



5th ECMWF-ESA Machine Learning Workshop

Programme

Monday Agenda

Location: Botte B4 pavilion - DAMA Technopole

Agenda time displays according to the selected time zone.

The selected timezone is Europe/London

	Opening and keynote Session chairs: Massimo Bonavita (ECMWF) and Rochelle Schneider (ESA)	
12:00 to 13:00	Registration and coffee	
13:00 to 13:10	Opening and welcome Video recording	Massimo Bonavita (ECMWF) Rochelle Schneider (ESA)
13:10 to 13:40	AI for Humanity: Foundational Machine Learning and Data Assimilation for a Resilient Earth Keynote speaker Presentation slides Video recording	Rossella Arcucci (Imperial College London)
13:40 to 14:10	Machine learning-driven advances in geophysical data assimilation Keynote speaker Presentation slides Video recording	Marc Bocquet (École Nationale des Ponts et Chaussées and ECMWF Fellow)
14:10 to 17:10	Poster session and ice breaker	
14:10 to 15:10	Coffee and posters	
15:10 to 17:10	Aperitivo cocktail reception and posters	

Aperitivo sponsored by the University of Bologna, the Alma Climate Institute



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA
CENTRO INTERDIPARTIMENTALE
ALMA MATER RESEARCH INSTITUTE ON
GLOBAL CHALLENGENS AND CLIMATE CHANGE

Tuesday Agenda

Location: Botte B4 pavilion - DAMA Technopole

Agenda time displays according to the selected time zone.

The selected timezone is Europe/London

	Session 1.1: TA1 ML4DTE system Session chairs: Rochelle Schneider (ESA) and Mounia El Baz (ESA)	
08:00 to 08:30	CLIM4health: from Citizen Science, Machine Learning and Earth Observation towards Urban Climate Services Keynote speaker Presentation slides Video recording	Ana Oliveira (CoLAB +ATLANTIC)
08:30 to 08:50	The WeatherGenerator Project: Building a multi-modal, multi-resolution Foundation Model for Weather and Climate science Presentation slides Video recording	Ilaria Luise (ECMWF)
08:50 to 09:10	Lessons from Weather: Adapting GraphCast for Global Ocean Forecasting Presentation slides Video recording	Stefano Campanella (National Institute of Oceanography and Applied Geophysics - OGS, University of Trieste)
09:10 to 09:30	High-Resolution Thermal Mapping for Land Cover Intervention Planning Presentation slides Video recording	Hugo Poupard (Murmuration-SAS)
09:30 to 09:50	Bris and Forecast-in-a-Box: Applications and results for Malawi. Presentation slides Video recording	Lene Østvand (The Norwegian Meteorological Institute)
09:50 to 10:20	Group photo and coffee break	
	Session 1.2: TA1 ML4DTE system Session chairs: Rochelle Schneider (ESA) and Mounia El Baz (ESA)	

10:20 to 10:40	Probing sensitivities in sea ice surrogate models toward probabilistic forecasting Presentation slides Video recording	Flavia Porro (University of Bologna)
10:40 to 11:00	Downscaling of vertical profiles of mean and turbulent atmospheric variables using deep learning Presentation slides Video recording	Maximilian Pierzyna (Technische Universiteit Delft)
11:20 to 11:40	Generative Adversarial Networks for Simulating Dynamic Interactions in Digital Twins of Coastal Ecosystems Online presentation Presentation slides Video recording	Oscar Leung (HKU) Ye Ha Kim (UCL)
11:00 to 11:20	AI Climate Emulators as Tools for Reducing Weather Risk Uncertainty: Insights from a Large-Ensemble Approach Presentation slides Video recording	Amaury Lancelin (Laboratoire de Météorologie Dynamique (LMD), Ecole Normale Supérieure, RTE)
11:40 to 12:00	Going with the flow: generalising physically consistent data-driven sea-ice models Presentation slides Video recording	Tobias Finn (CEREA, ENPC, EDF R&D, Institut Polytechnique de Paris)
12:00 to 13:30	Lunch break	
	Session 1.3: TA1 ML4DTE system Session chairs: Rochelle Schneider (ESA) and Mounia El Baz (ESA)	
13:30 to 13:50	A New Concept for Comparing Satellite Observations and km-scale Atmospheric Simulations using Self-Supervised Machine Learning Presentation slides Video recording	Dwaipayan Chatterjee (Institute for Meteorology and Climate Research, Karlsruhe Institute for Technology)
13:50 to 14:10	SHRUG-FM: Reliability-Aware Foundation Models for Earth Observation Presentation slides Video recording	Joppe Massant (Ghent University)

