COMPUTER APPLICATIONS IN PHARMACY

BIOINFORMATICS

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Points to be covered in this topic:

- Introduction
- Objectives of Bioinformatics
- Bioinformatics Database
- Concept of Bioinformatics
- Impact of Bioinformatics in Vaccine Discovery

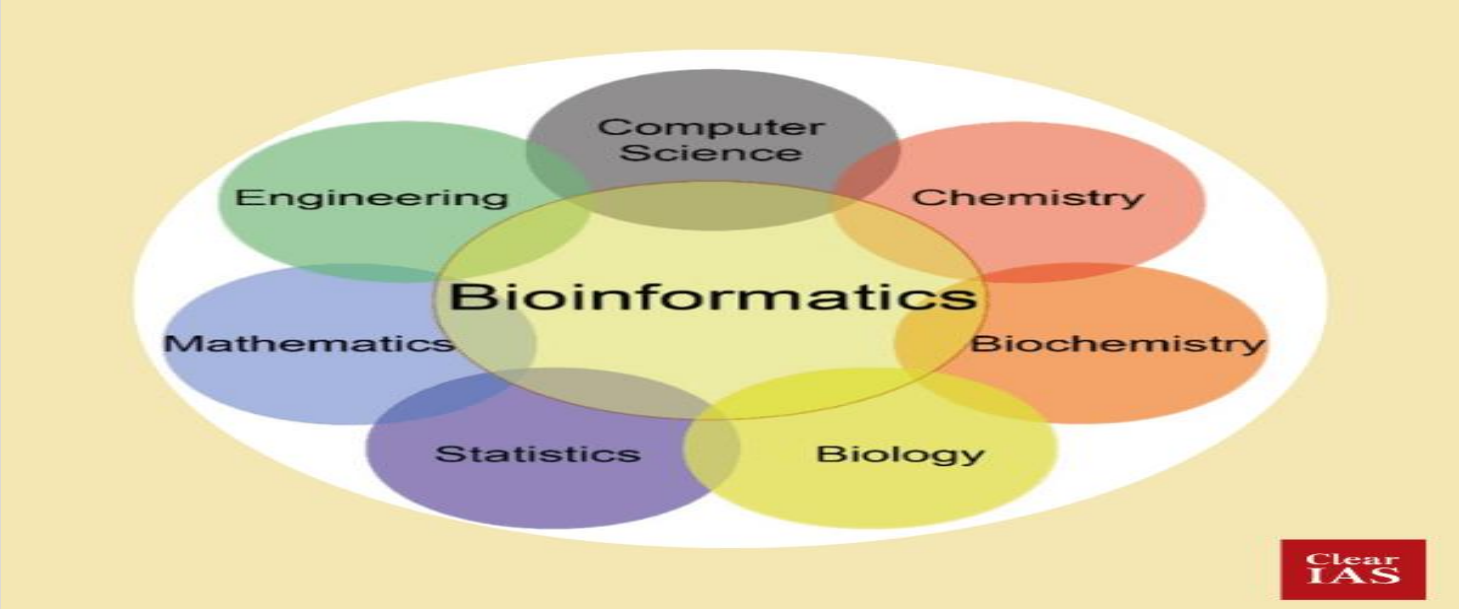
INTRODUCTION

- Science of collecting and organizing biological data is known as Bioinformatics.
- It is a branch of computer science that develops various methods and software tools to understand and analyze biological data.
- Bioinformatics combines the use of mathematical, statistical and computational methods to analyze various types of biological, molecular and genetic data.

- It mainly helps in studying varied forms of DNA structures and compositions.
- Biochemists all over the world are trying to find out correlation between various DNA and are studying about every single cell in the body.

What is Bioinformatics?

The mathematical, statistical and computing methods that aim to solve biological problems using DNA and amino acid sequences and related information".



