1. INTRODUCTION

The stock market runs two economic and finance functions [1]. Technical analysis is a finance technique to predicting the trend in stock market [2]. In a journal by Osman and his coworkers, fundamental and technical analyses were the methods that used to predict stock prices and Artificial Neural Networks are the most common techniques in predicting stock prices [3]. On predicting the trend of market stock in a short time, technical analysis were use in this conditions [2]. Several technical indicators are used to get the accurate predictions on technical analysis [4]. Ten main indicator tools are being popular to use in the technical analysis, according to the journal by Nuraini (2015) [5].

The decision-making for financial investment is very crucial in practice, and it becomes interesting in the research field of computational finance. Several computational approaches have been developed to support the decision in a trading strategy: predicting stock price using the model of time series analysis, finding the hidden market regimes for a given stock price defined as observable states using the statistical method called Hidden Market Model (HMM) [6], and even the application of deep learning for image processing was applied in finance field by the research works as in [7] and [8] to detect the candlestick patters from a given candlestick image. Candlestick patterns are commonly used by analysts for future trends prediction to support investment decision making. Although its formation and the shapes are revealed in the literature, the ambiguity and misreading are very likely to occur since the description is actually a natural language. This makes difficult to be adopted in computational analysis. There are more than a hundred known candlestick patterns, and several research studies tried to establish the definition of the patterns to be more comprehensive. One of the works is [9] that formulated the formal specification of these patterns in first logic order representation. The formulation such as [9] is helpful for computation purposes, to identify the pattern formally from the structure of the candlestick data, base on the recent condition. The classification of candlestick patterns has been researched in [7] by a visual approach using two steps to recognize the pattern from candlestick images, consists of the method called Gramian Angular field (GAF) to detect data time series in the images. Next step is applied the Convolutional Neural Network (CNN) to classify the critical structure of candlestick patterns. Another work of [8] also used CNN to identify the market movement from a given dataset of candlestick pattern images. The learning model was developed from the images generated by some formal rule formulation of candlestick based on historical data, then used to predict the movement in the next day.

In this work, ANN is used to predict the candlestick pattern from the given information of the technical indicators obtained from the market stocks. And then, the trading strategy such as buying or selling the stock is generated by categorical trends characterized from candlestick patterns. The idea to use the information base on technical indicators to predict the candlestick pattern is a novelty in this research. Moreover, since it is included only numerical data for the input, the data preparation becomes simpler and more efficient computationally. The chosen stocks in this study based on stock clustering for IDX stocks refer to the work [10] that performed a clustering algorithm for portfolio investment diversification. In this study, several scenarios of a given period are performed. Once the model is generated using ANN for a certain time period that has already been set up, some data validation is inputted into the model to obtain the prediction of the candlestick pattern and then determine the trading strategy based on the obtained patterns. On evaluating the model performances, the measurement from the confusion matrix is used. Also, we implemented the K-Fold Cross Validation to check the dependency and performances of the model that generates.