

Preface

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This volume contains the Proceedings of the Seventh Workshop on Conformal and Probabilistic Prediction with Applications (COPA 2018), which is co-organised by Royal Holloway, University of London, UK, and Maastricht University, The Netherlands. The Workshop is held at Maastricht University on June 11–13, 2018.

Conformal prediction was developed originally at the end of the 1990s and summarized in the monograph *Algorithmic Learning in a Random World*, Springer, New York, 2005. The main purpose of this method is to complement predictions delivered by various algorithms of Machine Learning with provably valid measures of their accuracy and reliability under the assumption that the observations are independent and identically distributed. Conformal prediction is a universal tool in several senses; in particular, it can be used in combination with any known machine learning algorithm, such as SVM, Neural Networks, Decision Trees, Ridge Regression, etc. It has been applied to a variety of problems from diagnostics of depression to the behaviour of bots.

After 20 years of development, the method of conformal prediction is becoming popular among machine learning and statistical communities. Moreover, since the method is not just theoretically appealing but also useful in practice, there have been several successful examples of its application to real-life problems, including some in medicine, industry, and security. In 2016, the Fifth Workshop was held at CIEMAT, a large Physics laboratory in Madrid, reflecting the fact that conformal prediction has been used successfully in physics, in particular, plasma physics. Last year, the Workshop took place in Karolinska Institutet, Stockholm, Sweden, many practical usefulness of conformal prediction in pharmaceutical industry and medical diagnostics were presented and discussed.

A sister method of Venn prediction was developed at the same time as conformal prediction and is used for probabilistic prediction. The COPA series of workshops is a home for work in both conformal and Venn prediction, as reflected in its full name “Conformal and Probabilistic Prediction with Applications”. Since 2016, the Workshop is open not only to the study of conformal and Venn prediction, but also of a variety of other methods for probabilistic or probability-type prediction.

Overall, 16 papers have been accepted for publications in the Proceedings of Machine Learning Research. The papers can be roughly divided into four groups:

- conformal and Venn prediction;

- applications of conformal and Venn prediction in drug discovery and medicine;
- transfer learning;
- other methods of probabilistic and even probability-free prediction.

In addition, nine posters have also been accepted for presentation at the Workshop. The Workshop starts from a tutorial day (June 11):

- “Probabilistic prediction: Venn-ABERS prediction” (Paolo Toccaceli);
- “Introduction to Conformal Prediction” (Lars Carlsson);
- “Conformal Instance Transfer” (Shuang Zhou).

As a part of COPA 2018 programme, one of the most world-renowned computer scientists, Vladimir Vapnik, will be honoured to deliver the University of London Kolmogorov Lecture “Rethinking Statistical Learning Theory: Learning Using Statistical Invariants” and will receive the Kolmogorov Medal on 11 June 2018. The Kolmogorov lecture was launched by the Centre for Machine Learning (CLRC) at Royal Holloway, University of London. The Centre celebrates 20th anniversary this year and comprises leading researchers in the field of predictive learning algorithms used in pattern recognition, machine intelligence and many other data science applications. This year the Kolmogorov lecture is organised in a cooperation with the Department of Data Science and Knowledge Engineering, Maastricht University. An invitation to give a Kolmogorov Lecture acknowledges life-long research contributions to one of the fields initiated or transformed by Kolmogorov. Past lecturers range from the late Professor Ray Solomonoff, the inventor of algorithmic probability and founder of algorithmic information theory (2003) to Professor Robert Merton, 1997 Nobel Prizewinner (2010).

To complete the picture, there is also one invited talk by Peter Grunwald on “Safe Testing”.

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