UNIVERSITÀ DEGLI STUDI
DI TRENTO

Dipartimento di Dipartimento di Ingegneria e Scienza dell'Informazione
Academic year 2019/2020

Algorithms for Bioinformatics [145765]

No class division

Study course Computer Science
Regulation Ordinamento 2011
Curriculum Scienze e Tecnologie Informatiche

Lecturers: ENRICO BLANZIERI (Tit.)

Hours amount: 48

Period: Second semester

Credits: 6

Fields: ING-INF/05

Formative aims
Goal of the course is to provide the student with notions about the main algorithms used in bioinformatics and skills for their implementation.
At the end of the module the student should be able to: recall and discuss the algorithms presented, reading the literature about an algorithm in the same class and implement it.

Prerequisites
General notions of algorithms and programming skills in Python

Course programme
Alignment algorithms. Pairwise sequence alignment. Global alignment.
Needleman-Wunsch algorithm. Smith-Waterman Algorithm
String Distance measures. Scoring Matrices: PAM. Local alignment, BLAST.
Multiple alignment: PSI BLAST

Introduction to phylogenetics and phylogenetic trees. Distance data: ultrametric and additive matrices. Additive trees. Parsimony and quartet method.

Patterns in sequence analysis. Frequent and infrequent substrings. Hidden Markov Models.

Teaching methods
Frontal lessons (up to 32 hours) and computer exercises (at least 16 hours). During the exercises the students will be guided in the implementation of an algorithm from the literature and they will seen practical applications of alignment algorithms.

Learning assessment method
Oral/written examination about the contents and practical discussion of the project developed during the exercises and its possible modifications and extensions.
In case of online examination (as in 2020 summer session) oral with discussion of project/exercise.

Reference books
Neil C. Jones and Pavel A. Pevzner: An Introduction to Bioinformatics Algorithms (2004).
Joseph Felsenstein: Inferring Phylogenies (2004).
Hans-Joachim Böckenhauer and Dirk Bongartz: Algorithmic Aspects of Bioinformatics (2010)
Specific papers to be presented during the lectures.

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Further information
Lecturers and contacts

Enrico Blanzieri
Associate Professor
Dipartimento di Ingegneria e Scienza dell'Informazione.
University of Trento
Povo – Trento
Polo Ferrari B
blanzier@dit.unitn.it
tel 39 0461 282097
Office hours during the course: Tuesday 13.15-14.00 (information on
http://webapps.unitn.it/People/it/Web/Persona/PER0004537#RICEVIMENTO)

One additional lecturer to be announced.

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