Activity 4.2: Factorial Analysis

Pig Feed Experiment

> **i** Note
>
> Submit via Gradescope, don't forget to assign pages to the questions in the outline!

A study was performed to investigate the effects of two feed additives on the growth of male pigs. The additives were Lysine (at 0%, 0.05%, 0.10% and 0.15% added to feed) and Soy Protein (12% or 14%). There were four pigs assigned at random to each treatment combination and each pig was randomly assigned to a separate pen in the building. The measured response was Average Daily Gain (ADG), in pounds, of each pig, over a 7-day period on the experimental feeds. The data are in the file `pigfeed_data.csv` found on Canvas.

> **⚠** Warning
>
> Ensure "Lysine" and "Protein" are a character/factor data types after reading the data into JMP/R. By default it will be read these in as numeric.

The researchers would like to determine which of these additives, if any, affect the pigs' weight gain, and what trends there are, if any, among the different levels of the additives. In addition, the researchers would like to know if there is a combination of lysine and soy protein which results in the most weight gain over the 7-day period.

a. Identify the structure of the experiment

Treatment structure

Experimental structure

b. Complete the skeleton ANOVA table below

Source of Variation	DF

c. State the statistical effects model

Make sure to define **all** terms, denote i, j, k values, and include assumptions.

d. Fit the factorial model in JMP/R

- Following the decision flow chart, provide conclusions for the *relevant* effects. Make sure to support your answer using (F = ; df = ; p =).

- Based on your conclusion above, should you proceed by looking at:

  Main Effects   Joint/Simple Effects

> **i** ϵ_{ijk} iid $\sim N(0, \sigma^2)$
>
> Get in the habit of looking at your residual plots for model assumptions here!

e. Visualizing the interaction

- Create a plot that illustrates how Lysine (x-axis) modifies the effect of Soy Protein (separate colored lines) on ADG.
- Copy/paste/sketch your plot.
- In 2–3 sentences, describe what you notice in the plot.

f. Simple effects: Protein within Lysine

Conduct slice tests to compare mean ADG between 12% and 14% Protein at each level of Lysine.

- Lysine = 0: F = _____; df = _____, _____; p = _____
- Lysine = 0.05: F = _____; df = _____, _____; p = _____
- Lysine = 0.1: F = _____; df = _____, _____; p = _____
- Lysine = 015: F = _____; df = _____, _____; p = _____

Summarize your findings in words, how does this support what you saw in the interaction plot above?

g. Recommendation

Which feed combination(s) would you recommend to maximize ADG, on average?
Support your recommendation with:

- treatment means (with units),

- and appropriate multiple comparisons (e.g., compact letter display).