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# Nonasymptotic bounds on the $L_2$ error of neural network regression estimates

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**Abstract** The estimation of multivariate regression functions from bounded i.i.d. data is considered. The  $L_2$  error with integration with respect to the design measure is used as an error criterion. The distribution of the design is assumed to be concentrated on a finite set. Neural network estimates are defined by minimizing the empirical  $L_2$  risk over various sets of feedforward neural networks. Nonasymptotic bounds on the  $L_2$  error of these estimates are presented. The results imply that neural networks are able to adapt to additive regression functions and to regression functions which are a sum of ridge functions, and hence are able to circumvent the curse of dimensionality in these cases.

**Keywords** Neural networks · Nonparametric regression · Dimension reduction · Additive models · Curse of dimensionality