Research internship proposal (2016-2017)

We offer a 5-6 month internship for the last semester of an M.Sc student. The internship will take place in the LISIC lab, located in Calais, on the Opal Coast (https://en.wikipedia.org/wiki/C%C3%B4te_d%27Opale), nearby Great Britain and Belgium.

Title: Learning the calibration model and parameters of a mobile sensor network from data collected using mobile crowdsensing

Abstract: Mobile crowdsensing consists of acquiring a large amount of data provided by numerous sensors from connected to smartphones. A sensor typically converts a physical input to a voltage or an intensity. Estimating the physical input from the electrical sensor output is only possible if the sensor calibration model and their parameters are known. Those are usually estimated in a laboratory, by inferring several sensor outputs from the inputs in a controlled environment.

In the mobile crowdsensing framework, it is not possible to perform the calibration of the numerous sensors in a laboratory. Performing calibration in the wild, without a controlled environment, is named blind sensor calibration [1]. We recently proposed such calibration techniques for an homogeneous network of mobile sensors. In particular, we revisited the calibration problem as an informed matrix factorization with missing entries [2-4]. In our formalism, the matrix factors contain the structure of the considered calibration function (i.e., the calibration model assumed to be similar for each sensor of the network) and the calibration parameters associated to each sensor, respectively. Our proposed sensor calibration formalism is thus similar to many problems met in Signal Processing and in Machine Learning, e.g., inpainting [5], matrix completion [6], or collaborative filtering [7].

In the framework of this internship, we propose to extend our previous work in order to blindly calibrate an heterogeneous sensor network, i.e., with different calibration models according to sensors. The proposed method(s) will be using a matrix factorization formalism with additional specific constraints.

The internship might be followed by a Ph.D. thesis, in the field of matrix factorization (subject to obtaining some funding: this will be defined during the internship).

References:

Requested skills: We are looking for a curious student with excellent programming skills (e.g., in Matlab, Python, or C/C++). The candidate must have some strong background in computer science (e.g., signal processing, machine learning), applied maths, or any field related with the proposed subject.

Advisors: Matthieu PUIGT, Clément DORFFER, Gilles DELMAIRE, Gilles ROUSSEL

E-mail: For more information, please write to Firstname.LASTNAME@univ-littoral.fr, where Firstname and LASTNAME should be replaced by the name of the advisors (e.g., matthieu.puigt).

To apply: please send to Matthieu PUIGT a resume, a cover letter, and transcripts of M1 and M2 years. Recommendation letters (or at least a list of references) will be appreciated.