

## HW4- Advanced Data Analysis

1. (12pt) Suppose you want to compare the types of popcorn popper and the brand of popcorn with respect to their yield (in terms of cups of popped corn). Factor A is the type of popper: oil-based versus air-based. Factor B is the brand of popcorn: gourmet versus national brand versus generic. For each combination of popper type and brand, you took three separate measurements. The ANOVA table is

Source	df	SS	MS	F
Popper (A)	—	4.5	—	—
Corn (B)	—	15.75	—	—
Interaction (A*B)	—	—	—	—
Error	—	1.67	—	—
Total	—	22.00		

- (a) (2pt) Complete the table above.
- (b) (2pt) Test  $H_0$  : No interaction against  $H_1$  : there is an interaction, use  $\alpha = 0.05$ .
- (c) (2pt) It is decided to fit a model without an interaction and the partial results are

Source	df	SS	MS	F
Popper (A)	—	4.5	—	—
Corn (B)	—	15.75	—	—
Error	—	—	—	—
Total	—	22.00		

- (d) (2pt) Complete the table above.
- (e) (2pt) Test  $H_0$  : No popper effect against  $H_1$  : there is a popper effect. Use  $\alpha = 0.05$
- (f) (2pt) Test  $H_0$  : No corn effect against  $H_1$  : there is a corn effect. Use  $\alpha = 0.05$ .
2. (8pt) In this exercise A and B are two fertilizers types, M, N, O and P are four wheat types and  $y_{ijk}$  values are wheat yields in bushels per plot (one third of an acre) corresponding to the different combinations of fertilizer type type and wheat type. Also, assume that this data was obtained by using a completely randomized experimental design. (see HW2data.csv)
- (a) (2pt) Construct an interaction plot? Does it suggest that there is an interaction between fertilizer type and wheat type?

- (b) (2pt) Test  $H_0$  : No interaction against  $H_1$  : there is an interaction, use  $\alpha = 0.05$ .
- (c) (2pt) Fit a model without an interaction and test  $H_0$  : No fertilizer effect against  $H_1$  : there is a fertilizer effect. Use  $\alpha = 0.05$  if you reject  $H_0$ , use Tukey's method to do pairwise comparisons of the different fertilizer types.
- (d) (2pt) Test  $H_0$  : No wheat effect against  $H_1$  : there is a effect effect. Use  $\alpha = 0.05$  if you reject  $H_0$ , use Tukey's method to do pairwise comparisons of the different wheat types.