Multi-Class Function Approximation and Applications

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We generalize a function approximation problem introducing several admissible classes of functions in Reproducing Kernel Hilbert (Banach) spaces. Corresponding algorithms are developed, which adaptively cluster data points to clusters such that each cluster is approximated by the best function from the best admissible class. The described problem can be considered as a generalization and a new approach to some basic problems in applied mathematics such as:

    1) Non-linear least square problem,

    2) Support vector kernel regression in machine learning,

    3) Principal Component Analysis,

    4) Blind signal separation problems and sparse representation of signals (Sparse Component Analysis, Independent Component Analysis, Non-Negative Matrix Factorization),

    5) Subspace Clustering,

    6) Manifold learning

We will give a brief overview of these topics, together with an overview of the kernel methods involved, and give research problems potentially of interest for collaborative research.