

Preface

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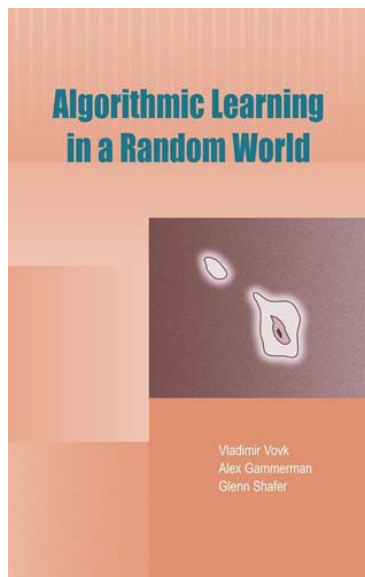
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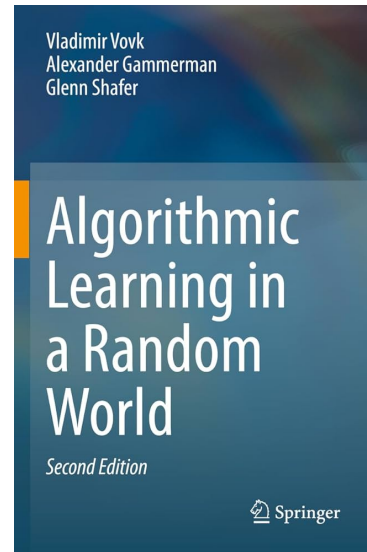
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This volume presents the proceedings of the Fourteenth Symposium on Conformal and Probabilistic Prediction with Applications (COPA 2025). The symposium takes place at Royal Holloway University of London, the birthplace of Conformal Prediction, on September 10–12, 2025. Notably, this event also marks the 20th anniversary of the influential book “Algorithmic Learning in a Random World”, authored by the founders of Conformal Prediction.



First Edition



Second Edition

Figure 1: The first and second editions of the book.

Overall, 36 full papers and 13 extended abstracts have been accepted for publication in the Proceedings of Machine Learning Research, Volume 266. The full papers are divided into the following 7 topics:

- **Foundations and Generalisations of Conformal Prediction** (4 papers)
 - *Inductive Randomness Predictors: Beyond Conformal* by Vladimir Vovk
 - *When Can We Reuse a Calibration Set for Multiple Conformal Predictions?* by Alexander Balinsky and Alexander David Balinsky
 - *Venn-Abers Testing of Exchangeability* by Ilia Nouretdinov
 - *Calibrating Without Labels: Source-Free Conformal Prediction Using Pseudo-Labels* by Shachar Angelman, Rotem Nizhar and Jacob Goldberger
- **Privacy, Robustness and Security** (4 papers)
 - *Conformal Prediction of Classifiers with Many Classes based on Noisy Labels* by Coby Penso, Jacob Goldberger and Ethan Fetaya
 - *Privacy-Preserving Conformal Prediction Under Local Differential Privacy* by Coby Penso, Bar Mahpud, Jacob Goldberger and Or Sheffet
 - *Provably Efficient and Robust Conformal Prediction under a Realistic Threat Model* by Alberto Carlevaro, Luca Oneto, Davide Anguita and Fabio Roli
 - *High Probability Risk Control Under Covariate Shift* by Duarte C. Almeida, João Bravo, Jacopo Bono, Pedro Bizarro and Mário A. T. Figueiredo
- **Multi-Output and Multi-Label Prediction** (5 papers)
 - *Exact and Approximate Conformal Inference for Multi-Output Regression* by Chancellor Johnstone and Eugene Ndiaye
 - *Conformal multi-hop relation detection and classification in knowledge graphs* by Frederick Law
 - *Dynamic Conformal Prediction for Multi-Target Regression: Optimising Informational Efficiency under Joint Validity* by Filip Schlegelbach, Evgeni Smirnov and Mark H. M. Winands
 - *Conformal LLM Multi-label Text Classification with Binary Relevance Approach* by Viktor Örnbratt and Johan Hallberg Szabadváry
 - *Incorporating Structural Penalties in Multi-label Conformal Prediction* by Kostas Katsios and Harris Papadopoulos
- **Conformal Regression and Predictive Distributions** (5 papers)
 - *SEMF: Supervised Expectation-Maximization Framework for Predicting Intervals* by Ilia Azizi, Marc-Olivier Boldi and Valérie Chavez-Demoulin
 - *A Review and Comparative Analysis of Univariate Conformal Regression Methods* by Jie Bao, Nicolo Colombo, Valery Manokhin, Suqun Cao and Rui Luo
 - *Stacked conformal prediction* by Paulo Marques
 - *Hierarchical Copula-based Conformal Prediction and Exact Validity via Nested Prediction Regions* by Bruce Cyusa Mukama, Soundouss Messoudi, Sylvain Rousseau and Sébastien Destercke

