

Advanced Estimation Methods For Radio-Astronomy: Calibration & Inverse problems

Conditions:

- An outstanding and highly motivated candidate is solicited in the SATIE laboratory of ENS Cachan and signals and system laboratory (L2S) of Paris XI University-SUPELEC for a 5 to 6 months internship.
- Students at the M.Sc., M. Eng., Master (or equivalent) level with background in signal processing, probability, statistics, or information theory are encouraged to apply. Good mathematical background is required. Above all, the applicants must be motivated to learn quickly and work effectively on challenging research problems.

Application process:

Please send your CV, transcripts of grades with qualifications and pertinent information, **as soon as possible**, to Prof. P. Larzabal (pascal.larzabal@satie.ens-cachan.fr), Dr./HDR R. Boyer (remy.boyer@lss.supelec.fr) and Dr. M. N. El Korso (m.elkorso@u-paris10.fr)

Short description of the internship:

This internship concerns the calibration and imaging in the radio-astronomy context. Future astronomical instruments will be constituted of a largely distributed sensor arrays with a hierarchy of phased array elements. In order to provide meaningful images for such arrays, accurate calibration is of critical importance. Calibration must solve the unknown antenna gains and phases as well as the unknown atmospheric and ionospheric disturbances. Furthermore, future telescopes will have a large number of elements and a large field of view. Consequently, such parameters are strongly direction-dependent, resulting in a large number of unknown nuisance parameters. All this makes calibration a daunting parameter estimation task for which the existing methods are ineffective. In this internship, we will overcome this drawback by designing advanced statistical robust algorithms based on probabilistic modeling which can marginalize the unknown nuisance parameter. Finally, the specificity of the above problem requires a performance analysis of the proposed calibration schemes in the context of large data.

This internship is a part of the ANR MAGELLAN and the mastodons/display CNRS projects (with collaboration with LTCI TelecomParisTech and Lagrange Nice-Université laboratories). Depending on the motivation of the candidate, a Ph.D. thesis pursuit can be envisaged.

References:

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- [8] S. J. Wijnholds and A. V. D. Veen, "Multisource self-calibration for sensor arrays", *IEEE Trans. Signal Processing*, vol. 57, pp. 3512-3522, Sep. 2009.