ERA Chair VIBraTE

Senior Postdoctoral Researcher

The Horizon Europe project VIBraTE is currently seeking a highly motivated and skilled postdoctoral researcher to join our research team in the field of applied mathematics. The successful candidate will work with a team of interdisciplinary researchers to develop mathematical models, analytical tools, and numerical simulations to study complex systems in fields, such as physics, engineering, and biology.

Location

Sofia, Bulgaria

Responsibilities:

- Develop and implement mathematical models and methods to analyze complex systems
- Conduct numerical simulations and data analysis to validate and refine the models
- Collaborate with other researchers within the project to achieve the goals and deliverables
- Present research findings at international conferences and publish research papers in high-impact journals
- Contribute to the dissemination and outreach activities of the project, including organizing workshops and engaging with stakeholders
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Qualifications:

- A Ph.D. in Mathematics or a related field
- Strong background in applied mathematics, with expertise in at least one of the following areas: mathematical modeling, dynamical systems, numerical analysis, optimization, or statistics
- Proficiency in programming languages such as MATLAB, Maple, or R
- Experience in interdisciplinary research and working in teams
- Excellent written and oral communication skills in English
- Demonstrated ability to publish research papers in international peer-reviewed journals
- Ability to work independently and guide junior members of the team

We offer:

- A competitive salary according to the Marie Curie European standards
- An international and dynamic research environment
- Access to state-of-the-art facilities and equipment
- Opportunities for professional development and career advancement

This is a full-time position for two years (24 months), with the possibility of an extension until the end of the project (Jan 2028) based on the performance of the candidate. The position is available from July 2023, and applications will be reviewed on a rolling basis until the position is filled.

Application

We look forward to receiving your application and will screen it as soon as possible. To apply, please submit a

- cover letter (max 2 pages)
- CV, including a list of 5 most important publications.
- 2 letters of recommendation
- 3-minute video pitch in English

The applications will be evaluated by an international hiring panel. Shortlisted candidates will be invited to an interview and may be asked to give a research presentation.

Applications should be sent to Tsvetelina Yorgova : tsvetelina.yorgova@iict.bas.bg

About the project

A brain-computer interface (BCI) is a technology that collects brain signals and transmits them to an external device that outputs commands. Insight into the interaction between BCI implants and the brain tissue will help maximize the potential of the technology. The EU-funded VIBraTE project aims to support the establishment of a BCI lab at the Institute of Information and Communication Technologies of the Bulgarian Academy of Sciences. Among the objectives of the lab will be to model and investigate the properties, geometry, and mechanical effects of the interaction of the brain with the implanted electrodes. The research objectives of the VIBraTE Chair are situated along the following research axes:

- Axis 1: Viscoelastic coupling
- Axis 2: Optimization of the interface geometry for invasive and non-invasive BCI
- Axis 3: Diffusion phenomena in the brain tissue
- Axis 4: Effects of viscoelastic deformations on modeled brain activity

The main expected outcome in Axis 1 would be to quantify the mechanical interactions of different implants and link them to physiological states and the observed tissue response. Viscoelastic phenomena are typically investigated with the tools of fractional calculus.

Fractional calculus is a domain of applied mathematics, which develops very fast and is especially suited to model processes with memory (time-fractional) or spatial inhomogeneities (space-fractional). It is expected that Axis 2 would identify some design rules for brain electrodes and less invasive BCI as a main application. Some partnerships with SMEs are expected to be initiated along Axis 2. The results in Axis 3 would extend our understanding of local drug or gene delivery in tissues. An example of such an approach is optogenetics, which could possibly be extended to human applications by local transfection around an implanted electrode. Axis 4 could refine our understanding of the limitations of invasive neural electrode signal decoding (i.e. spike-sorting).

ERA Chairs are funded by the European Union to support the development of research excellence in specific scientific areas. The objective of the ERA Chair project is to attract and maintain high-quality researchers at the host institution, improve research quality and impact, and enhance the institution's research environment. The project provides funding for research projects, mobility opportunities, and training activities for researchers.