BCAM Internship Position Announcement

The following BCAM Internship position is open at BCAM – Basque Center for Applied Mathematics, an interdisciplinary research center located in Bilbao, Basque Country – Spain. The interested applicants can apply via the following webpage: http://www.bcamath.org/en/research/internships. It is strongly recommended to apply at least 3 months before the expected starting date.

| INTERNSHIP DATA |
|-----------------|--------------------------------------------------------------------------------------------------|
| Research topic title: | Multi-scale and multi-modal analysis of neuronal signals in epileptic patients |
| Research topic description: | About one epileptic patient out of four is diagnosed with intractable (drug-resistant) epilepsy, presenting severe, life-impairing seizures for which the only, currently available treatment option is surgical removal of epileptogenic neuronal circuits. The success of this surgery however depends on our ability to exactly identify epileptogenic circuits. This task is challenged by the emerging hypothesis that epileptogenic circuits are distributed rather than localized in a single brain spot. In turn, this distributed scenario suggests that epileptic seizures present multi-scale spatial organization in conjunction with hierarchical temporal activation of multiple neural circuits. In line with this hypothesis is the observation that the spectrum of oscillatory neural electrical activity during seizures recorded by electroencephalography (EEG) presents multiple frequency components, ranging from milli- to kilohertz. It remains however unclear how to relate such temporal structure with the underlying spatially-organized activation of epileptogenic neural networks. The aim of this internship is to gain familiarity with development of mathematical and modelling techniques that could help the analysis of spatial and temporal correlations in epileptic neural activity. The intern will work in collaboration with Dr. Maurizio De Pittà (BCAM) to adapt current models of neuron-glial networks to reproduce epileptic seizures, and with Dr. Paolo Bonifazi (BioCruces) for the analysis of neural time series and brain networks. |
| Keywords: | computational neuroscience, time-series analysis, |
complex networks, epilepsy, neuron-glia interactions

**Required knowledge and skills:**

- Basic knowledge of graph theory and statistical data analysis, and numerical integration
- Essential programming skills in MATLAB and/or Python
- Basic knowledge in neuroscience is a plus
- Ability to meet deadlines
- Strong interest to pursue research in complex network theory

**Required language skills**: English

**Duration and dates:**

6 months (to define, between March – September 2019).
3 months of the Internship will be at BCAM (Bilbao) and the other 3 months at BIOCRUCES.

**Covered expenses:**

To be negociated

**Application deadline:**

March 1st, 2019 (or till position is filled)

**SUPERVISOR DATA**

**Supervisor:**

Maurizio De Pittà (BCAM); Paolo Bonifazi (BioCrucies)

**Research line:**

MCEN

**Email:**

mdepitta@bcamath.org; paolo.bonifazi@osakidetza.eus

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1. Note that English is the official language at BCAM.