STAT/ME 424 Homework 7 (due 9:30 AM, Dec 13, 2022)

A 2^4 complete factorial experiment was performed to study four factors on the taste of brownies. The factors and their levels are given in Table 1. Six persons were asked to provide scores for each batch of brownies and the average score for each batch is given in Table 2 together with the order of the runs.

1. Estimate the main and interaction effects.
2. Use Daniel's, Length's, and Dong's methods to determine the significant effects.
3. Which, if any, effects are significant at level $\alpha = 0.10$?
4. Fit a model containing only the significant effects to the data, plot the residuals, and state your conclusions.
5. Show a plot of the yields (average scores) versus run order.
6. Can the plot provide a possible explanation for the significant effects?

Table 1: Factor levels for cookie experiment

Factor	Low level (–)	High level (+)
Oven temperature (A)	300 degrees	400 degrees
Cooking oil (B)	vegetable oil	coconut oil
Mixing method (C)	hand mixing with spoon	electric mixer
Amount of sugar (D)	1 cup	2 cups

Table 2: Results from brownie experiment

Run order	Factor A Temperature	Factor B Oil	Factor C Mixing	Factor D Sugar	Average score
3	−	−	−	−	15.3
9	+	−	−	−	7.6
12	−	+	−	−	11.2
6	+	+	−	−	13.0
14	−	−	+	−	10.8
16	+	−	+	−	14.0
7	−	+	+	−	17.8
1	+	+	+	−	13.2
11	−	−	−	+	9.0
13	+	−	−	+	17.3
5	−	+	−	+	11.0
15	+	+	−	+	8.8
2	−	−	+	+	15.0
8	+	−	+	+	12.8
10	−	+	+	+	13.0
4	+	+	+	+	18.6