BIA 654 Homework 7

1. Recall this exercise (from Homework 6, Problem 1) which was inspired by a real problem described in the article "Strategic Testing Stops Leaky Litter Cartons in Their Tracks" (*Packaging Digest*, August 2001); <u>download it from Canvas.</u>

   The makers of "Cats Love It" cat litter are facing a serious problem. Retail customers are reporting that cartons of the firm's premium brand cat litter are leaking the product onto store shelves. The company realizes that while cat lovers are used to cleaning stray sprays of litter tracked through the house, they are not willing to put up with cartons that leak on the way home.

   Management has determined that the problem is with the carton-sealing process. Cartons are filled and sealed on a production line run by 20 workers. The company decides to perform 3-factor factorial experiment. A run consists of filling and sealing 200 cartons. The factors to be tested and levels of each are shown below.

   Factor A is line speed with the minus level at 22 cartons per minute and the plus level at 30 cartons per minute. Factor B is the pressure applied by the gluing machine, with the minus level being lower pressure and the plus level being higher pressure. Factor C is the amount of glue used, with the plus level being the current amount and the minus level being 40% less glue.

   The response is the proportion(%) of cartons that leak, whose values are observed as 8, 45, 47, 10, 8, 40, 41, 8, listed in the *standard* order.

   Estimation results (You computed these for A, B, and AC in your previous Homework problem) are given as:

   $Average = 25.875, A = -0.25, B = 1.25, C = -3.25,$
   $AB = -34.75, AC = -0.25, BC = -0.75, ABC = 2.25.$

   (a) Suppose each response is the average of two replicated runs (note the numbers have been rounded). Suppose the pooled estimate of the variance of the response of an individual run is equal to 16. Based on 95% confidence intervals for an effect, which effects are significant? (Note: If a 95% confidence interval does not contain 0, then you can reject H_0 with $\alpha = 0.05$ when your H_1 is two-sided.)

   (b) What is the regression prediction equation? (Note: In the regression prediction equation, only significant effects are included. The intercept term in that equation is the mean response (i.e., the average of responses).)

   (c) What levels would you recommend for each factor? What is the predicted response (proportion of leaking cartons) <u>if your recommended settings are used?</u>

2. Read 'BIA 654 Final Project Guideline 1' on Canvas, and submit a two-page proposal to me as instructed therein. Send one proposal per team, via email Chihoon.Lee at stevens.edu.