India-Italy Workshop on

"Machine Learning Applications in Climate and Ocean Science"

Jointly organised by IITM, Pune, MoES, India and CMCC, Italy

Day 1:

09:00 - 09:30: Registration

09:30 - 10:00: Opening Ceremony and Welcome Addresses

Opening remarks from India and Italy delegates

10:00-11:00: Keynote talks

10:00 -10:20: "Opportunities for Improving Climate and Monsoon Modelling"

Dr. R. Krishnan, IITM, India

10:20 - 10:40: "The Role of ML in Advancing Climate Science – Part-1"

Dr. Antonio Navarra, CMCC, Italy

10:40 - 11:00: "The Role of ML in Advancing Climate Science – Part-2"

Dr. Paola Mercogliano, CMCC, Italy

11:00 - 11:30: Coffee Break

11:30 – 12:50: Technical Session 1: Building AI Infrastructure for Climate

11:30-11:50: "Infrastructures for AI in weather and climate "

Dr. Paola Nassisi, CMCC; Italy

11:50-12:10: "Monsoon Forecasting: Role of HPC and AI-ML

Dr. Suryachandra Rao, IITM, India

12:10-12:30: "AI initiative to boost Climate Science and Disaster Management"

Dr. Manish Modani, NVIDIA, India

12:30-12:50: "Framework of physics-driven AI/ML model for hyperlocal weather forecasting" **Prof. Sridhar Balasubramanian**, IIT, Mumbai

12:50 - 14:00: Lunch Break

14:00 - 15:40: Technical Session 2: Climate Change Modeling and Downscaling using AI

14:00-14:20: "AI-assisted climate downscaling for rapid Assessment"

Dr. Ilenia Manco, CMCC, Italy

14:20-14:40: "Generative AI for High Resolution data: Mimicking Dynamical Downscaling with a Latent Diffusion Model" **Dr. Marco Cristoforetti**, FBK,Italy

14:40-15:00: "AI/ML application for coastal studies" – **Dr. Das**, NCCR, India

15:00-15:20: “Dynamical downscaling and the need for bias correction using CNNs for sectorial needs” **Dr. Sabin**, IITM, India

15:20-15:40: “Application of AIML models in the Weather and Climate Impact-based Forecasting” **Dr. Rajib**, IITM, Pune

15:40 - 16:00: Coffee Break

16:00 - 17:20: Technical Session 2: Prediction of Extreme Events

16:00-16:20: “High resolution weather nowcasting and alerting with AI”,

Gabriele French, FBK, Italy

16:20-16:40: Complex networks for Extreme Precipitation Synchronisation

Prof. Bedartha Goswami, IISER Pune, India

16:40-17:00: “Heatwaves in the Euro-Mediterranean region: characterisation, seasonal prediction and machine learning methods”

Dr. Ronan James McAdam, CMCC, Italy

17:00-17:20: “Deep Learning Framework for Predicting Extremes Associated with LPS” **Prof. Sandeep S**, IIT Delhi, India

17:20- 18:30: Poster Session**

19:00- 21:00: Welcome Dinner

Day 2: ***Keynote talks***

09:30 - 09:50: "ML Breakthroughs in Oceanography" Dr. Giovanni Coppini, Italy

09:50-10:10: “Ocean Services for Disaster Risk Reduction and Application of AI”

Dr. Balakrishnan Nair, INCOIS, India

10:10 - 11:30: Technical Session 3: Ocean Dynamics and Prediction

10:10 - 10.30: “ML approach for Ocean Prediction: Medformer”

Dr. Italo Epicoco, Italy

10:30 - 10.50: “Machine Learning for Estuary salinity prediction”

Dr. Rosalia Maglietta, CNR-STIIMA and CMCC, Italy

10:50 - 11:10: “A two phase neural mode for climate model bias correction”

Dr. Deepak Subramani, IISc, India

11:10-11:30:” Indian Ocean Extreme Sea Level Projections using ML”

Dr. Swapna, IITM, India

11:30 - 11:50: Coffee Break

11:50 - 13.10: Technical Session 4: Applications of AI in Climate Services

11:50 – 12:10: “Generative AI Models for Climate Forecasting”

D**r. Hariprasad Kodamana**, IIT Delhi

12:10 – 12:30: “Heatwave prediction over Northern India: a machine learning perspective**” Dr. Amar Jyoti**, NCMRWF, India

12:30 – 12:50: “Real-World Application of Deep Learning Models in Weather Forecasting” **Dr. Bipin Kumar**, IITM

12:50 - 14:00: Lunch Break

14:00 - 15:30: Roadmap for future collaboration and closing remarks

****Poster session**

The posters should be prepared in A0 size (110 cm in height × 88 cm in width). Authors will also have the opportunity to present their posters through a 5-minute talk, a 5-minute video or via remote connection (tbd).

- **Poster 1**: AI for climate change multi-hazard-spatio-temporal footprints across present and future scenarios (D. Ferrario, M. Masina, J. Furlanetto, M. Maraschini, M. Sanò, A. Critto e S. Torresan)
- **Poster 2**: Detection of Extreme Events through AI - Ronan McAdam on behalf of the CLINT consortium
- **Poster 3**: Storylines of heatwaves over Po Valley in a 15oC world: drivers and impacts - Squintu, A., McAdam, R., Perez-Aracil, J., Alvarez-Castro, C., Scoccimarro, E.
- **Poster 4**: Expanding the Application of ERA5-DownGAN Downscaling to U.S. Geographical Domain Manco I., Riviera W., Zanetti A., Mercogliano P., Navarra A.
- **Poster 5:** Identifying Recurring Patterns of Extreme Daily Precipitation Using K-means algorithm: Uncovering Spatial Shift driven by Climate Change over the Italian Peninsula, Manco I., Feitosa O. M., Raffa M., Schiano P., Rianna G., Mercogliano P.
- **Poster 6:** Development of a Catalogue of Extreme Daily Precipitation Events for Emilia-Romagna and Analysis of Cluster Shifts under RCP8.5 Using K-Means, Duminuco P, Manco I., Rianna G.,. F., Mercogliano P.
- **Poster 7:** Koopman Theory for Advanced SST Forecasting, P.L.-Sanchez, M. Newman, J. Albers. A. Subramanian, A. Navarra