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Inverse problems in Mass Spectrometry and Bayesian solutions

There have been recent advances in different techniques of Mass spectrometry. However, in many of these techniques there are common mathematical framework: Inverse problems. In this work, a few of these inverse problems are presented and an overview of the methods to handle them is given. The Bayesian inference approach is a very useful approach to handle these problems as it give the possibility to account both for prior modeling of the signals and images and for the uncertainly associated to the measurement process. It also gives the necessary tools to estimate the hyper parameters and the remaining uncertainties in the proposed solution. To illustrate this, we take the deconvolution problem which is one of the main inverse problems in mass spectrometry and go through the different regularization and Bayesian inference methods and compare their relative performances.

Biography

Ali Mohammad-Djafari received the B.Sc. degree in electrical engineering from Polytechnic of Teheran, in 1975, the diploma degree (M.Sc.) from Ecole Supérieure d'Electricit(SUPELEC), Gif sur Yvette, France, in 1977, the "Docteur-Ingénieur" (Ph.D.) degree and "Doctorat d'Etat" in Physics, from the University of Paris Sud 11 (UPS), Orsay, France, respectively in 1981 and 1987. Presently, he is "Directeur de recherche" at CNRS, France and his main scientific interests are in developing new probabilistic methods based on Bayesian inference, Information Theory and Maximum Entropy approaches for Inverse Problems in general in all aspects of data processing, and more specifically in imaging and vision systems: image reconstruction, signal and image deconvolution, blind source separation, sources localization, data fusion, multi and hyper spectral image segmentation. The main application domains of his interests are Medical imaging, Computed Tomography (X rays, PET, SPECT, MRI, microwave, ultrasound and eddy current imaging) either for medical imaging or for Non Destructive Testing (NDT) in industry, multivariate and multi dimensional data, space-time signal and image processing, data mining, clustering, classification and machine learning methods for biological or medical applications. He has supervised more than 20 Ph.D. Thesis, more than 20 Post-doc research activities and more than 50 M.Sc. Student research projects. He has more than 60 full journal papers and more than 300 papers in national and international conferences.

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