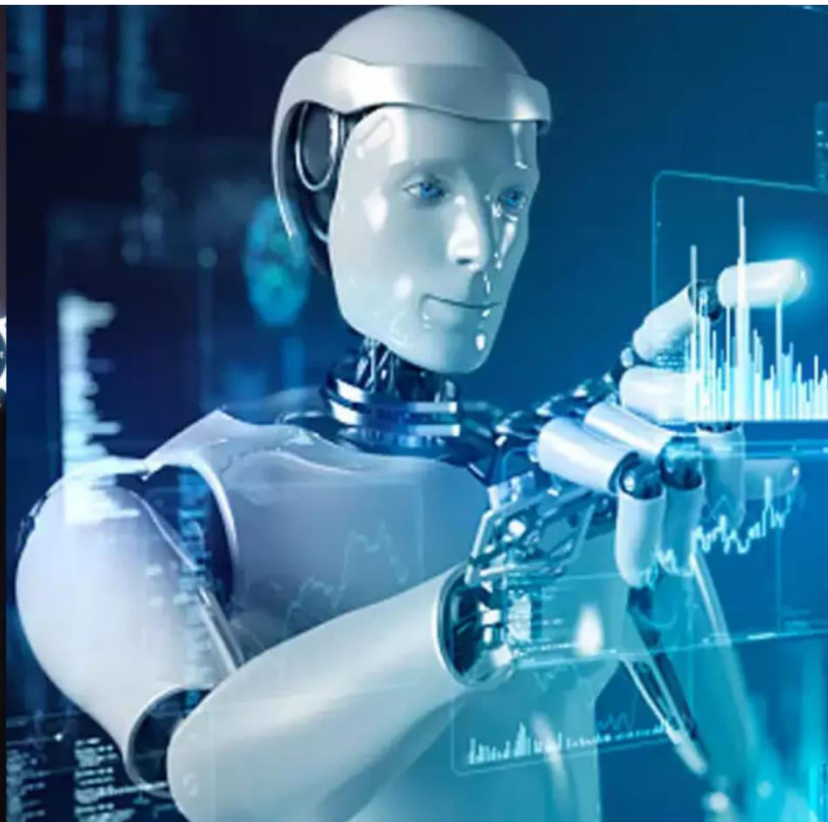




International Journal of Innovative Research in Science Engineering and Technology (IJIRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 8.699

Volume 14, Issue 3, March 2025

Uncovering Fraud in Medicaid: A Data-Driven Approach to Detecting Waste, Abuse, and Inefficiencies in Public Health Programs

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ABSTRACT: Healthcare fraud continues to be a challenge, funds critical to patient care are diverted from being used where it is needed most, trust in government programs is eroded, and the existence of Medicaid is threatened. This paper considers how AI can thwart fraudulent activities, especially GNNs and GPT driven auditing. The real time fraud detection is improved with the aid of AI driven solutions, evaluation of claims is automated and policy is enforced. AI handles advanced data analysis and machine learning to improve oversight and this results in an efficient allocation or use of resources. The implications for AI in public healthcare funds protection, the reduction of financial losses and transparency in turn contribute to an accountable and equitable public healthcare system.

KEYWORDS: Medicaid fraud detection, AI-powered anomaly detection, healthcare claim optimization, GPT-powered auditing, ChatGPT for fraud analysis, graph neural networks (GNNs), machine learning in healthcare compliance, reducing financial fraud in Medicaid/Medicare.

I.INTRODUCTION

Fight against fraud loyalty remains a struggle against billions of dollars lost from the national healthcare system annually. AI driven technologies are more scalable to scale as compared to traditional fraud detection methods, and they leave vulnerabilities that are susceptible to being addressed with AI based solutions. Real-time fraud Monitoring, Anomaly detection, Automated Audits are provided by the Advanced AI models like Graph Neural Networks (GNNs) and audited with GPT.

