Shape constraint free two-sample contamination model testing

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Abstract: In this talk, we will present new results about the contamination model (two-component mixture with one known component) testing in the two sample case. This type of model is of particular interest when a known random phenomenon is contaminated by an unknown random effect. We propose in this setup to compare the unknown random sources involved in two separate samples. For this purpose, we introduce the so-called IBM (Inversion-Best Matching) approach resulting in a relaxed semiparametric Cramer-von Mises type two-sample test requiring very minimal assumptions (shape constraint free) about the unknown distributions. The accomplishment of our work lies in the fact that we establish a functional central limit theorem on the proportion parameters along with the unknown cumulative distribution functions of the model when Patra and Sen (JRSS B, 2016) prove that the asymptotic normality cannot be achieved on these quantities in the basic one-sample case. An intensive numerical study is carried out from a large range of simulation setups to illustrate the asymptotic properties of our test. Finally, our testing procedure is applied to a real-life application through pairwise post-covid mortality effect testing across a panel of European countries.

Keywords:
finite mixture model, semiparametric estimation, Cramer-von Mises, mortality.