Analysis of the time varying events of nature has been the focal point of research in various domains such as finance, engineering, weather, medicine, science and so on. The whole idea behind this analysis is to foretell future values of a certain variable, from past successive observations. Owing to the commercial applications and potential significant benefits, financial time series analysis is one of the most popular one. Analysis of future behavior of the financial time series data especially stock market data, as one of the core tasks of data mining is the focal point of this thesis. As is known, it is hard to forecast the future behavior of the financial time series data with respect to its fabulous rapid variations and complicated non-linear dimensionality. However, the benefits fascinated in accurate prediction have encouraged researchers for developing newer and advanced tools and models. In this research it is proposed to devise new methods in three different areas of financial time series analysis such as, stock index price prediction, volatility prediction and stock trading decision point prediction following stock index movement classification.

Primarily the research is focused on estimation of future stock price index in different prediction horizons using a low complexity neural network model along with different learning schemes. A hybrid learning framework called Self Adaptive Differential Harmony Search Based Optimized Extreme Learning Machine is proposed for two Single Hidden Layer Feed forward Networks to address the problem of short term and long term prediction of financial time series data like stock price and its volatility. Further the work is extended in modeling a Self Evolving Recurrent Neuro-Fuzzy Inference System so that the efficient prediction of dynamic time series values can be formulated as a function of getting output from the past input, output or both. A modified differential harmony search technique is also suggested for parameter estimation of the model.

As expected market return is highly related to predictable stock market volatility, so next integrated time series and Neuro-fuzzy models have been devised to measure the fluctuation in financial security price around its expected value that helps in reducing the investing risk in stocks. An innovative Fuzzy computationally efficient
EGARCH model is discussed in details how to enhance the ability of time series model in forecasting return volatility by integrating it with reasoning of fuzzy inference system and functional expansion, learning component of a neural network. The Differential Evolution algorithm is used for parameter adaptation of the fuzzy time series model. Further an extension of the fuzzy computationally efficient EGARCH model is discussed by applying interval type2 fuzzy sets in antecedent part of the model. The model performance is observed with two membership functions i.e. Gaussian with fixed mean, uncertain variance and Gaussian with fixed variance and uncertain mean. Again a Differential Harmony Search algorithm is applied to estimate the parameters of the proposed methodology.

Lastly for improving the investment decision of when and how many stocks to sell or buy, depending on results of prediction system, a trend analysis has been done using an efficient time frequency approach. A classification model using the computationally efficient functional link artificial neural network with extreme learning machine is proposed for classifying the stock price index movements as up and down movements. Later the work is extended for generating the stock trading decisions. The output from the computationally efficient functional link artificial neural network model is transformed in to a simple trading strategy with buy, hold and sells signals using suitable rules.

The parameters of the developed models have been optimized using new globally optimized evolutionary techniques and then the performance of the models is evaluated using a few error metrics. To realize a suitable model in a particular field, a comparative method has been adopted by considering other efficient models used in the literature. The goal is to improve the accuracy of the analysis by developing more robust dynamic models in different applications of financial data mining.