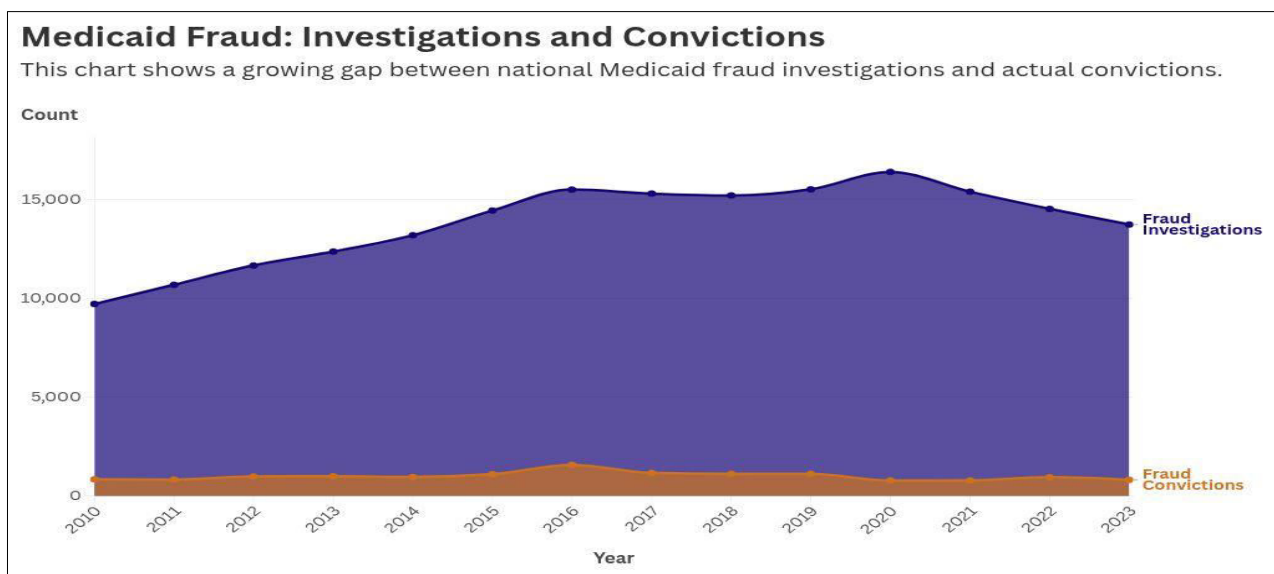


Fig. 1 Medical Fraud investigations (Government Technology, 2025)

An improvement in financial oversight does not only include greater government accountability and policy enforcement; these innovations further strengthen and empower the government through better policy enforcement and government accountability. Integrating AI to Medicaid fraud prevention will strengthen transparency, reduce financial leakages, and equity of use of the resources for both healthcare patients and the healthcare system as whole.

II.MEDICAL FRAUD

Financial Losses

Medicaid fraud is a financial burden on the U.S. healthcare system that taxpayers are footing the bill for billions of dollars annually. Such fraudulent activities as overbilling, ghost billing and kickback schemes drain Medicaid funds to such an extent that the program is unable to help those in need. Perez & Wing (2019) also tell us that Medicaid Fraud Control Units (MFCUs) are key players in the investigation and prosecution of fraud [1].

The billing data is used to identify high risk providers that send in too many claims for fraud prone services in these units. For example, their study finds that increasing the amount spent on MFCU results in a large rise in the number of fraud enforcement actions such as investigations, convictions, and recoveries of funds. However, despite the efforts, fraud remains and thus proving the existence of advanced AI based solutions to detect and prevent fraudulent claims more effectively.

Taxpayer Burden

Losses from Medicaid fraud are far deeper than just financial. This will increase tax burden of taxpayers since the government will use more of the resources to fight fraud, instead of utilizing them to improve on the healthcare services. Falsifying complaints exaggerates the total expenses for healthcare, which naturally results in higher premiums and out-of-pocket health costs for the consumers.

According to McDaniel & Blakely (2020), Medicaid expansion under the Affordable Care Act (ACA) allowed for more fraudulent schemes [2]. This is particularly true of the rise in pharmacy benefit abuse, which tends to be through opioid fraud, and it has resulted in huge financial pressures on Medicaid. As more fraud schemes continue to evolve, however, such that frauds cannot be adequately prevented by tougher regulations, state regulations become stricter, and the demand for more efficient fraud detection mechanisms remains urgent.