14:10 to 14:30	Evaluation of GraphCast and PanguWeather over India and Downscaling using WRF for Simulating the 2023 North Indian Floods Online presentation Presentation slides	Balu Shaharica (Indian Institute of Technology Roorkee)
14:30 to 15:10	TA1 - Open discussion Video recording	
15:10 to 15:40	Coffee break	
	Session 2.1: TA2 Hybrid ML-Physics based systems for DA and Weather and Climate prediction Session chairs: Rossella Arcucci (Imperial College) and Marc Bocquet (ENPC)	
15:40 to 16:00	Advancing Global Weather Prediction at ECCO Using Spectral-Nudging-Based Hybrid NWP-MLWP Modelling Presentation slides Video recording	Leo Separovic (Environment and Climate Change Canada)
16:00 to 16:20	Hybrid NWP-AI at Météo-France : nudging AIFS large scales in the global NWP operational model ARPEGE Presentation slides Video recording	Vincent Chabot (Météo France)
16:20 to 16:40	Enhanced land surface data exploitation using machine learning Presentation slides Video recording	Patricia de Rosnay (ECMWF)

Wednesday

Agenda

Location: Botte B4 pavilion - DAMA Technopole

Agenda time displays according to the selected time zone.

The selected timezone is Europe/London

	Session 2.2: Session chairs: Rossella Arcucci (Imperial College) and Marcin Chrust (ECMWF)	
08:00 to 08:30	Data Assimilation in the era of the AI revolution - where we stand today Keynote speaker Presentation slides Video recording	Steve Penny (SOFAR Ocean)
08:30 to 08:50	Development of an offline and online hybrid model for the Integrated Forecasting System Presentation slides Video recording	Alban Farchi (ECMWF)
08:50 to 09:10	Online bias-correction in sea-ice models using machine learning and data assimilation Presentation slides Video recording	Giovanni De Cillis (Dept. of Physics and Astronomy "Augusto Righi", University of Bologna, Bologna, Italy)
09:10 to 09:30	RUSH: Rapid-Update High-Resolution precipitation nowcasting and Global AI/NWP downscaling in a single Latent-Diffusion model Presentation slides Video recording	Simon De Kock (Electronics and Informatics (ETRO), Vrije Universiteit Brussel & Royal Meteorological Institute of Belgium)
09:30 to 10:00	Coffee break	
	Session 2.3: TA2 Session chairs: Rossella Arcucci (Imperial College) and Marcin Chrust (ECMWF)	

10:00 to 10:20	Hybrid machine learning and ensemble data assimilation Presentation slides Video recording	Wei Pan (ECMWF)
10:20 to 10:40	Machine Learning-Driven Background Error Covariances for High-Resolution Data Assimilation Presentation slides Video recording	Ravi Shankar Nemani (School of Mathematical, Physical & CompUniversity of Reading and National Centre for Earth Observation)
10:40 to 11:00	Multi-hazard nowcasting system over Romania Online presentation Presentation slides Video recording	Claudiu Adam (National Meteorological Administration)
11:00 to 11:20	Unmasking Compensating Biases: A Process-Partitioned Neural Network Approach Presentation slides Video recording	Yuiko Ichikawa (University of Cambridge)
11:20 to 12:00	TA2 - Open discussion Video recording	
12:00 to 13:30	Lunch	
	Session 3.1: TA3 ML applications for Earth system observations Session chairs: Maryam Pourshamsi (ESA) and Chiara Maria Cocchiara (ESA)	
13:30 to 14:00	Harnessing Satellite Data and AI to Address Climate Hazards for Children Keynote speaker Presentation slides Video recording	Do-hung Kim (UNICEF)
14:00 to 14:20	Collaborative Labelling of Earth System Features in Satellite Data for Nowcasting and Climate Applications Presentation slides Video recording	Lauren Biermann (EUMETSAT)
14:20 to 14:40	Machine-learning-based observation operators for land-surface data assimilation Presentation slides Video recording	Peter Weston (ECMWF)

