

PSYC 943: Fundamentals of Multivariate Modeling

Homework #3 (Total 10 Points)

Due: Friday, September 20, 2013 at 12pm.

Homework #3 consists of two parts: Part A, with questions about distributions, and Part B, with questions about predicted values from a linear model and questions about how that fits into distributions. **All questions are worth .5 points each.**

Instructions for Part A: Compute the value of the relative frequency (value of the PDF) for the following random variables. Note: it may be easier to use a spreadsheet program such as Excel for this section.

1. $X = 0.711$, where $X \sim \text{Normal}(\text{mean} = 0.859, \text{variance} = 5.298)$
2. $X = 0.946$, where $X \sim \text{Normal}(\text{mean} = -0.945, \text{variance} = 6.95)$
3. $X = -0.08$, where $X \sim \text{Normal}(\text{mean} = -0.839, \text{variance} = 7.317)$
4. $X = -2.016$, where $X \sim \text{Normal}(\text{mean} = 0.281, \text{variance} = 8.866)$
5. $X = -0.494$, where $X \sim \text{Uniform}(a = -1.325, b = 4.635)$
6. $X = -4.797$, where $X \sim \text{Uniform}(a = -6.447, b = 0.533)$
7. $X = 13.588$, where $X \sim \text{Uniform}(a = 7.046, b = 17.762)$
8. $X = -4.954$, where $X \sim \text{Uniform}(a = -9.491, b = -4.804)$

Instructions for Part B: Using the data from Homework #2, the study of mini-golf training, this section asks several questions about predicted values and how they relate to models.

First, recall the analysis from homework #2: mini-golf scores are predicted by experimental group (control, mini-golf only, regular golf only, or both mini and regular golf), experience scale (centered at 4), enthusiasm scale (mean of 0), and the interaction between experimental group and experience. In the data, the group variable indicates which group a student was assigned to: 1 = control, 2 = mini-golf only, 3 = regular golf only, and 4 = both mini and regular golf. See the assignment document from homework #2 for more information.

To answer the following questions, start by running the same analysis model as the correct model used in homework #2:

$$\text{Score}_p = \beta_0 + \beta_1 dGroup2_p + \beta_2 dGroup3_p + \beta_3 dGroup4_p + \beta_4 exp4_p + \beta_5 enth_p + \beta_6 dGroup2_p * exp4_p + \beta_7 dGroup3_p * exp4_p + \beta_8 dGroup4_p * exp4_p + e_p$$

Where:

- $dGroup2_p = 1$ if person p is in the mini-golf only group 2, = 0 otherwise.
- $dGroup3_p = 1$ if person p is in the regular golf only group 3, = 0 otherwise.
- $dGroup4_p = 1$ if person p is in the both mini and regular group 4, = 0 otherwise.
- $exp4_p = experience_p - 4$: person p 's experience score centered at 4
- $enth_p$: person p 's enthusiasm score

Short Answer Homework Questions (.5 points each) – for each state the answer and any supporting evidence such as test statistics and p-values:

9. Were the slopes for experience equal across the different experimental groups?
10. Based on your answer to #9, would you remove the experience-by-group interaction term from the model? If so, remove this term from the model. Report the overall R^2 for both models. If not, report the overall R^2 of the original model from homework #2

The remainder of the questions relate to the model selected in Question #10 (so be sure to double check):

11. Is there a significant effect of experience? If so, is this effect the same for everyone?
12. Is there a significant effect of enthusiasm? If so, is this effect the same for everyone?
13. Is there a significant effect of experimental group? If so, is this effect the same for everyone?
14. What are the estimates of the adjusted means for a person with experience of 4 and enthusiasm of 0?
15. Which means were significantly different from each other using uncorrected p-values?
16. What is the predicted golf score for a person in the control group with an experience of 6 and an enthusiasm of 2?
17. What is the standard error of the predicted golf score for a person in the control group with an experience of 6 and an enthusiasm of 2?
18. What is the estimate of the residual variance for this analysis?
19. What is the residual for a person in the control group with an experience of 6, an enthusiasm of 2, and a mini-golf score of 67?
20. Assuming residual values are normally distributed with a zero mean and a variance known and equal to that found in Question 18, what is the relative frequency of the data for a person in the control group with an experience of 6, an enthusiasm of 2, and a mini-golf score of 67? What is the natural log of this value?

Submission Instructions:

All homework and final answers must be your own and not be copied or paraphrased from anyone else's answers. Homework must be submitted via email (jtemplin@unl.edu) in the form of Microsoft Word document with the name: 943_FirstLast_HW#.docx. Late homework will have a penalty of 10% per calendar day.