Reviewing Additional Programming Languages: R, Python

SSC 322/329

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Email any questions to:
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Administrative Trivia

- Quiz-4 scores posted on Blackboard

- Exam will be held on December 5
  - 15% of the total grade
  - Comprehensive exam – C, C++, Fortran
  - Pattern of the exam will be the same as Quiz-4
  - Any questions? Topics not clear?

- Class project is due on December 5

Reviewing R Programming Language

What is R?

- R is a statistical tool used for data analysis and visualization
  - It has packages supporting not only statistical functions but additional functions also like those for data analysis, plotting graphs, etc.

- R also has support for writing programs (implementing your own functions)
  - Caution: programs written in R can be slow
  - For some domain specialists, this might be a very user-friendly environment though

R on Stampede

```
login1$ module load R
login1$ R

R version 2.15.1 (2012-06-22) -- "Roasted Marshmallows"
Copyright (C) 2012 The R Foundation for Statistical Computing
ISBN 3-900051-07-0
Platform: x86_64-unknown-linux-gnu (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

  Natural language support but running in an English locale

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

>
```

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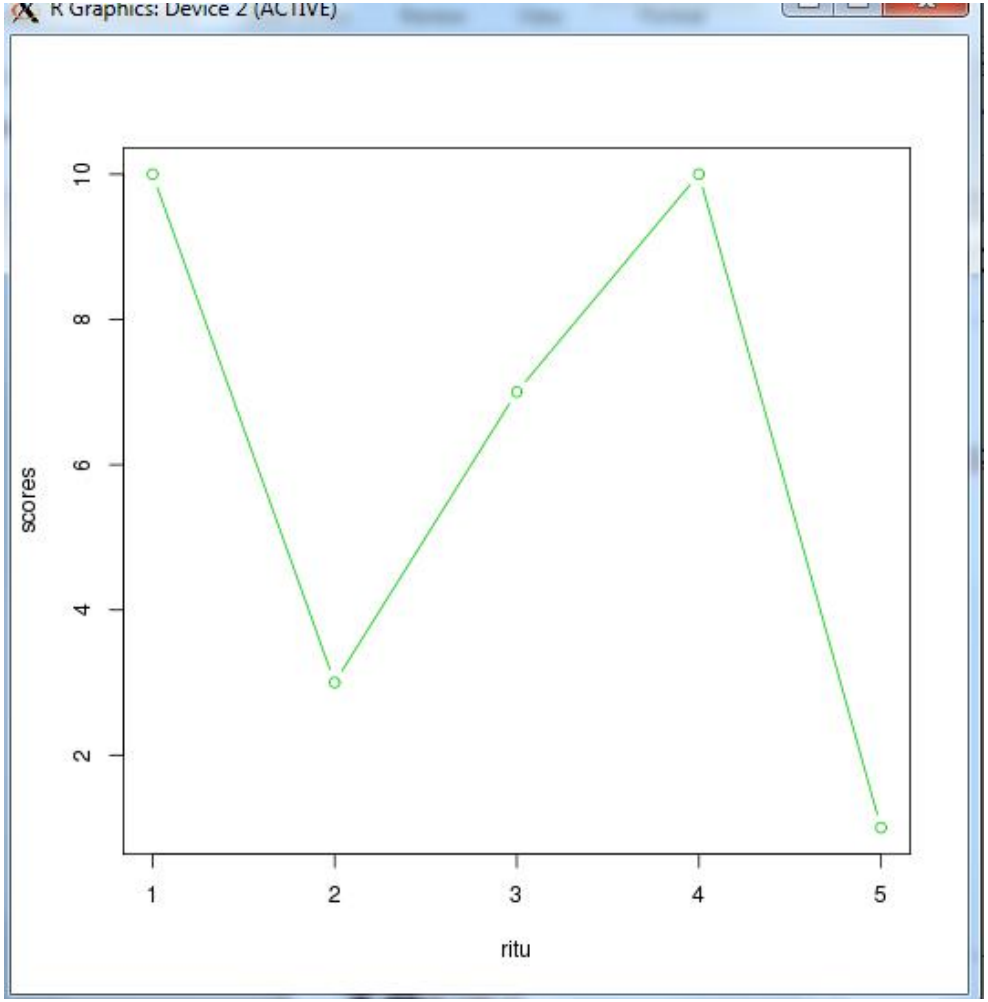
Examples of Using R for Statistical Analysis

