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A Systematic Literature Review Of Artificial Intelligence In Detecting Fraud in Health Insurance

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fraud; health insurance; forensic accounting; artificial intelligence.

ABSTRACT
Purpose: *The purpose of this study is to find out how research on fraud in the world of health insurance is developing and how fraud can be detected.* ***Methodology***: *The Systematic Literature Review (SLR) method was used by researchers to answer the Research Question (RQ) in this study* ***Results:*** *Research on fraud in health insurance has grown significantly over the past decade, several types of fraud often occur in health insurance such as Upcoding, fragmentation, repeat billing, fake reimbursement and the use of AI can help detect fraud.* ***Findings***: *Artificial Intelligence can help detect fraud so that it can help prevent losses that will be experienced by the company.* ***Novelty***: *Watase Uake software is used in this study a systematic literature review approach to examine global health insurance fraud from a variety of reference sources.* ***Originality***: *This study provides an empirical analysis of how the role of Artificial Intelligence in detecting fraud and the development of research related to fraud in the world of health insurance.* ***Conclusion***: *Research on fraud in health insurance has grown significantly over the past decade, several types of fraud that often occur in health insurance such as upcoding, fake reimbursement, repeat billing and fragmentation, the use of AI can help detect fraud and It is hoped that future research can examine how AI can evolve in detecting fraud.* ***Type of Paper***: *Empirical research Paper*

INTRODUCTION

The health sector is not only an important component in maintaining and restoring the health of the wider community but also plays an important role in the national economy. The pandemic that occurred several years ago opened the eyes of the world, that how important strength and independence in the health sector is so that countries in the world including Indonesia are increasingly prioritising it by increasing the availability and adequate infrastructure. The health sector consists of a network of hospitals, pharmaceuticals, laboratories and other health support facilities.

The development of the number of hospitals has increased since 2009, based on CEIC data, a significant increase occurred in 1 decade, from 2002 to 2021, the number of hospitals jumped to 2522 from 953 or increased by 169.73%. Meanwhile, based on ownership, most of them are owned by private and non-private ownership, followed by hospitals owned by city / district governments (cncbindonesia.com). The following graph shows the development of the number of hospitals in Indonesia from 2002 to 2021:

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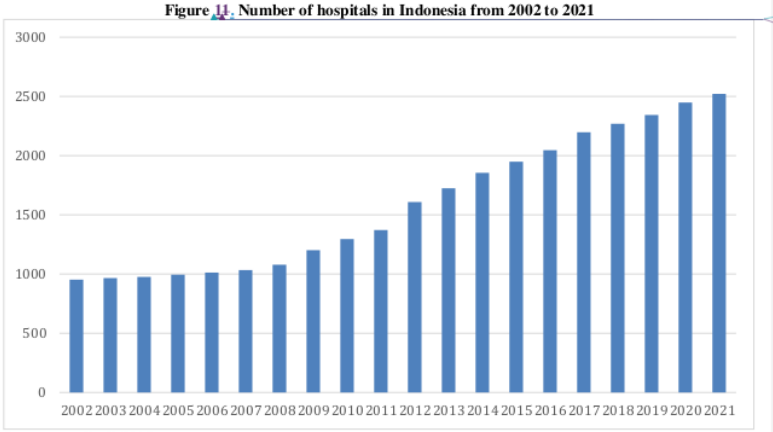
Figure 11. Number of hospitals in Indonesia from 2002 to 2021



Source: Data CEIC (2024)

The presence of these hospitals is expected to help the community's health service needs, especially referral services or care and treatment using health insurance such as BPJS health. The number of BPJS health participants as of June 2024 was 273,525,350 participants out of a total of 280 million Indonesians. Seeing this number is very potential to generate coffers of income for these health service providers. In addition, the large number of participants and the income obtained is very tempting for fraudsters to carry out fraud schemes (fraud) by utilising the BPJS Health insurance facility. Any action taken by a person or group of people to gain unauthorised benefit from another party is defined as fraud. (Carpenter & Reimers, 2013). Fraud can be considered a criminal offence as a result of actions or intentions taken to obtain personal gain by dishonest and unlawful means (Pawitri et al., 2024).

