# Lin_ST625_HW3

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### 1a

Right censoring since at the time of the study, the event of interest still has not occurred.

### 1b

Left censoring since the event of interest has already occurred, but the event time is unknown.

### 1c

No censoring since the event of interest has already occurred, and the event time is known.

### 2a

Right censoring since the event of interest has never been observed during the study period.

### 2b

Interval censoring since the event of interest has occurred, the event time is unknown but falls between a known interval bounding.

### 2c

Right censoring since again the event has never been observed.

Further, random right censoring since censoring is due to some unexpected cause.

### 2d

Right censoring since again the event has never been observed.

Further, random right censoring since censoring is due to withdraw from the study.

## 3

For sample 0.5, 1, 0.75, 0.25+, 1.25+ (+ denotes right censoring), the likelihood function is given as

$$f_\theta(t = 0.5)\ f_\theta(t = 1)\ f_\theta(t = 0.75)\ S_\theta(t = 0.25)\ S_\theta(t = 1.25),$$

where $f(t) = \alpha\lambda t^{\alpha-1}e^{-\lambda t^\alpha}$ and $S(t) = e^{-\lambda t^\alpha}$, since the likelihood function for right censored data is given as

$$L(\theta) = \Pi_{i=1}^{n}(f_\theta(t_i))^{\delta_i}(S_\theta(t_i))^{1-\delta_i},$$

where $\delta_i = 1$, if an event occurred with $T_i = T_i^0$, and $\delta_i = 0$, if an event is censored with $T_i = C_i$.

Further, $f_\theta(t_i)$ captures the contribution of uncensored data, and $S_\theta(t_i)$ captures the contribution of right censored data.

## 4

### 4a

Table 1: Table continues below

| id | age | gender | hr | sysbp | diasbp | bmi | cvd | afb | sho | chf | av3 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 83 | 0 | 89 | 152 | 78 | 25.54 | 1 | 1 | 0 | 0 | 0 |
| 2 | 49 | 0 | 84 | 120 | 60 | 24.02 | 1 | 0 | 0 | 0 | 0 |
| 3 | 70 | 1 | 83 | 147 | 88 | 22.14 | 0 | 0 | 0 | 0 | 0 |

Table 2: Table continues below

| miord | mitype | year | admitdate | disdate | fdate | los | dstat |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 1 | 01/13/1997 | 01/18/1997 | 12/31/2002 | 5 | 0 |
| 0 | 1 | 1 | 01/19/1997 | 01/24/1997 | 12/31/2002 | 5 | 0 |
| 0 | 1 | 1 | 01/01/1997 | 01/06/1997 | 12/31/2002 | 5 | 0 |

| lenfol | fstat |
|---|---|
| 2178 | 0 |
| 2172 | 0 |
| 2190 | 0 |

### 4b

Output and class of `Admitdate` (new variable of `admitdate`)

```
## [1] "1997-01-13" "1997-01-19" "1997-01-01"
```

```
## [1] "Date"
```

Output and class of `Disdate` (new variable of `disdate`)

```
## [1] "1997-01-18" "1997-01-24" "1997-01-06"
```

```
## [1] "Date"
```

Output and class of `Fdate` (new variable of `fdate`)

```
## [1] "2002-12-31" "2002-12-31" "2002-12-31"
```

```
## [1] "Date"
```

### 4c

```
## [1] "13Jan1997" "19Jan1997" "01Jan1997"
```

```
## [1] "18Jan1997" "24Jan1997" "06Jan1997"
```

```
## [1] "31Dec2002" "31Dec2002" "31Dec2002"
```

### 4d

```
## Time differences in days
## [1] 2178 2172 2190
```

### 4e

Table 4: Table continues below

| id | age | gender | hr | sysbp | diasbp | bmi | cvd | afb | sho | chf | av3 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 83 | 0 | 89 | 152 | 78 | 25.54 | 1 | 1 | 0 | 0 | 0 |
| 2 | 49 | 0 | 84 | 120 | 60 | 24.02 | 1 | 0 | 0 | 0 | 0 |
| 3 | 70 | 1 | 83 | 147 | 88 | 22.14 | 0 | 0 | 0 | 0 | 0 |
| 4 | 70 | 0 | 65 | 123 | 76 | 26.63 | 1 | 0 | 0 | 1 | 0 |
| 5 | 70 | 0 | 63 | 135 | 85 | 24.41 | 1 | 0 | 0 | 0 | 0 |
| 6 | 70 | 0 | 76 | 83 | 54 | 23.24 | 1 | 0 | 0 | 0 | 1 |
| 7 | 57 | 0 | 73 | 191 | 116 | 39.49 | 1 | 0 | 0 | 0 | 0 |
| 8 | 55 | 0 | 91 | 147 | 95 | 27.12 | 1 | 0 | 0 | 0 | 0 |
| 9 | 88 | 1 | 63 | 209 | 100 | 27.44 | 1 | 0 | 0 | 1 | 0 |
| 10 | 54 | 0 | 104 | 166 | 106 | 25.54 | 1 | 0 | 0 | 0 | 0 |

Table 5: Table continues below

| miord | mitype | year | admitdate | disdate | fdate | los | dstat |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 1 | 13Jan1997 | 18Jan1997 | 31Dec2002 | 5 | 0 |
| 0 | 1 | 1 | 19Jan1997 | 24Jan1997 | 31Dec2002 | 5 | 0 |
| 0 | 1 | 1 | 01Jan1997 | 06Jan1997 | 31Dec2002 | 5 | 0 |
| 0 | 1 | 1 | 17Feb1997 | 27Feb1997 | 11Dec1997 | 10 | 0 |
| 0 | 1 | 1 | 01Mar1997 | 07Mar1997 | 31Dec2002 | 6 | 0 |
| 0 | 0 | 1 | 11Mar1997 | 12Mar1997 | 12Mar1997 | 1 | 1 |
| 0 | 1 | 1 | 10Mar1997 | 15Mar1997 | 31Dec2002 | 5 | 0 |
| 0 | 1 | 1 | 11Jan1997 | 15Jan1997 | 15Feb2001 | 4 | 0 |
| 0 | 0 | 1 | 31Dec1996 | 04Jan1997 | 09Jul1999 | 4 | 0 |
| 0 | 0 | 1 | 16Jan1997 | 21Jan1997 | 31Dec2002 | 5 | 0 |

| lenfol | fstat | Admitdate | Disdate | Fdate | time |
|---|---|---|---|---|---|
| 2178 | 0 | 1997-01-13 | 1997-01-18 | 2002-12-31 | 2178 days |
| 2172 | 0 | 1997-01-19 | 1997-01-24 | 2002-12-31 | 2172 days |
| 2190 | 0 | 1997-01-01 | 1997-01-06 | 2002-12-31 | 2190 days |

| lenfol | fstat | Admitdate | Disdate | Fdate | time |
|---|---|---|---|---|---|
| 297 | 1 | 1997-02-17 | 1997-02-27 | 1997-12-11 | 297 days |
| 2131 | 0 | 1997-03-01 | 1997-03-07 | 2002-12-31 | 2131 days |
| 1 | 1 | 1997-03-11 | 1997-03-12 | 1997-03-12 | 1 days |
| 2122 | 0 | 1997-03-10 | 1997-03-15 | 2002-12-31 | 2122 days |
| 1496 | 1 | 1997-01-11 | 1997-01-15 | 2001-02-15 | 1496 days |
| 920 | 1 | 1996-12-31 | 1997-01-04 | 1999-07-09 | 920 days |
| 2175 | 0 | 1997-01-16 | 1997-01-21 | 2002-12-31 | 2175 days |

**4f**