# Global Artificial Intelligence (AI) In Genomics Market - Focused Insights 2024-2029

Market Report | 2024-08-06 | 159 pages | Arizton Advisory & Intelligence

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**Report description:**

The global AI in genomics market is expected to grow at a CAGR of 50.99% from 2023 to 2029.

MARKET TRENDS & DRIVERS

Rapid Advancements in Genomics and AI

Recent years have witnessed remarkable advancements in genomics, significantly accelerated by artificial intelligence (AI) breakthroughs. The integration of AI into genomics has revolutionized the speed and precision of genomic data analysis, enabling scientists to decode complex genetic information with unprecedented efficiency. One of the most notable achievements is the advent of AI-driven algorithms for genome sequencing and annotation. These algorithms can analyze massive datasets, identifying patterns and mutations that may indicate diseases, thus paving the way for personalized medicine. AI's ability to predict the functional impact of genetic variations is particularly transformative, allowing for early diagnosis and targeted therapies tailored to an individual's genetic makeup. Another significant advancement is the application of AI in CRISPR-based gene editing. AI models are being employed to enhance the precision of CRISPR technology, minimizing off-target effects and improving the accuracy of gene edits. This has profound implications for treating genetic disorders, as it increases the feasibility and safety of gene therapy. Furthermore, AI has facilitated the development of novel CRISPR tools, expanding the range of genetic modifications that can be performed. These innovations are not only advancing therapeutic applications but also enhancing our understanding of gene function and regulation. The rapid and latest advances in genomics, driven by the integration of AI, are transforming various fields, from healthcare to agriculture. AI's capability to process and interpret vast amounts of genetic data unlocks new possibilities for personalized medicine, gene editing, cancer treatment, and sustainable agriculture. As AI and genomics evolve, their synergistic relationship promises to usher in a new era of scientific discovery and innovation, with far-reaching implications for human health and well-being.

Emergence of AI-powered Genomic Health Personalization/Health Prediction

The emergence of AI-powered genomic health personalization marks a paradigm shift in healthcare, offering unprecedented potential for individualized health prediction and management. By leveraging the power of artificial intelligence, scientists and healthcare professionals can now analyze vast and complex genomic data sets with remarkable accuracy and speed. This capability is revolutionizing how we understand, predict, and manage health and disease on a deeply personal level. At the core of this transformation is the ability of AI algorithms to identify patterns and correlations within genomic data that are often invisible to human analysis. Machine learning models, for instance, are trained on extensive genomic and clinical datasets to recognize the genetic markers associated with specific health conditions. This allows for the early detection of diseases such as cancer, diabetes, and cardiovascular disorders, often before any clinical symptoms manifest. Early diagnosis is crucial for timely intervention and can significantly improve patient outcomes. In addition to early diagnosis, AI-powered genomic analysis enables highly personalized treatment strategies. By understanding the genetic underpinnings of an individual's condition, healthcare providers can tailor therapies most likely effective for that patient. This approach, often called precision medicine, moves away from the traditional one-size-fits-all treatment paradigm. For example, in oncology, AI can help identify specific genetic mutations driving a patient's cancer, allowing for targeted therapies that directly address those mutations, thereby enhancing treatment efficacy and reducing side effects.

Increasing Adoption of AI in Precision Medicine

The adoption of AI in precision medicine is rapidly increasing, driven by its potential to revolutionize patient care through highly personalized treatments. AI algorithms can analyze vast amounts of genomic, clinical, and lifestyle data to identify patterns and correlations that are not discernible through traditional methods. This capability allows for developing tailored treatment plans considering individual genetic profiles, leading to more effective and targeted therapies. For instance, AI-powered tools predict patient responses to specific drugs, enabling healthcare providers to choose the most effective medications while minimizing adverse effects. Additionally, AI is enhancing early disease detection and diagnosis by identifying biomarkers and genetic predispositions, which can facilitate preventive measures and early interventions. This approach is particularly impactful in treating complex diseases such as cancer, where precision medicine can significantly improve patient outcomes by targeting the unique genetic mutations driving the disease. As AI technologies advance, their integration into precision medicine is expected to grow, promising a future where treatments are increasingly tailored to patients' needs, enhancing healthcare delivery's overall efficacy and efficiency.

INDUSTRY RESTRAINTS

Challenges in Collecting Phenotypic Data

Phenotypic data collection poses significant challenges that can hinder the application of AI in genomics. Phenotypic traits, shaped by both genetic and environmental factors, exhibit inherent variability and complexity. This diversity makes standardization across datasets difficult, introducing potential inaccuracies and limiting the reliability of AI-driven analyses. Moreover, ensuring the quality and consistency of phenotypic data is crucial for effective integration with genomic information, requiring meticulous alignment and annotation processes. Ethical considerations regarding data privacy and protection also play a critical role, necessitating robust governance frameworks to mitigate risks and ensure compliance with regulatory standards. The resource-intensive nature of collecting and curating large-scale phenotypic datasets further underscores the complexities of leveraging AI to advance genomic insights and personalized medicine.

SEGMENTATION INSIGHTS

INSIGHT BY DELIVERY MODE

The AI in the genomics market by delivery mode type is segmented into on-premises and cloud-based. The on-premises segment

holds the largest market share in 2023. The revolution of data in healthcare is driving the need for robust data storage solutions that ensure data security while allowing access and fostering innovation. On-premises security involves storing data and servers within the office and using disaster and backup recovery software to retrieve data during network failures. Hospitals and clinics must quickly process patient data, such as scan images, for timely analysis. Research labs produce terabytes of data that need on-premises processing, as cloud transmission is inefficient. These applications require on-premises operations for real-time data processing.

