

STAT 696, Spring 2011  
Homework 2 Problems  
due Thurs. Feb. 10

2 Problems. Please follow the Lab report directions off the homework web page.

1. We will use the following data:

1	7	3
5	10	2
6	5	12

(a) Obtain the median polish by subtracting row medians first and then redo the median polish by subtracting column medians first for the data. Comment on any differences from the median polish obtained by subtracting the row medians first versus the column medians.

(b) There is a R function `medpolish`. To create a matrix of the data and perform the median polish in R, you can:

```
> data <- matrix(c(1,7,3,5,10,2,6,5,12), ncol=3, byrow=T)
> data.mp <- medpolish(data)
> data.mp
> plot(data.mp)
```

Compare the your answer to (a) with the R median polish values.

Problem 2 on the next page.

2. Return to **Soil pH data**. Data on soil pH comes from an observational study in which samples of soil were collected at the nodes of a grid with 11 rows  $\times$  11 columns. The pH of the samples were measured in a laboratory.

The data is available off the class web page:

`http://www.rohan.sdsu.edu/~babailey/stat696/soilph.dat`

Use the R `read.table` command with the `header=T` option. (You do not need to make your own labels!)

(a) Fit the following linear trend which is a third order polynomial surface to the data:  
 $m(x, y) = \beta_0 + \beta_1x + \beta_2y + \beta_3x^2 + \beta_4xy + \beta_5y^2 + \beta_6x^3 + \beta_7x^2y + \beta_8xy^2 + \beta_9y^3$ .

Please use the R function `I`, which is useful in the above formula.

Include summary and diagnostic plots of the model fit from `lm`. Do you detect any pattern in the residuals?

(b) Now use the R `medpolish` function to perform median polishing. Write down the model for  $m(x, y)$ . Include the estimates of the model parameters and a summary plot of the residuals. Do you detect any pattern in the residuals?

Note: the R `medpolish` takes a matrix as an argument. You can make matrix by using the following R `matrix` command:

```
soilphmat <- matrix(soilph$ph, ncol=11, byrow=T)
```