$L^1$-Optimal Splines for Outlier Rejection

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In this presentation, we consider control theoretic splines with $L^1$ optimization for rejecting outliers in data. Control theoretic splines are either interpolating or smoothing splines, depending on a cost function with a constraint defined by linear differential equations. Control theoretic splines are effective for Gaussian noise in data since the estimation is based on $L^2$ optimization. However, in practice, there may be outliers in data, which may occur with vanishingly small probability under the Gaussian assumption of noise, to which $L^2$-optimized splines may be very sensitive. To achieve robustness against outliers, we propose to use $L^1$ optimality, which is also used in support vector regression. A numerical example shows the effectiveness of the proposed method.

**Key Words:** Smoothing splines, control theoretic splines, outlier rejection, $L^1$ optimization, support vector regression