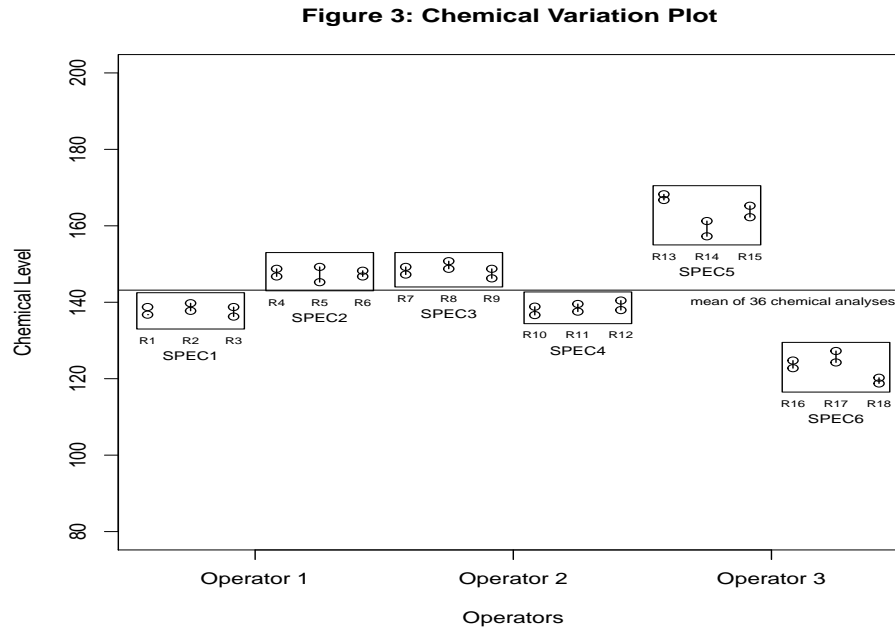


**STAT 641 Fall 2021**  
**Solutions for Assignment # 1**

- Problem 1 - ( 8 Points) Two major problems are
  - Ignoring the launches in which there were no O-ring failures and
  - Extrapolating the data from previous launches in which the temperature was above 50 degrees to a launch in which the temperature would be in the low 30's.
- Problem 2 - ( 8 Points) One of the most frequent misinterpretations of statistical findings is attributing a "causal" relationship between two events when only a strong correlation exists between the events.
- Problem 3 - ( 12 Points)
  - Study 1:** (i) Experimental. (ii) Comparative (iii) Response: Occurrence of heart disease.  
Explanatory: Amount of fiber in diet.
  - Study 2:** (i) Observational. (ii) Descriptive.  
The manufacturer is recording why pumps fail.
  - Study 3:** (i) Observational. (ii) Descriptive.  
The biologist is acquiring health data on the collected fish
  - Study 4:** (i) Observational. (ii) Comparative. (iii) Response: Baby's birthweight.  
Explanatory: Mother's weight gain during pregnancy.
- Problem 4 - ( 12 Points)
  - (a.) Systematic sampling.
  - (b.) Simple random sampling.
  - (c.) Stratified random sampling with the strata being the voting districts.
  - (d.) Stratified Multi-Stage Cluster sampling. The voting precincts are stratified into one of four regions, and then 10 voting precincts are randomly selected from each of the four regions. The selected precincts consist of clusters of voters and a random sample of 25 voters is selected from each of the selected precincts.
- Problem 5 - ( 12 Points)
  - (a) (i) Survey. (ii) Descriptive
  - (b) (i) Retrospective Study. (ii) Comparative. (iii) Response: Term of pregnancy. Explanatory: Mother's smoking habits.
  - (c) (i) Survey. (ii) Descriptive
  - (d) (i) Survey. (ii) Descriptive

• Problem 6 - ( 16 Points)

(a.) See the following plot. The code is at the end of this document.



(b.) S(O) means show the greatest amount of variability in comparison to the other three sources and the O means have the least amount of variability. In fact, 97% of the overall variability in the 36 response is attributable to S(O); 2.2% of the variability is attributable to R(S,O); 0.5% of the variability is attributable to A(R,S,O); 0.0% of the variability is attributable to O, and .3% of the variability is attributable to all other sources. We will demonstrate how to obtain these percentages in STAT 642.

