet Size

	Statistics of Unsteady Turbulent Flow Simulations"Tom Hickling, Jonathan MacArt, Justin Sirignano, Den Waidmann (University of Oxford)	State Network Approach in Unsteady Output Error Estimation"João C. Romana, Thomas Hunter, Steven Hulshoff (Delft University of Technology)	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)	"Learning Lagrangian Flow Simulations using Graph Neural Networks with Differentiable Particle Shifting"Rene Winchenbach, Nils Thuerey (Technical University Munich)	"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 (The Hong Kong Polytechnic University)	"Adaptive Collocation Point Sampling Strategies for Physics Informed Neural Networks (PINNs)"Jose Florido, Peter Jimack, Amirul Khan, He Wang (University of Leeds)	"Uncertainty Quantification in Separated Flows Leveraging Bayesian Neural Networks"Tyler Buchanan, Ali Eidi, Letian Jiang, Richard P. Dwight (TU Delft)
15:05	"HydroGym: Advancing fluid dynamics control and optimization through Reinforcement Learning"Christian Lagemann, Ludger Paehler, Jared Callahan, 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)	"Dynamical Mode Recognition of Turbulent Flame System in A Swirl-stabilized Annular Combustor via Deep-learning-based Time-series Classification" Tao Yang, Weiming Xu, Liangliang Xu, Peng Zhang (City University of Hong Kong)
15:15	"Model selection by	"Filling multi-	"Addressing turbulent

	phase-space quantization of a chaotic flow"Antonio Colanera, Luca Magri (Politecnico di Torino)	parametric databases using hybrid machine learning models"Arindam Sengupta, Guillermo Barragan, Rodrigo Abadfa Heredia, Ashton Ian Hetherington, Jesus Garicano Mena, Soledad Le Clainche Martinez (Universidad Politécnic de Madrid)	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"Jacopo Tirelli, Miguel Alfonso Mendez, Andrea Ianiro and Stefano Discetti (Universidad Carlos III de Madrid)	"Data-driven dynamical modelling of noise generation by a mixing layer"Dao Zhou, Zhong-Nan Wang (University of Birmingham)	"Coherent structures in the Atmospheric Boundary Layer: Digital Wind Tunnel compared with Synthetic and Precursor methods"Tiziano Leone, Paolo Schito, Alberto Zasso (Politecnico di Milano)
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	"Mixed data-source transfer-learning for a turbulence model augmented physics-informed neural network"Christian Toma, Bharath Ganapathisubramani, Sean Symon (University of	"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

	(ONERA)	Southampton)	Oberleithner and Jakob G. R. von Saldern (Technische Universität Berlin)
15:40	"Efficient model-based reinforcement learning for chaotic flow control" Priyam Gupta, Max Weissenbacher, Georgios Rigas (Imperial College London)	"Physics-aware Spatio-temporal Symbolic Regression Model" Alex Liberzon, Teddy Lazebnik (Tel Aviv University)	"Biomedical flows and shear stress prediction using explainable deep learning" Lisa PrahL Wittberg, Andrés Cremades, Frida Nilsson, Hanna Hörwing, Ricardo Vinuesa (KTH)

15:45 — 16:15

Coffee Break

Room: Arnold, Morris, Martineau

16:15 — 17:30

Talks: Parallel Sessions D2P2

Time	Session D2S2A (Mary Ward Hall) ROM/Fundamental ML	Session D2S2B (Brewer & Smith) Turbulence	Session D2S2C (Lethaby) Applications
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)	"Combining Graph Networks and Reinforcement Learning for Consistent Turbulence Modeling" Marius Kurz, Benjamin Sanderse (Centrum Wiskunde & Informatica)	"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,	"A data-driven study on ILES using the spectral difference method" Niccolò Tonicello, Nicola Clinco, Gianluigi Rozza (International School	"A Machine Learning Volume Of Fluid method for three-dimensional advection problems" Moreno Pintore, Bruno Després (Sorbonne University,

	Patrick Gallinari, Taraneh Sayadi (Sorbonne Université)	for Advanced Studies)	Inria)
17:00	"Physical Analysis of Machine Learning-identified Precursors of Extreme Events in Turbulent Flows"Nguyen Anh Khoa Doan(Delft University of Technology)	"Dynamic mixed model based on 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)	"Combined data-driven and model-based 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)	"Improving numerical simulation accuracy of a turbulent mixing layer with neural operators"B. Zang, Zhuofei Wang, Zhong-Nan Wang (University of Bristol)	"Data-driven modeling of active nematics via sparse identification of nonlinear dynamics"Anand U. Oza, Connor Robertson, Travis Askham (New Jersey 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

