## Regression Analysis - STAT 482 - Exam 2: Due Dec 14, 2021

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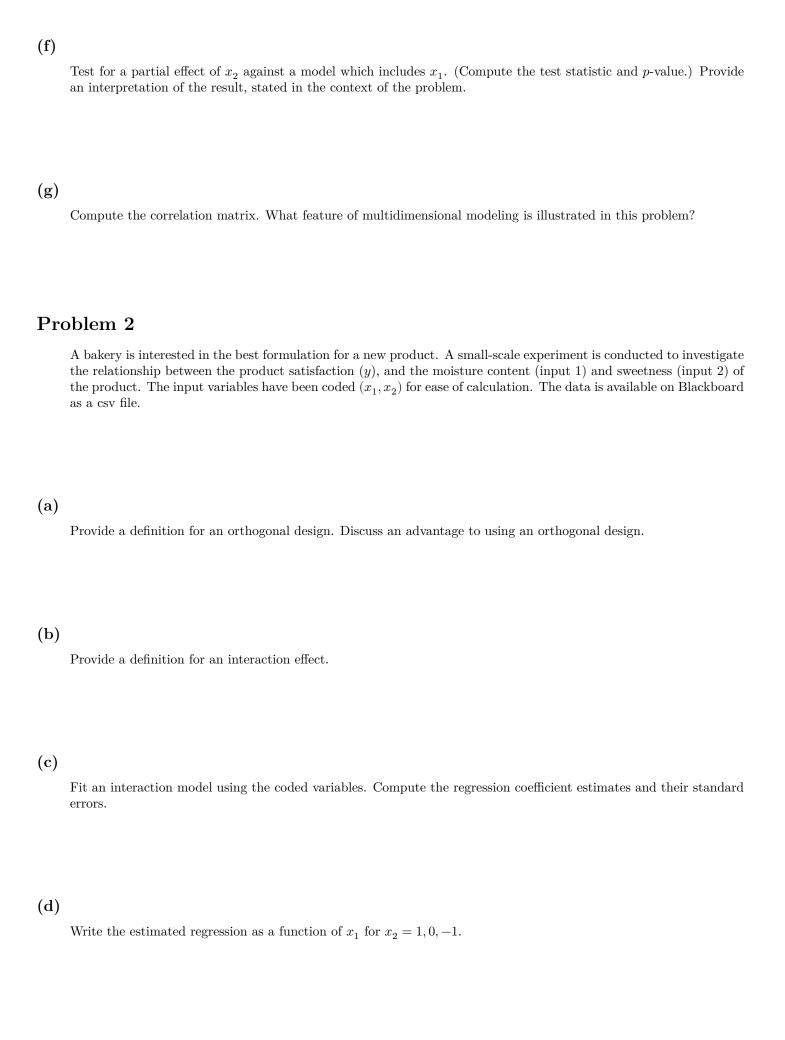
## Problem 1

A beer distributor is interested in the amount of time to service its retail outlets. Two factors are thought to influence the delivery time (y) in minutes: the number of cases delivered  $(x_1)$  and the distance traveled  $(x_2)$  in miles. A random sample of delivery time data has been collected. The data is available on Blackboard as a csv file.

- (a)

  Provide an interpretation of a regression coefficient in a multiple regression model.
- (b) Compute  $b_1, b_2$ , the estimated the regression coefficients for the delivery time data.
- (c) Compute t statistics for testing the effect of each input variable. Explain what type of effect is being tested here.
- (d)  ${\rm Compute~SS_R}(X_1) \ {\rm and~SS_R}(X_2|X_1). \ {\rm Explain~what~each~sum~of~squares~represents}.$
- (e)

  Test for a marginal effect of  $x_2$  against a model which includes no other input variables. (Compute the test statistic and p-value.) Provide an interpretation of the result, stated in the context of the problem.



(e)	Create interaction plots for both the interaction model and the additive effects model.
(f)	Test for an interaction effect. (Compute the test statistic and $p$ -value.)
Problem 3	
	An engineer is interested in comparing three chemical processes (categorical input with groups $A,B,C$ ) for manufacturing a compound. It is suspected that the impurity (continuous input $x$ ) of the raw material will affect the yield (response variable $y$ ) of the product. The data is available on Blackboard as a csv file.
(a)	Define indicator variables ${\cal I}_1$ and ${\cal I}_2$ using chemical process $C$ as the baseline level.
(b)	Write an additive model for response $y$ using continuous input variable $x$ and indicator variables $I_1$ , $I_2$ .
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(c)	Write a regression function for each of the chemical processes.
(d)	
( <i>~)</i>	Provide an interpretation for each effect parameter, stated in the context of the problem.
(e)	
` /	Compute interval estimates for each of the effect parameters.

(f)

Create a scatterplot of the data with the estimated regression lines.