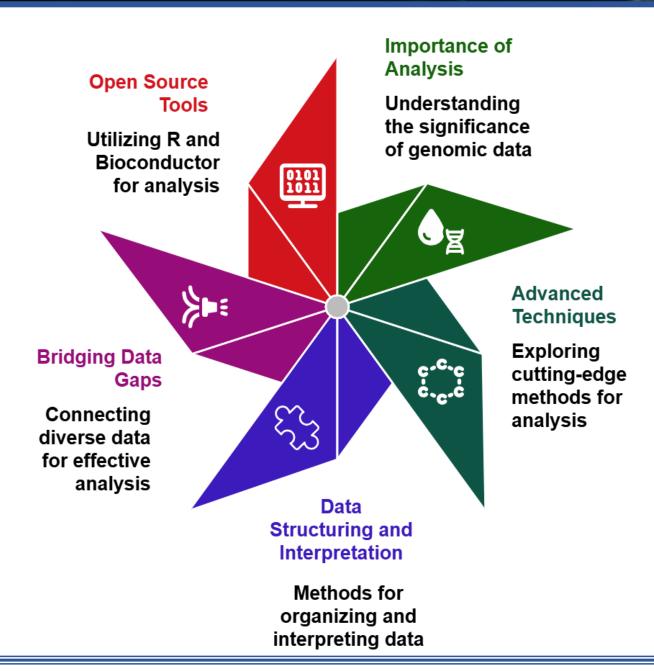


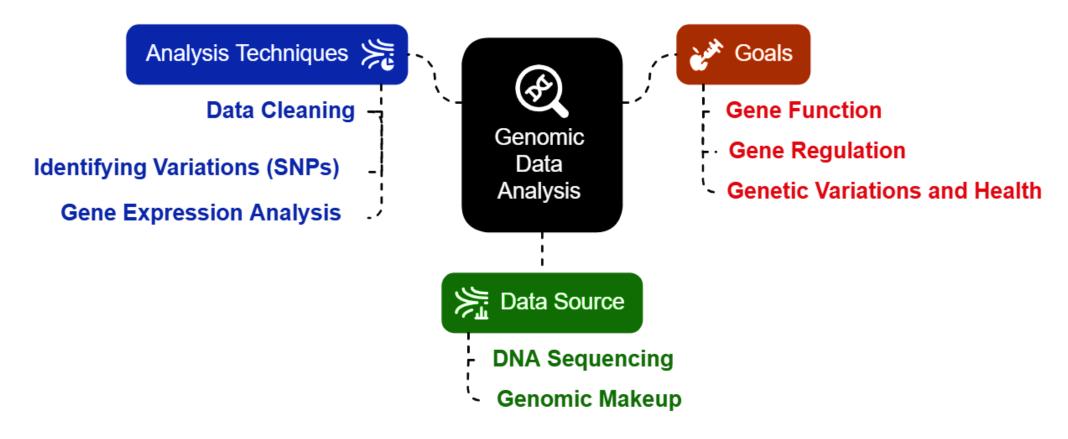
Assis. Prof. Dr. Labeed Al - Saad

## The objectives



#### What is Genomic Data Analysis?

Genomic Data Analysis: is essentially the process of cracking the code hidden within an organism's DNA.



### Why this analysis is important?

Impact of Genomic Data Analysis on Healthcare and Intelligent

Medical Systems

Risk Prediction Models

Improves healthcare by forecasting disease risks.





Intelligent Diagnosis
Systems

Enhances diagnosis accuracy through advanced algorithms.

Basic Genomic Data Analysis

Provides foundational insights with limited healthcare impact.

