SURVIVAL ANALYSIS - COMPUTER ASSIGNMENT I

Description

This computer assignment may be solved using any program language and/or software package that you find suitable. If you do not have any preference or do not know which to choose, the recommendation is to use `R`.

It is ok to do the assignment in groups, but the group size must not be greater than three.

Part 1.

- Generate n Weibull distributed random numbers from the Weibull distribution given by the density function

$$f(t;a,b) = \frac{a}{b}(\frac{t}{b})^{a-1}\exp\{-(\frac{t}{b})^a\},\ t,a,b \geq 0,$$

  when $a = 4.5$ and $b = 22.5$, for $n = 10, 100, 200, 500$ and 1 000. Denote the simulated outcomes by $T_i, i = 1, \ldots, n$, corresponding to life times. The chosen parameter values shall correspond to that the mean and standard deviation of T is approximately 20.5 and 5.2 respectively.
- Calculate the corresponding Nelson-Aalen estimates together with 95% confidence interval of choice.
- Calculate the corresponding Nelson-Aalen estimates when you only observe the total number of events at the end of each time interval of length 0.1, that is, you only register the total number of events in e.g. (0.2.0.3] at time 0.3.
- Calculate the intensity function $\alpha(t;a,b)$ relating to the above Weibull distribution and compare with your estimates.

Part 2.

- Generate n exponential random numbers with mean 80 for $n = 10, 100, 200, 500$ and 1 000 and denote these by $C_i, i = 1, \ldots, n$, corresponding to (independent) censoring times.
- Use that $T_i \leq C_i$ corresponds to a complete observation and that $T_i > C_i$ corresponds to a censored time.
- Repeat Part 1 given censoring.
- Fit a Weibull distribution to the censored data sets, i.e. excluding all censored individuals from the analysis, and plot the corresponding fitted $\alpha(t;a,b)$ and compare with the censored Nelson-Aalen estimators.

Part 3. Repeat Part 1-2, but for the Kaplan-Meier estimator.

Questions to Answer

- Argue for the performance of the estimators relative to the true theoretical model used, is any of the two preferable?
- What is the effect of censoring?
- What is the effect of n?

Report

A short written report (preferably not more than 5 pages) shall be submitted as a single pdf file using the submission tool on the course homepage. It is important that the report is submitted using the online submission tool, since this tool uses automatic plagiarism detection.

Note that the report shall

- only contain graphs/figures that are clearly referenced in the text and which are central to your argumentation – make sure that all figures, including captions and axis labels are *possible to read*,
- not contain any source code, but be prepared to supply code if asked for,
- be submitted by *one* of the group members – make sure that all group member's names are written on the front page of the report.