Module50 - 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

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

Vorkenntnisse / Previous knowledge:

Examination:
Final exam of module: 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>Credits</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>Lecture</td>
<td>1.00</td>
<td>14 h</td>
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<tr>
<td>Exercises</td>
<td>2.00</td>
<td>28 h</td>
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<tr>
<td>Seminar</td>
<td>1.00</td>
<td>14 h</td>
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**Total time of attendance for the module**

56 h