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A PARADOXICAL EFFECT OF NUISANCE PARAMETERS AND GEOMETRY OF ESTIMATING FUNCTIONS

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In a parametric statistical model with nuisance parameters, the asymptotic variance of the maximum likelihood estimator for a parameter of interest becomes larger when the nuisance parameters are unknown (and estimated) than when they are known. However, in a certain kind of statistical models (especially semi-parametric models), estimating nuisance parameters provides smaller asymptotic variances if a method other than the maximum likelihood estimation is used to estimate a parameter of interest. In this talk, we explain this paradoxical phenomenon by using geometry of estimating functions. The key idea is to represent the asymptotic variances of the estimators in terms of the projections of the score functions onto the linear space spanned by the estimating function, which we call projected estimating functions. The projected estimating function is a dual concept of the influence function, which is more popular to represent the asymptotic variance. However, this concept is more suitable to clarify the structure of the above paradoxical phenomenon.