
Weblogic and Oracle - Revolutionizing Offender Management System

Krishna C Gonugunta¹, Abdullah²

¹Sr. Database Admin/Architect, Dept of Corrections, 5500 Snyder Avenue, Carson City NV 89701

²Cadillac Fairview, Ontario, Canada

ABSTRACT

This research study analyzes the transformational impact of Generative AI on Oracle Database Automation, emphasizing its capacity to change data management and analytics. As enterprises increasingly depend on data-driven decision-making, efficient and effective database management solutions have become essential. The integration of Generative AI technologies with Oracle Database systems provides substantial advantages, such as augmented data processing capabilities, increased analytical accuracy, and the automation of repetitive operations. This article examines integration techniques, gives successful implementation case studies, and addresses problems companies may have, including technological obstacles and data protection issues. The study also delineates prospective trends in Generative AI and database management, forecasting developments in AI technology and their ramifications for data governance and compliance. This research seeks to elucidate the benefits and limitations of utilizing Generative AI in database automation for practitioners and scholars.

Keywords: Real-Time Data Processing, Application Server, High Availability, Scalability, Transaction Management, Security And Authentication, External Systems Integration, Business Rules Engine ,Case Management Workflow, Web-Based Interface, Load Balancing, Fault Tolerance, Reporting And Analytics, Event-Drive Architecture, Compliance And Auditing, Enterprise Integration, Microservices Architecture, Cloud-Native Capabilities, User Role Management, Audit Trails, Message Queues And Asynchronous Processing, Service-Oriented Architecture(SOA), Workflow Automation, Data Migration, Disaster Recovery, Compliance and Audit

Introduction

Background on Oracle Database

An Oracle database constitutes a cohesive aggregation of data. The function of a database is to store and retrieve interconnected information. A database server is essential for addressing information management challenges. A server efficiently oversees substantial data in a multiuser environment, enabling simultaneous access for several users. This is achieved while maintaining superior performance. A database server also inhibits illegal access and offers effective solutions for failure recovery. Oracle Database is the inaugural database engineered for corporate grid computing, the most adaptable and economical method for managing information and applications. Enterprise grid computing establishes extensive collections of standardized, modular storage and servers. This design enables the rapid provisioning of each new system from the component pool. Peak workloads are unnecessary as capacity may be readily augmented or redistributed from resource pools as required. The database comprises logical and physical components. The separation of physical and logical structures allows for the management of physical data storage without impacting access to logical storage structures [1-3].

Comprehensive Analysis of Generative Artificial Intelligence

Generative AI, a kind of Artificial Intelligence (AI), use machine learning to produce wholly novel data or content. In contrast to conventional AI used for prediction or categorization, generative AI produces original material (text, graphics, audio) in response to human inputs. These models are trained on extensive datasets. They utilize neural networks that replicate the architecture of the human brain to discern patterns in the data. This will enable them to generate original material that conforms to the acquired patterns [4-9].

Significance of Automation in Data Management

Comprehending Your Data

The significance of data management is paramount and cannot be exaggerated. It allows enterprises to comprehend their data and make educated decisions, enhancing efficiency, accuracy, and compliance. Data management is essential for the success of many firms nowadays, rendering data comprehension vital for every corporation. Primarily, data management enables a business to get enhanced insight into its operations by offering visibility across systems and divisions. This enables firms to discern patterns in their data and examine trends over time—an essential tool for informed strategic business choices. Moreover, proficient data management enhances communication across various departments and with clients or external parties. Consequently, access to precise information will facilitate procedures and yield long-term cost savings.

Moreover, effective data management mitigates risks of non-compliance by guaranteeing that all records are current and conform to requisite requirements. This mitigates expensive errors and enhances customer satisfaction by decreasing response times for questions or requests pertaining to the company's products or services. Furthermore, effective data management enables precise evaluation of your current storage requirements, eliminating the need for conjecture or external assistance. This conserves time and resources, which may be allocated to other significant duties.

In summary, if executed properly, efficient data management equips firms with the insights necessary to maintain competitiveness in contemporary marketplaces, from discerning current possibilities to pinpointing new areas for enhancement. Organizations may use its benefits—cost savings, greater risk mitigation, and enhanced visibility—to guarantee that sufficient evidence is consistently accessible for decision-makers when required.

Implementing Data Governance

Effective data governance is essential for data management. Establishing this essential feature guarantees that all pertinent stakeholders, including companies and people, comprehend the objectives of data control and collection the appropriate methods for utilization and distribution. An extensive management system safeguards sensitive information, enabling organizations to derive insights from their accumulated intelligence.

