



Shaping change: this is what drives us at Forschungszentrum Jülich. As a member of the Helmholtz Association with some 7,600 employees, we conduct interdisciplinary research into a digitalized society, a climate-friendly energy system, and a sustainable economy. We focus on the natural, life, and engineering sciences in the fields of information, energy, and bioeconomy. We combine this with expertise in high-performance computing and artificial intelligence using unique scientific infrastructures.

Apply your data science skills to real-world challenges! At the Helmholtz School for Data Science in Life, Earth and Energy (HDS-LEE), we train the next generation of data scientists to tackle key global issues in domain sciences such as life, earth or energy. Learn more at <https://www.hds-lee.de>

The current opening is located at the Institute for Advanced Simulation - Computational and Systems Neuroscience - IAS-6, <https://www.csn.fz-juelich.de>, which consists of seven working groups that conduct research in the field of computational and systems neuroscience. The Statistical Neuroscience group headed by Prof. Sonja Grün develops computational methods to analyze the joint activity of neuronal networks, and applies these methods to experimental data in the context of international collaborations. The PhD candidate will be co-supervised by Prof. Simon Musall, Molecular and Systemic Neurophysiology, RWTH Aachen University.

We are looking to recruit a

PhD position - Linking rate manifolds to higher-order spike patterns across cortical layers and brain regions within the HDS-LEE graduate school

Your Job:

This PhD project aims at relating precisely timed spike constellations across subsets of neurons to low-dimensional manifolds of high-dimensional space of population neuronal firing rates. Thus neuronal experimental data are to be analyzed for both aspects by PCA analysis and statistical multivariate methods to extract spatio-temporal spike patterns. Finally both results will be linked and related in space and time and to behavioral events.

Core Tasks:

The job will be advertised until the position has been successfully filled. You should therefore submit your application as soon as possible. We look forward to receiving your application via our

Online-Recruitment-System!

Questions about the vacancy?

Get in touch with us by using **our contact form**.

Please note that for technical reasons we cannot accept applications via email. www.fz-juelich.de

- Getting familiar with the experimental data and the concepts of neuronal coding, and Elephant
- Analysis of the parallel rate data for submanifolds and their temporal dynamics during behavior
- Leverage dimensionality reduction and regression models to isolate task-related submanifolds and their respective role for sensory processing and task performance
- Analysis of the data to identify higher-order spike correlations and their temporal dynamics
- Are there particular manifold transition points and is their timing related to the occurrence of specific spike correlation patterns and animal behaviors?
- Further extend the results on the contributions of specific cortical layers and neural activity in various brain regions. Are task-specific submanifolds or spike correlation patterns limited to local neural circuits or span across brain regions?
- Set up a network model to reproduce the main results and provide potential neuronal mechanisms. Existing recordings with optogenetic inactivation could be leveraged to causally verify or reject important model predictions
- Writing of the thesis and publication about the relation of experimental data and model results

Your Profile:

- A Masters degree with a strong academic background in physics, mathematics, computer science, or a related field
- Proficiency in at least one programming language (Python, C++, ...)
- Experience in neuroscience is an advantage
- Good analytical skills with a sound understanding of data evaluation.
- Good organisational skills and ability to work systematically, independently and collaboratively
- Effective communication skills and an interest in contributing to a highly international and interdisciplinary team
- Motivation for academic development, supported by bachelor's and master's transcripts and two reference letters
- Working proficiency in English for daily communication and professional contexts (TOEFL or equivalent or exemption required)
- Knowledge of German is beneficial

Our Offer:

We work on the very latest issues that impact our society and are offering you the chance to actively help in shaping the change! This HDS-LEE PhD position will be located at Forschungszentrum Jülich and RWTH Aachen University. We offer ideal conditions for you to complete your doctoral degree:

- World class science environment at the interface between neuroscience and digital technologies, enabling scientific progress on the most complex known systems
- Outstanding scientific and technical infrastructure
- A highly motivated group as well as an international and interdisciplinary working environment at one of Europe's largest research establishments
- Continuous scientific mentoring by your scientific advisors
- Chance of participating in (international) conferences
- Unique HDS-LEE graduate school program (including data science courses, soft skill courses and annual retreats) <https://www.hds-lee.de/about/>
- 30 days of annual leave (depending on agreed working time arrangements) and provision for days off between public holidays and weekends (e.g. between Christmas and New Year)
- A large research campus with green spaces, offering the best possible means for

networking with colleagues and pursuing sports alongside work

- Further development of your personal strengths, e.g. through an extensive range of training courses; a structured program of continuing education and networking opportunities specifically for doctoral researchers via JuDocS, the Jülich Center for Doctoral Researchers and Supervisors: <https://www.fz-juelich.de/en/judocs>
- Targeted services for international employees, e.g. through our International Advisory Service

The position is for a fixed term of 3+1 years. Pay in line with 75% of pay group 13 of the Collective Agreement for the Public Service (TVöD-Bund) and additionally 60 % of a monthly salary as special payment („Christmas bonus“). Pay higher than the basic pay may be possible. The monthly salaries in euro can be found on the BMI website: <https://go.fzj.de/bmi.tvod.entgelt> Further information on doctoral degrees at Forschungszentrum Jülich (including its various branch offices) is available at <https://www.fz-juelich.de/en/careers/phd>

We welcome applications from people with diverse backgrounds, e.g. in terms of age, gender, disability, sexual orientation / identity, and social, ethnic and religious origin. A diverse and inclusive working environment with equal opportunities in which everyone can realize their potential is important to us.

Further information on diversity and equal opportunities: <https://go.fzj.de/equality>