

task3_report

December 7, 2025

```
[86]: #https://www.emilyzabor.com/survival-analysis-in-r.html  
data <- read.csv("data_t3.csv")
```

```
[78]: # a first look at the data  
head(data)  
summary(data)
```

	X	X1	X2	X3	X4	X5
	<int>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>
A data.frame: 6 × 6	1	1	4.248	5.321	4.185	4.318
	2	2	4.492	5.022	4.275	4.209
	3	3	4.954	4.848	4.771	4.847
	4	4	4.492	4.766	4.300	4.516
	5	5	4.419	4.352	4.453	4.666
	6	6	5.031	4.800	5.097	4.701

```
X  
Min. : 1.00 Min. :3.837 Min. :3.585 Min. :3.454  
1st Qu.:25.75 1st Qu.:4.336 1st Qu.:4.303 1st Qu.:4.266  
Median :50.50 Median :4.554 Median :4.560 Median :4.500  
Mean :50.50 Mean :4.534 Mean :4.581 Mean :4.529  
3rd Qu.:75.25 3rd Qu.:4.726 3rd Qu.:4.878 3rd Qu.:4.778  
Max. :100.00 Max. :5.269 Max. :5.996 Max. :5.201  
  
X4  
Min. :3.754 Min. :3.295  
1st Qu.:4.313 1st Qu.:4.232  
Median :4.569 Median :4.508  
Mean :4.547 Mean :4.517  
3rd Qu.:4.745 3rd Qu.:4.830  
Max. :5.329 Max. :5.602
```

```
[79]: dim(data)
```

1. 100 2. 6

```
[87]: # Load necessary libraries  
library(readr)  
library(ggplot2)  
library(coxme)
```

```
library(lubridate)
library(irr)
library(survminer)
library(ggsurvfit)
library(gtsummary)
library(tidycmprsk)
```

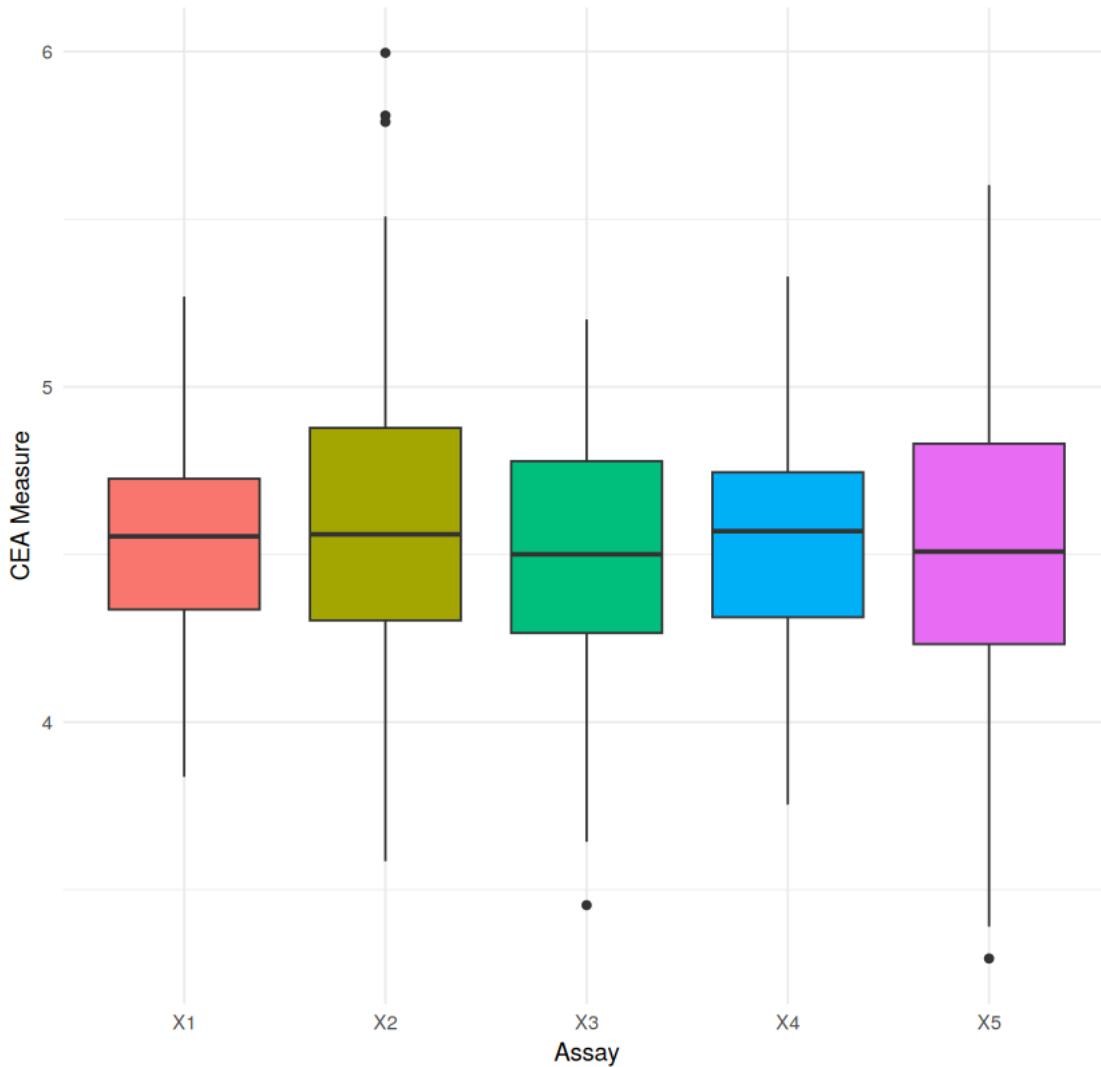
```
[81]: library(tidyverse)
library(ggpubr)
library(broom)
library(ggplot2)
library(reshape2)
```

```
[82]: data_long <- melt(data[-1], variable.name = "Assay", value.name = "CEA")
```