Establishing explicit limitations about access to specific data sets or resources will mitigate possible security threats. Structured authentication and authorization mechanisms must be

established to ensure that only those with the requisite credentials may access secret information. Moreover, adherence to diverse requirements concerning certain data kinds necessitates a comprehensible structure, enabling organizations to maintain compliance and avoid expensive errors.

Moreover, the firm must have effective processes to manage requests and modifications pertaining to personal records or other customer service-related matters. This may encompass tasks such as changing billing addresses and addressing inquiries regarding product returns. A simplified strategy allows teams to promptly and properly resolve these issues, rather than wasting time determining priorities while clients remain in uncertainty.

Data governance empowers organizations to safely manage their assets while using insights through meticulous monitoring and clearly established regulations around usage and protection. When limitations are correctly created according to corporate policy, excessive flexibility may result in turmoil, eventually obstructing growth instead of facilitating a smooth advancement [10-13].

Optimizing Data-Driven Procedures

The benefits of data management are progressively acknowledged as firms transition to more efficient, automated processes. Implementing data governance has created a framework to guarantee the security and precision of organizational information. Nonetheless, optimizing data-driven operations provides additional advantages. Recent study from IDC indicates that 45 percent of surveyed firms saw enhanced productivity due to superior decision-making facilitated by streamlined data processing methods.

Organizations may utilize these newly created approaches to enhance their operations for increased productivity and cost efficiency. By automating specific components, such as customer support functions or back-office operations, enterprises may save personnel expenses while enhancing the efficiency of several activities that need extensive data management. Moreover, employing analytics technologies such as artificial intelligence (AI) can facilitate the identification of patterns within gathered data, thereby enabling better informed judgments with enhanced precision and accuracy. This enables organizations to develop higher-value products and services more rapidly to maintain competitiveness in the current market.

Data management is a crucial instrument for every firm aiming to optimize operational efficiency and maintain a competitive edge in its sector. Optimized processes allow firms to respond swiftly and adjust to evolving market conditions without compromising quality or incurring extra overhead costs from inefficient workflows burdened by manual procedures or obsolete technology platforms. Consequently, it must be prioritized by all businesses aiming for sustained success amid unpredictable future circumstances [14-17].

Augmenting Data Security

Approximately 6,000 data breaches transpire each year in the United States, compromising an average of 3.86 million records (McAfee). This exemplifies the significance of improving data security within enterprises. Data management is essential for enabling firms to safeguard their personal information from external attacks and internal hazards from workers. Organizations must establish robust measures to safeguard private and sensitive data from external harmful actors and negligent access from within the organization. A crucial aspect of this process entails optimizing data collecting, storage, and transfer methods while adhering to industry standards, including GDPR and HIPAA requirements. Technological solutions such as blockchain can provide a secure infrastructure that restricts access to sensitive information to designated personnel. Furthermore, cryptographic techniques can secure important assets housed in cloud-based systems, inhibiting unwanted users from accessing them without consent.

Organizations must prioritize enhancing staff understanding of cybersecurity processes and procedures through frequent training sessions or seminars. All people must be familiar with optimal procedures for managing personal information and utilizing mobile devices linked to business networks. Furthermore, routinely upgrading systems and using firewalls helps mitigate vulnerability to intrusions. Effective safeguards must guarantee that any efforts at interfering with documents are promptly identified to provide timely intervention, preventing permanent harm resulting from a violation in security procedures.

Data management has become essential for global enterprises requiring dependable protections against cybercrime to maintain competitiveness. Consequently, companies must guarantee the effective use of robust protection systems to safeguard digital assets, irrespective of their origin, whether external or internal to the organization's network, including firewalls, antivirus software, and encryption [18-21].

Utilizing Data Analytics

Data analytics is an essential instrument for optimizing data management, enabling firms to fully leverage their current datasets. Data analytics functions as a magnifying glass, uncovering concealed nuances and patterns within otherwise opaque information, allowing organizations to derive significant conclusions from seemingly arbitrary data points. This robust method facilitates the extraction of insights that may enhance results or guide decision-making processes.

Data analytics provides several advantages for data management, including enhanced efficiency in swiftly and accurately collecting pertinent answers from queries. As this technology becomes more accessible, an increasing number of firms may obtain actionable intelligence regarding their operations. This sophisticated analytical method enables users to identify trends in extensive raw data effortlessly, hence revealing significant relationships among various components within the dataset.