14:40 to 15:00	A data-driven reanalysis of Amazon water levels with deep learning Presentation slides Video recording	Ruben Cartuyvels (ESA)
15:00 to 15:30	Coffee break	
	Session 3.2: TA3 Session chairs: Maryam Pourshamsi (ESA) and Chiara Maria Cocchiara (ESA)	
15:30 to 15:50	Benchmarking Earth Observation embeddings for large scale aboveground biomass mapping Presentation slides Video recording	Yu-Feng Ho (OpenGeoHub)
15:50 to 16:10	Contrail Instance Segmentation on Geostationary Imagery Presentation slides Video recording	Ana Maria Pelin (EUROCONTROL & TU Delft)
16:10 to 16:30	GridShield™: A Hybrid ML-Satellite Fusion Framework for Real-Time Power Grid Resilience and Climate-Verified Carbon Credit Generation Using ESA Copernicus Sentinel Data Online presentation	Milagrosa Russelle Ballestar (iONTEK Power Solutions Corporation - Innovate with EU Space Data Mentoring Programme 2025)
16:30 to 16:50	Data-Driven Eddy Detection from Wide-Swath Altimetry Presentation slides Video recording	Matteo Broccoli (CMCC Foundation, Italy)
16:50 to 17:10	Developing a Multimodal AI Framework for Wetlands Mapping with Multi-Sensor Earth Observation Data Online presentation Presentation slides Video recording	Khunsa Fatima (kf178@leicester.ac.uk)

Thursday Agenda

Location: Botte B4 pavilion - DAMA Technopole

Agenda time displays according to the selected time zone.

The selected timezone is Europe/London

	Session 3.3: TA3 Session chairs: Maryam Pourshamsi (ESA) and Chiara Maria Cocchiara (ESA)	
08:00 to 08:20	From Synthetic to Real: A Scalable Dataset and ML Framework for Global Methane Monitoring Presentation slides Video recording	Enno Tiemann (OHB Digital Connect / Technical University of Munich (TUM))
08:20 to 08:40	Filling the Multisensor Gap: Multimodal Generative Models for Volcano Monitoring Presentation slides Video recording	Simona Cariello (INGV-OE Istituto Nazionale di Geofisica e Vulcanologia Osservatorio Etneo, Catania, Italia)
08:40 to 09:00	Deep learning emulation of the far-infrared fast forward operator for ESA FORUM satellite Presentation slides Video recording	Simone Raciti (University of Bologna)
09:00 to 09:20	Intelligent All-sky Cameras for Dense Mesoscale Observations Online presentation Presentation slides Video recording	Ben Pickering (Wx Labs Ltd and NCAS)
09:20 to 10:00	TA3 - Open discussion Video recording	
10:00 to 10:20	Coffee break	
	Session 4.1: TA4 End-to-end ML systems for DA and Weather and Climate Prediction Multidomain ML4ESOP Session chairs: Alberto Carrassi (UniBo) and Massimo Bonavita (ECMWF)	

