Shape Constraints Meet Kernel Machines*

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Abstract

Shape constraints (such as non-negativity, monotonicity, convexity, or supermodularity) provide a principled way to encode prior information in predictive models with numerous successful applications in econometrics, finance, biology, reinforcement learning, and game theory. Incorporating this side information in a hard way (for instance at all point of an interval) however is an extremely challenging problem. In this talk I am going present a unified and modular convex optimization framework to encode hard affine constraints on function values and derivatives into the flexible class of reproducing kernel Hilbert spaces. The efficiency of the technique is illustrated in the context of joint quantile regression (analysis of aircraft departures), convoy localization and safety-critical control (piloting an underwater vehicle while avoiding obstacles).

Papers: real-valued output, vector-valued output.

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