2018-00481 - Post-Doc Position:
Probabilistic approach and numerical associated methods for rupture phenomena.
Applications to avalanches [S]

**Contract type:** Public service fixed-term contract
**Level of qualifications required:** PhD or equivalent
**Function:** Post-Doctoral Research Visit

**Context**
**Location:** Inria Nancy Grand Est research center --- Iecl, Nancy, France
**Project-team:** Tosca
https://team.inria.fr/tosca/

**Supervision and contact:** Madalina Deaconu, Researcher, Inria Nancy,
madalina.deaconu@inria.fr

**Assignment**

**Assignments:**
This project aims to develop the existing interest of Tosca Nancy in the probabilistic interpretation of rupture phenomena like avalanches in terms of fragmentation models.

More precisely we will construct a stochastic approach for the avalanche model by using some particular properties of an avalanche. This approach is an important issue in controlling the risk. The originality is here to include also the position of the particle (snow) one of the important parameters of the physical model. The numerical part of this work will be done in collaboration with researcher from Irstea, Grenoble.

Our aim is twofold. First, we intend to investigate the evolution equation of the fragmentation including both position and mass of the particle. This microscopic vision should conduct to a better understanding of this complex process. The second direction is to improve the model by considering coagulation/fragmentation models based on the physical properties of the avalanches in order to characterize the different stages of the physical phenomenon.

An important part of this project will be dedicated to the construction and the analysis of numerical probabilistic methods.

**For a better knowledge of the proposed research subject:**

The rupture phenomena arise in many applicative fields as : in snow or rock avalanche, in geophysics, in crystallography, etc. The mathematical description is still not very well developed and many important questions need to be answered. Recently Madalina Deaconu and her co-authors Lucian Beznea and Oana Lupascu obtained significant results in this direction by giving a probabilistic interpretation to the fragmentation model for the avalanche. They considered the interpretation of the rupture in terms of fragmentation models. In a first work [1] they connect the probabilistic interpretation of the fragmentation equation by a stochastic differential equation with jumps to a branching process. Afterwards, by considering a particular fragmentation kernel [2], [3], which illustrates a physical characteristic of the snow avalanche, they construct a stochastic interpretation for the avalanche and also a new numerical techniques to approximate it.

In this first approach the model gives the evolution of a particle system, which are characterized only by their masses. The aim is here to extend these approaches to the fragmentation process where the particles are both characterized by their mass and their position. Another step will be the introduction of the evolution of the avalanche before the rupture phase [4], [5] and [6], which can be interpreted as a coagulation

**General Information**

- **Theme/Domain:** Stochastic approaches
- **Scientific computing (BAP E)**
- **Town/city:** Villers-lès-Nancy
- **Inria Center:** CRI Nancy - Grand Est
- **Starting date:** 2018-10-01
- **Duration of contract:** 1 year, 4 months
- **Deadline to apply:** 2018-06-06

**Contacts**

- **Inria Team:** TOSCA
- **Recruiter:** Deaconu Madalina / madalina.deaconu@inria.fr

**The keys to success**

**Supervision and contact** Madalina Deaconu, Researcher Inria
madalina.deaconu@inria.fr

**Starting date:** September 1st, 2018 - December, 1st 2018
**Duration:** 16 months
**Application deadline:** 6 June 2018

**How to apply:**
Upload your CV on jobs.inria.fr; this should be a pdf file of at most 2Mo.
In addition, send the following documents to madalina.deaconu@inria.fr in a single pdf or ZIP file:
- CV including a description of your research activities (2 pages max) and a short description of what you consider to be your
model, the detection of the rupture time and also the description of the rupture as a fragmentation process (the study done before). The implementation of the numerical stochastic methods will be crucial for the understanding of the phenomenon. This approach is new and proposes an alternative approach to avalanche modeling by stochastic processes. The success of this study will allow to give some insight on important problems concerning avalanches and the connected risk.


Collaboration:
The recruited person will be in connection with **** who **** for ****.

Responsibilities:

Steering/Management:

Skills
Technical skills and level required:

Required qualification: PhD in applied mathematics and basis in stochastic calculus and numerical probabilistic method

Languages: French and English

Relational skills: Good relational skills

Benefits package

- Subsidised catering service
- Partially-reimbursed public transport
- French courses

Remuneration

Salary: 2653€ gross/month

best contributions and why (1 page max and 3 contributions max); the contributions could be theoretical or practical. Web links to the contributions should be provided. Include also a brief description of your scientific and career projects, and your scientific positioning regarding the proposed subject.

- The report(s) from your PhD external reviewer(s), if applicable.
- If you haven't defended yet, the list of expected members of your PhD committee (if known) and the expected date of defense (the defense, not the manuscript submission). In addition, at least one recommendation letter from your PhD advisor should be sent directly by their author(s) to madalina.deaconu@inria.fr.

Applications are to be sent as soon as possible

About Inria

Inria, the French National Institute for computer science and applied mathematics, promotes the scientific
excellence for technology transfer and society”. Graduates from the world’s top universities, Inria's 2,700 employees rise to the challenges of digital sciences. With its open, agile model, Inria is able to explore original approaches with its partners in industry and academia and provide an efficient response to the multidisciplinary and application challenges of the digital transformation. Inria is the source of many innovations that add value and create jobs.

**Conditions for application**

**Defence Security:**
This position is likely to be situated in a restricted area (ZRR), as defined in Decree No. 2011-1425 relating to the protection of national scientific and technical potential (PPST). Authorisation to enter an area is granted by the director of the unit, following a favourable Ministerial decision, as defined in the decree of 3 July 2012 relating to the PPST. An unfavourable Ministerial decision in respect of a position situated in a ZRR would result in the cancellation of the appointment.

**Recruitment Policy:**
As part of its diversity policy, all Inria positions are accessible to people with disabilities.

**Warning:** you must enter your e-mail address in order to save your application to Inria. Applications must be submitted online on the Inria website. Processing of applications sent from other channels is not guaranteed.