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**

Time	Session D3S1A (Mary Ward Hall) Fundamental	Session D3S1B (Brewer & Smith) Turbulence	Session D3S1C (Lethaby) Applications
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 Zehtabiyani-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 Modelling Using Physics-Informed Neural Networks" Joshua Rawden, Christina Vanderwel, Sean Symon (University of Southampton)	"Adjoint-accelerated Bayesian data assimilation for $k - \omega$ SST closure coefficients" Alessandro Giannotta, Stefania Cherubini, Pietro De Palma (Politecnico di Bari)	"Hydrogen combustion system development 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)	"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)	"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	"Differentiable Physics Programs at Scale" Andrei Paleyes, Dion Haefner, Andrin Rehmann, Alexander Lavin (Pasteur Labs; University of Cambridge)	"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)	"Machine Learning for Thermochemistry in Turbulent Reactive Flows: Enhancing Generalization" Alireza Darzi, Stelios Rigopoulos (Imperial College London)
12:00	"Investigating the Ability of PINNs To Solve Burgers' PDE Near Finite-Time BlowUp" Dibyakanti Kumar, Anirbit Mukherjee (University of Manchester)	"Neural operator-enabled closure for Burgers' turbulence" Sotiris Catsoulis, Tim Colonius (California Institute of Technology)	"Deep learning for sub-filter probability density function prediction in turbulent combustion" Hanying Yang, Nedunchezian Swaminathan (University of Cambridge)

12:15 — 13:15

Lunch Break

Room: Arnold, Morris, Martineau

13:15 — 15:30

Talks: Parallel Sessions D3S2

Time	Session D3S2A (Mary Ward Hall) Fundamental/Turbulence	Session D3S2B (Brewer & Smith) Mix	Session D3S2C (Lethaby) Applications
13:15	"A stochastic surrogate	"A multi-fidelity Data	"Augmentation of

	model for unsteady airfoil flows"Giacomo Baldan, Alberto Guardone, Nils Thürey (Politecnico di Milano)	Assimilation algorithm enhanced by Convolutional Neural Networks"Tom Moussie, Paolo Errante, Marcello Meldi (Université de Lille)	planar Partical 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	"Extracting self-similarity from data"Nikos Bempedelis, Luca Magri, Konstantinos Steiros (Queen Mary University of London)

		University of Manchester)	
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 del Rio-Chanona and Omar K. Matar (Imperial College London)	"Understanding Hypersonic Separated-flow Transition Experiments using Operator- and Data-Driven approaches"Clément Caillaud, Mathieu Lugin, Sébastien Esquieu (CEA)	"Towards a Digital Twin of Particle-laden Turbulent Flows: Extending Measured Ultrasound Data by Physics-Informed Deep Learning and Reduced-Order Modeling"Ariel Espinoza-Jara, Magdalena Waczlak (Pontificia Universidad Católica de Chile & Politecnico di Milano)

15:30 — 16:00

Coffee Break

Room: Mary Ward Hall

16:00 — 17:10

Talks: Parallel Sessions D3S3

Time	Session D3S3A (Mary Ward Hall) Control	Session D3S3B (Brewer & Smith) Mix	Session D3S3C (Lethaby) Mix
16:00	"Control and optimization of compressible turbulent channel flows through	"Bifurcation analysis of fluid flows via deep neural networks-based reduced-order-	"Gravity currents Reconstruction with Physics Informed Neural Networks from

	automatic differentiation in differentiable fluid dynamics"Xu Chu, Wenkang Wang (University of Exeter)	modelling"Alessandro Della Pia, Dimitrios Patsatzis, Lucia Russo, Constantinos Siettos (Scuola Superiore Meridionale, Naples)	synthetic and experimental data"Yoann Cheny, Mickaël Delcey Sébastien Kiesgen de Richter (Université de Lorraine)
16:15	"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)
16:30	"Smart Active Flow Control: Hydrodynamic Cloaking with Fluidic Pinball"Yanqi Wang, Hui Tang (The Hong Kong Polytechnic University)	"Estimation of inter-scale transfer rates using high-fidelity data"Pawel J. Przytarski, Matteo Dellacasagrande, Davide Lengani (University of Genova)	"Machine learning based intelligent CFD surrogates for interactive design exploration of built environments"Usamah Adia, Amirul Khan, Andrew Sleight, He Wang (University of Leeds)
16:45	"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	-	"Learning physics constraint loss parameters to optimise data fidelity in denoising tasks with PINNs"Viraj Patel, Katharine Fraser, Lisa Kreusser (University of Bath)	-

17:15 — 17:30

Prizes and Awards & Concluding Remarks

Room: Mary Ward Hall

17:30

End of Conference