International Journal of Psychosocial Rehabilitation, Vol. 24, Issue 05, 2020
ISSN: 1475-7192

Survey Paper on Fraud Detection in Medicare Using Machine Learning

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Abstract--- *Healthcare plays a major role in the growing population. Medicare systems provide effective remedies for the affordable healthcare systems. Increasing processing power, availability of big data and advancements in statistical modelling has been accelerated due to the adoption of machine learning. There are recent fraudulent activities detected in Medicare systems. It takes a lot of time for humans to read, collect, categorize and analyse the data. These fraudulent activities in Medicare systems, which can be tremendously reduced by using machine-learning methods. The survey currently focuses the algorithm that contributes better results to fraud detection. Our survey predicts the comparative analysis in the detection of fraudulent activities using the various algorithm techniques.*

Keywords--- *Fraud Detection, Medicare, Machine Learning.*

I. INTRODUCTION

The increase in the number of disease and the growing population has resulted in the need of health care. Due to the increase in the diseases, the essential treatments should be provided. The financial status of the common people serves a major role in the health component. The economic condition of the people should be affordable only then people will be able to stabilize their health. In order to improvise the economic condition, Medicare has been introduced. Clearly, these programs need to be economical for the general populace, but program costs, along with the elderly population, continue to increase, which can financially cripple individuals and families.

The fraudulent activities have been detected in Medicare that has created an impact in the normal Medicare systems. This fraud detection can be done using machine learning and artificial intelligence. The techniques explore various algorithms that can perform calculation that results in accurate fraud detection from the data set. Here we compare the obtained results of the fraud detection using various algorithms in machine learning. The algorithms that are brought into focus have obtained the maximum result. Here we are about to discuss the best one among the discussed algorithms. Considering the research done under the various algorithms, we have brought a comparative study from it. The comparative study has been applied in radiation oncology that ensures more relevant details such as the family practices followed which is easier.

II. LITERATURE ANALYSIS

1. **Medicare Fraud Detection using Machine Learning Methods**-Richard A. Bauderand Taghi M. Khoshgoftaar.

In order to detect the fraudulent activities in Medicare using machine learning many algorithms are preferred as

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DOI: 10.37200/IJPR/V24I5/PR2020130
Received: 07 Mar 2020 | Revised: 26 Mar 2020 | Accepted: 04 Apr 2020

well but the supervised and unsupervised algorithm are being brought into comparison and better results have been predicted.

2. **Medical Provider Specialty Predictions for the Detection of Anomalous Medicare Insurance Claims** - Matthew Herland Florida, Richard A. Bauder and Taghi M. Khoshgoftaar.

This aims in detecting the fraudulent physicians using anomaly detection. Their researches also had increased their detection range up to 67%. They also have proposed three improvement strategies, which include feature selection and sampling, removing specialties with a large number of overlapping procedures, and grouping similar specialties.

3. **A Probabilistic Programming Approach for Outlier Detection in Healthcare** -Richard A. Bauder and M. Khoshgoftaar.

This has balanced the techniques of outlier detection that has resulted in significant growth of anomaly detection. Their case studies using the temperature data and Medicare data revealed that the outliers have been detected and the comparative studies have been performed.

III. WHY MACHINE LEARNING

Machines are able to detect and recognise thousand of patterns based on user's identity. These user patterns have common private behaviour identities that are similar. Hence this can be detected using the machine learning algorithms. Any change in the user's behaviour patterns there can be an indication that is termed to be fraudulent by applying cognitive computing technologies to raw data. There are three major factors that explain the importance of the machine learning are:-

Speed

In a system to detect frauds that include humans, there can be intervention in the system which may include various outliers that cannot be managed properly. When this is brought into model such as neural networks autonomously updating its models to reflect machine learning the process is less time-consuming and does not involve manual interaction. Further these models can detect patterns and hence a huge number of registrations in the Medicare dataset can be analysed efficiently at higher speed. Moreover, an advanced the latest trends.

Scale

The fraud detection becomes more effective by using the method of machine learning with increased data set. With the increased amount of data set, the result becomes more accurate. Machine learning improves with more data because this model can pick out the differences and similarities between multiple behaviours. In case of the presence of an undetected fraud in the training data, machine learning will train the system to ignore that type of fraud in the future.

Efficiency

In contrast to humans, machines can perform repetitive tasks. On giving inputs, the machine learning methodology gives the efficient outputs by using the various algorithms. It can often be more effective than humans

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in detecting frauds. Moreover, unsupervised machine learning models can continuously analyse and process new data and then autonomously update its models to reflect the latest trends.

