

STAT 770, Spring 2017: Homework 3

- Problem 3.3. Do this by hand using formulae in the notes, then obtain an exact 95% CI in a software package. Interpret the results.
- Problem 3.4. Use a software package to obtain the three estimates and their 95% confidence intervals. Interpret.
- Problem 3.6. Only obtain an exact 95% CI using software and interpret.
- Problem 3.7. Hint: make a 2×2 contingency table and test $H_0 : \theta = 1$.
- Problem 3.11 (a) and (b) only.
- Problem 3.16. For part (c), obtain estimates of γ , ρ_P , and ρ_{pc} , as well as their 95% confidence intervals. Interpret.
- Problem 3.19. Sample SAS code looks like

```
data table;
input lead$ malformation$ count @@;
datalines;
no yes 7 no no 18
yes yes 7 yes no 7
;
proc freq order=data; weight count;
  tables lead*malformation;
  exact fisher;
run;
```

You need to figure out which is the correct p-value.

- Problem 3.20 (a) only.
- Problem 4.7 (a), (b), and (c). Use a software package.
- **Ph.D. students only:** Problem 4.15
- **Ph.D. students only:** Problem 4.16.

There is one more problem on the next page...

- Crab mating data. Consider the crab mating data from the text and notes. Let s_i be the number of satellites for crab i , c_i be the crab's color *treated as continuous*, and w_i be the crab's *weight* (**not** width as used in class).
 1. Fit the Poisson regression model $s_i \sim \text{Pois}(\mu_i)$, where $\log(\mu_i) = \beta_0 + \beta_1 c_i + \beta_2 w_i$.
 - (a) Interpret $\hat{\beta}_1$ and $\hat{\beta}_2$. Are they significant?
 - (b) What is the AIC for this model?
 2. Fit the Poisson regression model $s_i \sim \text{Pois}(\mu_i)$, where $\log(\mu_i) = \beta_0 + \beta_1 c_i + \beta_2 w_i + \beta_3 w_i^2$.
 - (a) Is the quadratic term β_3 significant?
 - (b) Does the AIC improve over the previous model? Remember that lower AIC = better model.
 3. Fit the negative binomial regression model $s_i \sim \text{NegBin}(\mu_i, k)$, where $\log(\mu_i) = \beta_0 + \beta_1 c_i + \beta_2 w_i$.
 - (a) Interpret $\hat{\beta}_1$ and $\hat{\beta}_2$. Are they significant?
 - (b) How does this AIC compare to the previous two? Which of the three does the AIC pick?