

Scholarship position for a PhD student

At Inselspital Bern, Bern University, Switzerland

in a project funded by the Swiss Cancer League



Project title: Personalizing screening recommendations from a microsimulation model for colorectal cancer screening



krebsliga schweiz
ligue suisse contre le cancer
lega svizzera contro il cancro

Application deadline: 31st of March 2021

Duration/funding level: Following guidelines of the Swiss National Science foundation for 36 months:
http://www.snf.ch/SiteCollectionDocuments/Annex_XII_Ausfuhrungsreglement_Beitragreglement_E.pdf

Requirements:

- MSc in biomedical engineering or another technical science, computer science, physics, mathematics or another specialty related to the project's scope
- Familiarity with methods and concepts of mathematical and computational modeling
- Strong bioinformatics and programming skills, familiarity with a high-level programming language such as C++ (preferred) or similar
- Experience in medical or biological applications is welcome but not necessary
- Proficiency in written and oral English at a high level
- Ability to work independently and in an interdisciplinary team at the interface of practical medicine, bioinformatics and software-engineering
- Strong motivation to advance a challenging bioinformatics and software engineering project.

In addition to the above requirements, a candidate is expected to represent high creativity, reliability, diligence and the ability to critically evaluate the obtained results. Moreover, we expect from a candidate an active participation in conferences and other forms to disseminate the project's results and preparation of scientific publications in English at a high, international level.

Submission of the application:

Applications should be submitted by the 31st of March 2021 via E-mail to benjamin.misselwitz@insel.ch (project's PI) and jpoleszczuk@ibib.waw.pl, with the subject: "PhD student – SCL CMOST".

Required documents:

- 1) Application letter (with some motivational part)
- 2) Curriculum vitae with a list of achievements, including the list of publications and a description of skills and experiences of the candidate which could be useful for the project
- 3) Scan of master's degree diploma
- 4) OPTIONAL: Short and concise 'portfolio' illustrating the previous research experience (part of conference/seminar/poster presentation)
- 5) OPTIONAL: At least one letter of recommendation and/ or opinion on the candidate from a previous supervisor (of MSc thesis) or former directors with whom the applicant has previously cooperated with the contact details

All required documents should be saved in one PDF file. The competition will be settled by the end of April 2021.

Project description:

Colorectal cancer (CRC) is the second most frequent solid cancer and the third leading cause of cancer related death. There is tremendous potential to reduce CRC incidence and CRC related death via CRC screening. The evidence for many CRC screening interventions is incomplete and **for some highly relevant questions no high-quality data are available**. For instance, even though colonoscopy is considered the gold standard for CRC screening, there is no randomized controlled colonoscopy study for CRC screening. **Microsimulation** is an attractive tool to assess effects of CRC screening on a population. Microsimulation models are used for forming medical policies which allocate billions of dollars to specific CRC screening and surveillance interventions. However, existing tools for CRC microsimulation are currently strictly proprietary, and predictions cannot be independently advanced. Moreover, **sensitivity analysis** is usually insufficient and the space of uncertainty in basic parameters barely explored. Finally, current microsimulation studies do not provide **personalized predictions**.

We recently developed the microsimulation tool **Colon Modeling Open Source Tool (CMOST)** (1). [CMOST](#) captures the natural history of CRC via early and advanced adenomas, accounting for gender, age, location within the colon and individual differences in CRC risk and allows simulating screening interventions. Detailed calibration and validation was performed and we continued to develop CMOST with >10,000-fold improvements in speed (CMOST 3.0, re-engineered in C++).

The current PhD project aims to enable CMOST to perform **personalized CRC screening** and surveillance recommendations, considering the detailed personal history of a given patient including many non-standardized situations. Individual carcinoma risk and co-morbidities will be estimated using published scores. We will simulate an individual history of a patient by mapping the parameter space according to the timing of past colonoscopies, CRC risk and comorbidities. For each situation, we will calculate the optimal time points for the next colonoscopies. Results will be related to data from a CRC screening database. Our results will be available on a webpage and can supplement existing guidelines.

In a separate project, we will further advance the functionality of CMOST. In existing CRC microsimulation studies, for **sensitivity analyses** basic model parameters are not varied. Taking advantage of the strong performance of CMOST, we will implement sensitivity analysis with a much broader scope by using a family of calibrated models with systematic variation of critical model parameters. This approach will enable a deep understanding of the impact of model assumptions on the outcome (e.g. cost-effectiveness of CRC screening) and provide a realistic margin of error for all predictions. The PhD student will also have the opportunity to participate in **additional case studies** regarding the application of CMOST (e.g. in Germany or Zimbabwe).

Related literature:

1. Prakash MK, Lang B, Heinrich H, Valli PV, Bauerfeind P, Sonnenberg A, et al. CMOST: an open-source framework for the microsimulation of colorectal cancer screening strategies. BMC Med Inform Decis Mak. 2017;17(1):80.