Department of Decision Sciences

Statistics Seminar

Testing uniformity on high-dimensional spheres against rotationally symmetric alternatives

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Abstract

We consider the problem of testing uniformity on high-dimensional unit spheres. We are primarily interested in non-null issues. We show that rotationally symmetric alternatives lead to two Local Asymptotic Normality (LAN) structures. The first one is for fixed modal location theta and allows to derive locally asymptotically most powerful tests under specified theta. The second one, that addresses the Fisher-von Mises-Langevin (FvML) case, relates to the unspecified-\heta problem and shows that the high-dimensional Rayleigh test is locally asymptotically most powerful invariant. Under mild assumptions, we derive the asymptotic non-null distribution of this test, which allows to extend away from the FvML case the asymptotic powers obtained there from Le Cam's third lemma. Throughout, we allow the dimension p to go to infinity in an arbitrary way as a function of the sample size n. Some of our results also strengthen the local optimality properties of the Rayleigh test in low dimensions. We perform a Monte Carlo study to illustrate our asymptotic results. Finally, we treat an application related to testing for sphericity in high dimensions.

Joint work with Christine Cutting and Thomas Verdebout

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