BM2_HW9

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4/29/2019

Problem 1

$H(x) = \int_0^t h(x).dx = \int_0^t \frac{2x}{1+x^2}.dx = ln(1+t^2)$
$h(x) = \frac{f(x)}{s(t)}$
$s(t) = exp(-H(x)) = e^{-ln(1+t^2)} = \frac{1}{1+t^2}$
$f(t) = \frac{2t}{1+t^2} * \frac{1}{1+t^2} = \frac{2t}{(1+t^2)^2}$

Problem 2

```
ti = c(1,2,4,5,6,7,8,9,10)
ni = c(10,9,7,6,5,4,3,2,1)
di = c(1,2,0,0,1,0,0,0,0)
ci = c(0,0,1,1,0,1,1,1,1)
lamda_i = c("1/10"," 2/9", "0/7"," 0/6", "1/5", "0/4", "0/3", "0/2", "0/1")
Kaplan_Meier_estimator = c("1*(1-1/10)=0.9", "0.9*(1-2/9)=0.7", 0.7, 0.7, "0.7*(2-1/5)=0.56", 0.56, 0.5
Nelson_Aalen_estimator = c("1/10", "1/10+2/9=0.32", "0.32", "0.32", "0.32+1/5=0.52", "0.52", "0.52", "0
Fleming_Harrington_estimator = c(0.90, 0.72, 0.72, 0.72, 0.59, 0.59, 0.59, 0.59, 0.59)
df = data.frame(ti, ni, ci, lamda_i,  Kaplan_Meier_estimator, Nelson_Aalen_estimator, Fleming_Harringto

kable(df)
```

ti	ni	ci	lamda_i	Kaplan_Meier_estimator	Nelson_Aalen_estimator	Fleming_Harrington_estimator
1	10	0	1/10	1*(1-1/10)=0.9	1/10	0.90
2	9	0	2/9	0.9*(1-2/9)=0.7	1/10+2/9=0.32	0.72
4	7	1	0/7	0.7	0.32	0.72
5	6	1	0/6	0.7	0.32	0.72
6	5	0	1/5	0.7*(2-1/5)=0.56	0.32+1/5=0.52	0.59
7	4	1	0/4	0.56	0.52	0.59
8	3	1	0/3	0.56	0.52	0.59
9	2	1	0/2	0.56	0.52	0.59
10	1	1	0/1	0.56	0.52	0.59

Problem 3

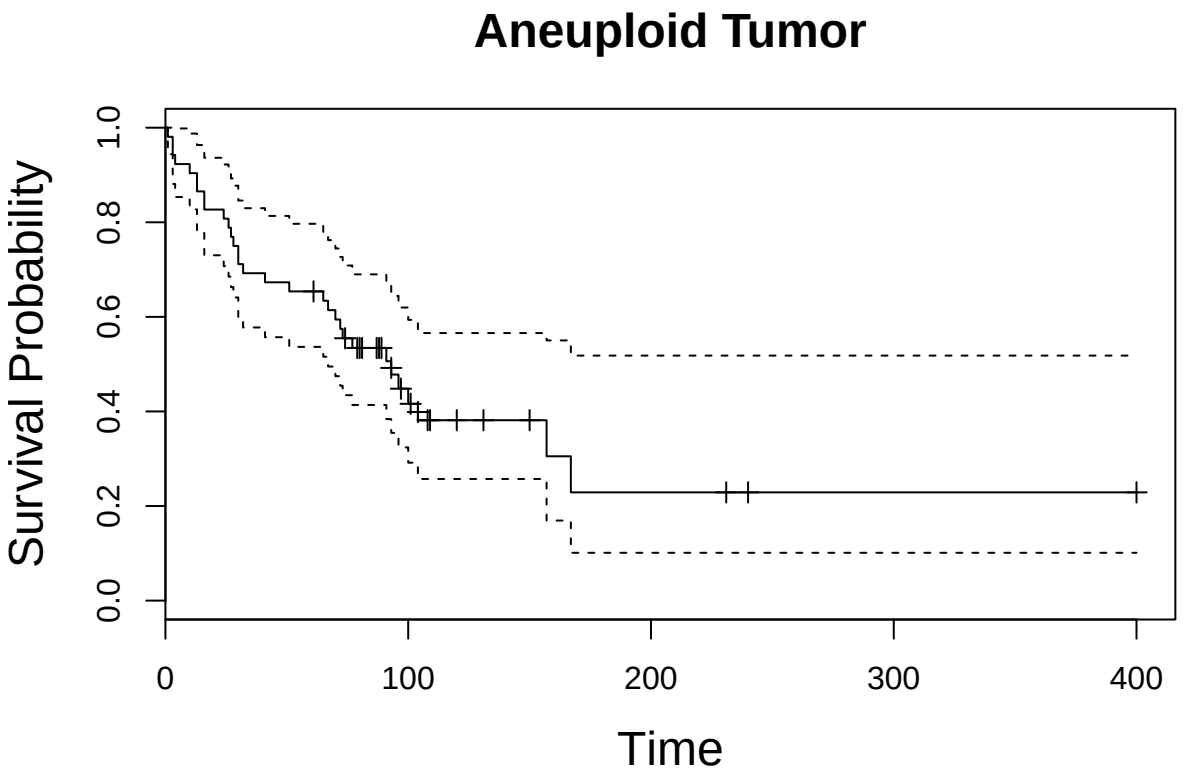
```
#Format
#This data frame contains the following columns:
#type Tumor DNA profile (1=Aneuploid Tumor, 2=Diploid Tumor) time Time to death or on-study time, weeks
#delta Death indicator (0=alive, 1=dead)
data(tongue)
head(tongue)
```

```
##   type time delta
## 1    1    1     1
```

