

Talk ICICSP 2022

September 17, 2022

Title: Misspecified lower bounds and its application to inference problems with Complex Elliptically Symmetric distributed data.

Abstract:

Inferring information from a set of acquired data is the main objective of any signal processing (SP) method. Developing an estimation algorithm often begins by assuming a statistical model for the measured data, i.e., a set of probability density functions (pdfs), which, if correct, fully characterizes the behaviour of the collected data/measurements. However, a certain amount of mismatch between the true and the assumed data model is often inevitable in practice, leading to the *model misspecification* problem.

The first part of the talk provides a comprehensive overview of the misspecified estimation framework with a particular focus on the Misspecified Cramér-Rao bound (MCRB). Misspecified bounds generalize the classical bounds on the Mean Squared Error (MSE) by allowing the true, but possibly unknown, data model and the model assumed to derive the estimator of the parameter vector to differ, yet establishing performance limits in a way that makes the SP practitioner aware of the potential losses due to the model misspecification. In the second part of the talk, to show an application of the theoretical findings, an inference problem in Complex Elliptically Symmetric (CES) distributed data will be analysed: the covariance matrix estimation for adaptive radar detection in heavy-tailed disturbance.

Fulvio Gini – short bio



Fulvio Gini (Fellow IEEE) received the Doctor Engineer (cum laude) and the Research Doctor degrees in electronic engineering from the University of Pisa, Italy, in 1990 and 1995 respectively. In 1993 he joined the Department of Ingegneria dell'Informazione of the University of Pisa, where he became Associate Professor in 2000 and he is Full Professor since 2006. Prof. Gini is the Deputy Head of the Department since November 2016. From July 1996 through January 1997, he was a visiting researcher at the Department of Electrical

Engineering, University of Virginia, Charlottesville. He is an Associate Editor for the IEEE Transactions on Aerospace and Electronic Systems (AES) (2007-present) and the Elsevier Signal Processing journal (2006-present). He is the Specialty Chief Editor for the "Radar Signal Processing" section of the journals *Frontiers in Signal Processing* (2021-present). He has been AE for the Transactions on Signal Processing (2000–06) and a Senior AE of the same Transaction (2016-17). He was a Member of the EURASIP JASP Editorial Board (2003-09). He was the Area Editor for the Special issues of the IEEE Signal Processing Magazine (2012-14). He was co-recipient of the 2001 and 2012 IEEE AES Society's Barry Carlton Award for Best Paper published in the IEEE Transactions on AES and co-recipient of the 2020 EURASIP JASP Best Paper Award. He was recipient of the 2022 IEEE AESS Warren White Award for Excellence in Radar Engineering, the 2020 EURASIP Meritorious Service Award, the 2003 IEE Achievement Award, and the 2003 IEEE AES Society Nathanson Award to the Young Engineer of the Year. He is the IEEE AES Society Awards Chair. He was Member of the IEEE AES Society Radar System Panel (2008-2020), member of the IEEE AES Society Board of Governors (BoG) (2017-2022) and member of the IEEE Signal Processing Society BoG (2021-2023). He was a member of the IEEE SPS Awards Board (2016-2018) and of the IEEE SPS Conference Board (2019-2020). He has been a Member of the Signal Processing Theory and Methods (SPTM) Technical Committee (TC) of the IEEE Signal Processing Society and of the Sensor Array and Multichannel (SAM) TC for many years. He is a member of the IEEE TAB Awards and Recognition Committee (TABARC) (2020-2021). He was a Member of the Board of Directors (BoD) of the EURASIP Society, the EURASIP Award Chair (2006-2012) and the EURASIP President (2013-2016). He was the General co-Chair of the 2020 IEEE Radar Conference, Florence (Italy). He was the Technical co-Chair of the 2006 EURASIP Signal and Image Processing Conference (EUSIPCO 2006), Florence (Italy), of the 2008 Radar Conference, Rome (Italy), and of the 2015 IEEE CAMSAP workshop, Cancun (Mexico). He was the General co-Chair of the 2nd Workshop on Cognitive Information Processing (CIP2010), of the 2014 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP 2014), and of the 2nd, 3rd and 4th editions of the workshop on Compressive Sensing in Radar (CoSeRa). He was the Section Editor for the "Radar Signal Processing" section, Vol. 3 of the *Academic Press Library in Signal Processing*, S. Theodoridis and R. Chellappa editors, Elsevier Ltd, 2013. He was the guest co-editor of two special sections of the Journal of the IEEE SP Society on Special Topics in Signal Processing, one on "Adaptive Waveform Design for Agile Sensing and Communication" (2007) and the other on "Advanced Signal Processing for Time/Frequency Modulated Arrays" (2017), guest editor of the special section of the IEEE Signal Processing Magazine on "Knowledge Based Systems for Adaptive Radar Detection, Tracking and Classification" (2006), guest co-editor of the two special issues of the EURASIP Signal Processing journal on "New trends and findings in antenna array processing for radar" (2004) and on "Advances in Sensor Array Processing (in memory of Alex Gershman)" (2013). He is co-editor and author of the book "Knowledge Based Radar Detection, Tracking and

Classification" (2008) and of the book "Waveform Diversity and Design" (2012). He authored or co-authored 11 book chapters, 150 journal papers, 175 conference papers, and 2 national patents (under approval). H-index: 49, 9415 citations (source: Google Scholar).