No id variables; using all as measure variables

```
[83]: ggplot(data_long, aes(x = Assay, y = CEA, fill = Assay)) +
  geom_boxplot() +
  theme_minimal() +
  labs(title = "Boxplots of CEA Measures Across Assays",
       y = "CEA Measure",
       x = "Assay") +
  theme(legend.position = "none")
```

Boxplots of CEA Measures Across Assays

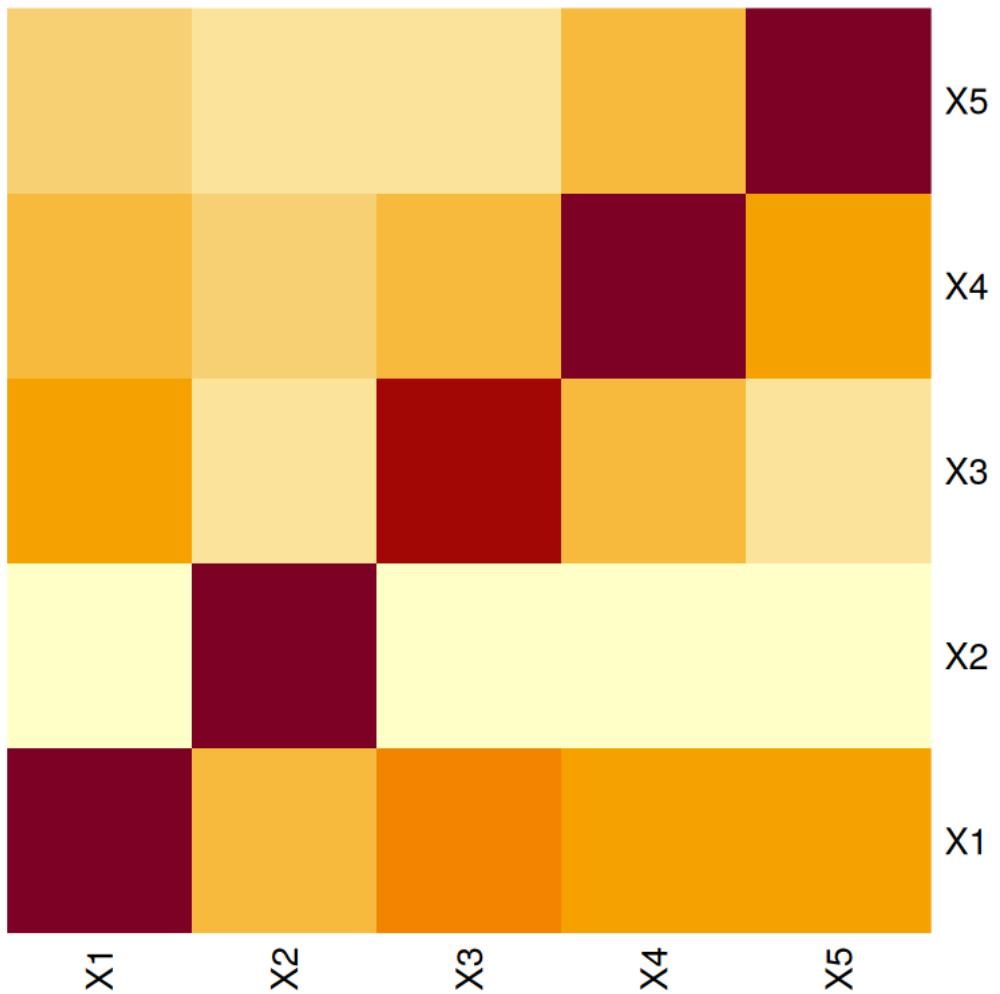


We can observe there is an average rater agreement across all the raters by observing the box plots.

```
[84]: # Compute the correlation matrix
cor_matrix <- cor(data[-1])

# Plotting the heatmap
heatmap(cor_matrix, main = "Correlation Matrix of CEA Measures",
        Colv = NA, Rowv = NA, scale = "column", margins = c(5, 5))
```

Correlation Matrix of CEA Measures



We can observe some slight correlation between raters but nothing concrete further testing is required to form any concrete observations.

```
[85]: library(psych)

# Calculate the ICC
icc_result <- ICC(data[-1])

# Convert to data frame (if not already done)
icc_df <- as.data.frame(icc_result$results)

# View the structure to confirm
print(icc_df)
```

```

boundary (singular) fit: see help('isSingular')

          type      ICC      F df1 df2      p
Single_raters_absolute  ICC1 0.4367499 4.877052 99 400 5.016847e-30
Single_random_raters    ICC2 0.4367499 4.877052 99 396 6.621512e-30
Single_fixed_raters     ICC3 0.4367499 4.877052 99 396 6.621512e-30
Average_raters_absolute ICC1k 0.7949581 4.877052 99 400 5.016847e-30
