

Computer Lab 10: Overview of Survival Analysis

Suppose we have the following data for the survival times of prostatic cancer patients:

Subject	Survival time	Censor indicator	Gender	Age	BUN
I	13	1	1	66	25
II	52	0	1	66	13
III	6	1	2	53	15
IV	40	1	1	69	10
V	10	1	1	65	20
VI	7	0	2	57	12
VII	66	1	1	52	21

- (a) Plot the survival functions based on both the Kaplan-Meier estimate and the parametric estimate using the Weibull distribution with density function

$$f(t) = 2\lambda^2 t \cdot \exp(-\lambda^2 t^2)$$

- (b) With $\alpha = 0.05$, please perform the log-rank and Wilcoxon tests to test if there is the gender effect.

- (c) Suppose the variables Age and BUN are the variables of interest. Using proportional hazards model, derive the partial likelihood and describe how to obtain the partial likelihood estimate.

[code:]

```
time=c(13,52,6,40,10,7,66)
status=c(1,0,1,1,1,0,1)
gender=c(1,1,2,1,1,2,1)
age=c(66,66,53,69,65,57,52)
bun=c(25,13,15,10,20,12,21)
```

(a)

```
k.fit1= survfit(Surv(time, status))
summary(k.fit1)
plot(k.fit1)
lambda=(sum(status)/sum(time^2))^0.5
time2=seq(0,65,by=1)
pfit2=exp(-lambda^2*time2^2)
lines(time2,pfit2)
```

```
#### (b)
wilcoxon=survdiff(Surv(time, status) ~ gender, rho=1 )
logrank=survdiff(Surv(time, status) ~ gender, rho=0)
wilcoxon
logrank

#### (c)
ph.fit1=coxph(Surv(time, status) ~ age)
summary(ph.fit1)

ph.fit2=coxph(Surv(time, status) ~ age+bun)
summary(ph.fit2)
```