AMRITA VISHWA VIDYAPEETHAM
DEEMED TO BE UNIVERSITY

22BIO211: Intelligence of Biological Systems - 2

Dr. Manjusha Nair M
Amrita School of Computing, Amritapuri

Email : manjushanair@am.amrita.edu
Contact No: 9447745519

Course Introduction

- **Batch**: S3 B. Tech CSE (AI)
- **Prerequisite**: Intelligence of Biological Systems 1
- **Course Credits: (2-0-1 : 3)**

Course Objectives

- Application of statistics to interpret biological sequence analysis.
- Application of programming to compare biological sequences.
- Evaluation of algorithms in antibiotic sequencing.
- Evaluation of statistical models in Bio-informatics.

Course Introduction

Course Outcomes

After completing this course, the students will be able to,

- CO1: Apply Dynamic Programming in Sequence Alignment.
- CO2: Apply Brute Force Method in Sequence Analysis.
- CO3: Apply Graph Theory in Genome Assembly.
- CO4: Apply Deep Learning in Bioinformatics.

Course Introduction

Syllabus

Unit-1

- Antibiotics Sequencing – Shattering into pieces – Brute force algorithm for Cyclopeptide Sequencing – Comparison of biological sequences – Cracking the Non-Ribosomal Code – Introduction to Sequence Alignment – Introduction to Dynamic Programming, building a Manhattan-like graph - Mass Spectrometry- From 20 to more than 100 Amino Acids

Unit-2

- Introduction - Assembling Genomes using Graph algorithms - String reconstruction problem – String reconstruction as a walk in the overlap graph – Gluing nodes – de Bruijn graphs – the seven bridges of Konigsberg Euler's theorem– Eulerian Cycle – Assembling genomes from read-pairs –Introduction to deep-learning in bioinformatics.

Course Introduction

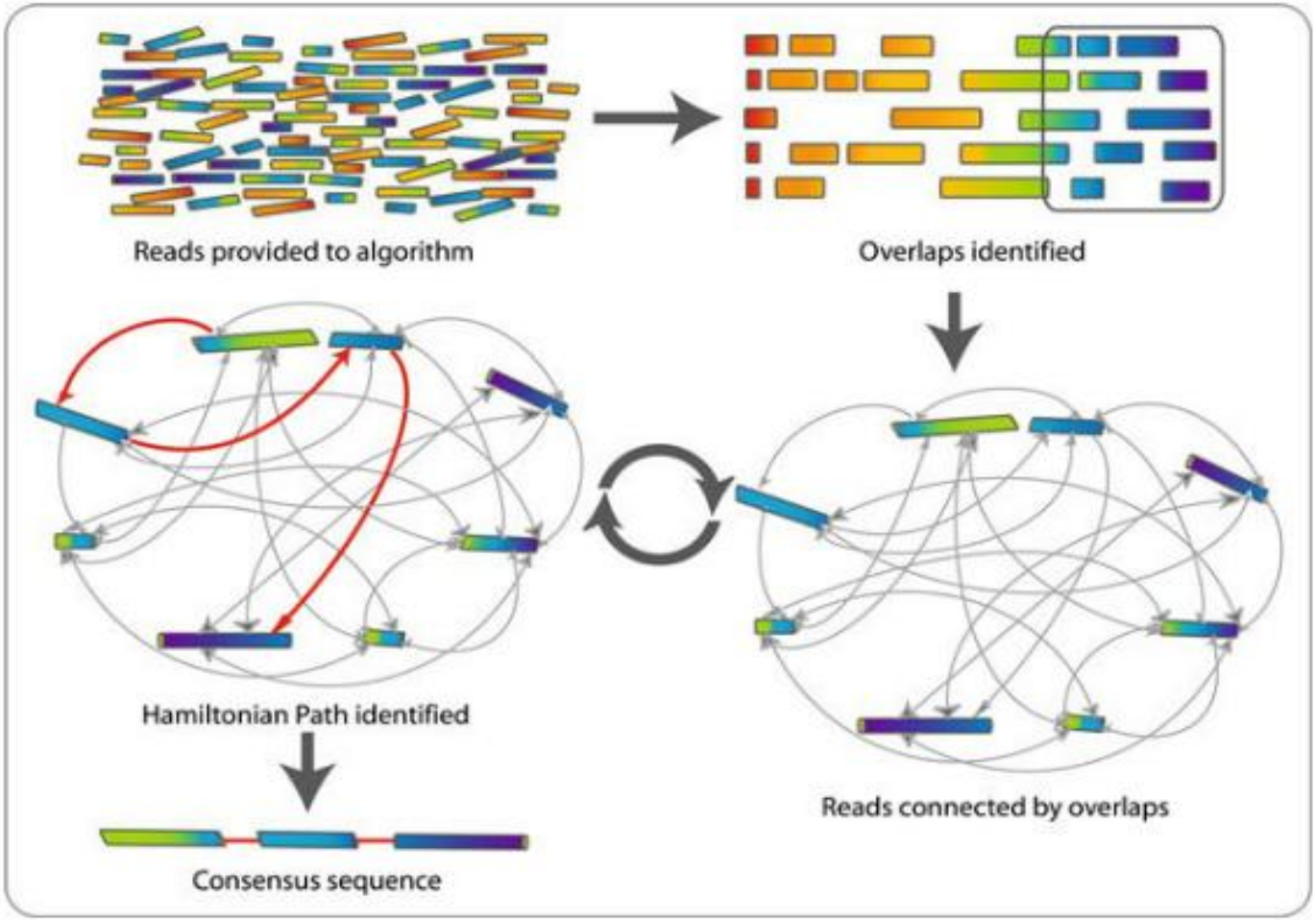
- **Textbooks/References**
  - 'Jin Xiong , Essential Bioinformatics , Cambridge University Press, 2006.
  - Gerald Karp, Chapter 15- Cell Signaling and Signal Transduction: Communication Between Cells, In Cell and Molecular Biology: Concepts and Experiments, 7e, Wiley, 2013.
  - Phillip Compeau & Pavel Pevzner, Bioinformatics algorithm, An active learning Approach Vol.1. and Vol. 2 , 2015.
  - Karthik Raman, an Introduction to Computational Systems Biology (Systems Level Modeling of Cellular Networks), CRC Press, 2021.
- **Web References**
  - https://ramanlab.github.io/SysBioBook/
  - http://rosalind.info/problems/list-view/?location=bioinformatics-textbook-track