OBJECTIVES OF BIOINFORMATICS

- Bioinformatics is necessary to understand the proper functioning of genes in human body because in later stages of pharmacy; a particular drug's design, target selection in a disease and its mode of action is entirely based on these facts.
- Thus, we can say that objectives of bioinformatics are as follows:

➢ Study normal biological processes.

- Design various approaches to improve biological processes.
- Aids in improving drug discovery techniques.
- Helps in developing new target drugs for fatal diseases.
- Enables study and research on development of preventive medicines for life-threatening diseases like cancer.

- Hence, bioinformatics helps in analyzing data that is globally available and highlight the facts which are unique to all of them.

BIOINFORMATICS DATABASE

Bioinformatics database refers to collection and compilation of data which is structured, presented and cross referenced across the globe. Some of the bioinformatics databases are as follows:

- **Genbank, Uniport:** Used in biological sequence analysis.
- **InterPro, Pfam:** Used in finding Protein Families.
- **Sequence Read Archive:** Used for Next Generation Sequencing.

GenoCAD: Used in design of synthetic genetic circuits.

PreDDICTA: Calculates drug DNA interaction.

Sanjeevani: Complete drug design software.

➢ Features of biological databases:

1) Data heterogeneity
2) High volume data
3) Uncertainty
4) Data Curation
5) Large scale data integration
6) Data sharing
7) Dynamic and subject to change

Classification of Bioinformatics Databases:

They can be classified on the basis of

- Data Type
- Data Source
- Database Design
- Special Categories

The different types of bioinformatics databases are listed below:

Data Types	Data Source	Special Categories
Genome Databases Sequence Databases Structure Databases Microarray Databases Chemical Databases Metabolic Databases Enzyme Databases Disease Databases Literature Databases Taxonomy Database	Primary Database Secondary Database	Integrated Database Composite Database

CONCEPT OF BIOINFORMATICS

- Concept of Bioinformatics refers to its approach towards balancing biology, mathematics and computer programming in order to ensure availability of tools to compute and analyze biological data in a best possible manner.
- It provides a deeper understanding of molecular biology, software programs, program coding and decoding, genetic data analysis and study of DNA structure and composition.

- Bioinformatics involves integration of computers, software tools, and databases that are used to address various biological queries.
- The two major activities involved in bioinformatics are study of genomics and proteomics.
- Bioinformatics is getting very popular because it applies knowledge from both Biology and Computer Science and this knowledge is further used to find new techniques of biological development for better human health and society.

- Bioinformatics provides a very challenging task for its researchers as it usually converts biological observations into a digital format or language that can be read by the computer.
- This technique of digitalizing each and every biological reaction or behavior into computer readable format is known as bioinformatics.

IMPACT OF BIOINFORMATICS IN VACCINE DISCOVERY

- Bioinformatics help in discovery of vaccines in a more effective way and in shorter span of time. This is because it combines biology with pharmacology.
- Bioinformatics reduces the time and cost required to develop high potency drugs with fewer side effects.
- Science of genomics plays a vital role in improving human health globally.
- It has been found that if a genome sequence of pathogen is available, a vaccine can be easily created to destroy that sequence and hence, occurrence of disease can be prevented.

- Genomic data are processed by a variety of software programs that help identify individual genes and their outcomes.
- Designing an ideal vaccine largely depends on targeted pathogens and their interactions with existing drugs.
- Study of genome sequences of various pathogens along with rapid advancements in biotechnology allows us to collect large amount of useful information about hosts and pathogens that play an important role in discovery of vaccine.

REFERENCES

- Bourne, Philip E., and Helge Weissig, eds. Structural Bioinformatics. Methods of Biochemical Analysis 44. Hoboken, NJ: Wiley-Liss, 2003.BA Call Number: 572.8733 (B1)
- Lecture Notes in Computer Science 3886. Lecture Notes in Bioinformatics. Berlin:Springer, 2006.BA Call Number: 006.3 P1111 (B4).

THANK YOU