

Simultaneous Learning of Fitting Surface and Noise Distribution from Large Data Sets

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Abstract: In this talk we address the problem of learning surfaces from large data sets subject to (possible large amounts of) noise. More precisely, we assume that the surface is described by the zero set of a function belonging to the set spanned by a given basis. Moreover, it is assumed that the noise is iid and its distribution is known up to some parameters. An example of this is noise uniformly distributed over a symmetric interval, but the bounds are not known a priori. Under these two assumptions, we show that the estimation of the function whose zero set describes the surface can be computed by determining the null space of a matrix M that can be efficiently approximated from the available data. Also, we show that the noise parameters can be determined by searching for the values that result in the matrix M mentioned above being singular. Moreover, we show that, as the number of data points tend to infinity, we recuperate the desired surface and the true noise parameters. Numerical results are provided showing the effectiveness of the proposed approach.

Constantino M. Lagoa (Member, IEEE) received the Ph.D. degree from the University of Wisconsin at Madison, Wisconsin, WI, USA, in 1998. He joined the Electrical Engineering Department of Pennsylvania State University, University Park, PA, USA, in August 1998, where he currently holds the position of a Professor. His research interests include robust optimization and control, chance constrained optimization, controller design under risk specifications, system identification and control of computer networks. Dr. Lagoa was as Associate Editor for IEEE Transactions on Automatic Control (2012–2017) and IEEE Transactions on Control systems Technology (2009–2013) and is currently the Associate Editor for Automatica.