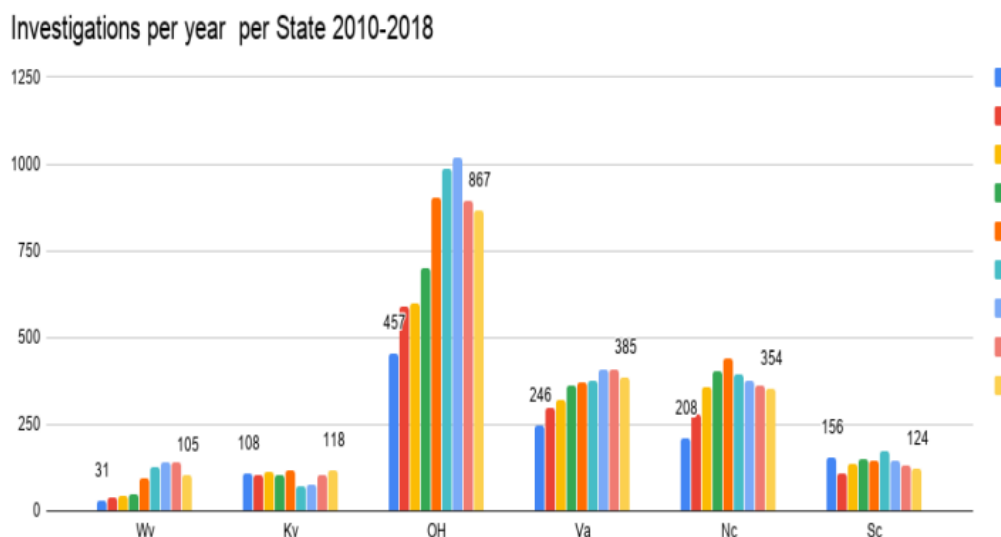


Fig. 2 Fraud Investigations (McDaniel & Blakely, 2020)

National Consequences

Provider fraud is clear to see in the high-profile cases of large-scale fraud that national level. States have been forced to spend billions due to instances of unethical billing practices, unnecessary medical procedures and fraud schemes involving fraudulent prescriptions. McDaniel & Blakely (2020) noting how the increase in opioid related fraud has

caused public health crisis to worsen, requires more from the government. At risk for Medicaid's sustainability are robust fraud detection systems [2].

III. IMPACT OF FRAUD ON NATIONAL HEALTHCARE SYSTEM

Resources for Patients

Billions of dollars away from Medicaid go towards healthcare fraud that deprives medicinal care dollars needed for genuine medicinal care. This resources that could otherwise improve patient outcomes, in particular among vulnerable populations, is lost to fraudulent claims, duplicate billing and phantom services. The disproportionate effect of fraud on underserved and racial communities worsens already existing healthcare as laid out by Davies (2024) [3].

The financial loss from fraud activities just eats up resources and at the same time decreases access to quality care thereby preventing prevention and chronic disease management of those who need it the most. A finding of studies is that fraud harms minority communities disproportionately through financial and systemic barriers to health care access as well as to reinforcing health inequalities. For this to happen, fraud detection mechanisms that are stringent to the point are necessary to the extent that Medicaid is being used by low-income individual.

Overbilling

Medicaid's long-term viability is at risk due to highway of overbilling (widely known practice of overbilling), whereby healthcare costs are inflated. Thaifur and co. (2021) states that such fraudulent claims are of medical personnel, such as doctors and healthcare providers, who submit duplicate or wrong claims to maximize reimbursements [4].

Such practices have led to Medicaid expenditure and prompted policymakers to divert additional funding toward health expenditure prevention than towards expanding access. Uncontrollable overbilling over time threatens to undermine Medicaid's financial soundness, resulting in cuts to the budget, service reductions, which harm patients.

Estimated Losses and Recoveries Medicaid fraud impact is shown below in the table:

Year	Estimated Medicaid Fraud Losses (in billion \$)	Fraud Recoveries (in billion \$)	Net Loss (in billion \$)
2019	36.2	3.7	32.5
2020	40.6	4.2	36.4
2021	45.1	4.8	40.3
2022	49.8	5.3	44.5

Even when trying to recoup a portion of lost money, the difference between fraud losses and recovery is very large, confirming the reinforcing need for the latest AI-backed fraud detection methods.

National Healthcare Programs

Fraud finances Medicaid, and fraud undermines the public's trust in government run healthcare. Public perception of Medicaid's efficiency declines as more high-profile fraud cases hit the news. Trust in the quality and integrity of services diminishes for patients and taxpayers begin to become concerned with whether their contributions are being maximally applied to services.

According to Davies (2024), fraud intensifies disparities in that they disproportionately harm the marginalized communities who are less likely to trust and participate in health care programs [3]. And since fraud has come to undermine Medicaid's mission in such a way, the strengthening of fraud detection processes including AI based anomaly detection and graph neural networks (GNN's) is imperative to restore public trust in the program and its sustainable impact.

IV. AI ROLE IN NATIONAL HEALTHCARE

Fraud Detection Fails

Methods of fraud detection on Medicaid and other government healthcare programs rely predominantly on manual audits, whistleblower reports and rule-based systems. Although these techniques are effective for identifying known fraud patterns, they do not scale because there are just so many healthcare transactions.