Moreover, utilizing data analytics provides consumers enhanced freedom in accessing their information, allowing them to delve into more granular details without the need to manually

sift through extraneous portions. These approaches provide unparalleled control over accessing stored information, presenting significant potential for individuals seeking to optimize their return on investment (ROI). Leveraging its skills can enhance firms' preparedness to attain objectives while assuring optimal resource allocation. Utilizing data analytics enhances operational performance and streamlines workflows, hence maximizing the value extracted from datasets, much to a diamond cutter meticulously refining a valuable stone to expose its full brilliance [22].

Improving Data Accessibility

The importance of data accessibility is unequivocal in contemporary society. It has emerged as a central hub for several enterprises, signifying a potential to ensure that critical information is accessible promptly and at all times. This enables teams to collaborate from many places, enhancing productivity and promoting teamwork. across this setting, improving data accessibility is crucial for companies across all sectors.

Optimal information access may be guaranteed through the utilization of suitable tools and technologies such as cloud computing or data warehousing. These solutions provide safe storage with instant access to documents for team members, facilitating work completion without delays or obstacles. Moreover, these solutions enhance interdepartmental communication, fostering improved comprehension and coordination of their initiatives.

Data accessibility offers numerous benefits: it diminishes expenses related to manual file management; it optimizes processes by facilitating rapid access to pertinent information; it enhances collaboration through improved communication; it expedites decision-making via more efficient retrieval of relevant records; and ultimately, it elevates operational efficiency across the organization. Leveraging improved data accessibility enables organizations to maintain competitiveness while delivering superior services and products.

Considering its numerous advantages, enhancing access to dependable data sources should be prioritized in the formulation of plans for corporate success. By utilizing appropriate technology, firms may fully leverage this potent instrument to gain a competitive edge in the current market, characterized by speed and dependability.

Improving Data Integrity

The quality of data is a crucial element of efficient data management. Maintaining the precision and integrity of data within a system or platform enables firms to enhance decision-making, optimize operations, and elevate customer happiness. To improve this facet of their operations, several firms have used tactics including automation and enhanced governance frameworks that facilitate uniform data entry and verification.

Automation minimizes manual mistakes in data entry by optimizing the information input process into digital systems. It also facilitates enhanced tracking capabilities, enabling administrators to detect possible mistakes before they escalate into significant problems. Moreover, strong governance mechanisms are essential to guarantee that all parties comply

with uniform standards when integrating new data into existing systems. This entails delivering precise testing standards utilized across departments and various file kinds, formulating explicit methods for implementing changes over time, and instituting hierarchical access levels to ensure that only authorized individuals may amend information as necessary.

Ultimately, employing systems like version control allows enterprises to monitor revisions while preserving the original content. Users may swiftly reinstate any prior revisions if necessary by maintaining several versions accompanied by an audit trail. When utilized effectively, these solutions offer significant benefits in improving data security and the general dependability of stored information.

Objective of the Study

This study article aims to investigate the transformative potential of Generative AI in Oracle Database administration. The paper specifically seeks to examine the integration of Generative AI with Oracle Database systems to augment automation and boost data management efficiency. It aims to ascertain the advantages of employing Generative AI in database automation, including augmented data processing and heightened analytics precision. The essay also discusses the barriers businesses may have in applying Generative AI, including technological obstacles and data protection issues. It also examines forthcoming developments in Generative AI and its ramifications for database systems and data governance. The study advocates for more research and development in this domain, offering insights for academics and businesses aiming to utilize Generative AI for enhanced database automation and analytics.

The Evolution of Distributed DBMS

Centralized DBMS in the 1970's

- Support for structured information needs.
- Regularly issued formal reports in standard formats.
- Prepared by specialist using 3GL in response to precisely channeled request.
- Centrally stored corporate data.
- Data access through dumb terminals.
- Incapable of providing quick, unstructured, and ad hoc information for decision makers in a dynamic business environment.

Figure 1: The Evolution of Database Management

The Evolution of Database Management

Conventional Database Management Methodologies

Processes and information systems designed for a particular business function. The accounting department would own a customized information system, whereas the sales section would utilize a distinct system altogether.

Initially, these distinct systems were straightforward to establish, since they predominantly reflected the business processes that departments had been executing for years, enabling them to operate more efficiently with reduced effort. Nevertheless, once the systems due to prolonged usage, it became very challenging for individual departments to maintain and depend on their data, since there was no dependable way to uphold data standards or administration.