-□By Delivery Mode
o□On-Premises
o□Cloud-based

INSIGHT BY FUNCTIONALITY

By functionality, global AI in the genomics market is categorized into genome sequencing, gene editing, and other areas. The gene editing segment shows significant growth, with the fastest-growing CAGR during the forecast period. The segmental growth in gene editing is due to significant advancements, particularly with CRISPR technology. One notable innovation is the development of in vivo gene editing, which allows for gene modifications directly within the body, bypassing the need for ex vivo procedures that require cell extraction and reinsertion. AI-driven tools are streamlining the guide RNAs (gRNAs) design, which directs the CRISPR-Cas9 system to the precise location in the genome for editing. AI can predict the efficiency and potential off-target effects of different gRNA sequences, allowing researchers to select the most effective and safest options.

-□By Functionality
o□Genome Sequencing
o□Gene Editing
o□Others

INSIGHT BY APPLICATION

The translational precision medicine application segment dominates and has the largest share of the market. The market is growing faster, and the trend will likely continue during the forecast period. Translational genomics aims to connect genetic and clinical data, forming the basis for precision medicine approaches. This field is expanding beyond genetics to include proteomics, gaining traction for its potential in identifying clinical biomarkers and aiding drug development. The continued advancement of AI in translational precision medicine is expected to refine further and personalize medical treatments, improve patient outcomes, and streamline the drug development process. As AI technologies evolve, they will likely bring even more sophisticated tools and methodologies, driving innovation in healthcare and translational research.

-□By Application
o□Translational Precision Medicine
o□Clinical & Genomic Diagnostics
o□Others

INSIGHT BY END-USER

By end-user, the pharma & biotech companies' segment shows prominent growth, with the highest CAGR during the forecast period due to the transformative role played by AI in the pharma and biotech industries, enhancing drug discovery, personalized medicine, clinical trials, and diagnostics. These advancements lead to more efficient processes, reduced costs, and improved patient outcomes. AI and machine learning algorithms analyze vast datasets, including chemical libraries and biological data, to

identify potential drug candidates faster and more efficiently than traditional methods.

-By End-User
oPharma & Biotech Companies
oPublic & Consumer Genomic Centers
oOthers

INSIGHT BY TECHNOLOGY TYPE

The AI in genomics market by technology type is segmented into machine learning, computer vision, and others. The machine learning segment accounted for a major market share in 2023. Machine learning technology in AI is poised to transform the genomics market, offering unprecedented opportunities for research, diagnostics, and personalized medicine. Future advancements will focus on integrating multi-omics data, ensuring the explainability and interpretability of AI models, expanding clinical adoption, and promoting collaborative research and data-sharing initiatives. ML algorithms play a crucial role in drug discovery and development within the genomics market. By analyzing genomic and clinical data, ML models can predict the efficacy and safety of potential drug candidates, accelerating the drug discovery process and reducing the time and cost associated with bringing new therapies to market.

-By Technology
oMachine Learning
oComputer Vision
oOthers

GEOGRAPHICAL ANALYSIS

North America accounted for the largest share and stands first in the market. North America is expected to grow at the highest CAGR during the forecast period. AI's integration into genomics in North America is driving groundbreaking advancements in healthcare, agriculture, and scientific research, with the potential to revolutionize how we understand and interact with the genome. North America is one of the leading AI markets globally, particularly in genomics and medical diagnosis. Countries like the US and Canada are pivotal contributors to this market, driving innovation and adoption in the region. The growing awareness among pharmaceutical and biotech companies in North America further propels the adoption of AI in genome sequencing and precision medicine initiatives.

By Geography
-North America
oThe U.S.
oCanada
-Europe
oGermany
oThe U.K.
oFrance
oItaly
oSpain
-APAC
oJapan
oChina
oIndia

o Australia
o South Korea
- Latin America
o Brazil
o Mexico
o Argentina
- Middle East & Africa
o Turkey
o South Africa
o Saudi Arabia

COMPETITIVE LANDSCAPE

This report contains exclusive data on 31 vendors. The market is characterized by intense competition among global, regional, and local players. Major vendors such as Fabric Genomics, IBM, Microsoft, and NVIDIA lead the market with a range of conventional and cutting-edge AI technologies, positioning themselves for growth amid increasing investments in drug discovery and healthcare R&D. Rapid advancements in genomics and precision medicine are driving significant changes in the AI in Genomics Market. These technological developments are enhancing the capabilities of AI applications, offering new opportunities for innovation and market expansion.

Key Vendors

- Fabric Genomics
- International Business Machines Corp (IBM)
- Microsoft
- NVIDIA

Other Prominent Vendors

- OrphAI Therapeutics
- Ares Genetics
- BenevolentAI
- Deep Genomics
- Invitae Corp
- DNAnexus
- Illumina
- Engine Biosciences
- FDNA
- Freenome
- Genuity Science
- Lifebit
- MolecularMatch
- Predictive Oncology
- Sophia Genetics
- Google DeepMind
- Intel
- Congenica

-Verge Genomics
-WhiteLab Genomics
-AITIA
-Data4Cure
-Genoox
-Lantern Pharma
-PathAI
-Tempus
-Recursion Pharmaceuticals

KEY QUESTIONS ANSWERED:

1.How big is the global AI in the genomics market?
2.What are the opportunities for global AI in the genomics market?
3.What is the growth rate of global AI in the genomics market?
4.Which region dominates the global AI in the genomics market?
5.Who are the major players in the global AI genomics market?

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