Center for Advancing Electronics Dresden

The newly established Chair of Network Dynamics headed by Prof. Marc Timme and the Junior Research Group “Biological Algorithms” headed by PD Dr. Benjamin Friedrich, both affiliated with the ‘Center for Advancing Electronics Dresden’ (cfaed) and the Cluster of Excellence ‘Physics of Life’ (PoL), jointly offer, subject to resources being available, a

Postdoc in Stochastic and Nonlinear Dynamics
(subject to personal qualification employees are remunerated according to salary group E 13 TV-L)

Research area: Predictable collective dynamics of bio-inspired reservoir networks

Terms: The position is available from 15th April, 2020 until 30th Sept, 2022. The period of employment is governed by the Fixed-Term Research Contracts Act (Wissenschaftszeitvertragsgesetz – WissZeitVG).

The Chair of Network Dynamics and the Junior Research Group Biological Algorithms strive for a conceptual understanding of the principles underlying self-organized collective dynamics, information processing and control in complex systems, bridging physics and biology to computer science and engineering, see http://networkdynamics.info and https://cfaed.tu-dresden.de/friedrich-home.

About the project

How artificial neural networks process and share information, is still poorly understood. The consequence is the difficult and often very limited predictability of learning outcomes and thus a high level of non-transparency. Within the project TransparNet, you will pioneer theoretical approaches to improve predictability and thus transparency of Artificial Intelligence methodology for networked computing by exploiting the paradigm of reservoir computing, where a pre-processing unit with fixed weights (the reservoir) is coupled to an output layer.

Tasks

The successful candidate will develop and apply methods from the nonlinear dynamics of complex systems, from network dynamics and from statistical physics to develop a predictive theory of reservoir dynamics. Understanding correlated nonlinear dynamics, multistability, and information routing in multi-dimensional networks will pave the road towards efficient and transparent learning rules for the output layer, especially for the processing of time-continuous and dynamic input signals, a feature currently out of reach for conventional artificial neuronal networks.

Requirements

We are looking for a theoretical physicist (or applied mathematician) who is motivated to perform cutting-edge research at the interface of physics and information science, and meets the following requirements:

- outstanding university doctoral degree (PhD) in Theoretical Physics, or closely related field
- experience in statistical physics, nonlinear dynamics, stochastic processes; information theory is a plus
- experience in Computational Physics (ODEs, PDEs, SDEs), and strong programming skills (e.g. Julia, Matlab, Python, C++)
- strong interest in applying physics to understand biological and bio-inspired processes, and the willingness to learn some biology en route
- strong analytic and problem-solving skills, creativity,
- an independent, target- and solution-driven work attitude,
- strong communication skills, especially in cross-disciplinary communication
- fluency in English – oral and written; German language skills are a plus but not initially required

**What we offer**
You will join an enthusiastic and ambitious research group, where you can drive your project forward and benefit from inspirational interactions with like-minded researchers. On this project, you will closely interact with a PhD student working on the same project, giving you the opportunity to gain (first) experience in supervising students by supervising the student jointly. The working language of our two international teams is English.

Dresden is a European hub for Information Sciences, Biological Physics and Engineering. You will be embedded in two research clusters, where we contribute insights into collective nonlinear network dynamics, bio-inspired algorithms and biological information processing. As part of the Cluster of Excellence “Physics of Life” and the Center for Advancing Electronics (cfaed), we enjoy the close proximity of collaboration partners at the Max-Planck Institutes for the Physics of Complex Systems, the Max Planck Institute for Cell Biology and Genetics, the Biotechnology Centre, and the new Center for Systems Biology Dresden.

For informal enquires, please contact PD Dr. Benjamin Friedrich at benjamin.m.friedrich@tu-dresden.de.

Applications from women are particularly welcome. The same applies to people with disabilities.

**Application Procedure**
Your application (in English only) should include: a motivation letter, your CV with publication list, the names and contact details of two references, copy of degree certificate, and transcript of grades (i.e. the official list of coursework including your grades). Please include also a link to your Master’s or PhD thesis. Complete applications should be submitted preferably via the TU Dresden SecureMail Portal https://securemail.tu-dresden.de by sending it as a single pdf document quoting the reference number PD-Bio0120 in the subject header to recruiting.cfaed@tu-dresden.de or alternatively by post to: TU Dresden, cfaed, Herrn PD Dr. Benjamin Friedrich, Helmholtzstr. 10, 01069 Dresden, Germany. The closing date for applications is **13.02.2020** (stamped arrival date of the university central mail service applies). Please submit copies only, as your application will not be returned to you. Expenses incurred in attending interviews cannot be reimbursed.

**Reference to data protection:** Your data protection rights, the purpose for which your data will be processed, as well as further information about data protection is available to you on the website: https://tu-dresden.de/karriere/datenschutzhinweis

**About TU Dresden**
The TU Dresden is among the top universities in Germany and Europe and one of the eleven German universities that were identified as an ‘elite university’. As a modern full-status university with 18 departments it offers a wide academic range making it one of a very few in Germany.