

# ROBUST DECISION SUPPORT SYSTEMS WITH MATRIX FORECASTS AND SHARED LAYER PERCEPTRONS FOR FINANCE AND OTHER APPLICATIONS

*Completed Research Paper*

**Hans-Jörg von Mettenheim**  
Institut für Wirtschaftsinformatik  
Leibniz Universität Hannover  
Germany  
mettenheim@iwi.uni-hannover.de

**Michael H. Breitner**  
Institut für Wirtschaftsinformatik  
Leibniz Universität Hannover  
Germany  
breitner@iwi.uni-hannover.de

## **Abstract**

*The recent financial crisis showed the need for more robust decision support systems. In this paper, we introduce a novel type of recurrent artificial neural network, the shared layer perceptron, which allows forecasts that are robust by design. This is achieved by not over-fitting to a specific variable. An entire market is forecast. By training not one, but many networks, we obtain a distribution of outcomes. Further, multi-step forecasts are possible. Our system uses hidden states to model internal dynamics. This allows the network to build a memory and hardens it against external shocks. Using a single shared weight matrix offers the possibility of interpreting system output. An often cited disadvantage of neural networks, the black box character, is not an issue with our approach. We focus on two case studies: determining value at risk and transaction decision support. We also present other applications, including load forecast in electricity networks.*

**Keywords:** Decision Support Systems (DSS), Artificial Neural Networks, Financial Forecast