Two-year postdoc position in signal processing and Monte Carlo methods applied to epidemiology

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Description of work

The purpose of the project is to design **Markov Chain Monte Carlo samplers** accompanied with, or including, **hyperparameter selection** for credibility interval estimation of epidemiological indicators, e.g., for the reproduction number R_t of Covid19. Elaborating on a recent epidemiological model [2], Monte Carlo samplers have been designed and implemented during the pandemic to estimate the reproduction number of the Covid19 [1, 3]. The major bottleneck to their systematic use and generalization to other epidemics is that they require fine-tuning of hyperparameters, which up to now has been done manually in conjunction with experts. Automated data-driven selection procedures will enable to apply the Monte Carlo sampler to a wide range of epidemics, and to gain objectivity and capacity to handle large amount of data.

The recruited postdoc researcher will tackle both implementation challenges and theoretical questions related to stochastic approximation. He/she is expected to develop commented, easy to handle codes to make available the proposed methodologies to nonspecialists. He/she will work in contact with epidemiologists and will be provided real epidemiological data. An interest in interdisciplinary research will be highly appreciated.
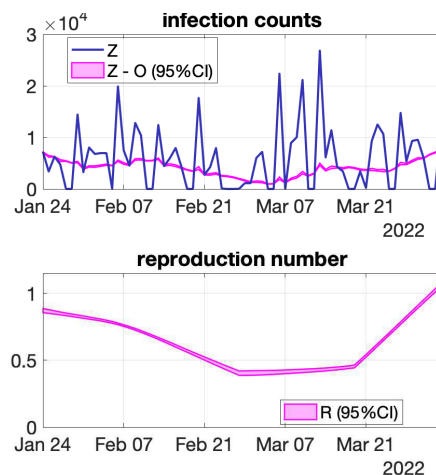
Covid19 indicators in Finland

Host institution and place of work

The recruited candidate will be hired by the Centre National de la Recherche Scientifique (CNRS) in the framework of ANR grant OptiMoCSI holded jointly by LP-IXXI in Lyon, IMT in Toulouse and LS2N in Nantes. CNRS is the largest state-funded French research institution, employing researchers in all fields from exact sciences to humanities. He/she will integrate the Laboratoire des Sciences du Numérique de Nantes (LS2N), in the Signal, Image and Sound (SIMS) team (`https://www.ls2n.fr/equipe/sims/`) and work on the campus of Centrale Nantes, a top-level engineering school.

"Regularly quoted in newspapers as being one of the nicest cities in France, Nantes is also renowned for being a rich, lively and innovative city. Its economic clout makes Nantes France's 3rd largest industrial city and 2nd most successful city in terms of employment growth." (`https://metropole.nantes.fr/nouveaux-arrivants`)

Candidate profile

Prospective applicants are expected to hold a PhD in signal processing, statistics or a related discipline, excellent programming skills (e.g., in Python or Matlab), and good communication skills in English, both written and oral. The net monthly salary is around 2250€ for researchers with less than 2 years of professional experience after the PhD, and starts around 3200€ in other cases. The position comes with health insurance and other social benefits. Financial support to attend international conferences and visiting other members of the consortium in Lyon and Toulouse, as well as international collaborators in Edinburgh is included.

Candidates are requested to send a CV, a brief statement of research interests and the contact details of two referees in a single PDF file. The position is open and can start anytime from October, 1st 2023 for one year renewable once. Applications will be collected until a suitable candidate is found and no later than March 2024.

Applications and informal information requests are to be emailed to `barbara.pascal@cnrs.fr`.

References

[1] H. Artigas, B. Pascal, G. Fort, P. Abry, and N. Pustelnik. Credibility interval design for COVID19 reproduction number from nonsmooth Langevin-type Monte Carlo sampling. In *2022 30th European Signal Processing Conference (EUSIPCO)*, Belgrade, Serbia, Aug. 29-Sept. 2 2022.

[2] A. Cori, N. M. Ferguson, C. Fraser, and S. Cauchemez. A new framework and software to estimate time-varying reproduction numbers during epidemics. *Am. J. Epidemiol.*, 2013.

[3] G. Fort, B. Pascal, P. Abry and N. Pustelnik. Covid19 reproduction number: Credibility intervals by blockwise proximal Monte Carlo samplers. *IEEE Trans Signal Process., to appear.*, 2023.