Interferometric Phase Image Estimation via Sparse Coding in the Complex Domain

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In this talk I will address interferometric phase image estimation -- that is, the estimation of phase modulo-2π images from sinusoidal 2π-periodic and noisy observations. These degradation mechanisms make interferometric phase image estimation a quite challenging problem. We tackle this challenge by reformulating the original estimation problem as a sparse regression in the complex domain. Following the standard procedure in patch-based image restoration, the image is partitioned into small overlapped square patches and the vector corresponding to each patch is modeled as a sparse linear combination of vectors, termed atoms, taken from a set called dictionary. Aiming at optimal sparse representations, and thus at optimal noise removing capabilities, the dictionary is learned from the data it represents via matrix factorization with sparsity constraints on the code ({\em i.e.}, the regression coefficients) enforced by the ℓ_1 norm. The effectiveness of the new sparse coding based approach to interferometric phase estimation, termed SpInPHASE, is illustrated in a series of experiments with simulated and real data.