Aim, Scope and Research areas of Bioinformatics

B.Sc Honors 1st year (Botany)

By

Dr. Richa Sharma

Guest Faculty, SOS in Microbiology

INTRODUCTION

- Term Bioinformatics was invented by Paulien Hogeweg and Ben Hesper in 1970 as "the study of informatic processes in biotic system".

- Bioinformatics is the application of computational technology to handle the rapidly growing repository of information related to molecular biology.

- Bioinformatics combines different fields of study, including computer sciences, molecular biology, biotechnology, statistics and engineering.

- It is particularly useful for managing and analyzing large sets of data, such as those generated by the fields of genomics and proteomics.

- Shortly it is a computational approach to solve biological problem.
- Bioinformatics is emerging and advance branch of biological science.

AIM OF BIOINFORMATICS

The field of **bioinformatics** has three main objectives:

1. To organize vast reams of molecular biology data in an efficient manner
2. To develop tools that aid in the analysis of such data
3. To interpret the results accurately and meaningfully.

Various Fields of Bioinformatics

Bioinformatics is being used in following fields:

➢ Microbial genome applications
➢ Molecular medicine
➢ Personalised medicine
➢ Preventative medicine
➢ Gene therapy
➢ Drug development
➢ Antibiotic resistance
➢ Evolutionary studies
➢ Waste cleanup
➢ Biotechnology

- Climate change Studies
- Alternative energy sources
- Crop improvement
- Forensic analysis
- Bio-weapon creation
- Insect resistance
- Improve nutritional quality
- Development of Drought resistant varieties
- Vetinary Science

Applications in Medicines-

- In the field of medicine applications of bioinformatics is used for following areas-

A. Drug discovery- The idea of using X-ray crystallography in drug discovery emerged more than 30 years ago, when the first 3D structure of protein was determined. Protein structure can influence drug discovery at every stage in design process. The Bioinformatics help us to detect Protein structure.

B. Personal medicines- Personalized medicine research is attempt to identify individual solution based on the susceptibility profile of each individual. It s hoped that these fields will enables new approaches to diagnosis, drug discovery and individualized therapy.

C. Preventive medicine- Preventive medicine consist of measures taken to prevent disease rather than curing them to treating their symptoms.

D. Gene therapy- Gene therapy is a novel form of drug delivery that enlists the synthetic, machinery of the patient's cell to produce a therapeutic agents. It involves the efficient introduction of functional genes into the appropriates cells of the patients in order to produce sufficient amount of the protein encoded by transferred gene (tansgene) So as to princely and permanently correct this disorder.

Strategies are-gene addition, Removal of harmful gene, Control of gene expression.

Microbial genome applications

- Waste clean up- in bioinformatics, bacteria and other microbes are identified which are helpful in cleaning waste. *Deinococcus radiodurans* bacterium has the ability to repair damaged DNA and small fragments from the chromosomes by isolating damaged segments in a concentrated area. Gene from the other bacteria have been inserted to the *D. radioduranas* for environmental cleanup.

Application in Agriculture

Bioinformatics plays a significant role in the development of the agricultural sector, agro-based industries, agricultural by-products utilization and better management of the environment

Crop improvement- Collection and storage of plant genetic resource and wisely **application of bioinformatics** help to produce stronger, more drought, disease and insect resistant **crops** and improve the quality of livestock making them healthier, more disease resistant and more productive.

Bioinformatics combining biology with computer science

- It can explore the causes of disease at the molecular level.

- Explain the phenomenon of the disease on the gene/pathway level.

- Make use of computer techniques (data mining, machine learning etc.). To analyse and interpret data faster.

- To enhance the accuracy of the results.

- Reduce the cost and time of drug discovery.