The existence of distinct information systems for each business function resulted in conflicts of interest inside the organization. Departments exhibited significant ownership for the data they gathered, processed, and controlled, resulting in several challenges to company-wide collaboration and data sharing. This data segregation resulted in superfluous redundancy and a significant prevalence of erroneous and inconsistent data.

Challenges Encountered in Data Management and Analytics

Given the pivotal significance of data management in the contemporary digital economy, systems must perpetually adapt to fulfill your organization's data requirements. Conventional data management practices hinder the scalability of capabilities without jeopardizing governance or security. Contemporary data management software must confront many obstacles to guarantee the accessibility of reliable data.

Augmented Data Volumes

Each department in your business has access to various data kinds and distinct requirements to optimize its value. Conventional methods necessitate IT to curate the data for each application and sustain the databases or files. As data proliferates, organizations may become oblivious to the nature, location, and utilization of their data.

Emerging Functions for Analytics

As your business increasingly depends on data-driven decision-making, a greater number of individuals are required to access and evaluate data. When analytics exceeds an individual's expertise, comprehending naming standards, intricate data structures, and databases can prove difficult. If the conversion of data requires less time or effort, analysis will occur, hence preserving the potential value of that data.

Regulatory Obligations

The incessantly evolving compliance rules render it tough to ensure individuals utilize the correct data. An corporation requires individuals to comprehend which data should be used promptly or avoided, including the ingestion, tracking, and monitoring of personally identifiable information (PII) for compliance with privacy standards.

Generative AI: An Overview

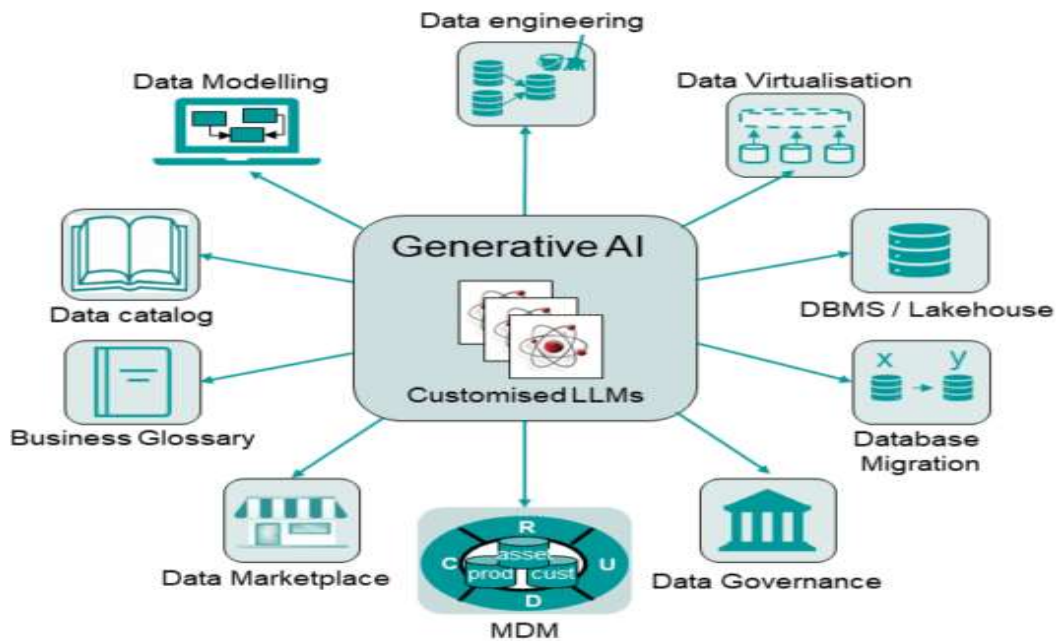


Figure 3: Generative AI

Generative AI may assimilate existing artifacts to produce new, realistic objects at scale that embody the traits of the training data without duplicating it. It is capable of generating original material, including photographs, videos, music, voice, writing, software code, and product designs. Generative AI employs several methodologies that are always advancing. Primarily, AI foundation models are trained on extensive collections of unlabeled data, enabling their use across many applications with further fine-tuning. The development of these trained models necessitates intricate mathematics and substantial computational resources; nonetheless, they fundamentally function as predictive algorithms.

Currently, generative AI predominantly produces content based on natural language prompts, eliminating the necessity for coding expertise; nonetheless, its applications in enterprises are extensive, including advancements in medicine and chip design as well as material science research.

