UCLouvain

lstat2340

2026

Statistical Analyses of -omics Data

5.00 credits	30.0 h + 9.5 h	Q2

Teacher(s)	Symul Laura ;
Language :	French > English-friendly
Place of the course	Louvain-la-Neuve
Prerequisites	Concepts and tools equivalent to those taught in teaching units LSTAT2020 Logiciels et programmation statistique de base LSTAT2110 Analyse des données
Main themes	• Introduction to omics data (definitions, reasons for generating them, examples) • Statistical characteristics of omics data (type and nature of data, typical distributions, etc.) • Correction methods for multiple tests • Details of the most common experimental protocols and methods for pre-processing and analysis of omics data (transcriptomics, metabolomics, proteomics, metagenomics, flow cytometry, and single-cell transcriptomics) • Reviews of supervised (classification and regression, PLS(-DA), O-PLS, Lasso & ridge regression, SVM) and unsupervised (PCA, MDS, clustering) multivariate analysis methods and variance component models (ASCA, APCA). • Data integration methods (multitable data analysis) • Mathematical and statistical methods for spectral data pre-processing (e.g. semi-parametric smoothing models for baseline correction, peak alignment). • Methods for correcting batch effects and experimental planning to avoid them. • Review and use of R packages for omics data analysis (typically BioConductor packages). • Application to real data.
Learning outcomes	**At the end of this learning unit, the student is able to :** 1 With regard to the AA referential of the “Master in Statistics, Biostatistics Orientation” program, this activity enables students to master • As a priority, the following AA: 1.4, 1.6, 2.2, 2.4, 2.5, 2.6, 3.1, 3.2, 3.3, 3.4, 3.5, 4.3, 4.5, 5.4, 5.6 • Secondary AAs: 5.2, 5.7 With regard to the AA referential of the “Master in Statistics, General Orientation” program, this activity enables students to master • Priority: 1.4, 1.6, 2.2, 2.4, 2.5, 2.6, 3.1, 3.2, 3.3, 3.4, 4.3, 5.3
Evaluation methods	In this course, students are evaluated in two ways: • continuous assessment including: • mandatory assignments to be delivered during the quarter according to a schedule set at the beginning of the quarter (40% of the final grade) • and a final project to be presented during the last class (40% of the final grade) • an open-book oral exam (20% of the final grade)
Teaching methods	The course consists of a series of activities that lead the student to actively immerse himself in the world of -omics data. It proposes: • presentations by specialists active in the field, • mini-projects of data processing to be carried out each week, • a final project on data proposed by the various participants in the course or data repositories.
Inline resources	Moodle Site: https://moodle.uclouvain.be/course/view.php?id=2964
Faculty or entity in charge	LSBA

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Data Science : Statistic	DATS2M	5		
Master [120] in Statistics: Biostatistics	BSTA2M	5		
Master [120] in Mathematics	MATH2M	5		
Master [120] in Statistics: General	STAT2M	5		
Master [120] in Chemistry and Bioindustries	BIRC2M	5		
Certificat d'université : Statistique et science des données (15/30 crédits)	STAT2FC	5		
Master [120] in Agricultural Bioengineering	BIRA2M	5		