Méthodes d'analyse de marqueurs de substitution appliquées aux vaccins contre la COVID-19

Master 2 Internship

Background

We can define a *surrogate marker* as a marker that can be measured earlier and/or more easily than the clinical outcome of interest, while retaining the ability to reliably assess the impact of a treatment on the latter[1]. Surrogate markers thus hold the promise of accelerating clinical trials. Their evaluation is therefore of prime importance for medical research, for example in the development of new vaccines[2].

However, the identification, characterization and validation of surrogate markers remains a challenging problem, and is still the focus of active research[3]. No single method currently reaches consensus, each having advantages and disadvantages, with different limitations[4]. In particular, two main paradigms have emerged to tackle this problem: on the one hand the meta-analysis approach[5,6], and on the other hand the causal approach[7,8]. Despite their differences and specificities, connections exist between these two approaches[9].

This internship topic sets itself among the larger program of the Inria associated team DESTRIER in collaboration with Denis Agniel (*RAND Corporation, Santa Monica, California USA*) and Layla Parast (*University of Texas, Austin, Texas USA*). This internship will be the occasion for exchanges with these partners

Objectives

Over the recent decades, several methods have been developed and proposed for the evaluation of substitute markers, with many implemented as R packages[10,11].

1. Conduct a literature review of the various approaches and summary quantities that have been proposed for the evaluation of surrogate markers.
2. Implement an R package unifying the different user interfaces, allowing to easily navigate between the various existing methodologies.
3. Benchmark the different methods available by applying them to the evaluation of standardized antibody levels as a substitute marker for the efficacy of COVID-19 vaccines[12,13].

Required skills:

- good knowledge in Biostatistics and/or Statistics
- programming proficiency with R
- an interest for biomedical research, and in particular in vaccine research
- English proficiency (both written and spoken)
- scientific curiosity
- Master 2/Bachelor/Engineering school with a major in Biostatistics and/or Statistics

Hosting laboratory:
SISTM team
Inria Bordeaux Sud-Ouest & Inserm U1219 *Bordeaux Population Health*

Location:
Inserm U1219 *Bordeaux Population Health* research center – SISTM team
Université de Bordeaux – ISPED
146, rue Léo Saignat
33076 Bordeaux Cedex

Duration:
Internship of 4 to 6 month available starting from January 2024.

Compensation:
Intern gratification according to the official recommendations (15% of social security ceiling, i.e. around 550€/month).

Contact:
Send a detailed CV and a motivation letter to **Boris Hejblum** [boris.hejblum@u-bordeaux.fr]

Bibliography

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