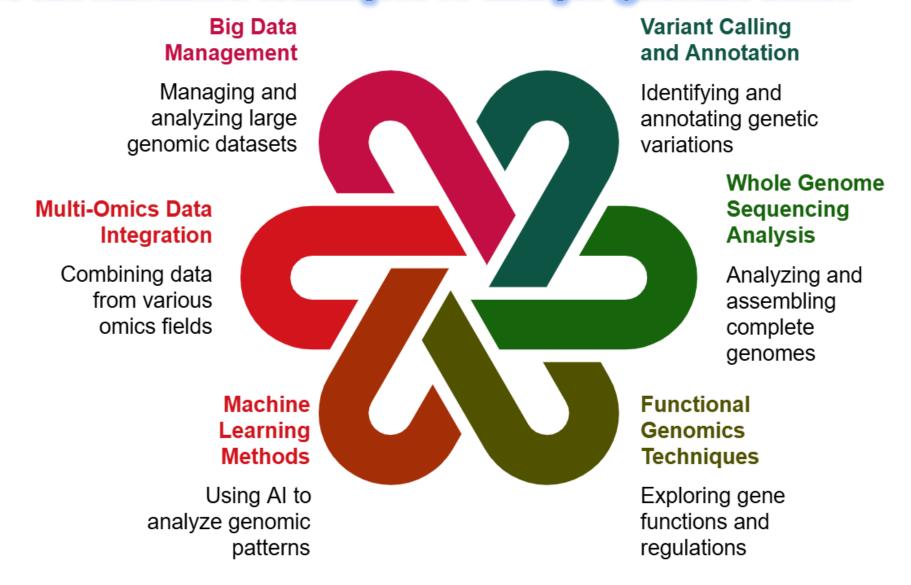




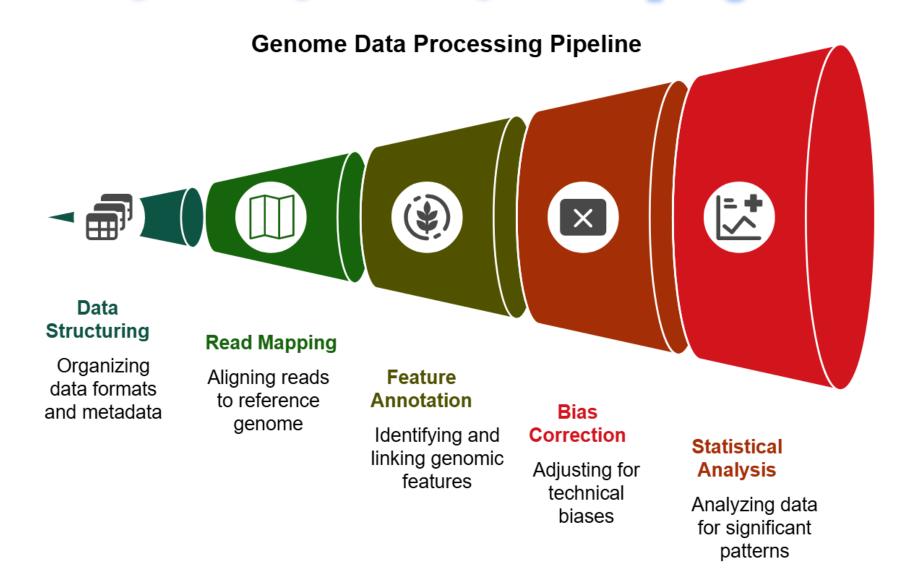
Personalized Medicine Development

Revolutionizes healthcare with tailored treatment plans.

### What are the Advanced techniques to analyze genomic data?



### How to structure, annotate, normalize, and interpret genome-scale assays

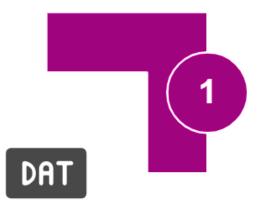


# Bridging the gap between diverse genomic data and effective analysis/presentation

## Cloud-based Computing

Cloud computing provides scalable resources with high technological complexity.



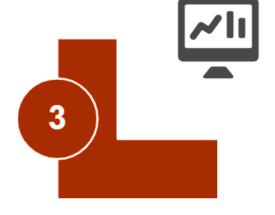


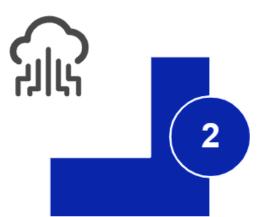
### Standardized Data Formats

Standardized formats improve data integration with minimal complexity.

#### Interactive Dashboards

Interactive dashboards offer basic data integration with low complexity.

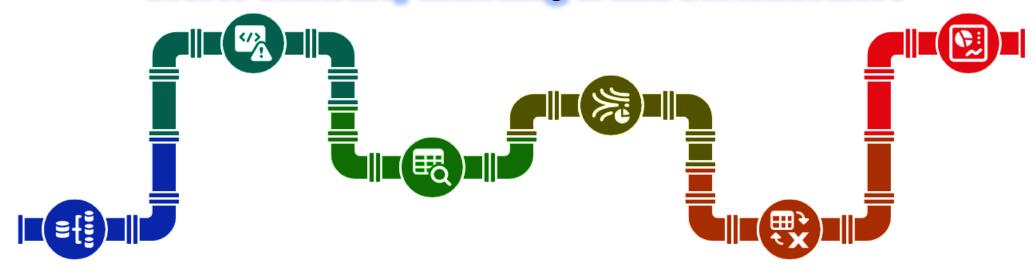




# Machine Learning for Data Harmonization

Machine learning enhances data integration by harmonizing diverse datasets.

# How to analyze data from several experimental protocols, using open source software, including R and Bioconductor?



01

Data
Preprocessing
and
Normalization

Initial data cleaning and normalization using Bioconductor packages 02

### Batch Effect Correction

Correcting technical variations between batches with tools like sya or ComBat

03

### **Exploratory Data Analysis**

Visualizing data trends and calculating statistical summaries using R 04

## Differential Analysis

Identifying significantly different genes or features across protocols with DESeq2 or limma 05

# Integration and Interpretation

Combining results across protocols and performing functional enrichment analysis 06

# Data Visualization and Reporting

Creating publicationquality figures and documenting the analysis workflow

# How to analyze data from several experimental protocols, using open source software, including R and Bioconductor?

#### **Additional Tips:**

- Utilize online resources and tutorials: Bioconductor offers extensive documentation and tutorials specific to different data types and analysis methods.
- Leverage online communities: Connect with the R and Bioconductor community forums for troubleshooting and seeking help from other users.
- Consider seeking bioinformatics support: Complex analyses might benefit from collaboration with bioinformaticians who can guide you through the process and ensure robust data analysis.

