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:
- Jörn Anemüller
- Jutta Kretzberg
- Jochem Rieger
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

Links:
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)
Modulart: Wahlpflicht
Lern-/Lehrform / Type of program
Vorkenntnisse / Previous knowledge

Examination:
- Time of examination: during the course
- Type of examination: Portfolio, consisting of daily short tests, programming exercises and short reports

Course type:
- Comment
- SWS
- Frequency
- Workload attendance
<table>
<thead>
<tr>
<th>Activity</th>
<th>Time (h)</th>
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<tbody>
<tr>
<td>Lecture</td>
<td>1.00</td>
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<tr>
<td>Exercises</td>
<td>2.00</td>
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<tr>
<td>Seminar</td>
<td>1.00</td>
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**Total time of attendance for the module**: 56 h