Average_random_raters   ICC2k 0.7949581 4.877052 99 396 6.621512e-30
Average_fixed_raters    ICC3k 0.7949581 4.877052 99 396 6.621512e-30
                                lower bound upper bound
Single_raters_absolute   0.3439548  0.5355998
Single_random_raters     0.3439500  0.5356031
Single_fixed_raters      0.3438419  0.5356767
Average_raters_absolute  0.7238657  0.8522148
Average_random_raters    0.7238615  0.8522164
Average_fixed_raters     0.7237657  0.8522537

```

Here above we can see the p values are quite significant for all the cases. ICC1 - One-way random-effects model. In this model, each subject is rated by a different set of randomly chosen raters. Here, raters are considered as the random effects ICC2 - Two-way random-effects model. A set of k raters are randomly selected, then, each subject is measured by the same set of k raters with similar characteristics. In this model, both subjects and raters are viewed as random effects. ICC3 - Two-way mixed effects model. Here the raters are considered as fixed.

We get the Similar ICC of 0.4467 for all the 3 models showing moderate agreement.

Similarly for Average ICC 1 to 3 the ICC is same and it's 0.749 showing good agreement i.e. the raters are usually consistent when averages are compared.

0.1 Alternative

```
[97]: kripp.alpha(t(as.matrix(data[-1])), method = "interval")
```

Krippendorff's alpha

```
Subjects = 100
Raters = 5
alpha = 0.434
```

Krippoendorff's alpha shows a value of 0.434 which shows moderate agreement across all 5 raters.