

Experimental Design and Data Analysis: Assignment 4

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Group 19

May 9, 2015

Exercise 1

1

```
sample_slices = sample(1:18, 18)
```

2

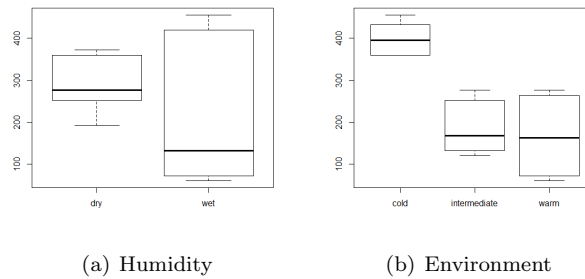


Figure 1: Boxplots of Hours with Humidity and Environment

3

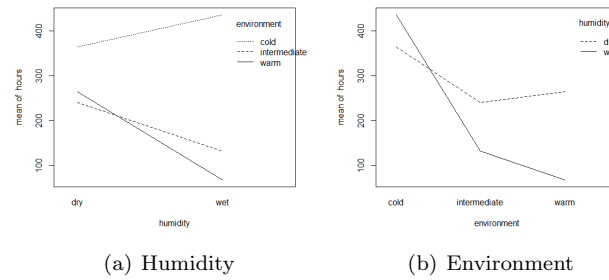


Figure 2: Interactionplots of Hours with Humidity and Environment

4

Analysis of variance on both factors:

Analysis of Variance Table

Response: hours

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
environment	2	201904	100952	23.1057	3.674e-05 ***
humidity	1	26912	26912	6.1596	0.02637 *
Residuals	14	61168	4369		

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1

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Exercise 2

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2

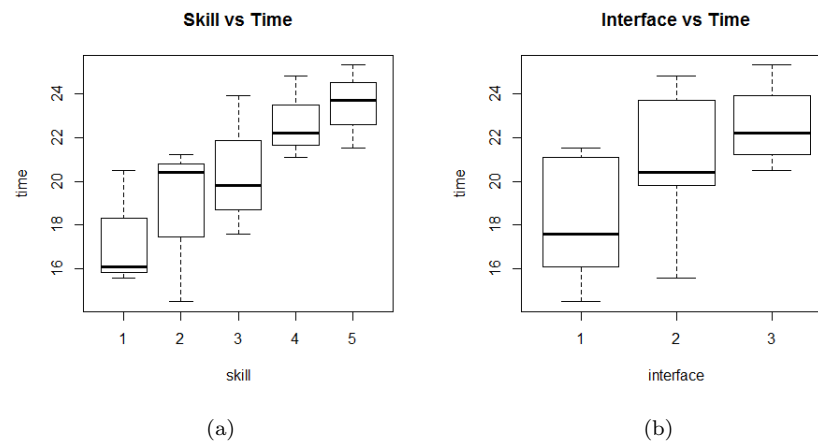


Figure 3: Box Plots of Skill and Interface vs Time

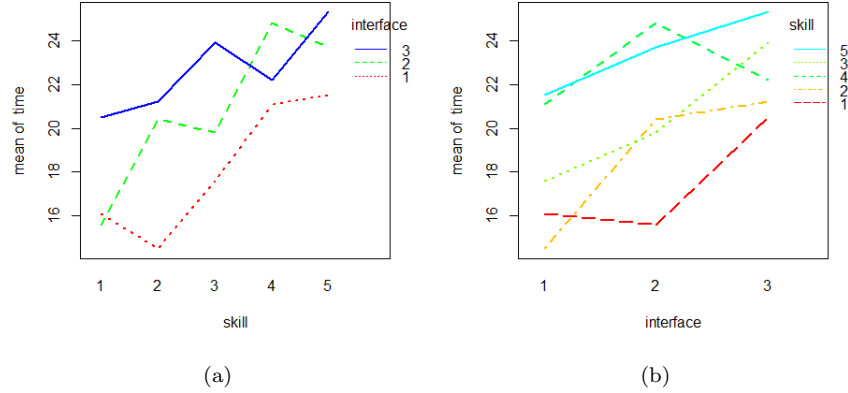


Figure 4: Interaction plots of Skill and Interface vs Time

It is difficult to conclude that there is an interaction between skill and interface as they are clearly not parallel, but they follow the same general trajectory, so this interaction may be due to noise.

3

Using the Kruskal-Wallis rank sum test, we test if the distributions of our populations in regards to the time measured for different interfaces are the same, and we obtain the following results:

Kruskal-Wallis **rank sum** test

data: **time** and **interface**

Kruskal-Wallis $\chi^2 = 4.22$, **df** = 2, **p-value** = 0.1212

Thus with a p-value of 0.1212 we reject the null hypothesis that our populations are the same, therefore the search time for all interfaces is not equal.

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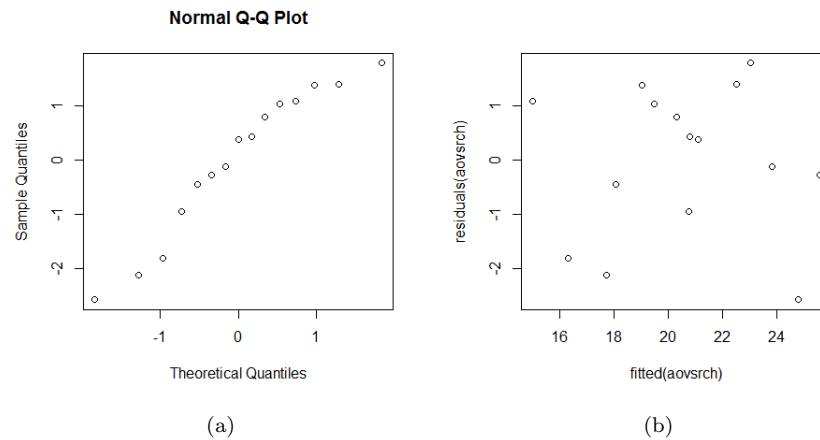


Figure 5: Diagnostic Plots

It is difficult to say for certain, there may be a slight curve in the qq-plot 5(a) but it looks approximately normal, and the fitted value plot 5(b) suggests there is no significant difference in the population variances.

6

Friedman **rank sum** test

data: **time**, interface and skill

Friedman chi-squared = 6.4, **df** = 2, p-value = 0.04076

With a p-value of 0.04076 we reject the null hypothesis, thus we conclude there is an effect of interfaces.

7

Analysis of Variance Table

Response: **time**

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
interface	2	50.465	25.233	2.8605	0.09642 .
Residuals	12	105.852	8.821		

Signif. **codes:**

0	***	0.001	**	0.01	*	0.05	.	0.1	1
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Exercise 3

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Exercise 4

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1 R-Code

1.1 Exercise 1

1.2 Exercise 2

1.3 Exercise 3

1.4 Exercise 4