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Interval Neural Networks

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***Abstract*— Traditional neural networks use *patterns*, i.e., pairs of observation results $(\vec{x}^{(p)}, y_p)$, $1 \le p \le P$, to reconstruct the dependency $y(\vec{x})$. To determine the parameters of the approximation, a special version of the gradient descent method called *backpropagation* is normally used.**

In real life, observations are not precise; instead of a precise value y, after measuring y, we only have an *interval* $\mathbf{y} = [\tilde{y} - \Delta, \tilde{y} + \Delta]$ of possible values of y, where $\tilde{y}$ is the measurement result, and Δ is the accuracy of the measuring instrument. Similarly, instead of the precise values of inputs $\vec{x} = (x_1, ..., x_n)$, we only have intervals of possible values. So, the input data for extrapolation consists of *interval patterns* $(\vec{\mathbf{x}}^{(p)}, \mathbf{y}^{(p)})$.

We have designed and implemented an interval modification of backpropagation technique. Experimental and theoretical results will be presented in the talk.

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