Structural Risk Minimization

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Structural risk minimization (SRM) (Vapnik and Chervonenkis 1974) is an inductive principle for model selection used for learning from finite training data sets. It describes a general model of capacity control and provides a trade-off between hypothesis space complexity (the VC dimension of approximating functions) and the quality of fitting the training data (empirical error). The procedure is outlined below.

1. Using a priori knowledge of the domain, choose a class of functions, such as polynomials of degree n, neural networks having n hidden layer neurons, a set of splines with n nodes or fuzzy logic models having n rules.
2. Divide the class of functions into a hierarchy of nested subsets in order of increasing complexity. For example, polynomials of increasing degree.
3. Perform empirical risk minimization on each subset (this is essentially parameter selection).
4. Select the model in the series whose sum of empirical risk and VC confidence is minimal.

Figure 1 (page 2) gives a diagrammatic representation of SRM.

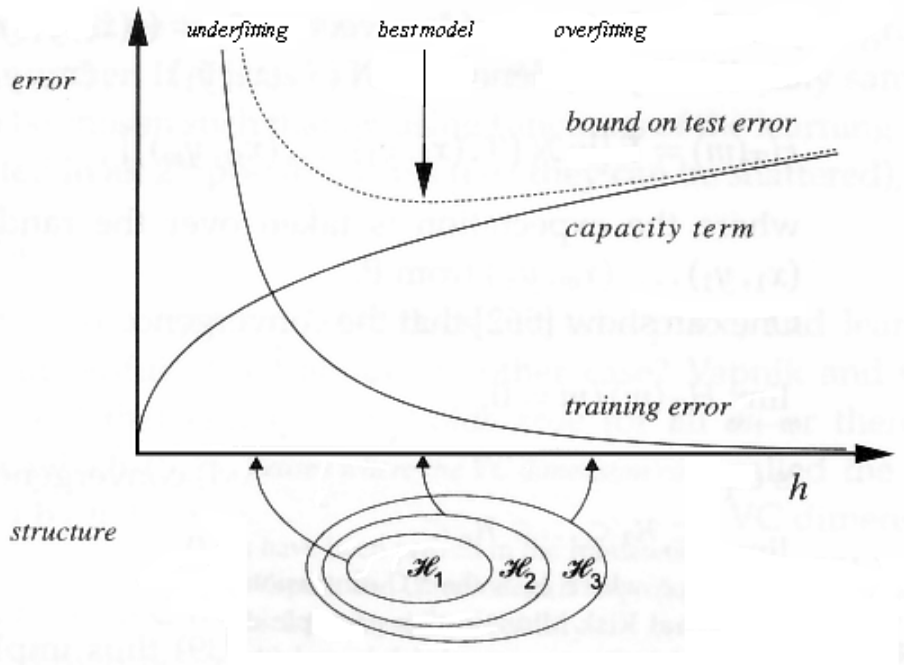

Figure 1: Structural risk minimization

References

VAPNIK, V. N., and A. Ya. CHERVONENKIS, 1974. *Teoriya Raspoznavaniya Obrazov: Statisticheskie Problemy Obucheniya. (Russian) [Theory of Pattern Recognition: Statistical Problems of Learning].* Moscow: Nauka.