Research Methods For Human Inquiry PSYC30013

Week 6: Chi-square test

Week 7: T-test

Week 8: ANOVA

Week 9&10: Regression

Chi-square

Week 6 day1

- **Interpret Chi-squared Goodness of Fit**

votingTable<-table(d$vote)
chisq.test(x=votingTable,p=ed)

Of the 90 people in our sample, 3 voted for bunny, 48 voted for doggie, 33 voted for gladly and 6 voted for shadow. When compared to the voting rates to each person in a previous election (12.5%, 45.5%, 33.4%, 20% respectively), using a chi-squared goodness of fit test, we found significant deviations, x^2(3)=7.94, p=.047. Therefore, we reject the null hypothesis which states that the distribution of votes for these options is the same as the distribution of votes in the earlier election. This suggests that the votes this time is significantly different from the distribution of votes in the earlier election and did not simply reflect the popularity of each person.

Not significant:
A Chi-Squared Goodness of Fit test was performed comparing the observed number of votes for each attack option against a null hypothesis stating that these options occurred with equal frequency. Results were not significant, indicating that we cannot reject the null hypothesis that all options were equally probable, X^2(2)=0.59, p=.7438. This may suggest to Doggie that people don’t really have any idea about how best to attack, and might be choosing randomly.

- **Calculate Chi-squared manually (Goodness of Fit)**

O<-votingTable
E<-90*ed
Xsquared<-sum((O-E)^2/E)
Xsquared

- **Calculate expected frequencies in Chi-square test of independence**

Unlike the goodness of fit test, we don't know the expected frequencies in an independence test. They are thus estimated based on the actual data, or a weighted average based on the observed frequencies across the entire dataset. The test of independence compare the observed frequencies to this weighted average, and if the observed frequencies are very different then that means they are also really different from each other.

- **Report Chi-square test of independence**

colourTable<-table(d$name,d$colour)
chisq.test(x=colourTable)

The distribution of colours in Flopsy and Shadow's closets, shown in Table 1 above, was compared using a Chi-Squared test of independence. Results suggested that the two closets had significantly different colour distributions, X^2(3)=10.311,p=.016.

- **Report Fisher Exact Test**

fisher.test(x=weaponTable)

The distribution of weapons in location A and B, shown in Table 1 above, was compared using a Fisher exact test since the values in the cells are too small for a Chi-squared test. Results suggested that the two locations had significantly different weapon distributions, p=.034.

- **McNemar Test and independence assumption**

We cannot assume independence because it's the same question on the pre- and post- test (Distributions come from the same people). The McNemar compares the cells from pre-right to post-wrong and pre-wrong to post-right (the cells on which there was a change). The question is whether there was more change in one direction than another; if so, that suggests improvement (there were more pre-wrong to post-right than the reverse)/ If not, it doesn't.

- **Report McNemar Test**

mcnemar.test(x=testTable)

A McNemar's Chi-squared test was run comparing Gladly's pre-test to Post-test data. The results were significant, X^2(1)=3.8919, p=.0485, suggesting that there was improvement on the test.

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also on the combination of the two. For instance, if in Bunnyland the people who were more worried supported immigration more while in Otherland it was the people who were less worried.

- **Compare two-way ANOVA with/ without interaction term**

```
artmaterialnointModel<-aov(time~art+supplies,data=da)
summary(artmaterialnointModel)
artmaterialintModel<-aov(time~art*supplies,data=da)
summary(artmaterialintModel)
```

Both of these results suggest there is a significant main effect of art and no significant effect of supplies. The analysis with the interaction is non-significant was well. These agree with each other qualitatively but the actual F-scores are different. The reason for this is that F-score is a function not just of the between-group sums of squares, but also what the residuals are, and the residuals are slightly different for each model. In this case they aren't that different because the interaction term wasn't significant, which means that it didn't absorb much variance, so the models with and without it weren't much different. But they were a little different, which is visible in the F-score for art.

- **Interpret eta-squared and partial eta-squared (two-way ANOVA)**

```
etaSquared(artmaterialintModel)
```

The eta squared values show that about 56% of the variability in the time it takes Cuddly Paws to spend on her art is due to the kind of art. Less than 0.002% is due to her supplies, and 0.17% is due to the interaction between the kind of art and her supplies. The partial eta squared values are the eta squared you would get if you ignored all of the other factors. It is hardly different at all for art (5.6e-01=0.56) because supplies and art:supplies hardly captured any variance at all, so taking them out makes little difference. It is very different for the other two, because art captured a lot of variance, so taking it out means there was a lot more available to be captured by supplies and art:supplies. However, it is still not a lot, which supports our conclusion that these factors didn't matter much to Cuddly Paws.

Week9 tut (anova content)

A violin plot for one-way anova, boxplot for two-way anova

- **Statistical null hypothesis and research null hypothesis**

The statistical null hypothesis is that the means of all of the groups are the same (i.e., drawn from the same underlying distribution). The research null hypothesis is thus that the species don't differ from each other in terms of how much food they harvest.

- **Within group and between group variation explanation**

High SSb intuitively means that the groups have means that are really different from each other. This is generally more likely to mean a significant difference between groups (they are different, after all!) but not necessarily: if the groups also have really high variability then this difference might not be very meaningful. SSw is basically the opposite: it means that each group tends to have high variation (i.e., high standard deviation). All other things being equal if this is high, it's less likely to mean a significant difference between groups, because they have to be even FURTHER apart from each other for it to be meaningful.

- **Compare F stats in One-way and Two-way ANOVA**

The F-statistic wouldn't necessarily be the same for Factor A in both of these cases. F-statistic incorporates the between-group sum of squares (which would be the same, because it's just looking at the groups in Factor A) but it also divides that by the residuals. The residuals (i.e., the within-group variance not accounted for by the model) are different. In the one-way ANOVA they include all the variance not accounted for by Factor A. In the two-way ANOVA they include the variance that's not accounted for by Factor A OR Factor B.

- **Is it possible to have a smaller partial eta square than eta square**

It is not possible to have a partial eta squared that is smaller than the corresponding eta squared - the other variables always account for some of the variation so removing them "gives" more variation to the one that remains. At most it might remain unchanged if one of the removed variables accounted for literally ZERO variation.