AMS 550.400 Homework 3 Additional Instruction Due Date: Nov 19

Last Compiled on November 28, 2012

General Instruction

- failure to follow the instruction will result in severe penalty (graded at 90% or even worse)
  - no second grading is planned for this homework set
  - type up your own homework (i.e., no copy-and-pasting from others & you know one can easily check this)
- from the home directory `~/`, make a directory for this homework set
  - use `mkdir nhleeHW3.git` for the directory name
  - create a Sweave file called `nhleeHW3.Rnw`
  - replace `nhlee` with the "left-hand side" of your school email
- initialize it as a git folder
  - do this from inside of the git folder for your own sake
  - make sure to verify that your folder contains a hidden folder called `.git`
  - set it up from RStudio as a RStudio project with git support
  - look for `[COMMIT]` from the text below for the location where you are supposed to add & commit
- using RStudio for editing and compiling your Rnw file is highly recommended
  - to compile, find and press "Complie PDF" button within the RStudio editor window (typically, the upper left corner window)
  - alternatively, you can use `R CMD <Sweave/pdflatex>` from bash-shell command line provided that you are in the "appropriate" directory

```
R CMD Sweave yourfilename.Rnw
R CMD pdflatex yourfilename.tex
```

- use the `homeworkset3.tex` file as a starting point for typesetting your homework solution
  - find it from the course git folder
  - do not delete the problem statements
  - do not delete/modify the existing codes in the preamble area
- once completed, compress the folder as a `.nhleeHW3.zip` or `nhleeHW3.tar.gz`, where `nhlee` is replaced with one from your school email
  - make sure that your compressed file can actually be decompressed

- on the due date,
  - submit a paper copy to the instructor during the class
  - upload the compressed folder to the designated BB discussion forum before midnight
  - any commit made after the class meeting time will be discarded using `git reset --hard`, and will not be counted as a part of your homework submission

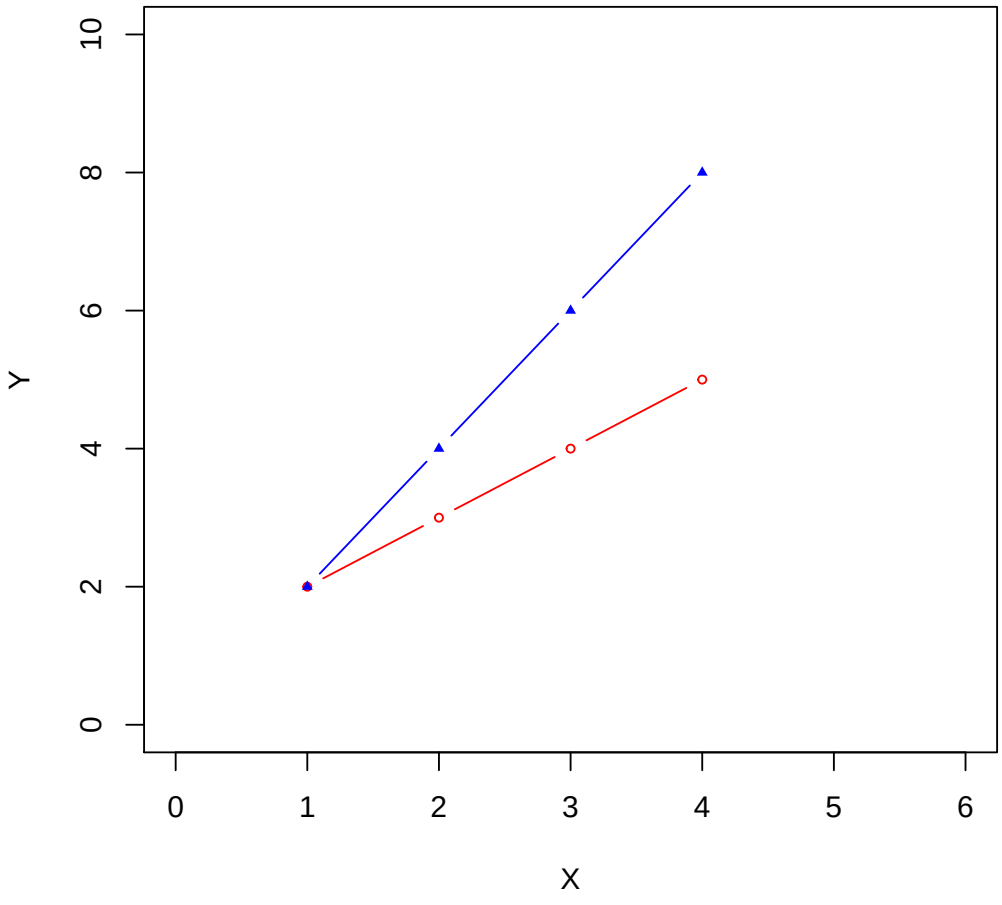
Problems from Chapter 7: Matrix Algebra for MDS

Ex 7.18

(a) `[COMMIT]` Use Sweave to accomplish this

- Use

```
\includegraphics{ywu67HW3-001}
```



- Make sure to label the horizontal axis, the vertical axis and give the main title, and give different color for A and B e.g., by filling out the space between the quotation marks, and choose a different symbol for A and B by specifying a number for `cex` and `pch`

```
plot(xydataA,xlab='',ylab='',main='',color='',cex=,pch=)
points(xydataB,cex=,pch=,cex=,color='')
```

- [COMMIT] Include your R codes using `lstlisting` making sure that it has an appropriate caption

(b) [COMMIT] Supplement your calculation using R/Sweave

- computations need to be done before using them in the text using or concurrently

```
The determinant is 1 or equivalently 1.
```

The determinant is 2 or equivalently 2.

