Minkowski-r Back-Propagation: Learning in Connectionist Models with Non-Euclidian Error Signals

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Abstract:

Many connectionist learning models are implemented using a gradient descent in a least squares error function of the output and

teacher signal. The present model Fneralizes. in particular. back-propagation [1] by using Minkowski-r power metrics. For small r's a "city-block"

error metric is approximated and for large r's the "maximum" or "supremum" metric is approached. while for r=2 the standard

back(cid:173) propagation model results. An implementation of Minkowski-r back-propagation is described. and several experiments are done which show that different

values of r may be desirable for various purposes. Different r values may be appropriate for the reduction of the

effects of outliers (noise). modeling the input space with more compact clusters. or modeling the statistics of a particular domain

more naturally or in a way that may be more perceptually or psychologically meaningful (e.g. speech or vision).