From the human oversight perspective, there is limitations on oversight; frequently human oversight does not notice there are fraudulent claims, duplicate billing, and unauthorized procedures. Like the U.S. system, the rapid growth in fraudulent activities may have slowed down health insurance fund income growth in China, which is noted by Lin et al. (2025) [5]. The fact is that it is based on outdated detection techniques which makes the job old fashioned especially nowadays:

- **Unnecessary investigations** – Most of the legitimate claims are flagged.
- **Investigations** – It takes months for investigations, giving fraudsters enough time to benefit from it longer.
- **Rule-based systems** - are inefficient at analysing the millions of unbilled claims where the billing pattern might be complex.

With the growing sophistication of fraud schemes it is after all a question of being able to have real-time, large-scale fraud detection via advanced AI driven techniques.

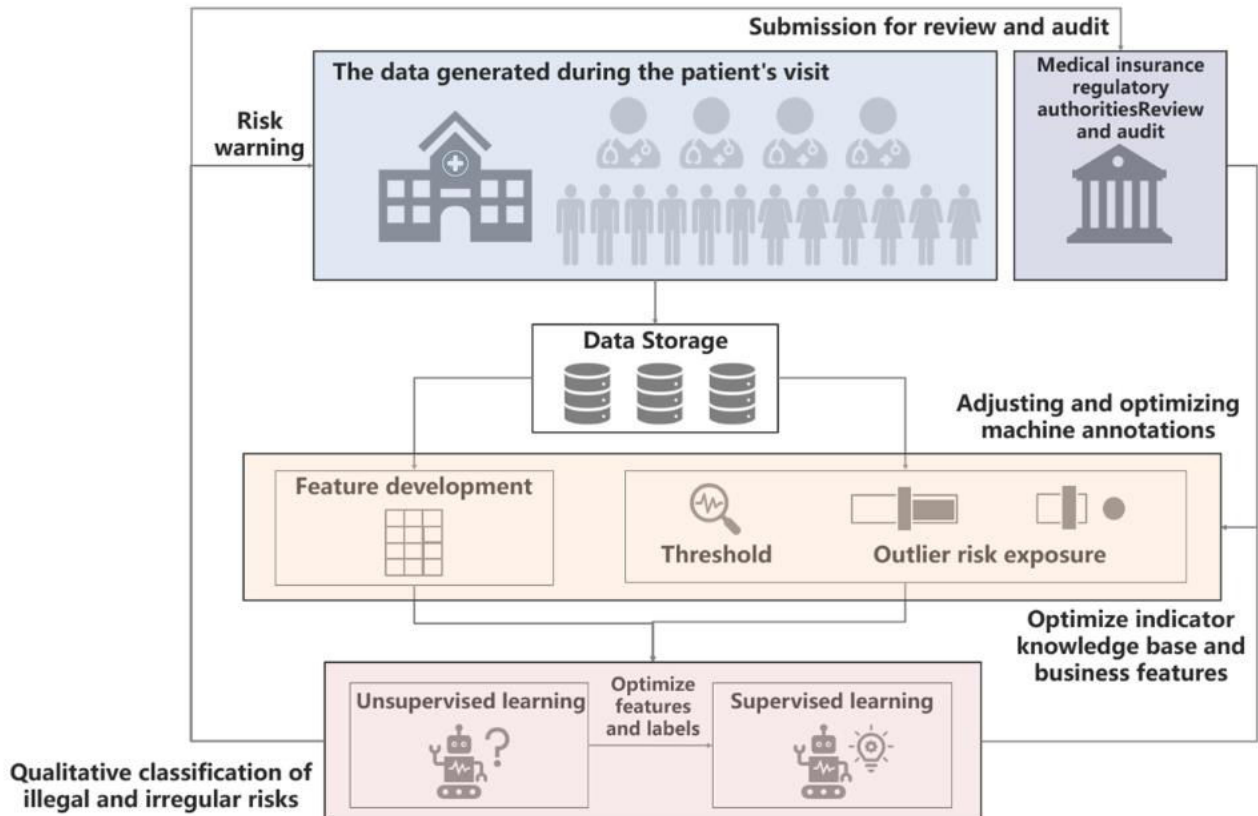


Fig. 3 Fraud Detection Mechanism (Lin et al., 2025)

Cost Savings

However, machine learning (ML) and deep learning (DL) algorithms present a powerful means to solve the problem of Medicaid fraud detection with artificial intelligence. However, AI has the capability to process large volumes of health data, detect abnormalities and alert about false activities.