Figure 22. Type of Industry affected by Fraud

Industry	Cases	Billing	Cash larceny	Cash on hand	Check and payment tampering	Corruption	Expense reimbursements	Financial statement fraud	Noncash	Payroll	Register disbursements	Skimming
Banking and financial services	305	12%	12%	18%	14%	44%	6%	5%	16%	4%	4%	8%
Manufacturing	175	27%	6%	4%	7%	55%	17%	6%	29%	10%	1%	9%
Government and public administration	170	24%	15%	8%	14%	52%	15%	4%	15%	18%	4%	11%
Health care	117	38%	9%	8%	12%	47%	21%	1%	22%	16%	2%	9%
Energy	78	19%	8%	9%	8%	60%	13%	4%	29%	10%	3%	6%
Retail	78	17%	10%	13%	5%	40%	6%	0%	32%	3%	9%	14%

Source: ACFE (2024)

In the figure above, it can be explained that corruption is in the first place of fraud schemes that occur in health services at 47%, while in second place is occupied by billing schemes at 38%. Billing schemes are a category of asset misappropriation in the fraud tree and are considered Fraudulent Disbursements. Billing Schemes are fraudulent

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disbursement techniques that involve sending bills for fictitious goods or services, inflated invoices or invoices for personal purchases to trick employers into paying.

The latest case of the disclosure of fraud billing schemes related to health insurance occurred in Indonesia in 2024, the Corruption Eradication Commission (KPK) along with the Ministry of Health and BPKP found a scandal of submitting fictitious claims to the Social Security Organising Agency (BPJS) to get claim money. A total of three private hospitals in three provinces submitted 4,341 claims to the BPJS but based on findings in the field only 1,000 claims could be accounted for while the other 3,000 claims were fictitious claims that were considered physiotherapy claims. For these fictitious claims, the state lost tens of billions of rupiah from 2022 to 2023. In addition to fictitious treatment claims, the hospital also used the data of doctors who no longer worked at the hospital.

The practice of fraud in business organisations will be very detrimental to all parties when it occurs. Prevention is the most effective way to reduce these losses. Not only can early detection of fraud reduce costs, but fraud detection activities done properly and on a regular basis can be a powerful tool to prevent fraud. Improving key business processes is the best way to prevent fraud from happening in the first place (Albrecht, 2012). Linkage of fraud prevention with stakeholder theory by Freeman (1984) which states that a company must pay attention to, balance, and fulfil the expectations of all its stakeholders to achieve its goals that go beyond making a profit.

One of the new models in stakeholder theory that was initiated by Freeman & Parmar (2020) that business and ethics must go together, many bad results are obtained when business decisions are separated from ethical decisions, businesses do not just focus on profit and money or leave other interests to the government and then hope that the market will solve everything well, in fact almost all business decisions have ethics. When a business entity commits an act of fraud such as the case above, it is an unethical act that contradicts stakeholder theory.

The relationship between AI and fraud is that using AI technology to detect fraud can provide more accurate and efficient solutions than traditional methods like detecting anomalies, analyzing historical data, and using Natural Language Processing, even if there is a system in place to detect fraud. To detect fraud, it can be seen from the symptoms of fraud that are signalled by fraudsters including accounting anomalies, weak internal controls, analytical anomalies, unusual behaviour, luxurious lifestyles and tips and complaints. Fraud symptoms are clear and observable signs that fraud may be occurring and can form the basis of a cover-up attempt (Hall, 1996). Reflecting on the above case, the symptoms seen in the case are analytical anomalies, which are relationships between financial statements or transactions that do not make sense (Laksana & Achmad, 2020), One of the symptoms of an analytical anomaly is the presence of unreasonable expenditures or substitutions.

To find evidence of fraud and deception, a process is needed to examine accounting records in financial statements, often referred to as forensic accounting (Singleton & Singleton, 2010). Forensic accounting is the application of accounting knowledge to resolve legal issues in court and out of court. (Suratman & Meinarsih, 2021). Meanwhile, forensic audits are conducted to support expertise in the legal process by providing expert testimony in the ligitation or trial process. (Tuanakotta, 2019). Investigative audits allow competent and independent parties to systematically discover and analyse available evidence to reveal actual fraud (Syahrudin, 2024).