Course Introduction

- **Evaluation Pattern**
  - Internal Evaluation– 70%
    - Assignments - = 30%
      - Six Lab sheets - 6 * 5 = 30 marks
    - Quizzes - 2 * 10 = 20%
      - Two MCQ , each with 25 marks
    - Midterm Exam – 20%
      - 2 hrs. written examination of 50 marks
  - End Semester Exam - 30%
    - 3 hrs. written examination of 100 marks

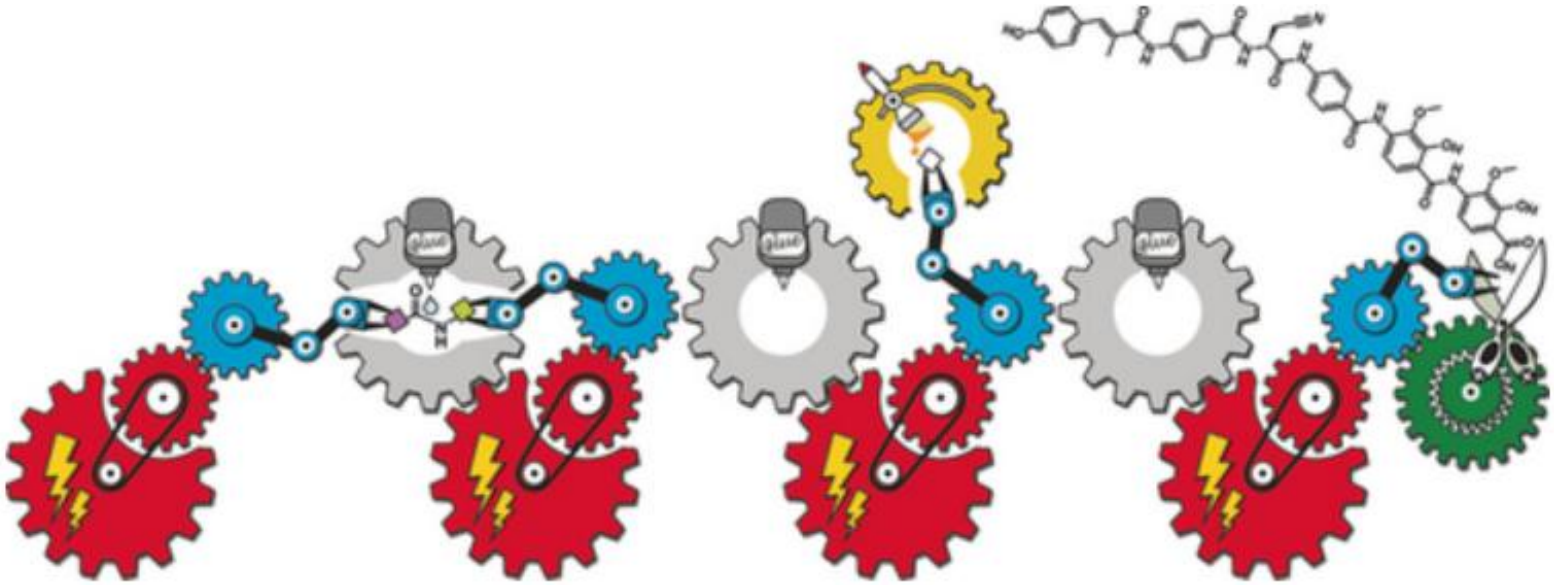
Course Description

- **Genome Sequencing and Assembling**



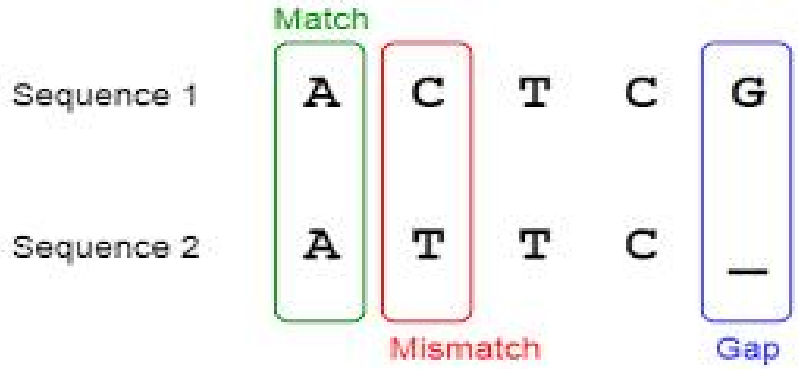
Course Description

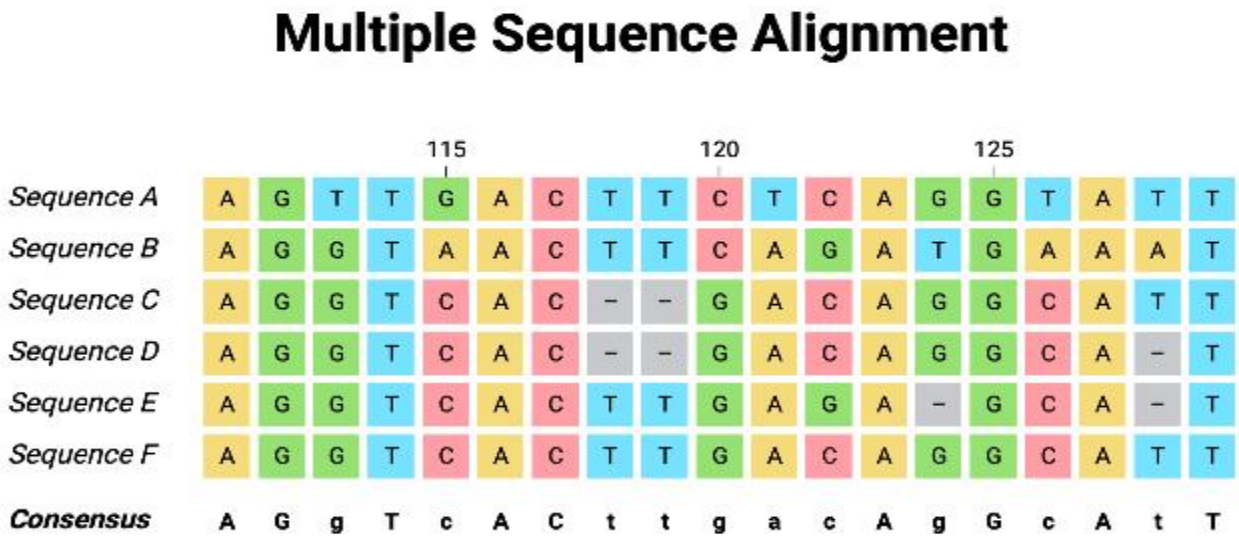
- **Antibiotic Sequencing**
  - Genomic Approach to antibiotic discovery



Course Description

- **Sequence Alignment**





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