Lin et al. (2025) noted that recent risk control AI frameworks, e.g. LightGBM can be used to predict medical fraud and are very effective [5]. These techniques enable:

- **Patterns:** It can sense the faint anomaly hidden in the billing trends and medical behaviors.
- **Predictive analytics:** The ML algorithms predict on the information of the historical data.
- **Automative:** Fraud detection made with AI takes out manual audits.

Medicaid stands to gain from improving fund allocation efficiency as well as reducing improper payments by a magnitude with the help of AI. For example, China's AI assisted financial live of the financial effect of the financial management in health insurance using the surplus rates increase driven by automatic fraud detection measures.

Administrative Costs

Fraud never is fully picked up by AI, and AI also reduces administrative costs by automating routine tasks. Much of Medicaid fraud investigation today is still executed with enormous human effort, such as claim review, medical audit, and legal proceedings. As argued by Abadi et al. (2020), spending on AI investments by the U.S. National Science Foundation is key for competitiveness and streamlining of not only US healthcare fund management but also other sectors [6]. Fraud detection decreased by:

- **Claim verification:** It takes a matter of seconds for an AI to confirm claims against patient history and the RI standards of treatment.
- **False alarms:** AI allows the algorithm to differentiate between legitimate and fake claims, this shall reduce unnecessary investigations.
- **Compliance:** In healthcare, AI systems obtain patient prescriptions in the form of non-compliant claims.

The use of AI to reduce administrative overhead, and in turn increase the fraud detection accuracy, delivers a cost-effective solution for preserving Medicaid funds and ensuring that the overall healthcare system remains to be as secure as possible.

V.ROLE OF GNN

Fraudulent Billing

Collusion is pervasive in healthcare fraud and recipients of such fraud are seldom providers, but have networked with additional providers, clinics, and billing entities to perpetrate healthcare fraud. Consequently, GNNs offer a natural solution to traditional fraud detection techniques as it can cope with these more complex interconnections.

GNNs specialize in analysing graph structured data and will detect anomalous relationship within a provider networks. Paul et al. (2024) report that GNNs hold great potential for healthcare applications especially in modelling complicated relationship to discover hidden patterns [7].

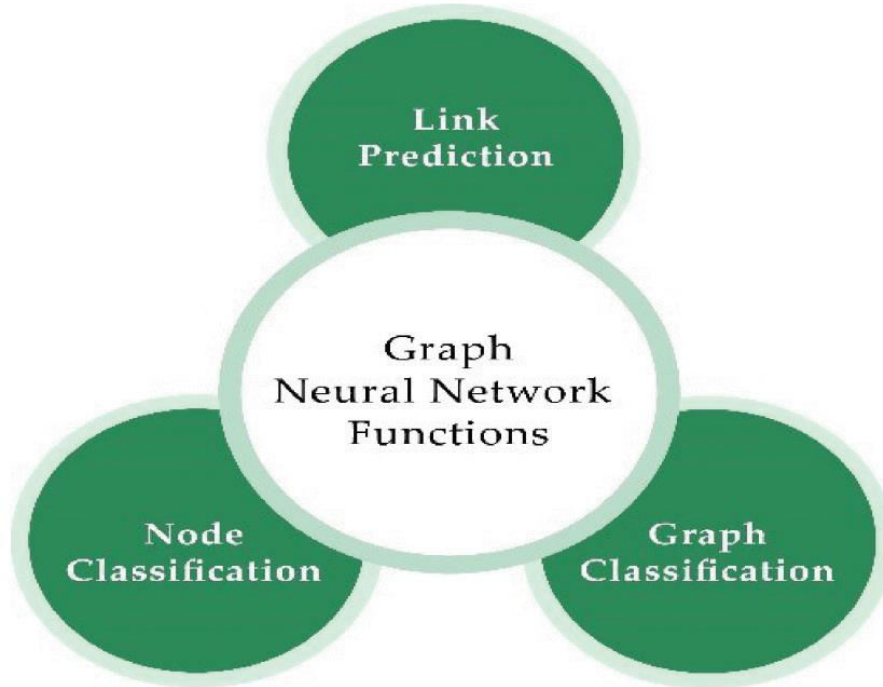


Fig. 4 GNN Functions (Paul et al., 2024)

GNNs are basically network aware so they use the topology of the network, represented by their nodes (the hospitals and claims) and edges (billing relationships between the hospitals and the claims); GNNs perform computations based on the given topology of the network. However, the propagation rule in GNN is usually defined as:

$$H^{(l+1)} = \sigma (W^{(l)} H^{(l)} A + b^{(l)}) \tag{1}$$

The node representation $H^{(l)}$ is a learnable weight matrix $W^{(l)}$, there is adjacency matrix A capturing network connectivity and a non-linear activation function σ . This allows is the network to increment write node representations by aggregating what some of the neighbour nodes are saying and detect unusual connections that would signal that there's some false information in this billing.

