

## M2 Research internship Relative survival analysis in Julia.

### Context

Survival analysis is a statistical theory targeted at the study of human lifetime. In particular, relative survival analysis deals with the case of datasets that do not contain the reason of death of the patients, this information (supposed binary: studied cause or other causes) has to be estimated [1,2]. This arises quite frequently in large cancer studies due to, e.g., unreliable data. Most of the implementations of relative survival statistical routines target an interface in R, with some underlying C++, which is suboptimal and, most importantly, hard to maintain and expand in the long run.

### Objectives

The main objective of the internship is to develop a new library in the -- rising -- programming language Julia to deal with relative survival analysis problem efficiently. This starts by the re-implementation of standard algorithms, while reviewing the literature, along which a real dataset will be used as a test case. Compatibility with the Julian ecosystem will be key (we will more specifically target the `StatsModels.jl` API), unlocking the application of bleeding-edge statistical tools (including, e.g., neural networks) to relative survival problems in the future.

The communication and publication of our results will be an integral part of the work. This is also a very good opportunity to learn a new programming language, that is gaining traction is academic and in the industry.

### Candidate's profile

The following are strictly required:

- A master 2 level in statistics, computer sciences, data science or related fields
- Very good written English
- Very good programming skills
- Knowledge of git, latex, and ability to read R and C++

The following are not required but will be nice bonuses:

- Knowledge of standard survival analysis
- Knowledge of the Julia language.

### Additional information

- **Length:** 4 to 6 months.
- **Location:** The internship will take place at the SESSTIM on the *Faculté des Sciences Médicales et Paramédicales* in Marseille, France.
- **Wages:** Regulatory internship stipend at the Université Aix-Marseille (4€35/hour for 35h/week, about 600€/month)
- **Advisor:** Oskar Laverny (Associate professor in statistics, SESSTIM, AMU)
- **Contact details:** Please send your application, containing a resume and a cover letter, to [oskar.laverny@univ-amu.fr](mailto:oskar.laverny@univ-amu.fr) with [StageSurvie2024] in the mail's object.

[1] Perme, M. P., Stare, J., & Estève, J. (2012). On estimation in relative survival. *Biometrics*, 68(1), 113-120.

[2] Grafféo, N., Castell, F., Belot, A., & Giorgi, R. (2016). A log-rank-type test to compare net survival distributions. *Biometrics*, 72(3), 760-769.