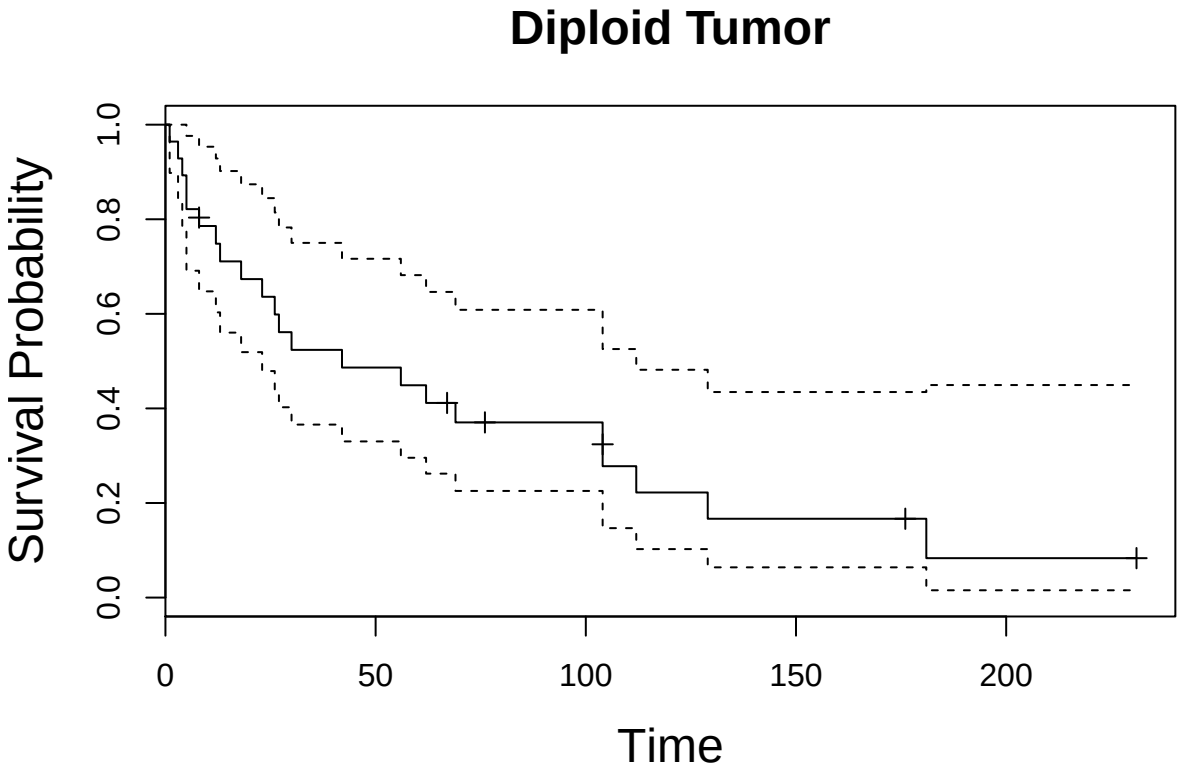
```
## 2    1    3      1
## 3    1    3      1
## 4    1    4      1
## 5    1   10      1
## 6    1   13      1
```

```r
# KM survival function

KM1=survfit(Surv(time,delta)~1, data = subset(tongue, type=="1"), conf.type='log')
plot(KM1, mark.time = TRUE,xlab="Time", ylab="Survival Probability", main="Aneuploid Tumor", cex.lab=1.5
```




```r
KM2 = survfit(Surv(time,delta)~1, data = subset(tongue, type=="2"), conf.type='log')
plot(KM2, mark.time = TRUE,xlab="Time", ylab="Survival Probability", main="Diploid Tumor", cex.lab=1.5,
```




```
summary(KM1, time=365/7)
```

```
## Call: survfit(formula = Surv(time, delta) ~ 1, data = subset(tongue,
##     type == "1"), conf.type = "log")
##
##  time n.risk n.event survival std.err lower 95% CI upper 95% CI
##  52.1     34      18    0.654   0.066        0.537        0.797
```

```
summary(KM2, time=365/7)
```

```
## Call: survfit(formula = Surv(time, delta) ~ 1, data = subset(tongue,
##     type == "2"), conf.type = "log")
##
##  time n.risk n.event survival std.err lower 95% CI upper 95% CI
##  52.1     13      14    0.486  0.0961         0.33        0.716
```

Based on the results, 1-year survival rate for aneuploid tumor is estimated to be 0.654 and its 95% CI is (0.537,0.797). 1-year survival rate for Diploid Tumor is estimated to be 0.486 and its 95% CI is (0.33, 0.716)