Abuse and Collusion

Typical clusters of providers engaged in collusive schemes include submitting inflated or duplicate claims. Traditional rule-based systems do not find these elaborate networks of abuse because these are not considered individually, but as part of an overall network.

However, GNNs are robust natural mechanisms of identifying such patterns, by learning the latent structures within billing networks. The main advantage of GNNs in the field of fraud detection is that they can consider the multi-hop relationships, i.e. fraudulent activity is not confined to direct links only but can propagate over a few hops of the interaction.

Suppose for example that a network of providers constantly submits claims for non-existing procedures, and GNN will spot the unusual denseness of the connections, but also the resemblance of the claims. Mathematically represented as the process:

$$H^{(l+1)} = \text{ReLU} (\Sigma (W^{(l)} H_i^{(l)} + b^{(l)})) \tag{2}$$

The GNN ‘learns’ fraudulent patterns by aggregating information from the surrounding entities represented by the neighbours of node v . Using these insights, regulatory bodies can pre-emptively state high risk provider groups and stop fraudulent networks from blooming.

Nationwide Fraud Schemes

GNNs were implemented in healthcare fraud detection using large scale billing datasets from the Medicaid claims. However, what researchers discovered was not just one ring, but several badly behaving rings that have been sucking money out of the system by operating in multiple different states.

We identified a cluster of clinics that had an abnormally extensive volume of the same claims being filed over an abnormally short time period, which was a sign of collusive fraud. Since traditional statistical models focused on individual claims, they were unable to identify these anomalies.

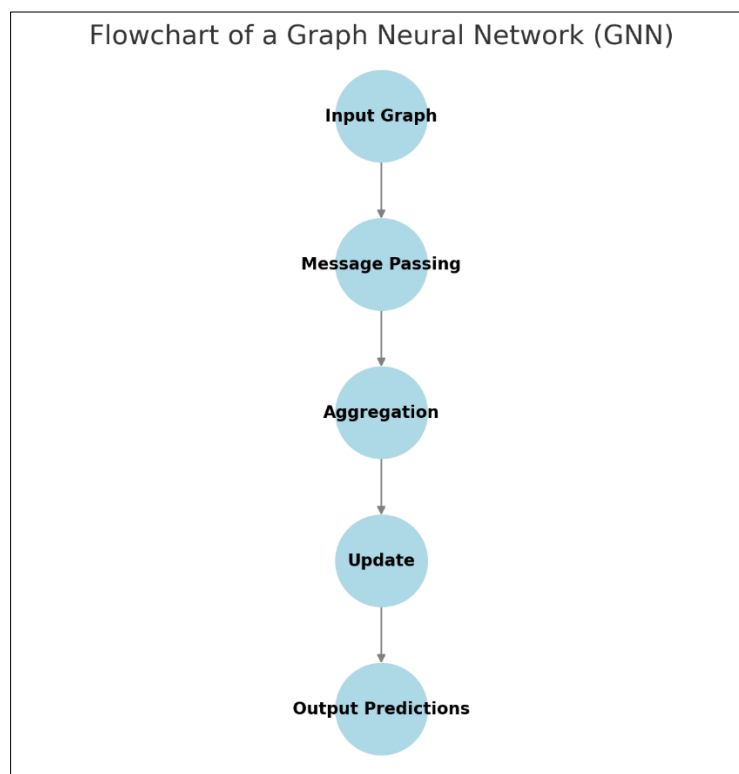


Fig. 5 Flowchart for Graph Neural Network (Self-created)

However, when a GNN was applied on the model, it could detect highly interconnected nodes in irregular patterns thereby denoting a fraudulent billing network that extends across several jurisdictions. The study agreed with the work of Paul et al. (2024) in proving that GNNs can completely change the way fraud detection can be achieved by revealing connections that cannot be observed through conventional ways [7].

By incorporating GNN based systems in the Medicare oversight tool, a considerable enhancement of the ability of the United States’ healthcare system to identify and correct major fraud would be possible, protecting public funds and offering equal healthcare access.

VLANOMALY DETECTION

Fraud Monitoring

For millions of Americans, healthcare fraud is not just a theoretical problem; it deters healthcare funds, costs billions of dollars a year, and prevents access to life saving medical services. Most of the fraud detection methods are said to be hard at scale, often being based on manual audits and rule-based systems.

