Electrical Engineering Seminar

"Finite Sample Size Optimality of GLR Tests"

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Abstract

In binary hypothesis testing, when hypotheses are composite or the corresponding data pdfs contain unknown parameters, the generalized likelihood ratio test (GLRT) constitutes a popular means for deciding between the two possibilities. GLRT has the very interesting characteristic of performing simultaneous detection and estimation in the case of parameterized pdfs or combined detection and isolation in the case of composite hypotheses. Even though this test is known for years and has been the decision tool in numerous applications, existing results demonstrate only large sample size asymptotic optimality. In our presentation we introduce a novel, finite sample size detection/estimation formulation for the problem of hypothesis testing with unknown parameters and a corresponding detection/isolation setup for the case of composite hypotheses. The optimum test that results from our performance measure optimization has a GLRT-like structure which is closely related to the criterion we employ for the parameter estimation or isolation part. When this criterion is selected in a very specific manner, we recover the classical GLRT of the literature, while we obtain interesting novel tests with alternative criteria. Our mathematical derivations are surprisingly simple considering that they solve a problem that has been open for more than half a century.

Bio

George V. Moustakides was born in Greece. He obtained the diploma in Electrical and Mechanical Engineering from the National Technical University of Athens in 1978, the MSc in Systems Engineering from UPENN in 1980 and the PhD in Electrical Engineering and Computer Science from Princeton University in 1983. From 1983 to 1986 he held a research position with INRIA, France and from 1988 to 1991 a research position with the Computer Technology Institute of Patras, Greece. Since 1991 he has been a faculty member with the University of Patras, Greece. His research focuses on various problems in Statistical Signal Processing, Sequential Detection and Signal Processing for Hearing Aids.