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HYBRID FUZZY CELLULAR AUTOMATA IN PREDICTING STOCK MARKET

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ABSTRACT

Stock market prediction is the most dynamic problems in this era. It is affected by political decisions, policy decisions of the companies, rumors, conversations in the public forums, demand and supply, investor's mood, weather etc. Stock market depends on various attributes like opening price, closing price etc. Many machine learning approaches, time series analysis methods, technical analysis methods were existing, but still there is lots of scope for a new mechanism to predict the stock market variations. We propose a novel classifier named Hybrid Fuzzy Cellular Automata to predict the stock market variations. This classifier is trained and tested with BSE data to perform stock predictions. This classifier output is compared with the existing standard algorithms. The prediction rate was considerably increased by 1.6%.

KEYWORDS: *Cellular Automata, Stock Prediction, Dynamic Data.*

Introduction

Twitter

In the previous decade, Twitter has encountered a huge development worldwide in accordance with the accomplishment of informal communities. Twitter is as of now the tenth most well known site all around with more than 300 million dynamic month to month clients. It is nothing unexpected numerous specialists begun to examine methods for utilizing this smaller scale blogging stage to discover new applications in all sort of spaces. Online assumption following has eminently gotten mainstream in social and mental investigation however the application range is really more extensive. Specifically, a few creators checked out the likelihood of foreseeing budgetary markets.

Securities Exchange

Different information of intrigue are obviously stock information which is to a great extent accessible on the web. The financial exchange alludes to open markets that exist for issuing, purchasing and selling stocks that exchange on a stock trade or over-the-counter. Stocks, otherwise called values, speak to fragmentary possession in an organization, and the securities exchange is where financial specialists can purchase and sell responsibility for investible resources. A proficiently working financial exchange is viewed as basic to monetary advancement, as it enables organizations to rapidly get to capital from general society.

Financial Exchange Indexes

The general execution of the financial exchanges is typically followed and reflected in the presentation of different securities exchange lists. Stock files are made out of a choice of stocks that is intended to reflect how stocks are performing by and large. In our venture we gathered NSE information. The National Stock Exchange of India Limited (NSE) is India's biggest money related market. One of the more mainstream contributions is the NIFTY 50 Index, which tracks the biggest resources in the Indian value showcase. Other than the NIFTY 50 Index, the National Stock Exchange keeps up market indices that track different market capitalizations, unpredictability, explicit areas, and factor systems.

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Implementation

The decimal equivalent of the next state function is defined as the rule number of the CA cell introduced by Wolfram. In a 2-state 3-neighborhood CA, there are 256 distinct next state functions, among 256 rules, rule 51 and rule 238 are represented in the following equations 1,2 respectively.

Rule 51 : $q_i(t + 1) = q_i(t)$ (1)

Rule 238 : $q_i(t + 1) = q_i(t) + q_{i+1}(t)$ (2)

Note 1: In the entire thesis + indicates OR operation as shown in Table 3.2. It operates on real values between 0 and 1.

Table 1: Example of Framing Rules

Neighbourhood	111	110	101	100	011	010	001	000	Rule
Next State (Rule 51)	0	0	1	1	0	0	1	1	51
Next State (Rule 238)	1	1	1	0	0	1	1	1	238

In the table 1 first row refers to the all possible 2^3 combinations. The next two rows represent the binary equivalent of the corresponding cell number/ rule. The rule 51 in equation 1 is a complemented rule, which denotes that for making a transition from one state to another it has to depend on its own complemented state.