With the advancement of technology, businesses are starting to use AI (Artificial Intelligence) as a tool to assist auditors in detecting fraud by using AI models designed by data architects and data engineers that are tailored to the company's management and operational conditions. Artificial intelligence is the science and methods for creating intelligent machines, especially intelligent computer programmes or applications (Mccarthy, 2007). Artificial intelligence technology is meant to make the work of accountants and auditors easier (Sholiqah et al., 2023). Machine learning, neural networks, data mining, and pattern recognition are some of the AI techniques used to detect fraud in companies.

The purpose of this study is to find out how research on fraud in the world of health insurance is developing and how fraud can be detected. This research uses a systematic literature review method using Watase Uake software, which explores global health insurance fraud from various reference sources, including scopus and sinta accredited research journals.

In previous research by Adnyana & Budi, (2023) It has been found that fraud can occur throughout the claims process, from patient care at the hospital to the hospital submitting the claim, BPJS Health verification, and Ministry of Health payment. Awaloedin et al., (2019) conducted a study on identifying fraud in the health insurance industry, finding that falsifying documents, sending double bills, and providing unnecessary care and maximising care were the types of fraud identified. Research by Firmansyah et al., (2022) stated that fraud is an act that often occurs in the provision of health, whether privately financed, private insurance or national insurance. Fraud has an impact on various legal aspects. Meanwhile, research by Idrus (2023) concluded that in monitoring the financial health of an insurance company directly, routinely and periodically, the Financial Services Authority does not seem to be doing its job properly. It is as if they act if fraud has occurred which causes customers to no longer be able to benefit from their insurance from the insurance company.

In addition, from several cases and previous studies, the implementation of AI has helped BPJS Health in helping to detect fraud such as the identification of false claims where IA can identify claims submitted by patients who have never applied for the service, then AI can detect repeated claims for the same drug service without valid medical justification.

Fraud

All types of fraud that can be perpetrated by human ingenuity to gain an advantage over others by using false representations are included in the general term for fraud (Albrecht, 2012). Workplace fraud has a greater impact for businesses that are frequent victims of financial crime (Syahrudin, 2024).

To detect fraud, it can be seen through the symptoms of fraud shown by the perpetrators themselves, including by looking at the symptoms of analytical anomalies, one of which is the unreasonable expenditure or reimbursement of costs.

Forensic Accounting

Forensic accounting is the process of investigating various methods of fraud with the intention of finding various sources or evidence of fraud (Arianto et al., 2023). A forensic audit, on the other hand, is an attempt to gather legal evidence that can be used in legal proceedings (Tuanakotta, 2019).

Forensic accounting is used by an entity to detect fraud that occurs internally or externally. Investigative audits are conducted if there is a strong suspicion of fraud or irregularities that can harm an entity.

Artificial Inteligence

Artificial intelligence is the science and methods for creating intelligent machines, especially intelligent computer programmes or applications (Mccarthy, 2007). AI is intended to facilitate auditors and accountants in their work (Sholiqah et al., 2023).

METHOD

Metode Analisis

This research is a qualitative study that uses a descriptive approach. Qualitative research can be interpreted as a type of research with the researcher as the main tool conducted in a natural object environment (Sugiyono, 2023). The Systematic Literature Review (SLR) method was used by researchers to answer the Research Question (RQ) in this study. SLR was chosen because it can process, identify, assess, and interpret all research documents that have been conducted so as to provide answers to research questions and objectives more specifically and accurately.

Table 1. Research Question

RQ	Description
RQ1	How is the development of fraud in the world of insurance?
RQ2	What are the fraud schemes that often occur in Health Insurance?
RQ3	What is the role of forensic accounting in detecting fraud?