7. - ( 8 points) **C.** The strata are the 5 Regions with a SRS of 10 Power Plants selected in each Region. The Power Plants are clusters with the daily measurements being the units within the clusters.
8. - ( 8 Points) **D.** The First Stage Clusters are Counties which are clusters of doctors. The Second Stage Clusters are Doctors with patients being the units within the clusters.
9. - ( 8 Points) **B.** The strata are the 35 Regions with a SRS of 15 Pine Trees selected in each Region. The Pine Trees are clusters with the limbs having pine bark beetles being the units within the clusters.
10. - ( 8 Points) **C.** The strata are the 25 Costal Counties with a SRS of 50 homes selected in each County.

```

run = c(1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,13,13,14,14,
15,15,16,16,17,17,18,18)
Res = c(
  136.75, 138.75,
  137.75, 139.75,
  136.25, 138.75,
  146.75, 148.75,
  149.25, 145.25,
  146.75, 148.25,
  147.25, 149.25,
  150.75, 148.75,
  146.25, 148.75,
  136.65, 138.85,
  137.55, 139.55,
  140.45, 137.95,
  166.75, 168.25,
  157.25, 161.25,
  162.25, 165.25,
  122.75, 124.75,
  124.25, 127.25,
  118.75, 120.25)
spec = seq(1,6)

plot(run,Res,type="p",xlab="Operators",ylab="Chemical Level",
      main="Figure 3: Chemical Variation Plot ",cex=.99,
      ylim=c(80,200),xaxt="n")
rect(0.75,133,3.25,142.5)
segments(1,136.75,1,136.75)
segments(2,137.75,2,139.75)
segments(3,136.25,3,138.75)
text(1,130,"R1",cex=.55)
text(2,130,"R2",cex=.55)
text(3,130,"R3",cex=.55)
text(2,126,"SPEC1",cex=.75)

rect(3.75,143,6.25,153)
segments(4,146.75,4,148.75)
segments(5,149.25,5,145.25)
segments(6,146.75,6,148.25)
text(4,140,"R4",cex=.55)
text(5,140,"R5",cex=.55)
text(6,140,"R6",cex=.55)
text(5,136,"SPEC2",cex=.75)

rect(6.75,144,9.25,153)
segments(7,147.25,7,149.25)
segments(8,150.75,8,148.75)
segments(9,146.25,9,148.75)
text(7,141,"R7",cex=.55)
text(8,141,"R8",cex=.55)
text(9,141,"R9",cex=.55)
text(8,137,"SPEC3",cex=.75)

rect(9.75,134.4,12.25,142.7)
segments(10,136.65,10,138.85)
segments(11,137.55,11,139.55)

```

```

segments(12,140.45,12,137.95)
text(10,131.4,"R10",cex=.55)
text(11,131.4,"R11",cex=.55)
text(12,131.4,"R12",cex=.55)
text(11,127.4,"SPEC4",cex=.75)

rect(12.75,155,15.25,170.5)
segments(13,166.75,13,168.25)
segments(14,157.25,14,161.25)
segments(15,162.25,15,165.25)
text(13,152,"R13",cex=.55)
text(14,152,"R14",cex=.55)
text(15,152,"R15",cex=.55)
text(14,148,"SPEC5",cex=.75)

rect(15.75,116.5,18.25,129.5)
segments(16,122.75,16,124.75)
segments(17,124.25,17,127.25)
segments(18,118.75,18,120.25)
text(16,113.5,"R16",cex=.55)
text(17,113.5,"R17",cex=.55)
text(18,113.5,"R18",cex=.55)
text(17,109.5,"SPEC6",cex=.75)

axis(side=1,at=c(3.5,9.5,15.5),
labels=c("Operator 1","Operator 2","Operator 3"))
abline(143.1667, 0)
text(16,140,"mean of 36 chemical analyses", cex = 0.7)

```