Table 2: Binary Equivalent Numbers of Cells for NCR

	111	110	101	100	011	010	001	000
254	1	1	1	1	1	1	1	0
252	1	1	1	1	1	1	0	0
238	1	1	1	0	1	1	1	0
204	1	1	0	0	1	1	0	0
240	1	1	1	1	0	0	0	0
170	1	0	1	0	1	0	1	0
250	1	1	1	1	1	0	1	0
0	0	0	0	0	0	0	0	0

Table 3: Non Complemented Rules

S.No.	Rule Number	General Representation
1.	254	$q_{i-1} + q_i + q_{i+1}$
2.	252	$q_{i-1} + q_i$
3.	238	$q_i + q_{i+1}$
4.	250	$q_{i-1} + q_{i+1}$
5.	204	q_i
6.	240	q_{i-1}
7.	170	q_{i+1}
8.	0	0

Table 4: Binary Equivalent Numbers of Cells for CR

	111	110	101	100	011	010	001	000
1	0	0	0	0	0	0	0	1
3	0	0	0	0	0	0	1	1
17	0	0	0	1	0	0	0	1
51	0	0	1	1	0	0	1	1
15	0	0	0	0	1	1	1	1
85	0	1	0	1	0	1	0	1
5	0	0	0	0	0	1	0	1
255	1	1	1	1	1	1	1	1

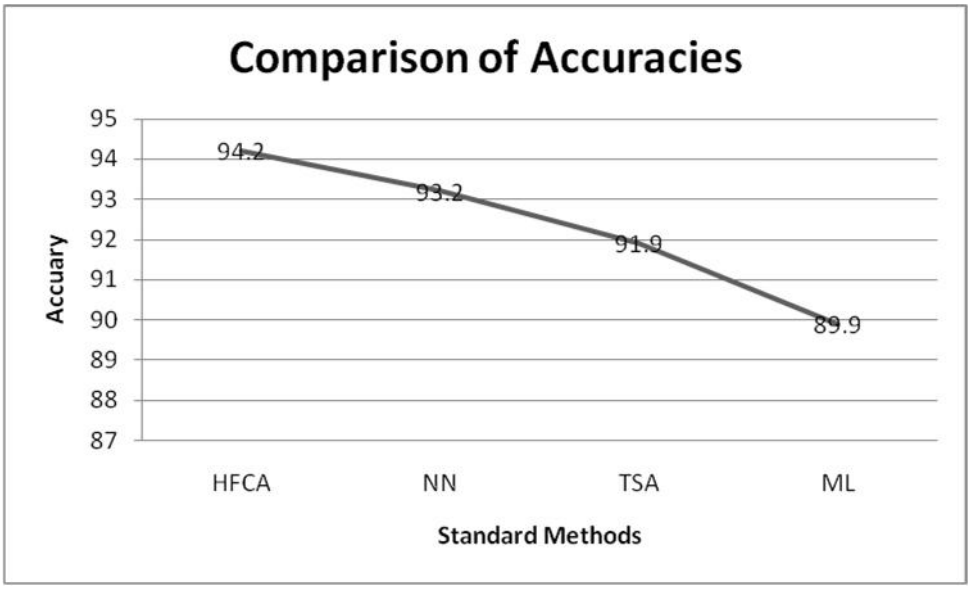
As the binary equivalent of 238 is 11100111, we need to find a general equation that will be true for all 8 (2^3) neighbors. Rule 238 is represented in the equation 3.2 is a non complemented rule which states, transition from one state to another depends on its state and its right neighbor. Arriving at a common equation for all the possible rules will be a very difficult task. We choose only those rules, which can fit to express themselves as general equations. So the global transition function can be represented in the form of a matrix.

Table 5: Complemented Rules (NOR)

S.No.	Rule Number	General Representation
1.	1	$\overline{q_{i-1}+q_i+q_{i+1}}$
2.	3	$\overline{q_{i-1}+q_i}$
3.	17	$\overline{q_i+q_{i+1}}$
4.	5	$\overline{q_{i-1}+q_{i+1}}$
5.	51	$\overline{q_i}$
6.	15	$\overline{q_{i-1}}$
7.	85	$\overline{q_{i+1}}$
8.	255	1

Comparison of Results

The developed classifier is tested with many standard methods like machine learning, Time series analysis, neutral networks approach and our approach has done better than the existing approach when tested with NSE data.



Conclusion

We have successfully developed a versatile classifier which can predict the stock markets with an average accuracy of 94.2. We are trying to take more parameters and extend this work, so that the developed classifier can predict the variations in any given data.

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