



## Applications of Neural Networks

Loan underwriting · Credit scoring · Credit card fraud detection  
Insurance underwriting · Reserves estimation · Investment prediction · Energy price prediction · Real estate appraisal  
Specimen identification · Protein sequencing · Tumor and tissue diagnosis · Heart attack diagnosis · New drug effectiveness · Missile targeting · Quality control and Six Sigma · Highway maintenance  
Telecommunication line fault detection · Prediction of air and sea currents · Air and water quality · Archaeological artifact identification and dating · Beer and wine flavor prediction · Identification of potential terrorists · Criminal behavior prediction

**Neural networks** are a newly proliferating technique in desktop quantitative analysis. Neural network software adds artificial intelligence to data analysis by using algorithms that imitate elementary brain cell functions to “learn” the structure of data; that is, to discern patterns in the data. The software can then use its new “knowledge” to predict the outcome of problems involving similar data. The computational process of a neural network is fully automated.

## Qualitative and Quantitative Analysis

Neural network software can be used to solve two basic kinds of problems: (1) classification problems in which the investigator is trying to determine in what category an unknown entity belongs, for instance, a certain medical condition or whether a borrower is likely to repay a loan; and (2) numeric problems in which the investigator needs to predict a specific numeric value, such as the age of a living organism or the level of sales during some future period.

## The Neural Networks Advantage

The difference between conventional problem solving by computer and neural network computing is that with conventional problem solving we make certain assumptions about the structure of our data, allowing us to use a relatively simple model of dependencies. However, our data often do not match the assumptions, resulting in inaccurate solutions. Neural networks are sophisticated systems with highly interconnected elements, capable of modeling complex relationships within data where conventional methods fail. The two approaches are not competing, but complement each other.

## More Than 60 Years of History

The term “neural network” refers to the brain cell called a neuron, because like its human counterpart, a computational neuron receives input from a number of sources and responds with a single output. Somewhat surprisingly, neural networks are not new, and not even recent. The first artificial neuron was proposed in 1943 by the neurophysiologist Warren McCulloch (University of Illinois, Chicago and MIT) and the logician Walter Pitts (MIT). But their invention did not find its purpose until the advent of high-speed computing.

## Real-World Applications

The current commercial and scientific environments in which computer systems harvest enormous bodies of data are ideal for the deployment of neural networks. The technique is accessible to many professionals who do not have high-level computing expertise. Neural network software is currently used in such applications as: the detection of fraud in credit card transactions, prediction of loan repayment, investment performance prediction, diagnosis of tumors, identification of unknown biological specimens, and prediction of products failing safety standards.