PS 6

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October, 2018

Problem 1: Categorical relationships

Consider the following data sets, which are the results of a survey where children were asked two questions. First, they were asked "At an indoor birthday party, would you prefer a. clowns; b. horses; c. chocolate fountain; d. magician?". Then they were asked the same thing about outdoor parties. tab1 looks at the cross-tabulations of each pair of responses. tab2 looks at hypothetical marginal values–what responses were given for indoor and outdoor across the four options.

```
set.seed(1000)
indoor<- sample(c("A","B","C","D"),prob=c(5,8,25,6),
   size=200,replace=T)
outdoor <-sample(c("A","B","C","D"),prob=c(5,20,3,6),
   size=200,replace=T)

tab1 <- table(indoor,outdoor)
tab2 <- table(c(indoor,outdoor),rep(c("I","O"),each=200))
tab1
```

```
##       outdoor
## indoor  A  B  C  D
##      A  4 11  3  5
##      B  9 23  1 10
##      C 19 59 10 19
##      D  5 12  2  8
```

```
tab2
```

```
##
##      I   O
##   A  23  37
##   B  43 105
##   C 107  16
##   D  27  42
```

Conduct both chi-squared tests and bayes factor contingency table tests for tab1 and tab2 to determine (1) whether responses to indoor preference influenced individuals response to outdoor preference, and (2) to determine whether indoor and outdoor preferences were the same. Describe the meaning of the result, and interpret specifically what it means for the particular table. Your explanation should differ for the two tables, regardless of whether they are significant or not.

Problem 2: Which test to do: You decide.

For the following example data sets and questions, answer the statistical question using an appropriate test. Whenever possible, run both a NHST and a Bayesian test. If you choose to use a non-parametric test, give a rationale for why. The data here are completely fabricated, so do not use your intuition for what should be true, but rather find out from the data.

The column names are: * age: age of car owner * gender: gender of car owner * type: type of vehicle * origin: location car was manufactured * origin.last: location of previous car's manufacture * carval: purchase price of vehicle * carval.last purchase price of previous vehicle

```
cardat <- read.table(text="age gender   type origin origin.last carval carval.last
  34      F    SUV     US          US  16400       15800
  31      M  Truck     US      Europe  16900       16000
  47      M  Sedan     US          US  18800       17100
  21      F  Sedan  Japan       Japan  16000       15500
  42      M    SUV     US       Japan  16800       16100
  43      F    SUV     US          US  17200       16300
  60      F  Truck Europe      Europe  19900       17800
  37      M  Truck Europe      Europe  17100       16200
  46      F    SUV  Japan       Japan  16900       16300
  27      M  Sedan     US          US  16200       15700
  50      M    SUV     US          US  18800       17100
  64      F    SUV  Japan          US  50700       31700
  33      M    SUV  Japan       Japan  16500       15900
  39      M  Truck     US      Europe  17000       16200
  58      F  Sedan  Japan          US  19400       17500
  53      F    SUV     US      Europe  19200       17400
  29      F  Sedan     US       Japan  16300       15700
  37      F  Sedan     US          US  17300       16300
  37      M    SUV     US       Japan  18200       16700
  54      F  Sedan  Japan       Japan  24500       19800
  46      F    SUV  Japan      Europe  18000       16700
  55      F    SUV     US       Japan  28900       21700
  46      F  Truck     US      Europe  16600       16100
  57      M    SUV Europe      Europe  24300       19700
  40      M    SUV     US          US  16800       16100
  27      M  Sedan  Japan          US  16900       16000
  58      M    SUV Europe      Europe  20300       17900
  64      M  Truck     US          US  40600       27100
  47      M  Truck     US      Europe  18400       16900
  32      M  Truck     US          US  15900       15600
  43      F  Sedan  Japan          US  17200       16300
  66      M  Truck Europe      Europe  19100       17500
  36      F    SUV     US       Japan  16900       16100
  68      M  Truck     US          US  69300       40100
  54      F  Sedan  Japan          US  17000       16400
  64      M  Truck  Japan      Europe  34900       24600
  27      M    SUV  Japan      Europe  15800       15500
  51      F  Sedan  Japan       Japan  29000       21700
  69      M  Sedan     US       Japan  54400       33400
  25      F  Sedan  Japan       Japan  15800       15500",header=T)
```

Answer each of the following: * Is there an impact of gender on the type of car purchased? * Is there a difference in amount paid for a car for men versus women? * Do people tend to buy vehicles from of the same origin as their last vehicle (US, europe, japan)? * Is there a relationship between driver age and the value of he car? * What is your best estimate for the value of a car driven by a 32, 52, and 62-year-old? * Is there a relationship between how much someone paid for their previous car and how much they paid for their current car? * Did people tend to pay more for their current car than their previous car? * Did trucks cost more than SUVs?

In each case: - describe the appropriate test to determine the answer - conduct the relevant NHST and

Bayesian tests, or appropriate methods for estimating/predicting. - Create an appropriate figure illustrating the answer to the question. - Give an answer in words, both in terms of the question asked and in terms of the statistical test. - Provide the code used to conduct the test.