Real-time monitoring is offered by AI powered anomaly detection and this has brought in the proactive fraud prevention. Further, fraudster mimics normal patient behaviours, so it is challenging to identify fraudulent claims through conventional means, said Zhou et al. (2020) [8]. To combat that, advanced machine learning techniques working to analyse enormous medical datasets attempt to spot subtle shortages that the auditors on the human side tend to miss.

MapReduce and frequent pattern mining are leveraged in AI systems to process millions of claims in short amounts of time and flag enough number of claims with high accuracy. This method prevents things like billing for non-existing patients and medically unnecessary procedures which have huge financial implications.

Suspicious Claim

AI models can analyse such patterns to find fraudulent claims among large-scale Medicaid and Medicare data. As with fraudulent activities, recurring patterns follow fraudulent providers that are habitually overcharging for the services they bring or claiming for an extremely large number of patients.

Zhou et al. (2020) showed that using AI driven cluster behaviour detection, it is possible to distinguish between both legitimate claims and claims which are exploiting the loopholes in the system [8]. The main advantage of AI based fraud detection technology is that it helps in processing both unstructured and structured data and combine medical records, billing information, provider history into single comprehensive risk assessment pipeline. As illustrated by the table below, AI can detect varying fraudulent behaviour in the claims processing:

Fraud	AI Detection	Manual Audits	Rule-Based
Phantom Billing	✓	✗	✗
Upcoding Services	✓	✓	✗
Duplicate Claims	✗	✓	✓
Unnecessary Tests	✓	✗	✗
Fake Prescriptions	✓	✓	✗
Unbundling	✗	✗	✓
Kickback	✓	✓	✗
Excessive Claims	✗	✓	✓

Phantom Billing

The two most common forms of Medicaid fraud are phantom billing and upcoding which magnify healthcare costs hugely. Phantom billing occurs when providers are billing for services that were never provided and upcoding when services rendered were more costly than carried out.

Zhou et al. (2020) BDSRooke13s remark that the AI supported fraud detection systems employ deep learning models and compare historical claims data against actual utilisation of medical practices [8]. These systems look for inconsistencies, so that the inappropriate payments are caught before they take place.

Real time fraud monitoring also enables healthcare agencies to take such immediate correctives as freezing suspicious payments and commencing investigations if the necessity arises. With the advancement of AI, the more technologies such as natural language processing (NLP) and computer vision, will prevent the rise of fraud detection and keep Medicaid funds for care of the patients and not in fraudulent schemes.

VII.GPT AUDITING

Human Error

The introduction of GPT powered auditing in the oversight of Medicaid claims has the potential to bring massive efficiencies to the industry through the elimination of human error. Salle et al. (2024) show that AI can ascertain recurring problems in the financial report, misallocations, and oversight failures that otherwise go undetected [9]. Since most Medicaid audits are conducted like most others, through manual reviews, they are time consuming and can be inconsistent.

GPT powered models can process millions of records and compared to claims with medical records, billing codes and guidelines to identify anomalies. These models communicate possible fraud as well as clerical errors like prohibited procedure codes and double billing that cause improper payments.

However, automating the review of Medicaid claims can drastically cut down both the fraudulent and erroneous payouts, thereby ensuring that the disbursement of funds is for credible healthcare needs. Additionally, AI driven audits enhance a conformance to healthcare regulations by offering standardized quantification, eliminate bias and accuracy across all assessments.

Government Accountability

The role of AI driven auditing is to strengthen the government accountability by improving oversight and making Medicaid spending more transparent. As pointed by Salle et. al (2024), internal controls should be strengthened and data management improved to prevent financial management [9]. The auditing systems powered by GPT take a look at historical spending patterns to detect any anomalies in the provider claims, grant distributions, and operational expenditures.

