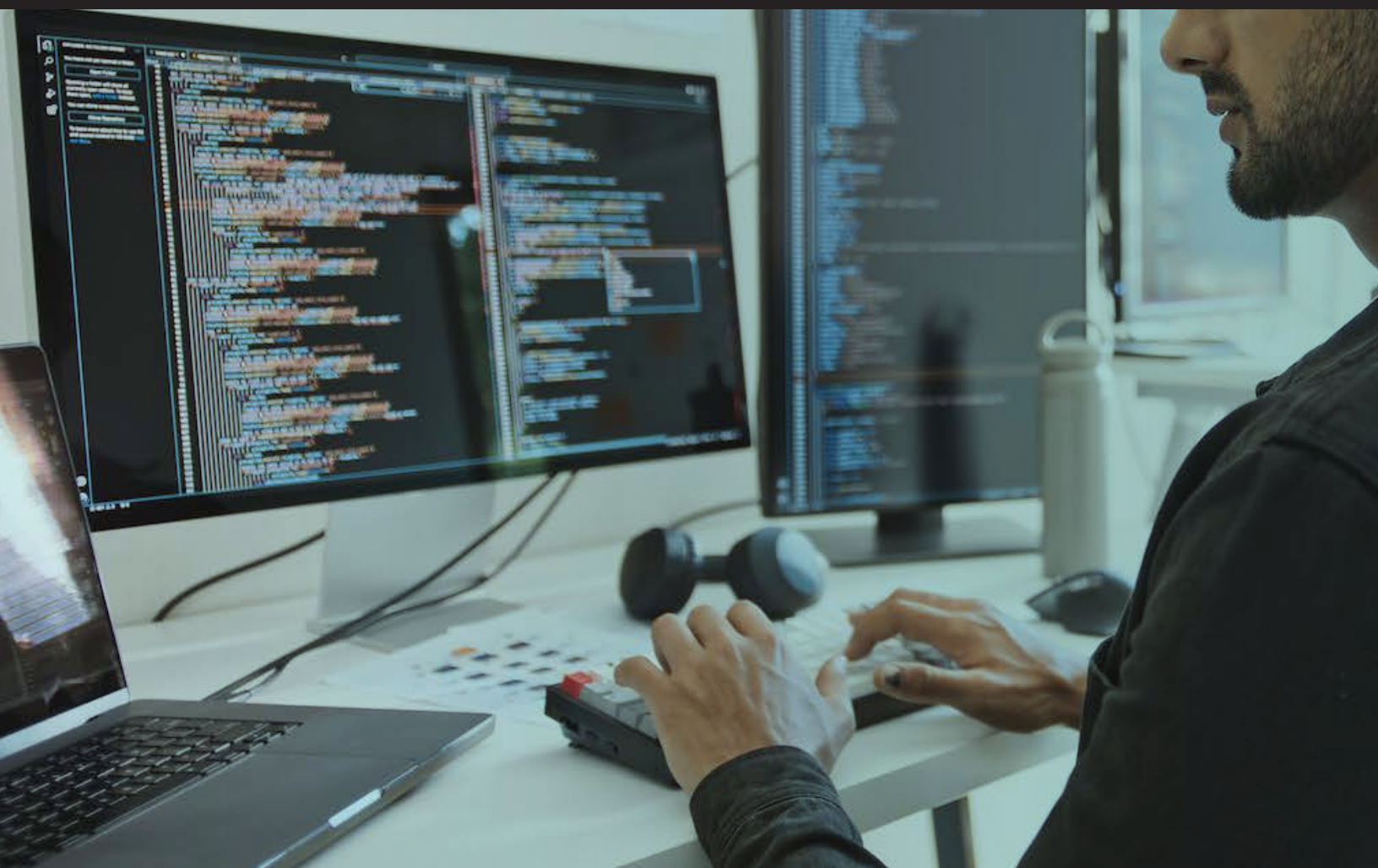


# Data Mining Algorithms Advancing in Payment Integrity

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Where Algorithms are Growing



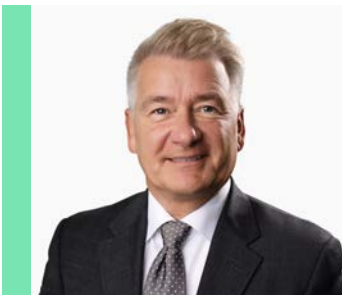
# Foreword

Data mining algorithms are a crucial tool for payers in advancing payment integrity and reducing improper payments. These sophisticated algorithms analyze vast amounts of healthcare data to uncover patterns, anomalies, and potential instances of fraud, waste, and abuse that human reviewers might miss. In the complex landscape of healthcare payments, algorithms serve as powerful tools in both prepay and post pay workflows.

Historically, payment integrity efforts relied on simplified rule-based systems. However, as data volume grew exponentially, more advanced techniques became necessary. Early data mining efforts as well as many of the algorithms used today focus mostly on post pay analysis, identifying overpayments after they occur. While effective, the pay and chase model has its limitations.

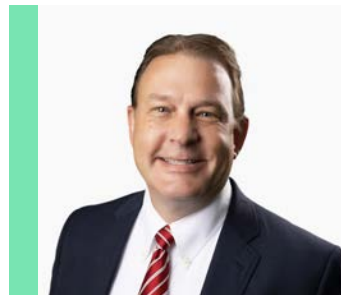
Over time, payers have been shifting to adding a proactive approach, and implemented prepay data mining alongside post pay algorithms. This dual strategy has proven effective in reducing improper payments while enhancing provider relationships and eliminating some of the administrative burdens of post pay processes.

This article takes a deeper dive into how algorithms have advanced over the past few years and where algorithms are growing and improving over the next few years to strengthen the system and catch potential errors as early as possible.