- R consists of ready-to-use smaller programs (functions basically)

```
> ritu=c(1,2,3,4,5)
> sum(ritu)
[1] 15
> mean(ritu)
[1] 3
> min(ritu)
[1] 1
> max(ritu)
[1] 5
> range(ritu)
[1] 1 5
```

Example of Using R for Plotting Graphs

```
> ritu=c(1,2,3,4,5)
> scores=c(10,3,7,10,1)
> plot(scores~ritu,typ="b",col=3)
```



Examples of using R as a Calculator

- You can do calculations directly at the command prompt

```
> 1+2
[1] 3
> 2-1
[1] 1
> log2(2)
[1] 1
> 2^-1
[1] 0.5
>
```

Variables in R

- You can create string, numeric or logical variables in R
- You can either use “=” or “<-” for assigning values to the variables
- By assigning multiple values to a variable, you can create a vector! You can use the c() or seq()

```
> vec1=c(1,2,3,4,5)
> vec2=seq(2:6)
> vec2
[1] 1 2 3 4 5
> vec1
[1] 1 2 3 4 5
```

Some Examples of Operations on Vectors

```
> vec2
[1] 1 2 3 4 5
> vec2+2
[1] 3 4 5 6 7
> vec2*3
[1]  3  6  9 12 15
> vec2^2
[1]  1  4  9 16 25
> 2^vec2
[1]  2  4  8 16 32
> sort(vec2, decreasing=T)
[1] 5 4 3 2 1
> vec2[3]
[1] 3
```

Examples on Creating and Using Matrices

```
> vec1
[1] 1 2 3 4 5
> vec2
[1] 1 2 3 4 5
> m1=cbind(vec1, vec2)
> m1
     vec1 vec2
[1,]    1    1
[2,]    2    2
[3,]    3    3
[4,]    4    4
[5,]    5    5
> t(m1)
     [,1] [,2] [,3] [,4] [,5]
vec1    1    2    3    4    5
vec2    1    2    3    4    5
```

References

- http://bio.fsu.edu/miller/docs/Tutorials/Tutorial5_IntroProgramming.pdf
- https://www.tacc.utexas.edu/c/document_library/get_file?uuid=2730b001-0036-4c28-9f31-52169dddeb6a&groupId=13601
- http://www.statmethods.net/management/functions.html
- http://math.illinoisstate.edu/dhkim/rstuff/rtutor.html

Reviewing Python Programming Language

What is Python

- A space-sensitive scripting language that is becoming popular amongst computational scientists
  - variable declaration is not mandatory
  - simple and easy to use syntax
  - easy creation of GUIs
  - merges simulation and visualization

- Commonly used for connecting existing program components that could be written in other high-level programming languages

- Would not recommend if you are likely to change your code after writing it once, if the application is memory-intensive, you need to have a control on low-level data structures

Python Syntax

- Write python programs in a text editor and save the file with the extension .py

- Python programs can be given the location of python as their first line to make them executable

```
#!/usr/bin/python
```

- Python programs can also be run from a command prompt by typing

```
python <file>.py
```

- There are no braces or semicolons in python and blocks are identified by the indentation-level

Python Program Examples

```
#!/usr/bin/env python
print "Hello world"
```

```
#!/usr/bin/env python
import math
r = math.pi / 2.0
s = math.sin(r)
print "Hello world, sin(%f)=%f" % (r,s)
```

References

- http://www.afterhoursprogramming.com/tutorial/Python/Introduction/
- http://www.astro.ufl.edu/~warner/prog/python.html