To ensure that the selected articles meet the desired criteria, the articles must go through the Quality Assessment (QA) process. QA is a method in selecting articles so that the selected articles have gone through several stages of selection both inclusion and exclusion. Articles to be discussed must meet the inclusion and exclusion criteria and must be thoroughly discussed in accordance with the Quality Assessment criteria. The following is the QA in this study:

Table 2. Quality Assesment (QA)

QA	Description
QA1	Does the article discuss fraud and health insurance?
QA2	Does the article explain about detecting fraud in health insurance?
QA3	Was the article published between 2019 and 2024?
QA4	Is the article published in a scopus or nationally accredited journal?

In this study, data was extracted from relevant published articles and classified for all available data, and then any important findings from the articles were recorded. Data extraction or summarizing information on an article in a literature review includes the title of the study, research design, research methods and data collection conducted, selected research population and sample, analyzing and discussing the results of the study, and finally drawing conclusions and suggestions for the study. The next stage is to synthesize the data after all the required research data has been collected.

In searching for research articles, researchers use a tool in the form of Watase Uake software by sourcing scopus and google scholar databases. The Watase UAKE application is an online application created to help researchers work together in conducting research with features including systematic literature review with prism, meta-analysis, article classification, and data visualisation (Setya et al., 2024).

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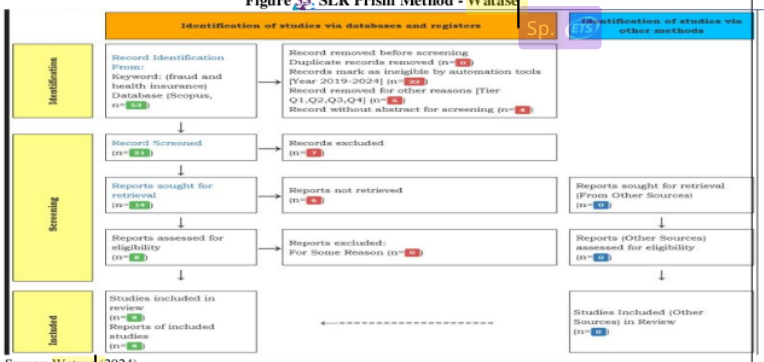
This program enables researchers and students to carry out organized and methodical study with the aid of Watase UAKE. Among the benefits of using this application are the collaboration feature, which enables them to work together on research projects, the article extraction and classification feature, which generates relevant research mapping, and the ability to build a basic research model based on a database of hypotheses compiled by researchers.

The following flowchart shows the SLR article selection process:

Figure 33. SLR Prism Method - Watase



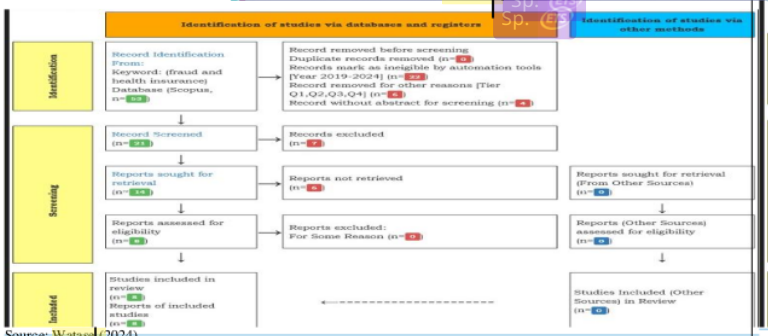
Source: Watase (2024)

RESULTS AND DISCUSSION

RESULTS

The following is a research journal of selection results using Watase Uake, namely:

Figure 44. SLR Selection Result with Watase Uake Prism



Source: Watase (2024)

The figure above is the article selection process carried out in this study, the number of articles obtained from the Scopus database through Watase software obtained 53 articles in the identification process. The next process is screening, the article selection process by removing the same or duplicate articles as many as 45 articles then the results of the screening process obtained 8 articles and eliminating 45 articles because they are not in accordance with Quality Assessment 1 to 4 as in table 2. The final result of the eligibility process obtained 8 articles that entered the selection criteria as listed in the table below:

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No	Article	Result
1	Health insurance fraud detection based on multi-channel heterogeneous graph structure learning (Hong et al., 2024)	Extensive experiments on real health insurance data have shown that Multi-Channel Heterogeneous Graph Structure Learning (MHGSL) detects potential fraud with greater accuracy than existing methods, and it is able to quickly and accurately identify patients with fraudulent behaviors to avoid loss of health insurance funds. Experiments have also shown that multi-channel heterogeneous graph structure learning in MHGSL can be very helpful for detecting health insurance fraud.
2	What influences the public's willingness to report health insurance fraud in familiar or unfamiliar healthcare settings? a cross-sectional study of the young and middle-aged people in China (Liu et al., 2024)	People are more inclined to report health insurance fraud in environments they are familiar with than in ones they are not, where their perception of risk after reporting it and their understanding of the seriousness of the repercussions of health insurance fraud play a significant impact.
3	A study on the path of governance in health insurance fraud considering moral hazard (Liu et al., 2023)	The study found that the initial construction of the payment matrix and the initial selection of parameters in the payment matrix are highly related to the evolution of governance behavior in health insurance fraud. Furthermore, the system's end strategy can be effectively driven toward a non-fraudulent state by lowering moral hazard for both patients and doctors, raising the cost of fraud for both parties, and stiffening sanctions for fraudulent behavior.
4	Health insurance fraud detection by using an attributed heterogeneous information network with a hierarchical attention mechanism (Lu et al., 2023)	Results from experiments on actual datasets demonstrated that a health insurance fraud detection model based on a multilevel attention mechanism (MHAMFD) was more accurate than current techniques at detecting health insurance fraud. According to the experiment, behavioral correlations between patients' repeated visits may also be very useful in identifying health care fraud. The many behavioral links between patients can also be taken into consideration by later study fraud detection techniques.
5	Identifying Health Insurance Claim Frauds Using Mixture of Clinical Concepts (Haque & Tozal, 2022)	By converting diagnosis and procedure codes into Mixtures of Clinical Codes (MCC), we offer a novel representation learning solution to the fraudulent claim detection problem. We also look on MCC enhancements with Robust Principal Component Analysis and Long Short Term Memory networks. The findings of our experiment show encouraging results in detecting false records.
6	Research on the Formation Mechanism of Health Insurance Fraud in China: From the Perspective of the Tripartite Evolutionary Game (Fei et al., 2022)	The findings indicate that: (1) The challenge and fundamental issue is how to stop medical institutions from engaging in fraudulent activity. Enhancing the MI's internal management, achieving effective supervision of the MAO, and utilizing the II's supervisory role are all essential. (2) In addition to encouraging the II to actively participate in the role of supervision and reporting, the MAO's regulatory actions should prioritize safeguarding the II's interests by preventing collusion with MI. (3) The MAO must, on the one hand, tighten oversight and stiffen penalties for fraud. However, they must also implement incentive programs to help all participants create a strong internal management system.

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No	Article	Result
7	Why Not Blow the Whistle on Health Care Insurance Fraud? Evidence from Jiangsu Province, China (Wang & Zhan, 2022)	A major obstacle to turning whistleblowing intent into action is the inability to identify fraud, risk perception does not lessen the incentive to blow the whistle, and policy understanding has a detrimental impact on whistleblowing behavior.
8	Decision Support System (DSS) for Fraud Detection in Health Insurance Claims Using Genetic Support Vector Machines (GSVMs) (Sowah et al., 2019)	When utilizing SVM kernel classifiers, the experimental findings demonstrated that the GSVM (Genetic Support Vector Machines) performed better in terms of detection and classification. Three GSVM classifiers were assessed, and the outcomes were contrasted. Experimental results demonstrated that the various SVM (Support Vector Machine) classifiers (linear (80.67%), polynomial (81.22%), and radial basis function (RBF) kernel (87.91%) increase classification accuracy while significantly reducing computing time on claims processing.

