

## Preface

**Matteo Fontana**

*Royal Holloway, University of London, UK*

MATTEO.FONTANA@RHUL.AC.UK

**Simone Vantini**

*Politecnico di Milano, Italy*

SIMONE.VANTINI@POLIMI.IT

**Henrik Böstrom**

*KTH Royal Institute of Technology, Sweden*

BOSTROMH@KTH.SE

**Lars Carlsson**

*Jönköping University, Sweden*

*Royal Holloway, University of London, UK*

LARS.CARLSSON@JU.SE

**Aldo Solari**

*Ca' Foscari University of Venice*

ALDO.SOLARI@UNIVE.IT

**Editor: Matteo F**

This volume contains the Proceedings of the 13<sup>th</sup> Symposium on Conformal and Probabilistic Prediction with Applications (COPA2024), organised by Politecnico di Milano, Italy, and held in Milano on September 9-11, 2024. Overall, 2 keynote speeches, 2 tutorials, 27 presentations and 5 posters have been presented during the conference. The rest of the publication includes full papers from the 27 presentations, one from one of the tutorials, and abstracts for the keynotes, one tutorial and the 5 posters. Titles and authors of the keynotes and of the tutorials were as follows

- **Keynotes**

- *Simultaneous Conformal Inference for Structured Matrix Completion* by Prof. Matteo Sesia
- *(Conformal) Isotonic Distributional Regression* by Prof. Johanna Ziegel

- **Tutorials**

- *MAPIE: A Versatile Tool for Conformal Prediction in Python - Uncertainty Quantification Made Easy* by Dr. Thibault Cordier
- *Conformal prediction in Python with crepes* by Prof. Lars Carlsson

The papers are divided into 7 groups, namely:

- **Theory**

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- *Enhancing Conformal Prediction Using E-Test Statistics* by Alexander A. Balinsky and Alexander David Balinsky.
- *Asymptotic uniqueness in long-term prediction* by Vladimir Vovk.
- *Split Conformal Prediction under Data Contamination* by Jason Clarkson, Wenkai Xu, Mihai Cucuringu and Gesine Reinert.

- **Classification**

- *Multi-label Conformal Prediction with a Mahalanobis Distance Nonconformity Measure* by Kostas Katsios and Harris Papadopoulos.
- *A probabilistic scaling approach to conformal predictions in binary image classification* by Alberto Carlevaro, Sara Narteni, Fabrizio Dabbene, Teodoro Alamo and Maurizio Mongelli.
- *Calibrated Explanations for Multi-class* by Tuwe Löfström, Helena Löfström and Ulf Johansson.
- *Multi-class Classification with Reject Option and Performance Guarantees using Conformal Prediction* by Alberto García-Galindo, Marcos López-De-Castro and Ruben Armañanzas.
- *Evidential Uncertainty Sets in Deep Classifiers Using Conformal Prediction* by Hamed Karimi and Reza Samavi.
- *Entropy Reweighted Conformal Prediction for Calibrated Neural Networks* by Rui Luo and Nicolò Colombo.
- *Distribution-free Conformal Prediction for Ordinal Classification* by Subhrasish Chakraborty, Chhavi Tyagi, Haiyan Qiao and Wenge Guo

- **Distributional Prediction**

- *Conformal Predictive Systems Under Covariate Shift* by Jef Jonkers, Glenn Van Wallendael, Luc Duchateau and Sofie Van Hoecke.
- *Inductive Venn-Abers Predictive Distributions: New Applications & Evaluation* by Ilia Nouretdinov and James Gammerman.
- *Tailoring the Tails: Enhancing the Reliability of Probabilistic Load Forecasts* by Roberto Baviera and Pietro Manzoni.

- **Time Series**

- *Adaptive Conformal Inference for Multi-Step Ahead Time-Series Forecasting Online* by Johan Hallberg Szabadváry.
- *ConForME: Multi-horizon conditional conformal time series forecasting* by Aloysio Galvao Lopes, Eric Goubault, Sylvie Putot and Laurent Pautet.
- *Conformal time series decomposition with component-wise exchangeability* by Derck Prinzhorn, Thijmen Nijdam, Putri Van der Linden and Alexander Timans.

- **Applications**

- *The Uncertain Object: Application of Conformal Prediction to Aerial and Satellite Images* by Vicky Copley, Greg Finlay and Ben Hiatt.
- *Calibrated Large Language Models for Binary Question Answering* by Patrizio Giovannotti and Alexander Gammerman.
- *Clustered Conformal Prediction for the Housing Market* by Anders Hjort, Jonathan P. Williams and Johan Pensar.
- *Copula-based conformal prediction for object detection: a more efficient approach* by Bruce Cyusa Mukama, Soundouss Messoudi, Sylvain Rousseau and Sébastien Destercke.
- *Uncertainty Quantification for Metamodels* by Martin Okánik, Athanasios Trantas, Merijn Pepijn de Bakker and Elena Lazovik.
- *Reliable Change Point Detection for ACGH data* by Charalambos Eliades and Harris Papadopoulos.

• **Regression**

- *CoPAL: Conformal Prediction in Active Learning An Algorithm for Enhancing Remaining Useful Life Estimation in Predictive Maintenance* by Zahra Kharazian, Tony Lindgren, Sindri Magnusson and Henrik Boström.
- *Distribution-free risk assessment of regression-based machine learning algorithms* by Sukrita Singh, Neeraj Sarna, Yuanyuan Li, Yang Lin, Agni Orfanoudaki and Michael Berger.
- *Conformal Regression with Reject Option* by Ulf Johansson, Cecilia Sönströd and Henrik Boström.

• **Testing and Feature Selection**

- *Conformal Stability Measure of Feature Selection Algorithms* by Marcos López-De-Castro, Alberto García-Galindo and Rubén Armañanzas
- *Estimating Quality of Approximated Shapley Values Using Conformal Prediction* by Amr Alkhatib, Henrik Boström and Ulf Johansson
- *Testing Exchangeability between Real and Synthetic Data* by Helena Löfström, Lars Carlsson and Ernst Ahlberg

During the poster sessions the following contributions have been presented

• **Posters**

- *Distribution-free Uncertainty Quantification for Contour Objects with Application to Tumour Segmentation in PET Imaging.* by Wenhui Zhang.
- *Fairness Considerations for Conformal Classification* by Arlan Abzhanov and Brieuc Lehmann.
- *Collective Outlier Detection and Enumeration with Conformalized Closed Testing* by Chiara Gaia Magnani, Matteo Sesia and Aldo Solari.

- *Preferent compression for tight generalization bounds* by Marco C. Campi and Simone Garatti.
- *Anomaly Detection in Multivariate Profiles with Conformal Bayesian Inference* by Nina Deliu and Brunero Liseo.

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