



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJIRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 12, Issue 4, April 2023

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.423

 9940 572 462

 6381 907 438

 ijirset@gmail.com

 www.ijirset.com

Operations of Genomics in Artificial Intelligence

Renju Kalarikkal

Lecturer in Computer Engineering, Central Polytechnic College, Thiruvananthapuram, Kerala, India

ABSTRACT: Genomics is a branch of molecular biology concentrated on studying all aspects of a genome, or the complete set of genes within a particular organism. Today, machine learning/artificial intelligence is playing an integral part in the elaboration of the field of genomics. Genomics also involves the sequencing and analysis of genomes through uses of high throughput DNA sequencing and bioinformatics to assemble and analyze the function and structure of entire genomes. Advances in genomics have triggered a revolution in discovery-based research and systems biology to facilitate understanding of even the most complex biological systems such as the brain.

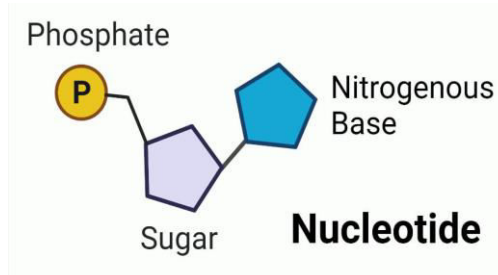
KEYWORDS: artificial intelligence, healthcare, gene technology, genomics, Machine learning

I. INTRODUCTION

Genomics is an interdisciplinary field of biology that focuses on the study of the structure, function, mapping, and editing of the genome. Machine learning models are capable of solving tasks in computer vision, such as semantic segmentation, image recognition, and image retrieval. AI, which stands for artificial intelligence, refers to systems or machines that mimic human intelligence to perform tasks and can iteratively improve themselves based on the information they collect.

II. AI AND GENOMICS BACKGROUND AND INSIGHTS UP

DNA sequencing allows specialists to explore the hereditary arrangement that governs the exercise of every single living being. Chromosomes are more coordinated into fragments of DNA called genes that produce or code for proteins. The genome is called the amount of qualities that a creature conveys. A nucleotide is an organic molecule with the basic composition of a nitrogenous base, a pentose sugar, and a phosphate. DNA is made up of the basic matches of A sets with T and C sets with G, in light of 4 key units (A, C, G, and T) called nucleotides. Adenine, thymine, guanine, and cytosine. A pairs with T and C with G. DNA is organized into chromosomes, and humans have a total of 23 pairs.



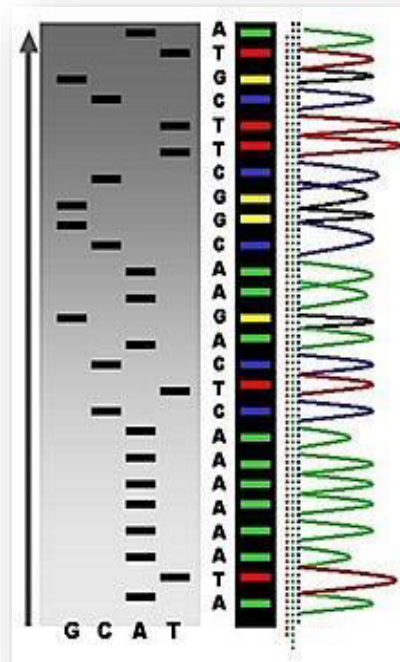
Genome sequencing (especially in precision medicine): Researchers use machine learning to identify patterns in large sets of genetic data. These patterns are then converted into computer models that can help predict an individual's likelihood of developing certain diseases or help design potential therapies.

Direct-to-consumer genomics: This category includes companies that offer genomic sequencing services to individual consumers. Companies use machine learning to gain greater insight into the interpretation of genetic information, such as how an individual's genes may affect their weight.

III. AI AND MACHINE LEARNING APPLICATIONS IN GENOMICS

A. SEQUENCING OF GENES

The Sanger sequencing machine has a sensor at the bottom that reads the fluorescence of each separated band. Each color represents a letter. It can be plotted on a graph.