Varieties of Generative AI Models Utilized in Data Management

Numerous generative AI models exist, each exhibiting distinct methodologies and uses. Several prevalent generative AI models include:

Generative Adversarial Network (GAN) refers to a deep learning model designed to produce new data that resembles the training data. Generative Adversarial Networks (GANs) have been efficiently employed in several applications, including text production, music composition, and image synthesis. Generative Adversarial Networks (GANs) comprise two neural networks: a generator and a discriminator that collaboratively enhance the model's outputs. The generator network produces novel data or content that mimics the original data.

The discriminator network distinguishes between the source and produced data to ascertain which is more similar to the original data. Generative Adversarial Networks (GANs) are often employed in picture and video production applications, demonstrating remarkable efficacy in producing realistic images, crafting animations, and constructing synthetic human faces. They are further employed in other domains, including natural language processing, music composition, and fashion design.

Transformer-based models are predominantly utilized for natural language processing tasks, including language translation, text production, and summarization. The Transformer model employs a self-attention mechanism to concurrently focus on all words in the input sequence, enabling it to more effectively capture long-range relationships and context compared to conventional NLP models. The Transformer model is frequently employed in generative AI for language translation. The Transformer model effectively captures intricate language patterns and subtleties, making it an invaluable tool for producing high-quality content across many situations.

Variational Autoencoder (VAE) models are generative deep learning architectures employed for unsupervised learning. They use autoencoder and probabilistic modeling principles to discern a dataset's fundamental structure and distribution. The encoder transforms input data into a reduced-dimensional latent space, whereas the decoder reconstructs the data from this latent space. Variational Autoencoders (VAEs) maximize two objectives: reconstruction loss and regularization loss. They can produce novel data samples from the acquired latent space distribution. Variational Autoencoders (VAEs) are utilized in picture and text production as well as data compression. They constitute a robust framework for unsupervised learning, representation learning, and generative modeling.

Autoregressive models are generative AI frameworks that employ probability distributions to produce new data. They generate the most recent content by producing one element sequentially and conditioning each preceding piece to compile the whole dataset. These models often generate sequences of text, music, or images. A language model may be trained to predict the probability of each word in a sentence based on its preceding words. The model begins with a primary word or set of words and thereafter use its predictions to generate subsequent words sequentially. Recurrent Neural Networks (RNNs), a type of artificial neural network, may be employed to develop autoregressive models. Autoregressive models are used in natural language processing and speech recognition applications. They are employed in picture and video generation, wherein the model produces a new image or video frame based on preceding frames.

Boltzmann machines - The Boltzmann Machine is a generative unsupervised model that learns probability distributions from a distinct dataset and use that distribution to infer unobserved variables. Boltzmann machines comprise a collection of binary units interconnected by weighted links. Boltzmann machines are generative models as they may produce fresh data samples by sampling from their acquired probability distribution. They

are advantageous for many applications, including image and speech recognition, anomaly detection, and recommendation systems.

Flow-based generative models are robust and capable of producing realistic data samples. Due to their ability to generate high-quality content, manage extensive datasets, and perform efficient inference, these models have gained importance recently. Flow-based models provide several advantages over other forms of generative AI models. Extensive datasets with high-dimensional inputs may be processed, high-quality samples can be generated without necessitating adversarial training, and efficient inference can be achieved by only calculating the probability density function. Nonetheless, they may lack the adaptability of other models for replicating intricate distributions and might incur significant computing costs during training, especially with complex datasets.

Advantages of Implementing Generative AI in Oracle Database Automation

- **Data Democratization:** Generative AI streamlines complexity and democratizes your organization's data. It enables non-technical individuals to access and analyze data, hence diminishing reliance on data scientists. This enables employees at all tiers to make data-informed decisions, cultivating a more nimble and knowledgeable workforce.
- **Address Blind areas:** Generative AI can detect and rectify blind areas in your data. The automatic identification of anomalies, trends, or concealed patterns facilitates the discovery of vital insights that may elude conventional data analysis techniques.
- **Interrogate Unstructured Data:** Conventional techniques require more structured data. Conversely, generative AI excels at processing unstructured data, enabling the extraction of important insights from previously underutilized sources. This feature expands the realm of data analytics, enabling organizations to get insights from various data kinds.
- **Real-Time Analytics:** Generative AI facilitates real-time analytics, crucial in the contemporary rapid commercial landscape. It can handle and analyze data in real-time, delivering current insights. This real-time capability is essential for making immediate judgments, particularly in the e-commerce, banking, and healthcare sectors.
- **Operational Efficiency:** Automating data analytics procedures with Generative AI may markedly diminish the time and resources necessary for data analysis. This minimizes expenses and enables your team to concentrate on more significant endeavors.
- **Continued Competitiveness:** By leveraging Generative AI in data analytics, your firm secures a competitive edge. It allows for adaptation to fluctuating market conditions, foresight of trends, and maintaining a competitive advantage.

