Subject-specific predictions in joint modeling framework

Context

In longitudinal health studies, with data that are collected repeatedly for each individual until the occurrence of an event such as death, interest lies in explaining the relationship between longitudinal and time to event data or in predicting the time to an event of interest. However, for such analyses, classical survival analysis such as Cox model can not be considered since these longitudinal markers are internal outcomes measured at discrete time points and potentially with errors. In these situations, the use of joint modeling approach is more appropriate in which the longitudinal and the time to event processes are jointly modeled.

In the context of clinical trials, such as prostate cancer trial, it is common to measure biomarkers, like PSA (Prostate Specific Antigen) for prostate cancer patients, repeatedly over time. Monitoring these biomarkers can help physicians to determine the state of the patient and to decide whether the patient should go under a new treatment. It is thus important to predict which patients are at high risk of an event, for example cancer recurrence, at an early time who would benefit from more strong treatments. Different prediction approaches have been proposed in the field of joint modeling in Bayesian or likelihood-based frameworks. During this internship, we propose to investigate and compare different prediction models proposed in the recent years.

Goals

The goal of the internship is to compare different extensions of joint models for subject-specific predictions. The main missions will be:

- to study all developments in joint modeling of longitudinal and time to event data area and the existing R packages for these models,

- to test these prediction models on a real data set available in Gustave Roussy,

- to write a paper presenting the results obtained during the internship.

Candidate Profile

- Master student in Biostatistics, Applied Statistics or Epidemiology

- Basic knowledge in survival analysis

- Experience working with R programming language

- English working skills

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