

## Chapter 37

# Using a Hybrid System Composed of Neural Networks and Genetic Algorithms for Financial Forecasting

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### ABSTRACT

*The possibility of applying artificial neural networks in different areas determined the discovery of more complex structures. This chapter describes the characteristic aspects of using a back-propagation neural network algorithm in making financial forecasting improved by a different technology: genetic algorithms. These can help build an automatic artificial neural network by two adaptive processes: first, genetic search through the data entry window, the forecast horizon, network architecture space, and control parameters to select the best performers; second, back propagation learning in individual networks to evaluate the selected architectures. Thus, network performance population increases from generation to generation. This chapter also presents how genetic algorithms can be used both to find the best network architecture and to find the right combination of inputs, the best prediction horizon and the most effective weight. Finally, this study shows how the results obtained using these technologies can be applied to obtain decision support systems that can lead to increased performance in economic activity and financial projections.*

### INTRODUCTION

In economic activity, the analysis is a tool used permanently. The analysis of different aspects of the activities is behind decision making process in any field. The amount of data that large or small organizations register using computer systems is very high. This makes very difficult the activity of analysis for economists or managers.

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For this reason there is a constant concern for finding software solutions that, by processing existing data provide support as efficiently as possible in decision making. These solutions are important, especially when decisions are made for a long time.

Economic activity is on the one hand determined and on the other hand influenced by a wide variety of factors. Depending on the evolution and their impact on the studied phenomenon can be formulated decisions. For this reason, a system that provides decision support should include all these aspects.

Data mining technologies are basic elements in data processing to perform economic forecasts. There are a variety of techniques provided by data mining but for economic forecasts, I will use artificial neural networks. They allow modeling data showing the evolution of a phenomenon or economic indicator in the form of time series. In addition, such a program should allow processing of large volume of data relating to economic activity so that they can support the person who manages it. To achieve this objective, after the analysis of database may be obtained knowledge. Knowledge represented in the knowledge base, form a synthesis element more easily understood by users.

Another aspect of the economic environment to be considered refers to its dynamics and permanent changes. It thus requires permanent access to the data appeared in analyzed field. Whether they are available, must be done the taking by the information system in real time, to provide an outcome as fair.

For any participant in economic activity, the dynamics of different phenomena or market indicators is essential. For this reason we need fast and efficient ways to conduct economic forecasts. An analysis technique is based on data for previous periods and can be achieved using neural networks. They have the ability to learn from the evolution of prices in a market, for example, to estimate their future values. But it is very difficult to effective conceive a neural network because of the “hidden” specific way of work. Thus, in neural network design can be used technology of genetic algorithms to get better results. Genetic algorithms can be used to find an optimal architecture for a neural network to design an optimal training algorithm control parameters and optimization.

## **Reasons for Using Hybrid Systems**

Preparation of data is followed by analyzing them in order to make a prediction. There are several methods that have been developed over time, based on mathematical or statistical calculations on the data and ending with modern methods resulted from research in artificial intelligence as: artificial neural networks, fuzzy logic, genetic algorithms. The reason to search for new methods is the trying to achieve more accurate predictions of processes of any kind. Help needed in any economic activity is to provide some answers or recommendations, and even in designing possible decisions.

The motivation of using intelligent hybrid systems is simple: although various intelligent techniques (neural networks, genetic algorithms, fuzzy logic, evolutionary computation, expert systems) offers encouraging results in solving problems with high degree of customization, complex problems can be solved through a single intelligent techniques. For example, neural networks are successfully used in making economic forecasts, but cannot provide an explanation regarding the decision.

To compare the performance of intelligent systems is necessary to define their properties. Knowledge acquisition represents a crucial stage in the development of intelligent systems. As a process, involves the interpretation and representation of knowledge for a specific area. In the case of expert systems, requires a long time, is expensive and sometimes unreliable. From this point of view, techniques such as neural networks or genetic algorithms that can learn directly from the input shook, have certain advantages.

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