10:20 to 10:40	GraphDOP: Are observations all you need? Presentation slides Video recording	Eulalie Boucher
10:40 to 11:00	An End-to-End Observation-Centric Graph Neural Network Framework for Global Earth System Prediction Presentation slides Video recording	Azadeh Gholoubi (NOAA/NWS/NCEP/EMC)
11:00 to 11:20	Duo-AttnOPNets: An End-to-End ML-4D-Var Framework for Atmospheric Composition Forecasting and Data Assimilation Presentation slides Video recording	Judongyang Zhou (Imperial College London)
11:20 to 11:40	Extending the Aila AI Weather Model: A Multi-Decoder Approach for Variable Expansion Presentation slides Video recording	Mikko Partio (Finnish Meteorological Institute)
11:40 to 12:00	AI-Based Weather Forecasting for Switzerland Presentation slides Video recording	Claire Merker (MeteoSwiss)
12:00 to 13:30	Lunch break	
	Session 4.2: TA4 Session chairs: Alberto Carrassi (UniBo) and Massimo Bonavita (ECMWF)	
13:30 to 14:00	From Real-Time Big Data Assimilation on Fugaku to Synergistic Development of DA and AI: Osaka Expo 2025 and Beyond Keynote speaker Presentation slides Video recording	Takemasa Miyoshi (RIKEN)
14:00 to 14:20	Beyond the atmosphere: Building a Data-Driven Earth System Model at ECMWF Presentation slides Video recording	Nina Raoult

14:20 to 14:40	The physics of AI weather models Presentation slides Video recording	George Craig (Meteorological Institute, LMU Munich)
14:40 to 15:00	Interpretability of AI Weather Models via Intermediate Decoding Presentation slides Video recording	Matthias Beylich (Meteorological Institute, LMU Munich)
15:00 to 15:30	Coffee break	
	Session 4.3: TA4 Session chair: Massimo Bonavita (ECMWF)	
15:30 to 15:50	Leveraging the kilometre-scale AROME reanalysis to develop AI-based regional forecasting systems over Western Europe Presentation slides Video recording	Thomas Rieutord (Météo-France)
15:50 to 16:10	Probabilistic GAN for European Winter Storm Downscaling Presentation slides Video recording	Athul Rasheeda Satheesh (Karlsruhe Institute of Technology)
16:10 to 16:30	Towards few-sample extreme event likelihoods with guided diffusion models Presentation slides Video recording	Peter Manshausen (NVIDIA)
16:30 to 17:00	TA4 - Open discussion Video recording	

Friday Agenda

Location: Botte B4 pavilion - DAMA Technopole

Agenda time displays according to the selected time zone.

The selected timezone is Europe/London

	Session 5.1: TA5 - HP and new computing technologies for ML applications in ESOP Session chair: Nina Raoult (ECMWF) and Diego Jatoba Dos Santos (ESA)	
08:00 to 08:30	Combining HPC and AI to advance potential: Example from HLRS and HammerHAI Keynote speaker Online presentation Presentation slides Video recording	Bastian Koller (High Performance Computing Center Stuttgart)
08:30 to 08:50	Scalable GPU-Accelerated Training of Graph Neural Networks for High-Resolution ESOP Simulations Online presentation Presentation slides Video recording	Oscar Leung (HKU) Ye Ha Kim (UCL)
08:50 to 09:10	Improving the performance and scalability of Anemoi Presentation slides Video recording	Jan Polster (ECMWF)
09:10 to 09:30	Satellite Earth Observation and AI-QC-Physics methods for enhanced climate predictions and volcano-climate interaction modeling Presentation slides Video recording	Eleonora Amato (Istituto Nazionale di Geofisica e Vulcanologia (INGV), Sezione Osservatorio Etneo, Catania, Italy)
09:30 to 10:00	Coffee break	
	Session 5.2: TA5 Session chair: Nina Raoult (ECMWF) and Diego Jatoba Dos Santos (ESA)	

10:00 to 10:20	Optimising Anemoi for higher resolution data and next-generation systems Presentation slides Video recording	Cathal O'Brien (ECMWF)
10:20 to 10:40	Global Volcano Monitoring from Space with hybrid Quantum Convolutional Neural Networks Presentation slides Video recording	Federica Torrisi (INGV-OE Istituto Nazionale di Geofisica e Vulcanologia Osservatorio Etneo, Catania, Italia)
10:40 to 11:00	Profiling Machine Learning Weather-Forecasting Models in Anemoi Presentation slides Video recording	Marieke Plesske (HPC Applications Team)
11:00 to 11:30	TA5 - Open discussion Video recording	
11:30 to 11:40	Closing remarks Video recording	Massimo Bonavita (ECMWF) Rochelle Schneider (ESA)