PhD program in Statistics

DSS Statistics Seminar

October 22, 2024, 12:00

In person **Room 34 (CU002)**

Webinar **https://uniroma1.zoom.us/j/86881977368?pwd=SWRFcVFjMDZTa0lXZk05TE1zNm5adz09**

Passcode: 432940

Online Multivariate Changepoint Detection: Leveraging Links With Computational Geometry

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The increasing volume of data streams poses significant computational challenges for detecting changepoints online. Likelihood-based methods are effective, but a naive sequential implementation becomes impractical online due to high computational costs. We develop an online algorithm that exactly calculates the likelihood ratio test for a single changepoint in p-dimensional data streams by leveraging fascinating connections with computational geometry. This connection straightforwardly allows us to recover sparse likelihood ratio statistics exactly: that is assuming only a subset of the dimensions are changing. Our algorithm is straightforward, fast, and apparently quasi-linear. A dyadic variant of our algorithm is provably quasi-linear, being $O_p(n\log(n)^{p+1})$ for n data points and p less than 3, but slower in practice. These algorithms are computationally impractical when p is larger than 5, and we provide an approximate algorithm suitable for such p which is $O_p(n\tilde{p}\log(n)^{\tilde{p}+1})$, for some user-specified $\tilde{p} \leq 5$. We derive some statistical guarantees for the proposed procedures in the Gaussian case, and confirm the good computational and statistical performance, and usefulness, of the algorithms on both empirical data and on NBA data.

Joint work with Liudmila Pishchagina, Gaetano Romano, Paul Fearnhead and Vincent Runge.
Link-arxiv : https://arxiv.org/abs/2311.01174

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