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**Machine Learning in Trading**

**Abstract**

**Garbage**

Some of the methods of Machine Learning that we will look through are:

1. Decision Trees
2. Neural-Networks
3. K-NN Clustering
4. Sentiment Analysis

Machine Learning (ML) offers a solution

But there is hope. As I’ve mentioned before, Machine Learning is a rapidly growing field and there is heavy investment into Machine Learning techniques for trading. The purpose of this literature review is to summarize, what has been done, what works, what doesn’t, and where we can go further in applying Machine Learning to Trading. In addition, we will review current techniques used in modern day trading and compare its effectiveness with Machine Learning techniques.

**1. Introduction**

The importance of information in trading is a well-known fact. Traders profit from informational inefficiencies in the market and inaccurate judgement of others to outperform the market’s overall growth (Malkiel 59). Therefore, it is vital for traders to obtain information rapidly, understand it, and then make correct decisions. Fortunately, for the most part obtaining information is much easier and quicker than before, so the challenge lies in the latter two.

Traders understands this and have started considering Machine Learning (ML). At its core, ML is a set of algorithms and mathematical techniques employed by a computer to learn and model a system with a large set of data. From the data, the computer extracts rules, patterns, and concepts, to make surprisingly accurate predictions. The only catch, is sufficient data must be provided, which is not a problem. In 2012, IBM recorded 2.5 exabytes of data generated daily, so there is no shortage in data. Machine Learning is also fast. Once the model, or classifier, has been trained with sufficient data, it can make predictions within nanoseconds, surpassing human’s speed in decision-making.

However, for such an intuitive solution, there has yet to be a widespread use of ML in trading. This is largely due to the difficulty and complexity of the market. For most Machine Learning applications, the general idea is to feed a Machine Learning algorithm, or classifier, large amount of data. After sufficient data is fed and the classifier is trained, it can be used for predictions. This approach assumes the future can be predicted from the past.

This isn’t necessarily the case for most markets. The weak form of Efficient Market Hypothesis (EMH) states market’s prices fully reflect the information contained in historical sequences of prices (Malkiel 59). This is an attack against technical analysis, which is the study of past prices to predict future prices (Malkiel 59). Because the weak form of EMH assumes prices to already account for the information in past prices, then the only information added onto the price of tomorrow is the randomness of tomorrow’s events (Malkiel 60). This is known commonly as the “Random Walk Hypothesis” (Malkiel 60). It is equivalent to predicting the outcome of a coin flip.

In 2008, Marshall did an intensive research on the effectiveness of technical analysis across multiple markets, and the conclusion drawn was: *“… over 5,000 popular technical trading rules do not appear to add value, beyond that which maybe explained by chance, when used in isolation in the time period we consider.”* (Marshall 20). However, there are studies that have shown it to be possible (Fernandez-Rodrigues et. al 92; Neely et. al 423). The purpose of this paper, is to explore further the effectiveness of ML applications in trading. It will explore the methodology used for evaluation, but will assume correctness in application.

**2. Machine Learning Approach to Trading**

Most ML approaches in trading is based on technical analysis. Technical analysis is effective if inefficiencies exist in the market, but the market tends towards efficiency as technology advances (Marshall 19). Therefore, the articles reviewed will be in chronological order starting from the earliest.

**2.1** **Sentiment Analysis of News and Blog**

The approach here is different from the others. Instead of looking at the numbers, Wenbin and Skiena wanted to see the response of

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