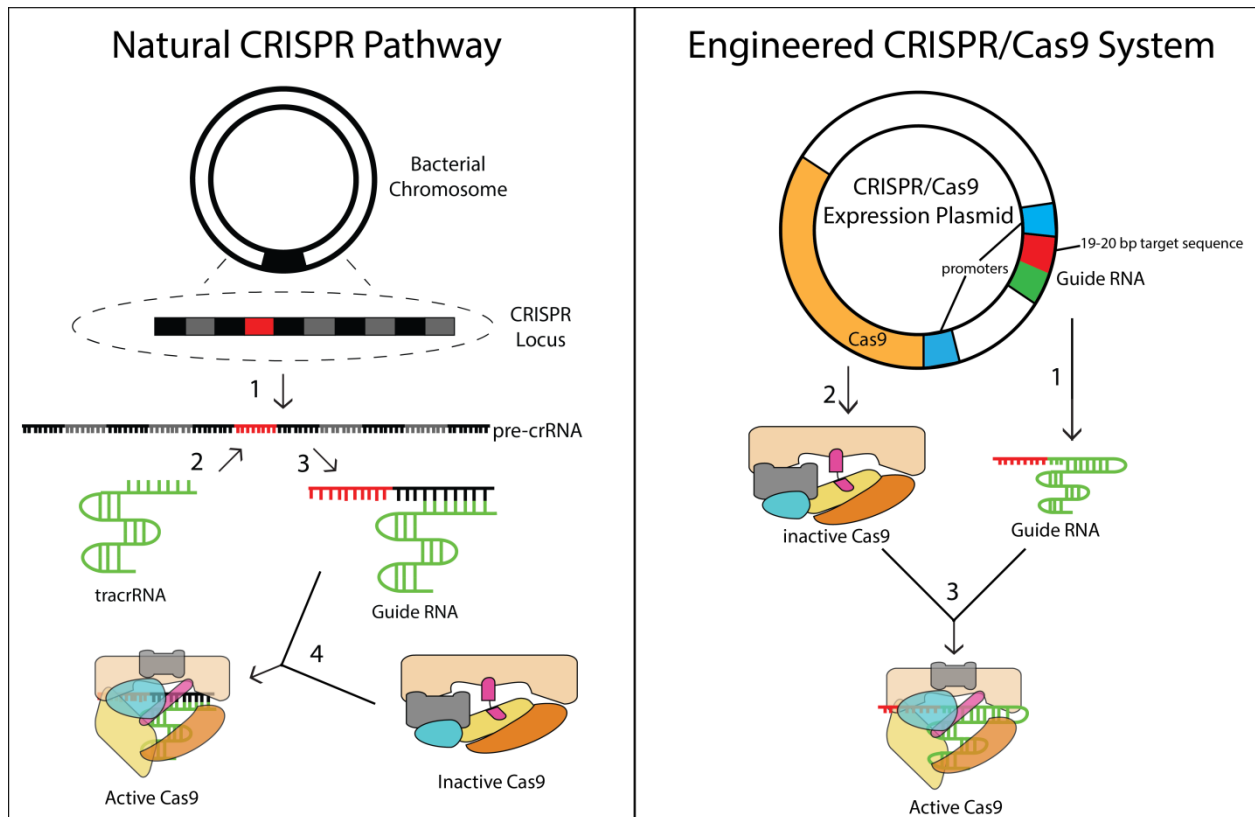


B. EDITING OF GENES

The technique used in which the slight and precise changes are made at cellular levels is called gene editing. The instrument which is responsible for editing of genome is said to be CRISPR.



Gene editing is performed using enzymes, particularly nucleases, which have been designed to target a specific DNA sequence, where they introduce cuts into the DNA strands, allowing the removal of existing DNA and the insertion of replacement DNA.



IV. SCREENING METHODS FOR GENOMICS

Genetic screening of newborns is an increasingly popular procedure. Conditions such as Down syndrome can be diagnosed during birth with this non-invasive genetic screening. Based on available evidence, artificial intelligence can predict the outcomes and risks associated with treatment for genetic diseases.