IV. CHALLENGES IN ADOPTING MACHINE LEARNING

Though machine learning has its own advantages, there are serious risk factors in adopting this machine learning technology. The following are the limitations: -

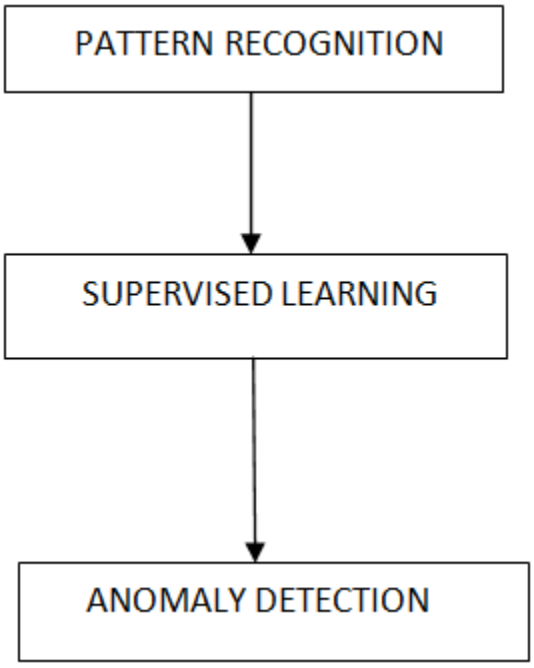
Improper Training to the System

Medicare system becomes more efficient by adopting machine learning methodology. There is a necessity to maintain a backend machine learning model. Hence to conclude a fraudster the machine learning has to be trained sufficiently. The accuracy can be obtained only by proper training. In case of improper training the judgement may vary. Hence this can be considered as a major drawback.

Necessity of Datasets

There requires a significant amount of data for machine learning models to be accurate without the appropriate amount of data, the machine may conclude a false result. It is often better to feed the machine with large amount of data to get maximum results.

Evolution in Detection Algorithm



Pattern Recognition

The field of pattern recognition is concerned with the discovery of regularities in data via the use of computer algorithm.These regularities are used to take actions such as classifying the data into different categories. Pattern recognition can be used to formalise, visualise and explain the pattern while machine learning completely focuses on maximizing the recognition rate.Since machine learning isn't limited to simple pattern recognition, the next step was

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deploying the supervised machine learning models to look for variations of known fraud patterns.

Supervised Learning

Every example in supervised learning is a pair of an input object and a desired output. This supervised learning algorithm can be used for mapping new examples because it analyses the training data and produces an inferred function. The data used for fraud detection, primarily provided by the Medicare, is massive, making it impossible to detect manually for fraudulent behaviour. Machine-Learning techniques holds to provide sophisticated tools for the analysis of fraudulent patterns in these vast health insurance databases. Among all the machine-learning methodologies, supervised learning algorithm has emerged as a key step in understanding the activity of fraudulent and non-fraudulent activities in Medicare as they can be adjusted and trained to detect all complex and growing fraudulent activities. These might be new types of fraud that are similar, but not identical to existing patterns – the sort of thing a traditional analytics dashboard would struggle to detect[1],[2],[3][11][12].

V. ANOMALY DETECTION

Anomaly detection is used to identify unusual patterns that do not lie in the expected behaviour, called outliers. It is also a task on its own. This method of detection identifies the cases which are totally different from normal. The fraud detection becomes more efficient by using this anomaly detection method. The data points or the items or the observations which are outside the expected range are identified by this particular method. Thus, this helps in trapping the abnormal activities of the clients.

VI. CONCLUSION

Our intent for this line of survey is to suggest a best algorithm for the Medicare fraud detection. Fraudsters are so clever and they use different ways to do fraudulent activities. On analysing the different algorithms such as pattern recognition, supervised learning and anomaly detection we can conclude that anomaly detection is more efficient. Pattern recognition method is so limited to some rules that it cannot give accurate results. Also, in supervised learning there is drawback that the machine should be given a prior training about the problem statement, so that it gives an accurate result. Whereas in anomaly detection, it goes out of box to give accurate conclusion. Here the abnormal datasets which are not fitted into the expected range are also considered and the fraud is detected. Thus we can conclude that meticulous results are obtained by anomaly detection method.

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DOI: 10.37200/IJPR/V24I5/PR2020130
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