Guidelines for Student Reports

BAYESIAN COMPESSIVE SENSING-BASED STRATEGIES FOR BIOMEDICAL APPLICATIONS

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Abstract

Compressive Sensing (CS) techniques, recently developed in signal processing field, allow to obtain a reliable reconstruction of high resolution signals using a number of measurements extremely lower than the number predicted by the well-known Nyquist-Shannon theorem. CS techniques have been already successfully applied to many practical problems like radar and audio/video compression. More recently, the Compressive Sensing (CS) paradigm has been employed to develop new strategies for imaging sparse scatterers at microwave and optical frequencies exploiting the Born approximation, the Rytov approximation, and the Contrast Source formulation in order to obtain a linear dependency of the unknowns to the collected data, with appreciable results.

This project is aimed to develop Bayesian Compressive Sampling (BCS)-based strategies for biomedical applications. The a-priori knowledge concerning the unperturbed biological structure will be exploited in the inversion process, so that the object to be detected will be only a defect in an otherwise known object (as for example, a malignant tissue inside a tomographic cross section of a human thorax). By means of the definition of a suitable inhomogeneous Green's function, the problem will be recast as the retrieval of the (only few) non-zero coefficients related to a set of suitable basis functions that model the unknown object.

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