

# Bioinformatics

- The combination (or marriage) of biology and information technology.
- It is a recently developed science using information to understand biological phenomenon.
- It involves the computational tools and methods used to manage, analyse and manipulate volumes and volumes of biological data.

- It may also be regarded as a part of the computational biology
- Letter is concerned with the application of quantitative analytical techniques in modeling and solving problems in the biological systems.
- It is an interdisciplinary approach requiring advanced knowledge of computer mathematics and statistical methods for understanding of biological phenomena at the molecular level.

# History of Bioinformatics

- It was first introduced in 1990s
- It dealt with the management and analysis of the data pertaining to DNA, RNA and protein sequences
- It includes many other types of biological data. most important ones are listed below
  - ✓ Gene expression profiles
  - ✓ Protein structure

## Contd...

- ✓ Protein interaction
- ✓ Microarrays (DNA chips)
- ✓ Functional analysis of biomolecules
- ✓ Drug designing

# Broad coverage of bioinformatics

- **Functional genomics:**  
identification of genes and their respective functions
- **Structural genomics:**  
predictions related to functions of protein
- **Comparative genomics:**  
understanding the genomes of different species of organisms

## Contd...

- DNA microarrays:

designed to measure the levels of gene expression in different tissues, various stages of development and in different diseases

- Medical informatics:

involves the management of biomedical data with special references to biomolecules, in vitro assays and clinical trials

# Components of bioinformatics

## 1. Creation of databases:

- Involves the organizing, storage and management of the biological data sets
- Databases are accessible and submit new entries. Protein sequences data bank for molecular structures

## 2. Development of algorithms and statistics:

- Involves the development of tools and resources to determine the relationship among the members of large data sets.
- Comparisons of protein sequence data with the already existing protein sequences



### 3. Analysis of data interpretation:

- Includes DNA, RNA and protein sequences, protein structure, gene expression profiles, and biochemical pathways

# Bioinformatics and the internet

- It is an international computer network
- It involves a group of computers that can communicate (usually over telephone system) and exchange data between users.
- Internet protocol(Ip) determines how the packets of information are addressed and routed over the network.
- To access the internet, computer must have the correct hardware, appropriate software and permission for access to network.

# Applications of bioinformatics

- Sequence mapping of biomolecules(DNA, RNA and proteins)
- Identification of nucleotide sequences of functional gene
- Finding of sites that can be cut by restriction enzymes
- Prediction of functional gene products

## Contd...

- To trace the evolutionary trees of genes
- For the prediction of 3-dimensional structure of proteins
- Molecular modelling of biomolecules
- Designing of drugs for medical treatment
- Handling of vast biological data which otherwise is not possible
- Development of models for the functioning various cells, tissue and organs.