neu250 - Computational Neuroscience - Statistical Learning

Module label: Computational Neuroscience - Statistical Learning
Module code: neu250
Credit points: 6.0 KP
Workload: 180 h
Used in course of study: Master's Programme Neuroscience > Background Modules
Contact person: Module responsibility
- Jutta Kretzberg

Authorized examiners
- Alle hier genannten

Module counseling
- Jochem Rieger
- Jörn Anemüller

Entry requirements: attendance in pre-meeting

Skills to be acquired in this module
- Neurosci. knowlg. Expt. methods Independent research + Scient. literature + Social skills
- Interdiscipl. knowlg. + Maths/Stats/Progr. + Data present./disc. + Scientific English Ethics

Upon successful completion of this course, students
- have refined their programming skills (in Matlab) in order to efficiently analyze large-scale experimental data
- are able to implement a processing chain of prefiltering, statistical analysis and results visualization
- have acquired an understanding of the theoretical underpinnings of the most common statistical analysis methods
- have practised using existing toolbox functions for complex analysis tasks
- know how to implement new analysis algorithms in software from a given mathematical formulation
- can interpret analysis results in a neuroscientific context
- have applied these techniques to both single channel and multi-channel neurophysiological data

Module contents
- data preprocessing, e.g., artifact detection and rejection, filtering, z-scoring, epoching
- data handling for high-volume data in matlab
- introduction to relevant analysis toolbox software
- theory of multi-dimensional statistical analysis approaches, such as multi-dimensional linear regression, principal component analysis, independent component analysis, logistic regression, gradient-based optimization
- practical implementation from mathematical formulation to software code, debugging and unit testing
- postprocessing and results visualization
- consolidation during hands-on computer-based exercises (in Matlab)
- introduction to selected specialized analysis approaches during the seminar

Reader’s advisory
- More text books will be suggested prior to the course.

Scientific articles: Copies of scientific articles for the seminar will be provided prior to the course

Module contents
- More text books will be suggested prior to the course.

Language of instruction: English
Duration (semesters): 1 Semester
Module frequency: jährlich
Module capacity: 18
Reference text: Course in the first half of the semester

Students without Matlab experience should take the optional Matlab course (1. week) of Computational Neuroscience - Introduction

Modullevel: MM (Mastermodul)
Lern-Lehrform / Type of program: Wahlpflicht

Vorkenntnisse / Previous knowledge:

Examination Time of examination Type of examination
Final exam of module during the course Portfolio, consisting of daily short tests, programming exercises and short reports

Course type Comment SWS Frequency Workload attendance
Lecture 1.00 14 h
Exercises 2.00 28 h
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<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
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<tr>
<td>Seminar</td>
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<td>1.00</td>
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Total time of attendance for the module