



# Exploitation of Sparsity for Hyperspectral Target Detection

Soutenance de thèse – Ahmad BITAR (SONDRA/CentraleSupélec)

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Salle F306 à CentraleSupélec (Bâtiment Bréguet)

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## Résumé

The title of this PhD thesis contains three keywords: sparsity, hyperspectral image, and target detection. Sparsity is a word that is used everywhere and in everyday life. It generally means “small in number or amount, often spread over a large area”. A hyperspectral image is a three dimensional data cube consisting of a series of images of the same spatial scene in a contiguous and multiple narrow spectral wavelength (color) bands. With the rich information afforded by the high spectral dimensionality, target detection is not surprisingly one of the most important applications in hyperspectral imagery. The main objective of this PhD thesis is to answer the question “How and Why can sparsity be exploited for hyperspectral target detection?”. Answering this question has allowed us to develop different target detection contributions that mainly take into consideration 1) the heterogeneity of the environment, 2) the fact that the total image area of all the targets is very small relative to the whole image, 3) and the estimation challenge of the covariance matrix (surrounding the test pixel) in large dimensions. The proposed contributions are evaluated on both synthetic and real experiments, the results of which demonstrate their effectiveness for hyperspectral target detection.