

Applied Nonparametric Statistical Methods Homework 2

This homework covers lecture material through 2/9. Type responses (preferred) or write them **very** neatly. Show calculations where relevant. SPSS can be found in campus computer labs. When software is required, please include the relevant output. [total points = 40]

1. Do the following problem, and provide all calculations by hand for both (a) and (b). [5]

Students in an introductory statistics class were asked how many brothers and sisters they have and whether their hometown is urban or rural.

Number of Siblings in Rural vs. Urban Areas

Rural	3	2	1	1	2	1	3	2	2	2	2	5	1	4	1	1	1	1	6	2	2	2	1	1
Urban	1	0	1	1	0	0	1	1	1	8	1	1	1	0	1	1	2							

- Test for a significant difference between rural and urban areas using the Wilcoxon rank-sum test (by hand).
- Test for a significant difference using the two-sample t -test (also by hand). To obtain the p -value for the t -test you can refer to a web calculator, the Excel function T.DIST.2T, or simply repeat your analysis in SPSS or some other statistics program. Compare the results with those obtained in part (a). Why are the results different?

2. Conduct a permutation test on the data in (1). Is the p -value closer to that of the Wilcoxon rank-sum test or to that of the two-sample t -test? What does this suggest about the relationship between the permutation test and the two-sample t -test? [5]

3. Again using the data in (1), apply the large-sample approximation to the Wilcoxon rank-sum test to test for differences between the rural and urban groups. Do all calculations by hand. [5]

4. It has been shown that a diet rich in corn stimulates aggression (sidenote: food served in the American penal system is rich in corn-based products). You are interested in seeing whether or not this effect can be replicated in schoolchildren. You create two groups (C1: cornless control; C2: corn-rich treatment) and observe the following data, where higher values indicate higher externalizing (overtly aggressive) behavior:

C1:	1.0	5.3	1.2	3.9	8.3	6.3	2.2	9.8	2.8	2.6	
C2:	5.1	6.0	8.0	8.2	7.3	4.4	7.4	7.5	6.4	4.5	8.9

To determine if these two groups differ in central tendency, use permutation (Resampling Stats) and a t -test (Excel, SPSS, or R, etc.). Compare and contrast results. [7]

5. One of the assumptions of the t -test in (4) is that the population variances of the two groups are equal. Rather than blindly assuming equality, you wisely decide to test this assumption. Use the F -test, the Siegel-Tukey test, and Higgins' permutation test. Compare your results across all of these methods. Do they agree? [8]

6. The following data are samples from three simulated distributions, and you are interested in comparing them in terms of central tendency. [5]

Group 1:	2.9736	0.9448	1.6394	0.0389	1.2958
Group 2:	0.7681	0.8027	0.2156	0.0740	1.5076
Group 3:	4.8249	2.2516	1.5609	2.0452	1.0959

- a. Apply the permutation F -test to the data.
- b. Compare the results in part (a) with the results of the usual one-way ANOVA.

7. Referring to the data in (6) above, apply the Kruskal-Wallis test to the data, and compare the conclusions with those obtained in (6). [5]