CRISPR and RNAi are two screening tools that you can use to study gene function by modulating gene expression and observing the results. While CRISPR does this at the transcriptional level by binding to DNA, RNAi binds to mRNA and blocks translation, typically by degrading the mRNA.

V. GENOMICS FOR AGRICULTURE

The potential for genomics to help improve soil quality and crop yield is an emerging area of interest and promise within the sphere of agriculture. If genetic data can be used to predict the yield or health of crops (and the resulting impact on soil) could help farmers better predict and optimize yields. AI is also pushing the capabilities of the field of genomics in agricultural applications. Traditionally, crop breeding programs are lengthy and costly, due to the complex interactions between genetic and environmental factors.

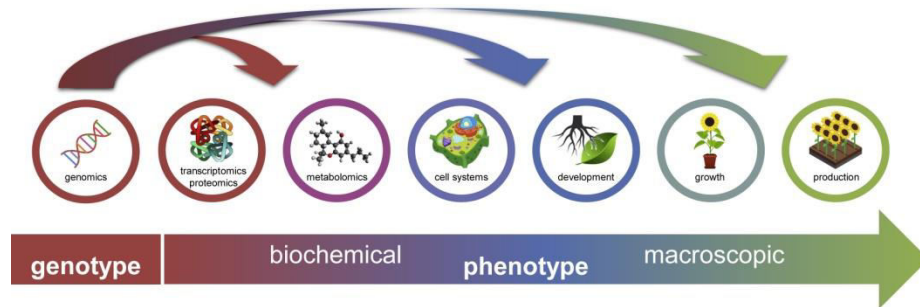
VI. PHENOTYPE TO GENOTYPE MAPPING

A person genetic makeup possesses different hereditary varieties, autonomous of individual wellbeing status, which are either recently distinguished as pathogenic or expected to be pathogenic.

VII. GENOTYPE TO PHENOTYPE PREDICTION

Genetics therapeutic aim is to include future disease risk diagnoses and projections. Relatively easy statistical approaches to the prediction of polygenic risk allow risk stratification for some common complex diseases, both personally and clinically useful

Some of the deep learning models of genotype to phenotype



VIII. IMAGE TO GENETICS DIAGNOSIS

CNN-based facial image analysis algorithm, dramatically outperforms human dysmorphologists in this task and is precise enough to distinguish between molecular diagnoses that are mapped to the same clinical diagnosis. Genetic syndromes that are identified through facial analysis can be readily confirmed with DNA testing, but adequate material for somatic mutation testing is not always available in some instances of cancer

IX. CHALLENGES AND LIMITATIONS

AI-based algorithms can be superhuman in their ability to interpret complex data.

Their power and complexity can also result in spurious or even unethical and discriminatory conclusions when applied to human health data.

Without careful consideration of the methods and biases embedded in a trained AI system, the practical utility of these systems in clinical diagnostics is limited.

The challenges and limitations of AI in clinical diagnostics.

X. CONCLUSION

Machine learning in genomics formerly has an effect on several touch points, including how genetic testing is carried out, how physicians deliver medical care and genomics availability to people interested in learning more about how their heredity can influence their health.

education and terse examples of the utility and significance of this technology would have to condense the data interpretation capabilities available by machine learning

REFERENCES

- [1] Google machine learning and generative AI for solutions architects by Kieran kavanagh and priyanka vergadia
- [2] Genomics at the Nexus of AI, Computer Vision, and Machine Learning, Shilpa Choudhary, Sandeep Kumar, Swathi Gowroju, Monali Gulhane, R. Sri Lakshmi
- [3] <https://www.azolifesciences.com/article/AIs-use-in-Genomics.aspx>
- [4] <https://humgenomics.biomedcentral.com/articles/10.1186/s40246-022-00396-x>
- [5] <https://blogs.nvidia.com/blog/how-ai-is-transforming-genomics/>



Impact Factor: 8.423



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  ijirset@gmail.com



www.ijirset.com

Scan to save the contact details