- *DUEn: An Ensemble Framework Enhanced by Distribution-Free Uncertainty for Regression* by Songlin Du, Ling Luo, Ilia Nourtdinov and Uwe Aickelin
- **Explainability and Decision Making** (4 papers)
 - *Explaining Set-Valued Predictions: SHAP Analysis for Conformal Classification* by Ulf Johansson, Cecilia Sönströd and Aicha Maalej
 - *Conformal Predictive Decision Making: A Comparative Study with Bayesian and Point-Predictive Methods* by Simon Lanngren, Martin Toremark and Johan Hallberg Szabadváry
 - *Counterfactual Explanations for Conformal Prediction Sets* by Aicha Maalej, Cecilia Sönströd and Ulf Johansson
 - *Individualised Counterfactual Examples Using Conformal Prediction Intervals* by James Adams, Gesine Reinert, Lukasz Szpruch, Carsten Maple and Andrew Elliott
- **Applications** (5 papers)
 - *Conformal Risk Control for Pulmonary Nodule Detection* by Roel Hulsman, Valentin Comte, Lorenzo Bertolini, Tobias Wiesenthal, Antonio Puertas Gallardo and Mario Ceresa
 - *Conformal Survival Bands for Risk Screening under Right-Censoring* by Matteo Sesia and Vladimir Svetnik
 - *Robust Vision-Based Runway Detection through Conformal Prediction and Conformal mAP* by Alya Zouzou, Léo Andéol, Mélanie Ducoffe and Ryma Boumazouza
 - *Temporal Multimodal Probabilistic Transformers for Safety Monitoring in Autonomous Driving Systems* by Yehia Ahmed, Felipe Roza and Dr.-Ing.Núria Mata
 - *Conformal Prediction for Uncertainty Estimation in Drug-Target Interaction Prediction* by Morteza Rakhshaninejad, Mira Jürgens, Nicolas Dewolf and Willem Waegeman
- **Online Testing, Change and Anomaly Detection** (9 papers)
 - *Validity and efficiency of the conformal CUSUM procedure* by Vladimir Vovk, Ilia Nourtdinov and Alexander Gammernan
 - *online-cp: a Python Package for Online Conformal Prediction, Conformal Predictive Systems and Conformal Test Martingales* by Johan Hallberg Szabadváry, Tuwe Löfström and Rudy Matela
 - *Testing Exchangeability for Multiple Sequences of P-values* by Henrik Boström
 - *Testing by Betting for Anomaly Detection in Rental E-Scooter GNSS Traces* by Marco Capuccini, Rahul Rajendra Pai and Lars Carlsson
 - *Anytime-Valid Tests of Group Invariance through Conformal Prediction* by Tyron Lardy and Muriel F. Pérez-Ortiz

- *Conformal Anomaly Detection for Functional Data with Elastic Distance Metrics* by Jason Adams, Brandon Berman, Joshua Michalenko and J. Derek Tucker
- *On the Integration of Cross-Conformal Prediction, Ensembles, and Sampling for Uncertainty Quantification in One-Class Anomaly Detection* by Ishan Garg and Shayan Majumder
- *A Conformal Martingales Approach for Recurrent Concept Drift* by Charalambos Eliades and Harris Papadopoulos
- *Testing Marginal and Conditional Coverage in Conformal Prediction for Non-Stationary Time Series via Value-at-Risk Backtesting* by Konrad Retzlaff, Filip Schlembach, Dennis Bams and Philippe Dreesen

The proceedings also include 13 extended abstracts:

• **Extended Abstracts**

- *A Bayesian framework for calibrating Gaussian process predictive distributions* by Aurélien Pion and Emmanuel Vazquez
- *Conformal Predictive Simulations for Univariate Time Series* by Thierry Moudiki
- *Reliable Household Demographic Classification* by Javier Carreno, Khuong An Nguyen, Zhiyuan Luo and Andrew Fish
- *Conformal Prediction for Reliable Image Super-Resolution* by Tapabrata Chakraborti and Samiran Dey
- *Detect Adversarial Examples with Exchangeability Martingale* by Genghua Dong, Roman Bresson and Henrik Boström
- *Exponential Estimates for Contagion in Financial Networks* by Dimitrios Ioannides and Stavros Ioannidis
- *Conformal Classification with New Labels* by Tianmin Xie, Ziyi Liang, Stefano Favaro and Matteo Sesia
- *Class-Conditional Robust Conformal Prediction for Structured Perturbations* by Luis Marchante Arjona, Protim Bhattacharjee and Peter Jung
- *Sequential Conformal Risk Control for Safe Railway Signaling Detection* by Léo Andéol and Thomas Massena
- *FlowGuard: Guarding Flow Matching via Conformal Sampling* by Ziyun Li and Henrik Boström
- *Physics-Aware Conformal Prediction for Deep Learning-based Wheelchair Local Navigation* by Sara Narteni, Alberto Carlevaro, Zeming Duan, Serge Autexier and Maurizio Mongelli
- *Conformal Prediction for Reliable Stock Selections* by Ipek Kaya and Khuong An Nguyen
- *Aleatoric and Epistemic Uncertainty in Conformal Prediction* by Yusuf Sale, Alireza Javanmardi and Eyke Hüllermeier

The Symposium features two keynote presentations:

- *Assessing the Performance of Classification Rules* by David Hand (OBE), Imperial College London
- *Information Theoretic Perspective on Conformal Prediction* by Arash Behboodi, Qualcomm AI Research

We are grateful to the Programme and Organising Committees; the success of the Symposium would have been impossible without their hard work.

Programme Committee

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