DISCUSSION

Increased research on health insurance fraud

A total of 55 Scopus-indexed articles were obtained through a search based on the keyword fraud and health insurance with a search time range from 1997 to 2024. The search was conducted with the help of Watased software, while the record limitation was set from 1997 to 2024 and tier Q1 to Q4. The increase in the number of studies related

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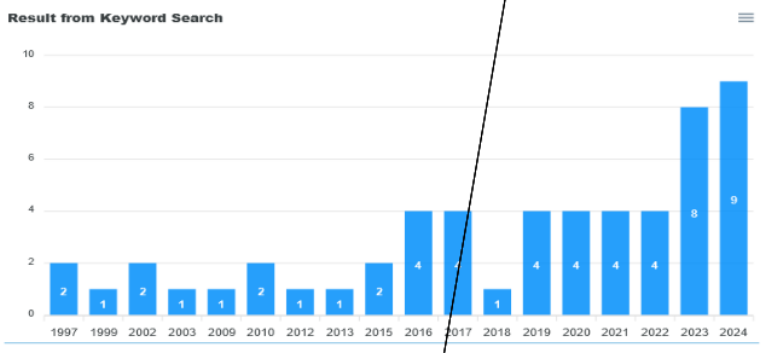
to fraud and health insurance has occurred since 2016 with an average of 4 studies per year although it decreased in 2018 and then jumped to 8 research articles in 2023 and 9 research articles in 2024.
The image below shows the results of searching for articles based on keywords using Watase Uake:

Figure 55. Search results by keyword



If the search result articles based on the two keywords are depicted in the keyword analysis graph, the following results will be obtained: ~~Search results by keyword~~

Figure 66. Keyword Analysis Graph

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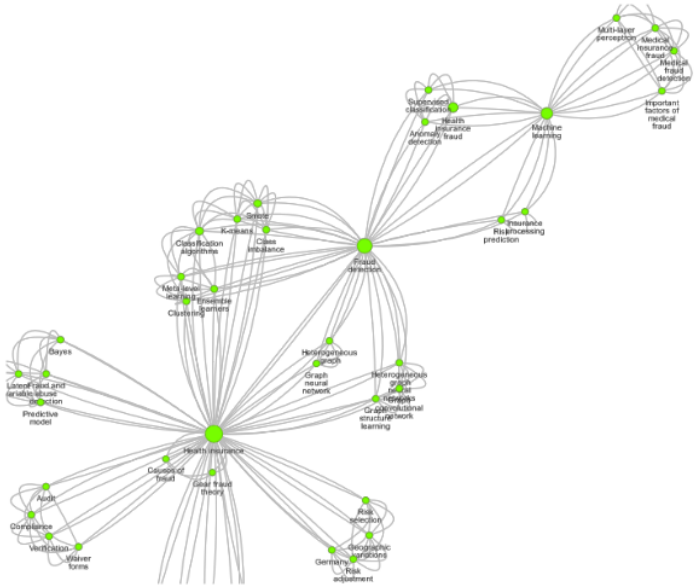

Fraud Scheme in Health Insurance

Fraud schemes or fraud that usually occur in the world of health insurance according to Permenkes No.36 of 2015 and are researched based on searches on Google Scholar, including:

1. Upcoding which can be interpreted as creating diagnosis and procedure codes with higher costs than they should be. Upcoding and phantom billing is one of the frauds committed by Advanced Referral Health Facilities or FKRTL. (Triska, 2020).
2. Fragmentation, which is a claim for two or more diagnoses and or procedures that should be a package of services in one episode of patient care with the aim of obtaining a larger claim value for one period of care. One of the hospitals committed fragmentation due to the absence of a fraud prevention team that could detect fraud early, which in turn caused the hospital to commit violations. (Rahayu et al., 2021).
3. Repeat Billing, is a repeated claim with the same case. One of the findings in the investigative audit conducted was a double claim scheme through the use of legalized receipts. (Awaloedin et al., 2021)
4. Fake Reimbursment, Insurance carriers may commit fraud, such as providing false compensation and deceiving benefit/service reports (Adnyana & Budi, 2023). Fraud can occur during the verification process as BPJS Kesehatan is only responsible for doing so. This includes results that do not match the actual circumstances in the claim file, such as passing inappropriate claims and verifying expired claims as appropriate so that the Ministry of Health can pay them later.

From some of the fraud cases that occurred above, All documents required to submit a claim were forged, from the identity of the policy recipient, hospital treatment documents, to the occupation and income of the insured. In a recent case at a hospital in Bandung, the KPK discovered fraud and temporarily suspended BPJS services. The hospital was asked to return the embezzled funds within six months.

