

## **One Early Stage Research Position in Theoretical Neuroscience.**

**One Early Stage Research position (leading to a Phd) in Theoretical Neuroscience «Formal models of visual perception based on cortical architectures» at the Centre d'Analyse et de Mathématique Sociales, CNRS–EHESS, Paris.**

**Deadline for application: 28 Febraury 2014.**

The Centre d'Analyse et de Mathématique Sociales, CNRS-EHESS, Paris, announces 1 Early Stage Research position, leading to a PhD in Theoretical Neuroscience, subjected to final approval of funding from the E.U.

The position will start in April 2014 within a multidisciplinary and multi-partner research project titled MANET Metric Analysis for Emergent Technologies. This is an EU funded Marie Curie Initial Training Network (ITN).

The scientific objective of the MANET project is to develop new and highly sophisticated instruments of metric analysis in rich geometrical setting, non isotropic or non regular. Non isotropic problems arise while describing the motion of a system in which some directions are not allowed by a constraint, as models of the visual cortex or robotics, or traffic dynamic. Non regular metric analogue of differential objects arise as limits of regular surfaces, or minima of a functional. The differential instruments are no more sufficient to handle these objects and have to be replaced by instruments of geometric measure theory: mass transportation, and singular integrals. These results will open the possibility of affording a large spectrum of emergent technological problems from human to computer vision and medical imaging from eye path tracking to traffic dynamics and robot design.

### ***PhD Project description***

#### **Formal models of visual perception based on cortical architectures**

The PhD project will focus on formal models of visual perception based on the functional architecture of the visual brain. The main scope is to mathematically formalize cortical circuitry of the visual cortex taking into account its multilevel structure. Neurogeometry

underlying both low level and high level cognitive functionality will be considered, covering a wide range of cognitive tasks.

The structure of the project allows a modular approach to the computation of neural connectivity. Starting from first principles, the geometry of connectivity of the functional architectures of low level visual cortex is modelled with instruments of differential geometry. It will provide invariant constitution of visual percepts. The same geometric structures are recovered starting from the stimuli set, showing that the neurogeometry is a dimensionality reduction of the stimuli space. Functional architectures underlying high level perceptual functionality will be formalized by means of a hierarchical multiscale dimensionality reduction technique.

### ***Who is eligible to apply ?***

Applicants will hold a Masters degree and to have no more than four years (full-time equivalent) of postgraduate research experience by the time of appointment.

Applications will be assessed based on the following criteria:

- \* Practical experience and academic background of relevance for the project
- \* Quality of outline proposal in terms of originality, feasibility, theoretical framing, methods
- \* Knowledge of scientific theory and method of relevance to the research project
- \* Analytical ability and skills in writing, as demonstrated by the submission of written work for assessment by the appointments panel
- \* Additional skills and expertise pertinent to the project
- \* References from two academic referees closely familiar with the applicant's work.

The language of instruction will be mostly in French and the thesis will be expected to be written in French or English.

There are no nationality restrictions. HOWEVER, to fulfil Marie Curie mobility requirements applicants at the time of recruitment by the host organisation must not have resided or carried out their main activity (work, studies, etc.) in the country (in this case France) of their host organisation for more than 12 months in the 3 years immediately prior to the commencement of the award in October 2013. (Compulsory national service and/or short stays such as holidays are not taken into account.)

For further information and regulations regarding PhD study at EHESS-Paris, see <http://www.ehess.fr/fr/enseignement/diplomes/doctorat/>

EHESS strives to achieve a more even gender balance among its staff and women are especially encouraged to apply.

Information about the Phd training program may be requested to: <http://www.ehess.fr/fr/enseignement/diplomes/doctorat/ecole-doctorale/>

## ***How to apply***

Please supply the following documents :

- \* A Curriculum vitae (undergraduate and graduate education and courses, other relevant research experience, list of publications and unpublished dissertations, employment record)
- \* A short (1 page) personal presentation (letter of intent that explain why you are interested in studying for a PhD in Theoretical Neuroscience, why you are interested in this post and why you consider yourself well suited to undertake the research. )
- \* One example of an independently written paper or thesis authored by the applicant within the framework of his/her bachelor or master level education.
- \* A 2 pages PhD research proposal outline in the field of formal models of visual perception based on cortical architectures. This should adhere to the following structure: Title, aims, theoretical and intellectual background (including prior research) data sets to be recovered and analysed, methods, expected results, references & timetable.
- \* Two letters for reference from academic referees – to be sent independently.
- \* Ancillary documentation that the applicant wishes to be taken into consideration.

A complete application headed with the reference VISION\_MANET should arrive no later than 28 February 2014.

**Applications to be sent as either Word Documents or as PDF to [alessandro.sarti@ehess.fr](mailto:alessandro.sarti@ehess.fr)**

**The deadline for application is 28 February 2014.**

**The starting date is April 1<sup>st</sup> 2014, or as soon as possible thereafter.**

## ***Name and contacts details:***

For further information, please contact:

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