HOMEWORK I : Nonparametric statistics & Function estimation

2014/10/02

1. The performances of engine bearings made of different compounds were tested. The following table gives the times until failure in units of millions of cycles:

Type I	3.03	5.53	5.60	9.30	9.92	12.51	12.95	15.21	16.04	16.84
Type II	3.19	4.26	4.47	4.53	4.67	4.69	12.78	6.79	9.37	12.75

(1) Test if there is no difference between two types of bearings assuming normality on the populations.
(2) Test if there is no difference between two types of bearings using a nonparametric method. Find a 95% confidence interval for the difference of two locations parameters using normal approximation based on the nonparametric method.

2. The following table gives the lengths (in inch) of sunfishes:

3.03	5.53	5.60	9.30	9.92	12.51	12.95	15.21	16.04	16.84

(1) Test if the mean length is larger than 3.7 using normal theory.
(2) Test the same hypotheses using the Sign statistic. Find a 99% confidence interval.
(3) Test the same hypotheses using the Wilcoxon rank statistic. Find a 99% confidence interval.

3. There are three kinds of electric bulbs. One want to know if the lifetime of them are all the same or not. The following table gives a tested results for some selected samples:

Bulb A	Bulb B	Bulb C
12	13	11
17	15	30
10	18	28
14	16	26
	21	29
		27

(1) Test if there is a difference among group using the parametric one-way ANOVA.
(2) Test the same hypotheses using a nonparametric method.

4. The following table gives bowling scores for 10 couples:

	1	2	3	4	5	6	7	8	9	10
Husband	147	158	131	142	183	151	196	129	155	158
Wife	122	128	125	123	115	120	108	143	124	123

(1) Calculate the Pearson correlation coefficient, the Spearman's rank correlation coefficient and the Kendall tau correlation coefficient.
(2) Test if they are significantly correlated based on the above three correlation coefficient.