Detecting fraud that occurs using artificial intelligence

Hong et al., (2021) using a multi-channel heterogeneous graph structure, he developed a novel model in his research termed MHGSL (Multi-Channel Heterogeneous Graph Structure Learning) to identify health insurance fraud. According to experimental results, MHGSL can successfully identify suspicious people with a high fraud likelihood and performs well on genuine health insurance datasets. The methodology offers notable advantages in anomaly identification when compared to some of the current embedded methods, demonstrating its promise in the field of health insurance fraud detection.

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Sowah et al., (2019), The goal of this work was to create a new fraud detection model for processing insurance claims that is based on genetic support vector machines. This model combines and capitalizes on the advantages of support vector machines and genetic algorithms. HICFDS has been developed through research and application of the GSVM (Genetic Support Vector Machines). In order to identify irregularities and categorize health insurance claims as either authentic or fraudulent, this study employed GSVM. SVMs are thought to be better than other classification methods because of a number of benefits.

Lu et al., (2023), This study examines the issue of detecting health insurance fraud by examining the correlation between various patient visit habits using actual healthcare datasets. Analysis is done on how the relationships between various elements in the healthcare scenario affect the identification of fraud. AHIN uses the MHAMFD model (a health insurance fraud detection model based on a multilevel attention mechanism) to capture these interactions. Results from experiments on actual datasets demonstrated that MHAMFD was more accurate than current techniques at detecting health insurance fraud. The research tests the suggested model using actual data sets, compares it with some preliminary approaches, and uses visualization techniques to explain the findings in a more understandable way and provide a brief overview of the underlying experimental design. To compare the effects of different modules, we conducted ablation experiments. Finally, to examine how hierarchical attention mechanisms affect the final task.

The advantages of utilising AI above compared to using traditional methods are Leverage machine learning to automatically learn patterns from data, Advanced techniques like neural networks or support vector machines provide higher accuracy by capturing intricate patterns, Ideal for applications requiring instantaneous decision-making (e.g., fraud detection, cybersecurity).

Limitations

Due to the researcher's limited resources, the study does not go into great detail about using AI to identify fraud committed by connected parties. If other pertinent measures, like execution time or energy efficiency, are not taken into account, the usage of specific metrics (such accuracy, precision, and recall) might not be enough to reflect total performance. and Simulated testing might not accurately represent the dynamics and difficulties of the actual world.

CONCLUSION

We can conclude based on the findings and discussion that Increased research related to fraud and health insurance with an increase in the number of studies related to fraud and health insurance occurred since 2016 with an average of 4 studies per year although it had decreased in 2018 and then jumped to 8 research articles in 2023 and 9 research articles in 2024. Seeing the increasing number of studies related to fraud, AI and health insurance, there are still few that explore or deepen forensic audit activities, it is hoped that future research will further deepen the role of forensic audit in detecting fraud in the world of health insurance with the help of AI.

Upcoding, fragmentation, repeat billing, fake reimbursement are types of fraud that often occur in the world of health insurance, especially BPJS in Indonesia. From some of the fraud cases that occurred above, All documents required to submit a claim were forged, from the identity of the policy recipient, hospital treatment documents, to the occupation and income of the insured. In a recent case at a hospital in Bandung, the KPK discovered fraud and temporarily suspended BPJS services. The hospital was asked to return the embezzled funds within six months. The suspension of these activities will create a deterrent effect for the Hospital that is the perpetrator of fraud, but routine audit activities should be carried out by the BPJS Party against the Hospital or Health Facility that is its member, this is intended to prevent potential losses that will be experienced by the BPJS Party or Health Insurance Party.

The use of Artificial Intelligence is proven to be effective in detecting fraud in the world of health insurance, by analyzing the relationship of several elements in the health care scenario in identifying fraud that occurs. The advantages of utilising AI above compared to using traditional methods are Leverage machine learning to automatically learn patterns from data, Advanced techniques like neural networks or support vector machines provide higher accuracy by capturing intricate patterns, Ideal for applications requiring instantaneous decision-making (e.g., fraud detection, cybersecurity).

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