POSTDOCTORAL FELLOWSHIP

OPEN POSITION

DESCRIPTION

Post-doctoral fellowship in Probability and Statistics

Title: Modeling, simulation and estimation of telomere length dynamics

Location: IECL Laboratory, Université de Lorraine Vandoeuvre-lès-Nancy, France; INRIA Nancy Grand Est research center, France

Supervision: Anne Gégout-Petit (anne.gegout-petit@univ-lorraine.fr), Denis Villemonais (denis.villemonais@univ-lorraine.fr)

Duration: 24 months starting from September 2018

Scientific context

Telomeres are nucleoprotein structures located at the ends of chromosomes that protect against melting and degradation phenomena during cell replication. Short leukocyte telomere length is associated with many degenerative diseases linked to aging and with higher mortality risk. In a recent collaboration with Pr Athanase Benetos, Simon Toupance (Company Posifit) and Eliane Albuisson (CHRU of Nancy and IECL), we studied the evolution of telomere length distribution over time in adults. This statistical study was based on a cohort of 72 individuals and is currently extended to a cohort of 500 individuals. Understanding the mechanisms underlying the observed shortening evolution and their potential link with many degenerative diseases is a challenge lying at the edge of current research.

The Post-Doc is founded by Lorraine Université d'Excellence program Geenage (Personalized medicine and diseases related to aging) of Université de Lorraine. It involves IECL (Institut Elie Cartan de Lorraine), INSERM (Institut national de la santé et de la recherche médicale) and Nancy's CHRU (Centre Hospitalier Régional Universitaire).

Missions

The main objective of the post-doctoral applicant is to propose several models accounting for the dynamics of the telomere length distribution and to implement numerical simulations of these models. The applicant will be required to conduct the mathematical study of these models and to answer challenging questions on their large number of cells behaviour and their long time behaviour. An additional objective is to design appropriate statistical estimation methods of the parameters of the models, and apply them to data generated by Telomeric Restriction Fragment Southern Blot (TRF) in a longitudinal study. The consistency between the predicted probability and the observed data will be used to select the best model and the statistical method. Parallel to this, the post doc researcher will also develop other statistical methods not directly based on models, but rather trying to detect statistical links between telomere shortening and several health conditions.

Methods

The modeling part of the project will be based on standard stochastic individual based models. The statistical part consists in parametric estimation for these models. Any appropriate method for this may be used (likelihood maximization, Bayesian methods, MCMC for density estimation…). The asymptotic

behaviours will be studied using classical scaling approximation technics. Finally, the direct statistical study (not based on models) can involve different methods (machine learning, curve clustering, random forests, discriminant analysis…).

Environment

The Post-doc will take place in IECL Nancy under the supervision of Anne Gégout-Petit and Denis Villemonais. The Institut Élie Cartan de Lorraine (IECL) is the laboratory of Mathematics of Université de Lorraine. The Probability and Statistics group, composed of more than 30 permanent members, is the largest one in east part of the France. Two Inria projects belong to this group: the first one called BIGS (BIology, Genetics and Statistics) works on statistics and stochastic modeling for Biology and Medicine; TOSCA (TO Simulate and CAlibrate stochastic models) is the second one, with field of research stochastic modeling, control and stochastic numerical methods. The Post-doctoral project takes part of a collaboration with INSERM (the French National Institute of Health and Medical Research) and CHRU of Nancy. Regular meetings are planned between the different partners of the project.

Skills and profile

Required qualification: Ph.D. thesis in probability or statistics. Specific knowledge on estimation of Markov processes is desirable. A strong interest in medical applications is also important.

Funding

Lorraine Université d'Excellence program LUE Impact GEENAGE (Functional Genomic, Epigenomic and ENvironment interplay to IMPACT the understanding, diagnosis and management of healthy and pathological AGEing) of Université de Lorraine.

[porteur de projet]

TERMS AND TENURE

This two-year position will be based at the ***Institut Elie Cartan de Lorraine*** 54506 Vandœuvre-lès-Nancy Cedex, France. The duration can not exceed 24 months.

The target start date for the position is ***September 1st 2018*** with some flexibility on the exact start date.

HOW TO APPLY

Applicants are requested to submit the following materials:

- A cover letter applying for the position
- Full CV and list of publications
- Academic transcripts (unofficial versions are fine)

Deadline for application is 09/06/2018.

Applicants will be interviewed by an Ad Hoc Commission with the current at the latest 22 of june 2018.

Applications are only accepted through email. All document must be sent to Anne Gégout-Petit (anne.gegout-petit@univ-lorraine.fr), Denis Villemonais (denis.villemonais@univ-lorraine.fr)

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JOB LOCATION

Nancy, Lorraine, France

REQUIREMENTS

DOCUMENTS

- Curriculum Vitae - Your most recently updated C.V. including list of publications
- Cover Letter
- Statement of Research

BIBLIOGRAPHIE

Bourgeron T, Xu Z, Doumic M, Teixeira MT. The asymmetry of telomere replication contributes to replicative senescence heterogeneity. Scientific reports. 2015 Oct 15;5:15326.

Eugène S, Bourgeron T, Xu Z. Effects of initial telomere length distribution on senescence onset and heterogeneity. Journal of theoretical biology. 2017 Jan 21;413:58-65.

Toupance S, Labat C, Temmar M, Rossignol P, Kimura M, Aviv A, Benetos A. Short Telomeres, but Not Telomere Attrition Rates, Are Associated With Carotid AtherosclerosisNovelty and Significance. Hypertension. 2017 Aug 1;70(2):420-5.

Toupance S, Watfa G, Settembre N, Lacolley P, Benetos A. Telomere length measurement and comparison in skeletal muscle, adipose tissue, skin and leukocytes: methodological aspects and preliminary results. Arch. Cardiovasc. Dis. 2014(S6):18.