Statistical Learning - module III

PhD in Economics and Statistics, University of Milano-Bicocca

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Schedule

| Day 1 | November 29, 2021 | 10:00 - 12:00, 14:00 - 16:00 (4 hours) |
| Day 2 | November 30, 2021 | 10:00 - 12:00, 14:00 - 16:00 (4 hours) |

Program

Conformal prediction (day 1)

While improving prediction accuracy has been the focus of machine learning in recent years, this alone does not suffice for reliable decision-making. Deploying learning systems in consequential settings also requires calibrating and communicating the *uncertainty* of predictions.

We will introduce a recent line of work called distribution-free predictive inference (a.k.a. *conformal prediction*) that give prediction intervals with finite-sample statistical guarantees for any (possibly incorrectly specified) predictive model and any (unknown) underlying distribution of the data, ensuring reliable uncertainty quantification for predictions.

Main references:

- Lei, G'Sell, Rinaldo, Tibshirani, Wasserman (2018). Distribution-free predictive inference for regression. JASA, 113:1094-1111.

- Barber, Candes, Ramdas, Tibshirani (2021). Predictive inference with the jackknife+. The Annals of Statistics, 49:486–507.

- Tutorials and videos.

Variable selection with statistical guarantees (day 2)

In many fields of science, we observe a response variable together with a large number of potential explanatory variables, and we would like to be able to discover which predictors are important for the response.

We will introduce a recent set of methods that allow to identify the truly important predictors with rigorous statistical guarantees.

Main references:

- Dezeure, Buhlmann, Meier, Meinshausen (2015). High dimensional inference: Confidence intervals, p-values and r-software hdi. Statistical Science, 533–558.

- Meinshausen, Buhlmann (2010). Stability selection. JRSS-B, 72:417-473.

- Barber, Candès (2015). Controlling the false discovery rate via knockoffs. The Annals of Statistics, 43, 2055–2085.