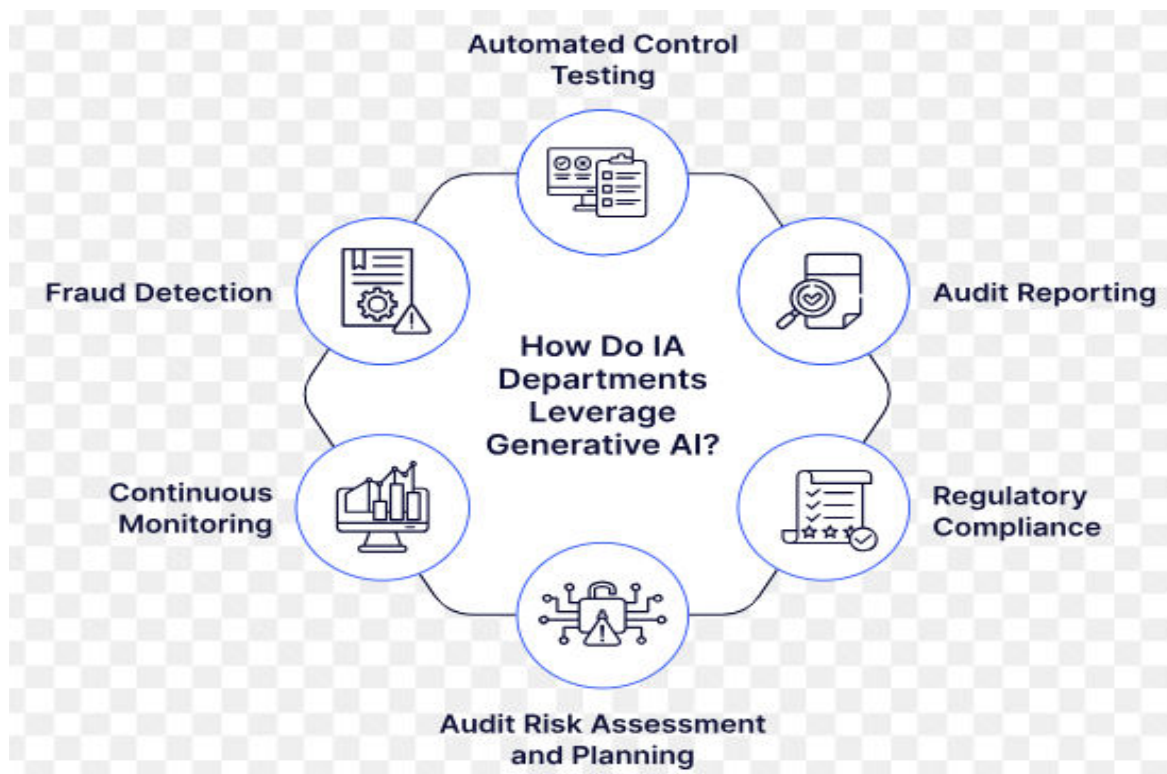


Fig. 6 GenAI in auditing (ZBrain, 2025)

AI driven audits differ entirely from traditional audits, where the latter can take months to complete but AI driven ones allow for immediate corrective actions as soon as the insights are revealed. They can spot discrepancies from a set of financial policies, and will therefore notify the regulatory bodies for any potential abuse or inefficiencies.

In addition, large language models can create complete reports on Medicaid expenditures that are not only clear but also informatively data based for policymakers. This level of automation and precision provides the government agencies to keep public trust in health care programs and at the same time maintain fiscal responsibility. It helps to reduce risk of large-scale fraud because instead of having continuous audits or periodic reviews [sic] the ability to do continuous audits instead of the periodic reviews reduces the risk of large-scale fraud across the healthcare sector.

Policy Enforcement

GPT and other large language models have revolutionized policy enforcement and fraud prevention in Medicaid by automatically interpreting and enforcing the rules regarding complex health care. In his discussion of the application of AI-powered audits, Salle et al. (2024) highlight that AI powered audits can help identify inefficiencies and gaps in oversight, as the two factors which are important for detecting fraudulent activity [9].

By channelling AI models that can verify instantaneously whether claims stick to Medicaid guidelines, the patterns of abuse typically exhibited by such things as excessive billing, upcoding, and unbundling of services can be detected. But these models keep learning with new data and refining their fraud detection capabilities to outpace tactics of fraudulent providers with which they are challenged.

Additionally, the enforcement of policy is powered by AI which allows the real time monitoring of compliance reducing the burden on human auditors and ensuring that Medicaid resources are used on patients. Integrating GPT powered auditing into Medicaid oversight not only helps government agencies improve their onboarding process, but also enables fraud detection, and most importantly it enables proactive prevention of financial losses and ensuring public healthcare funds available for generations to come.

VIII.CONCLUSION

By integrating AI in the Medicaid fraud detection, there is a breakthrough in healthcare oversight, allowing for the reduction in financial loss and increase of accountability. With the use of AI based anomaly detection, GNNs, and GPT based audits, the fraudulent claims can catch more noisily and speedily.

On the significance of this research is its highlighting of the role that AI plays in automating the claim reviews; ensuring policy compliance and even security of public funds. Due to the advancement of AI technologies, it will be of immense importance to maintain the healthcare integrity with AI technologies, allocating the financial resources for patient care instead of fraud activities and building trust on the government funded healthcare programs.

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