CODE MCXA0006

Proteomics for Health Research

Credits:	**3 ECTS**
Semester:	**1**
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Content of the Course Unit

The proteomics for Health Research teaching unit is dedicated to learn about proteomic strategies used for protein identification, protein quantitation, post-translational modifications (PTM) investigation, protein-protein interaction, biomarker research and characterization of biopharmaceutical products. The big data generated by proteomics request often the use of artificial intelligence to go further in the gene ontology analysis, network analysis and drug repositioning. So, in addition to learn major proteomic techniques (from sample preparation, protein/peptide separation methods, mass spectrometry interface to bioinformatics and data analysis for the applications listed below), you will learn how to use artificial intelligence such as machine learning approaches for gene ontology analysis, protein and signalling network analysis and performing drug repositioning.
This teaching unit requests a background in biology and biochemistry.

Detailed program

SEQ	Chapter. Title	Teachers
1	1. Introduction to proteomic principles and applications	S. Bourgoin
2	2. Principles of mass spectrometry	S. Bourgoin
3	3. Protein analysis by mass spectrometry	S. Bourgoin
4	4. Overview of separation methods and strategy	M. Seve
5	5. Principles of bioinformatics and identification methods in	M. Seve
6	proteomics	
7	6. Quantification methods in proteomics	S. Bourgoin
8	7. Study of post-translational modifications	Reckonect - SigNet
8	8A. Data analysis, ontology and artificial intelligence	S. Bourgoin
9	8B. Interactomics	S. Bourgoin
9	9A. From Biomarker Discovery to Biomarker Validation	S. Bourgoin
	9B. Methods for characterization of biopharmaceutical products	S. Bourgoin

Each sequence is schedule for 21 days and contains:
- A lecture with slides and audio explanations
- Written comments on the lecture
- An article/review that students should read after listening the lecture
- Student's questions/ teacher's answers
- An auto-evaluation with questions on the lecture and the article/review

During the teaching unit, the students of MIAI master will work on a selected project dealing with the analysis of proteomic data through artificial intelligence approaches.

Competencies acquired for MIAI Label

Competencies	Novice	Intermediate	Advanced
1 - Select and use the right tools for structuring, exploring, researching, storing, and using data	X		
1.1 - By collecting and consolidating, explaining the data for decision-making assistance (business intelligence)	X		
1.2 - Knowing the sources and the data acquisition to train a model	X		
1.3 - By assessing the ethical and regulatory impacts linked to the data and their use		X	
2 - Know and apply learning and symbolic AI technologies	X		
2.1 - Knowing the main models and tools (their context and application conditions, their inputs and outputs)		X	
2.2 - By modeling a customer or application problem and identifying the use of AI to solve it	X		
3 - Identify, explore and model AI technologies on real applications	X		
3.1 - By having the ability to interact with specialists in the field to identify the problem and specify the needs			X
3.2 - By understanding the AI architecture dedicated to an application and by making it evolve so that it matches business or customer needs: data (collection, storage, management); learning; decision making; analysis and model relevance.	X		
3.3 - By knowing and mastering the management of an AI project in a company			
3.4 - Using AI to transform the company and its management			

Organisation

11 lectures for 45min-1h each

11 on-line exercises for auto-evaluation for 30 min-1h each

Select a project for a group of 2-3 students dealing with the analysis of proteomic data through artificial intelligence approaches. The project will be presented by the students at the end of the teaching unit.

Rules of validation

A. *Continuous evaluations (coeff 0.4/1)*
- *Online auto-evaluation with questions and exercises after each lecture on the lecture and on an article/review that students read after listening the lecture (one week) (coeff 0.2/1)*
- *Project (coeff 0.2/1)*

B. *Final exam (coeff 0.6/1)*

Online exam with a supervisor in the exam room: Questions on lecture and questions on an article posted one week before the exam