(c) [COMMIT] directly use the code and output from R/Sweave, but make sure to explain your answers

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Ex 7.24

- [COMMIT] use `lstlisting` to list your R code
- [COMMIT] use R/Sweave for computation, but do not use the built-in `dist` function

```
\begin{Schunk}
\begin{Sinput}
> #Your R codes go here
\end{Sinput}
\end{Schunk}
```

- [COMMIT] use R/Sweave for computation, and this time, do use the built-in `dist` function for comparison

```
\begin{Schunk}
\begin{Sinput}
> #Your R codes go here
\end{Sinput}
\end{Schunk}
```

- [COMMIT] make sure to explain your computation, e.g., compare the two computations

Ex 7.30 Omit (c), (d) and (e). The necessary data is saved in `matlabclown.RData` and can be found from the course git folder. The followings are the equivalent R version:

```
load('matlabclown.RData')
image(X) # omit this in your Sweave code
svdX = svd(X)
U = svdX$u
S = diag(svdX$d)
V = svdX$v
k = 10
M = U[,1:k,drop=FALSE] %*% S[1:k,1:k,drop=FALSE] %*% t(V[,1:k,drop=FALSE])
image(M) # omit this in your Sweave code
image(M,col=gray.colors(k))
```

(a) [COMMIT] choose a small, a medium and a large value for k

- for each k,
  - do [COMMIT]
  - your performance evaluation is to be included as a caption, and change `tinyK`, `width` and `height` accordingly

```
\begin{figure}
    \centering
\begin{Schunk}
\begin{Sinput}
> tinyK = 1
> #smallK =
> #mediumK =
> #largeK =
> #Your R codes go here
\end{Sinput}
\end{Schunk}
\includegraphics{ywu67HW3-007}
\caption{<YOUR PERFORMANCE EVALUATION> on $1$}
    \label{fig:matlabclownKaNumber}
\end{figure}
```

(b)
- [COMMIT] code up all your computation using R/Sweave before starting to type your explanation
- [COMMIT] write your explanation referring to the numbers computed in the previous step, using

Problems from Chapter 4: Multidimensional Scaling

Ex 4.1

- [COMMIT] Modify the code in Listing 1 for illustrating the first ten objects on a "line"

Listing 1: TikZ Code for Figure 1

```
\begin{tikzpicture}
  \foreach \x in {1,2,...,5,7,8,...,12}
    \foreach \y in {1,...,5}
    {
      \draw (\x,\y) +(-.5,-.5) rectangle ++(.5,.5);
      \draw (\x,\y) node{\footnotesize $(\x,\y)$};
    }
\end{tikzpicture}
```

- [COMMIT] list your R/Sweave codes using `lstlisting`
- [COMMIT] use the R/Sweave codes to compute
- [COMMIT] explain your computed numerical values

- make sure to refer to your R code listing via `\ref` and to the computed values using `\Sexpr`
- refer to [**?**] if necessary

$(1,5)$	$(2,5)$	$(3,5)$	$(4,5)$	$(5,5)$	$(7,5)$	$(8,5)$	$(9,5)$	$(10,5)$	$(11,5)$	$(12,5)$
$(1,4)$	$(2,4)$	$(3,4)$	$(4,4)$	$(5,4)$	$(7,4)$	$(8,4)$	$(9,4)$	$(10,4)$	$(11,4)$	$(12,4)$
$(1,3)$	$(2,3)$	$(3,3)$	$(4,3)$	$(5,3)$	$(7,3)$	$(8,3)$	$(9,3)$	$(10,3)$	$(11,3)$	$(12,3)$
$(1,2)$	$(2,2)$	$(3,2)$	$(4,2)$	$(5,2)$	$(7,2)$	$(8,2)$	$(9,2)$	$(10,2)$	$(11,2)$	$(12,2)$
$(1,1)$	$(2,1)$	$(3,1)$	$(4,1)$	$(5,1)$	$(7,1)$	$(8,1)$	$(9,1)$	$(10,1)$	$(11,1)$	$(12,1)$

Figure 1: An extension of an example from the TikZ & PGF manual [**?**]

Ex 4.2

- `[COMMIT]` list your R code using `lstlisting`
- `[COMMIT]` demonstrate that your function is "functioning" by way of R/Sweave

Ex 4.3

- `[COMMIT]` list your R code using `lstlisting`
- `[COMMIT]` load the data (`require(MVA);data(gardenflowers)`) and compute using R/Sweave
- `[COMMIT]` include a plot of (relative) positions using R/Sweave
- `[COMMIT]` allocate at least a quarter page of *text* explaining the result

References