Hw week9

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Assist

- Helped by `106000199`
  - Discussion of systematic and random error.
  - How to explain the problem 1-ii.
- Helped by `106022213`
  - Discussion of type I and type II error in problem 1-b-iv
  - How to explain the converage error different to random or systemitic error in probelm 1-i.
- Helped by `106070038`
  - The part of ANOVA test in problem 2-e.

Set up

import libary

```
library(ggplot2)
library(plyr)
require(qqplotr)
```

Q1

	i. It's systematic or random error?	ii. Which part would be affected? (The real compared with samples)	iii. Power increase or decrease?	iv. Which kind of error?
a	It should be the **converage error** instead of **neithor systematic or random error**.	• diff: **Smaller** since the part of olders' usage time is smaller than mean.. • sd: **Larger** since the part of olders' usage time is different to the origin part..	**Decrease**.	**Type II error.** Since the uncover part of older users should be append.
b	The more data we get, the less error will have in this case, so it's **random error**.	• n: **Larger** since the part of wrong data were removed in samples.	**Decrease**	**Type I error** Since the wrong data should be removed.
c	This situation has only changed the way we interpret it, so it's **neithor systematic or random error**.	• α: Change from 0.05 to 0.1.since the confidence level is changed from 0.95 to 0.9.	**No change**.	**Type I error.** Since confidence level affect the type I error..
d	It should be the **converage error** instead of **neithor systematic or random error**.	• diff: **Larger** since the part of not-olders' usage time is bigger than the origin part. • sd: **Larger** since the part of usage time in weekend is different to the origin part.	**Decrease**.	**Type II error.** Since the uncover part of weekend's data should be append.

Note: Since there are two different ways to explain the influence in part ii and the answer will be totally opposite,

1 is how this effect the observed-data will chagne since the reason occurs.

2 is how the real world data compared with the samples we observed.

I choose the way 2 to expalin the answer in this case.

Q2

Read file

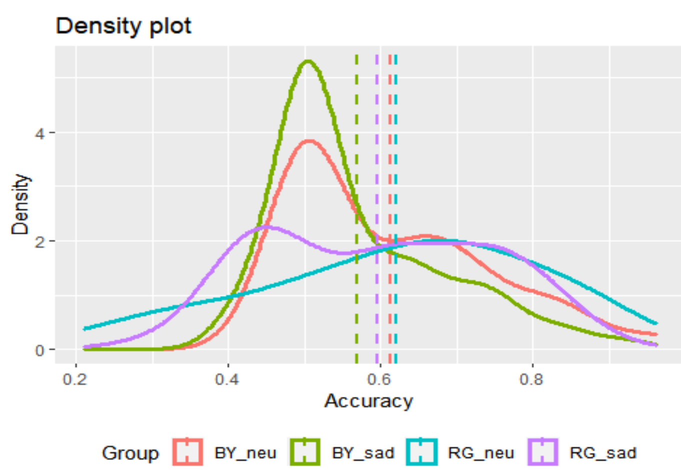
```
experiment <- read.csv('study2Data.csv', header=TRUE)
BY_data <- with(experiment, data.frame(Subject, Axis='BY', Emotion_Cond
ition, ACC=BY_ACC, SAD_ESRI))
RG_data <- with(experiment, data.frame(Subject, Axis='RG', Emotion_Cond
ition, ACC=RG_ACC, SAD_ESRI))

BY_data_sad <- BY_data[BY_data$Emotion_Condition == "Sadness",]
BY_data_neu <- BY_data[BY_data$Emotion_Condition == "Neutral",]
RG_data_sad <- RG_data[RG_data$Emotion_Condition == "Sadness",]
RG_data_neu <- RG_data[RG_data$Emotion_Condition == "Neutral",]

BY_data_sad$Group <- "BY_sad"
BY_data_neu$Group <- "BY_neu"
RG_data_sad$Group <- "RG_sad"
RG_data_neu$Group <- "RG_neu"
```

(a) Visulize

```
df <- rbind(BY_data_sad, BY_data_neu, RG_data_sad, RG_data_neu)
# get means of each group
mu <- ddply(df, "Group", summarise, grp.mean=mean(ACC))
# Visualize the density plot and add mean lines.
p <- ggplot(df, aes(x=ACC, color=Group)) +
  geom_density(lwd=1.2) +
  geom_vline(data=mu, aes(xintercept=grp.mean, color=Group),
             linetype="dashed",lwd=1) +
  labs(title="Density plot",x="Accuracy", y = "Density") +
  theme(legend.position="bottom")
p
```



ANSWER: The `BY_data` is more concentrated than `RG_data`. The `RG_neu` group is the least concentrated.

(b) Trational t-test in blue-yellow accuracy between sad and neutral.

```
t.test(BY_data_sad$ACC, BY_data_neu$ACC, var.equal = FALSE, conf.level
= 0.95)

##
##  Welch Two Sample t-test
##
## data:  BY_data_sad$ACC and BY_data_neu$ACC
## t = -2.0435, df = 125.61, p-value = 0.04309
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.086308149 -0.001384159
## sample estimates:
## mean of x mean of y
## 0.5690769 0.6129231
```

ANSWER: Since the p-value $0.04309 < 0.05$, so we can reject H_0. It means that there is a significant difference in blue-yellow accuracy between sad and neutral participants at 95% confidence.

(c) Trational t-test in red-green accuracy between sad and neutral.

```
t.test(RG_data_sad$ACC, RG_data_neu$ACC, var.equal = FALSE, conf.level
= 0.95)

##
##  Welch Two Sample t-test
##
## data:  RG_data_sad$ACC and RG_data_neu$ACC
## t = -0.87491, df = 121.98, p-value = 0.3833
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.08432635  0.03263405
## sample estimates:
## mean of x mean of y
## 0.5944615 0.6203077
```

ANSWER: Since the p-value $0.3833 > 0.05$, so we can NOT reject H_0. It means that there is NOT a significant difference in red-green accuracy between sad and neutral participants at 95% confidence.

(d) (not graded) Do the above t-tests support a claim that there is an interaction between emotion and color axis?

ANSWER: Not necessarily. While there is a significant difference between blue-yellow, there is not between red-green.

(e) ANOVA

```
all_data <- rbind(BY_data, RG_data)
summary(aov(formula = ACC ~ Axis + Emotion_Condition + Axis:Emotion_Con
dition, data=all_data))

##                            Df Sum Sq Mean Sq F value Pr(>F)
## Axis                        1  0.017 0.01745   0.806 0.3703
## Emotion_Condition           1  0.079 0.07893   3.644 0.0574 .
## Axis:Emotion_Condition      1  0.005 0.00526   0.243 0.6224
## Residuals                 256  5.545 0.02166
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

ANSWER: As shown by ANOVA, the significance level of `Emotion_Condition` was between (0.05,0.1).
This means that if we change the applicable confidence level from 95% to 90%, then we can say that color has a significant effect on emotion.

Reference

- Random vs Systematic Error