**Greg Dorn**

President



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# The Evolution of Data Mining Algorithms

AI and automation have been more deeply integrated into data mining algorithms over the past few years from data preparation to modeling and analysis. While changes are occurring rapidly in many areas, we have highlighted 5 key areas where algorithms are increasingly becoming more defined and impactful including:

① **Pattern Recognition**

② **Anomaly Detection**

③ **Unstructured Data Processing**

④ **Predictive Fraud Scoring**

⑤ **Reinforcement Learning**



## 1. Pattern Recognition

Technology advancements have enhanced pattern recognition by improving the ability to detect complex patterns in large datasets and uncover subtle correlations and anomalies that traditional statistical methods miss. Machine learning algorithms used in AI-enhanced data mining not only identify existing patterns, but are now being used to make accurate predictions about future trends and behaviors.



## 2. Anomaly Detection

One of the biggest breakthroughs in data mining has been the use of unsupervised learning in algorithms and their impact on anomaly detection. These techniques are particularly effective in identifying outliers and unusual patterns in claims data without the need for predefined rules, labels or fraud markers. Advanced algorithms group claims into "normal" and "anomalous" clusters, helping payers detect potential fraudulent claims early. These procedures have become more sophisticated and are being used upstream to catch claims earlier in the process.



## 3. Unstructured Data Processing

A large portion of healthcare data is unstructured, including physician notes, medical records, and billing documents. Natural Language Processing (NLP) algorithms have been continually refined to process this type of data more accurately and use it to identify inconsistencies between treatments and billing codes. NLP tools are also being used to cross-reference medical codes with textual descriptions of patient encounters, making it easier to identify upcoding, medically unnecessary procedures, or documentation errors that contribute to payment integrity issues.



#### 4. Predictive Fraud Scoring

Algorithms now include more advanced predictions that assess the likelihood of fraud or errors before payments are made. These models, trained on historical claim data, use features such as claim frequency, provider behavior, and patient profiles to generate risk scores for each claim. These predictive models are increasingly used in prepay stages to flag potentially problematic claims in real-time.



#### 5. Reinforcement Learning

One of the newer areas of research in data mining algorithms includes reinforcement learning (RL). RL allows systems to improve over time by learning from the outcomes and actions taken on flagged claims. For example, if a prepay claim is denied and later confirmed to be fraudulent, the RL model reinforces that decision, optimizing for similar scenarios in the future. RL can also be applied in post pay auditing, where algorithms learn from successful recoveries or adjustments to improve the selection of claims for future audits. With claim selection being an important aspect in post pay datamining, this automation offers an opportunity to maximize not only outcomes but resources.

## The Future State of Data Mining Algorithms

AI and other advanced tech models are expected to continue to profoundly influence data mining algorithms in both prepay and post pay content in the next few years. Five key areas that are being researched to enhance the impact in balancing pre and post pay while advancing outcomes and efficiencies include the following:

① Deep Learning

② Predictive Intelligence

③ Smart Auditing

④ Adaptive Learning

⑤ Feedback Loops



## 1. Deep Learning

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Deep learning algorithms, such as convolutional neural networks (CNNs), will enable a more granular and context-aware analysis of claims data. CNNs, in essence, allow detailed analysis of image, speech, and audio inputs. These algorithms and other deep learning AI will not only analyze individual claims but also contextualize them by comparing them with multiple different types of data sets involving peer groups, provider histories, and even geographic trends.



## 2. Predictive Intelligence

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Some prepay algorithms are advancing from predictive analysis and scoring into predictive intelligence. This increases the accuracy and success of real-time predictions about the legitimacy of claims being flagged for audit. The evolution will continue to create more personalized, case-by-case assessments where algorithms flag issues with pinpoint precision, reducing false positives and speeding up the flow of legitimate claims. Some of the advancements being tested make prepay checks near-instantaneous with great accuracy.



## 3. Smart Auditing

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Post pay audit systems have already become more precise in selecting claims for recovery and predicting the probability of successful recovery based on past data is getting even smarter. We should continue to see a further reduction in the number of false positives and be able to focus audit efforts on high-probability recoveries, increasing efficiency. Future systems should be able to leverage AI to accurately deny or approve claims automatically based on complex, multifactor analysis. This automation will improve efficiency while reducing administrative costs.



## 4. Adaptive Learning

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With AI's ability to learn from every interaction, post pay integrity systems will continuously refine their understanding of how fraud or payment errors are evolving over time. Algorithms will be able to adapt to new fraud tactics, emerging inaccurate billing practices, and changing regulatory environments. One of the challenges with existing AI systems is that they can sometimes operate in a vacuum creating inaccuracies. However, future algorithms that continually adapt will offer explainable AI that not only flags claims but also provides clear, understandable reasons for why a claim was flagged, facilitating compliance with healthcare regulations.



## 5. Feedback Loops

Advanced tech will create more seamless feedback loops between prepay and post pay systems. For example, insights gathered during post pay audits will be immediately integrated into prepay processes and algorithms. With the opportunity to immediately refine integrity checks, data mining platforms can be further unified and integrate both prepay and post pay functionality. With more precision, payers will be able to monitor and manage the entire payment lifecycle more efficiently.

## Conclusion

Data mining algorithms in payment integrity have grown significantly, with AI and advancing tech playing a central role in enhancing their effectiveness. Over the next few years, AI will likely have significant influence on both prepay and post pay data mining algorithms. As tech continues to advance, we will begin to see more, precise, and adaptive fraud detection and claim auditing. This evolution promises to create more efficient, cost-effective, and accurate systems for managing payment integrity - benefiting both healthcare providers and payers.

**CERIS has partnered with payers across the nation to support their payment integrity program and help them advance where they are in their journey.**

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