Obstacles and Constraints

Technical Challenges

Integrating Generative AI with current systems can be technically complicated. Organizations may require assistance in integrating AI models with current architectures,

which might impede performance and efficiency. Moreover, there are predefined constraints on the quantity of agents and knowledge bases established inside a system, which may require augmentation for larger enterprises or more intricate applications.

Concerns Regarding Data Privacy and Security

Utilizing Generative AI frequently entails the handling of substantial amounts of sensitive data. Adhering to data protection standards, such as GDPR, while utilizing AI presents challenges, as firms must establish stringent security protocols to safeguard data integrity and privacy. Moreover, the integration of AI systems expands the attack surface for possible data breaches, necessitating that enterprises be attentive in safeguarding their databases from unauthorized access and vulnerabilities.

Reliance on the Quality of Training Data

Generative AI models are developed using pre-existing datasets that may have biases. This may provide results that reinforce stereotypes or omit certain viewpoints, compromising the authenticity and inclusion of the data management process. The efficacy of Generative AI is significantly dependent on the quality of the training data; subpar data may yield erroneous or deceptive outputs, negatively impacting decision-making processes.

Resistance to Change

Organizations may require additional help from personnel familiar with conventional management approaches. This opposition may hinder the adoption of Generative AI systems and restrict their efficacy. Furthermore, there may be a requirement for additional qualified workers adept in both Generative AI and current systems, which might impede the effective deployment and functioning of AI-driven solutions.

Operational Constraints

The availability of computing resources can influence the performance of Generative AI models. Organizations may need to invest in supplementary infrastructure to accommodate the requirements of AI processing, thereby elevating operating expenses. Furthermore, Generative AI agents frequently have a preset idle timeout, which can interrupt current sessions and result in a loss of contextual continuity, adversely affecting user experience and the efficacy of AI interactions [23-26].

Prospective Developments in Generative AI and Database Administration

The future of Generative AI in database administration is anticipated to yield substantial breakthroughs that will transform organizational data handling. The key elements of this trend are as follows:

Forecasts for Progressions in AI Technologies

As AI technologies advance, we should expect significant enhancements in their functionalities. Advanced natural language processing (NLP) will enable users to engage with databases using conversational language. Future AI models are anticipated to be more

advanced, enhancing their ability to comprehend context and produce more precise insights and forecasts. These advances will enhance user experiences and optimize data management operations.

The Function of AI in Prospective Database Architectures

Generative AI will be essential to the development of future database designs. As databases get more intricate owing to the escalating volume and diversity of data, AI will assist in managing this complexity through the automation of data organization, optimization, and retrieval. AI-driven databases will assimilate user interactions and modify their architectures appropriately, enhancing efficiency and performance. This dynamic flexibility will be crucial in real-time data processing and analytical contexts.

Potential Effects on Data Governance and Compliance

The use of Generative AI in database administration will profoundly influence data governance and compliance. Artificial Intelligence can automate compliance verifications, guaranteeing that data management processes conform to requirements like GDPR and HIPAA. Artificial intelligence may assist firms in upholding openness and accountability in their data management procedures through real-time monitoring and reporting functionalities. Moreover, AI may aid in recognizing and alleviating issues related to data security and privacy, hence augmenting compliance initiatives.

The future of Generative AI in database management is defined by breakthroughs in AI technology, novel database designs, and enhanced data governance methods. Organizations that adopt these trends will be strategically positioned to leverage data and facilitate informed decision-making in an increasingly data-centric environment.

Conclusion

The incorporation of Generative AI into Oracle Database Automation signifies a substantial progression in data management and analytics. This research study emphasizes the transformational potential of Generative AI, illustrating its capacity to augment data processing skills, boost accuracy and efficiency in analytics, and automate repetitive operations. By confronting the obstacles and constraints of integrating AI technology, enterprises may harness the advantages of automation to manage the intricacies of contemporary data environments. Future trends suggest that Generative AI will significantly influence the evolution of database designs and data governance methodologies. Organizations must allocate resources to continuous research, development, and personnel training to fully use these improvements. By doing so, enterprises can maintain competitiveness and adaptability in the ever-changing realm of data management and analytics.

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