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Fat-shattering and the learnability of real-valued functions. (English) [Zbl 0858.68076]

Summary: We consider the problem of learning real-valued functions from random examples when the
function values are corrupted with noise. With mild conditions on independent observation noise, we
provide characterizations of the learnability of a real-valued function class in terms of a generalization
of the Vapnik-Chervonenkis dimension, the fat-shattering function, introduced by Kearns and Schapire.
We show that, given some restrictions on the noise, a function class is learnable in our model if and only
if its fat-shattering function is finite. With different (also quite mild) restrictions, satisfied for example
by Gaussian noise, we show that a function class is learnable from polynomially many examples if and
only if its fat-shattering function grows polynomially. We prove analogous results in an agnostic setting,
where there is no assumption of an underlying function class.

MSC:
68T05 Learning and adaptive systems in artificial intelligence

Keywords:
learnability; Vapnik-Chervonenkis dimension

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