

Lab 13

Stat 427

Fall 2020

Instructions

Complete all questions. To prepare for the randomly collected lab, follow the instructions on the class website to prepare the work for submission. These submission rules will apply to all labs throughout the semester.

Advanced graphs

- (1) Listed below are 8 years of data collected by the U.S. Bureau of Land Management on the proghorn (*Antilocapra americana*) population in the Thunder Basin National Grassland in Wyoming. The variables are fawn count y , proghorn population size u , annual precipitation v , and winter severity index w . Create a scatterplot matrix of the variables.

| y | u | v | w |
|-----|-----|------|-----|
| 290 | 920 | 13.2 | 2 |
| 240 | 870 | 11.5 | 3 |
| 200 | 720 | 10.8 | 4 |
| 230 | 850 | 12.3 | 2 |
| 320 | 960 | 12.6 | 3 |
| 190 | 680 | 10.6 | 5 |
| 340 | 970 | 14.1 | 1 |
| 210 | 790 | 11.2 | 3 |

- (2) The dataset `volcano` is one of the datasets available in R. The dataset is simply a matrix of elevations of the region around the Maunga Whau volcano in New Zealand. Create a surface and contour plot of the volcano.

- (3) To decrease the use of insecticides in agriculture, predator insects are often released to combat insect pests. Coccinellids (lady beetles) in particular have a voracious appetite for aphids. In a 2005 study (Pervez and Omkar 2005), entomologists looked at the suitability of using lady beetles to control a particular aphid, *Myzus persicae* (common name is “green peach aphid”), a serious pest of many fruit and vegetable crops. In the study, the entomologists experimentally ascertained aphid kill rates for three different species of lady beetles. Provided below is the data for the beetles (feeding rates (# eaten 24 hr)) and aphids (#/jar).
- For each type of lady beetle, create a scatterplot (with points) of the feeding rate of the beetle versus aphid density
 - Add a kill rate (see module 1) curve to each of the beetle/aphid graphs; use the following constants in the kill rate equation:
 - C.sexmaculata*: $a = 234.5, b = 261.9$
 - C.transversalis*: $a = 178.9, b = 194.9$
 - P.dissecta*: $a = 100.4, b = 139.8$
 - Plot all three species of lady beetles on *one* graph
 - Use different symbols for each species of beetles
 - Add the fitted kill rate curves for each species of beetles
 - Create a legend

| APHID DENSITY (#/jar) | Cheilomenes sexmaculata | Coccinella transversalis | Propylea dissecta |
|--------------------------|----------------------------|--------------------------|-------------------|
| 25 | 21 | 21 | 15 |
| 50 | 37 | 37 | 26 |
| 100 | 65 | 60 | 42 |
| 200 | 102 | 90 | 59 |
| 300 | 125 | 109 | 69 |
| 400 | 141 | 120 | 74 |
| 500 | 154 | 129 | 79 |
| 600 | 164 | 136 | 82 |
| 700 | 170 | 140 | 83 |
| 800 | 177 | 143 | 85 |

- (4) Attempt problem 1 in `ggplot()`. You can attempt a scatterplot matrix or create scatterplots with `y` vs. `u`, `y` vs. `v`, etc. for all combinations of variables. Make sure you save the matrix from problem 1 as a data frame for use in `ggplot()`.