BIOENG-450

In silico neuroscience

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Cursus	Sem.	Type
Computational Neurosciences minor	E	Opt.
Life Sciences Engineering	MA2, MA4	Opt.
Neuroprosthetics minor	E	Opt.
Sciences du vivant	MA2, MA4	Opt.

Language of teaching	English
Credits	4
Session	Summer
Semester	Spring
Exam	Written
Workload	120h
Weeks	14
Hours	**4 weekly**
Courses	2 weekly
Exercises	2 weekly
Number of positions	

Summary

"In silico Neuroscience" introduces students to a synthesis of modern neuroscience and state-of-the-art data management, modelling and computing technologies.

Content

"In silico Neuroscience" introduces masters students to a synthesis of modern neuroscience and state-of-the-art data management, modelling and computing technologies. Following fundamental structural and functional building blocks of the mammalian brain from cells to circuits, the course teaches applied biophysical modeling for each of these building blocks and showcases applications thereof in modern neuroscience. Accordingly, the course covers a number of key technologies, including 1) how neuroscience data is acquired, organized and integrated, 2) data-driven modeling and validation, 3) simulation and analysis technologies. The target audience are technically adept students in the EPFL Neuroscience program and students from other programs (e.g. I&C, SB, CSE) interested in applying their domain techniques to neuroscience.

Learning Prerequisites

Recommended courses

Neuroscience II
Introduction to programming
Projects in informatics

Important concepts to start the course

general knowledge on cellular neuroscience
experience in elementary programming (preferentially python)

Learning Outcomes

By the end of the course, the student must be able to:

- Interpret discrepancies between experimental findings
- Assess / Evaluate different level of detail formulations of models
- Integrate biological facts into detailed neuron and tissue models
- Apply model concepts in simulations
- Exploit standard modelling and simulation software
- Analyze model predictions
- Explain formalisms and approaches in simulation software

Teaching methods

Classroom teaching & exercises
group work

Assessment methods

Written exam (80%)
Continuous control (20%)