

Fisher and Wilks expansions and their applications to statistical inference

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This course revisits two prominent results in classical parametric statistics: Fisher and Wilks Theorems.

The Fisher Theorem describes the asymptotic behaviour of the maximum likelihood estimator (MLE), while the Wilks results is about the likelihood ratio test statistic (excess). We show how asymptotic statements can be replaced by non-asymptotic expansions. These expansions can be used for addressing several issues important for statistical inference: limited sample size, large parameter dimension, model misspecification.

The results are illustrated on particular statistical models including linear, generalised linear, median, and quantile regression, i.i.d. sample, conditional-moment-restriction estimation.

Then we present two general applications of the Fisher and Wilks expansions: in Bayesian setup for obtaining the Bernstein-von Mises Theorem, and in resampling methods for justifying the consistency of the multiplier bootstrap.