Cross-validation-free Cramer-von Mises nonparametric smoothing

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Abstract: The usual form of nonparametric smoothing involves a least-squares term and a roughness penalty, with the roughness coefficient determined retrospectively by cross-validation, based on minimising mean-squared error. However, a naive approach to testing for the correct degree of smoothing leads to a Cramer-von Mises type of criterion, which turns out to be related to both the least-squares and the roughness terms in the original formulation. This suggests a statistical way of choosing the roughness coefficient, which, fortuitously, has reliable computational properties, and which avoids the need for cross-validation.