Subspace-based Dimension Reduction via Polynomials

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In this largely theory-centric poster we explore how polynomials can facilitate subspace-based dimension reduction. Unlike standard methods for sensitivity analysis—i.e., ANOVA decompositions and the related Sobol' indices—subspace-based techniques seek to find linear combinations of the input parameters along which the output quantity of interest varies the most. There are parallels between this idea, ridge functions and projection pursuit regression.

In this poster, two key ideas are explored: (i) finding "active subspaces" using global polynomial approximations; (ii) using variable projection techniques from polynomial least squares for finding dimension reducing subspaces. Results on sample analytical problems are presented.