

Empowering Users By Creating Data Visualization Applications In R/Shiny

Sudhir Singh, Pharmacyclics
Brian Munneke, Pharmacyclics
Amulya Bista, Pharmacyclics
Jeff Cai, Pharmacyclics

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Agenda

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- ▶ Understanding your user
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- ▶ Demo
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Introduction

- ▶ Need for real time data analysis and visualization by statisticians, clinical data managers and clinical scientists.
- ▶ Tableau/JReview/SAS Visual Analytics and others.
- ▶ R + Shiny helps us develop scalable simple web based data applications that can access the data in real time.

R+Shiny

- ▶ R is a programming language and software environment for statistical computing and graphics supported by the R Foundation for Statistical Computing.
- ▶ Shiny is a web application framework for R developed by RStudio that allows creating simple-to-use web application with dynamic data filters and real-time exploratory analysis (RStudio, Inc).
- ▶ Shiny allows users to integrate additional R packages, JavaScript and CSS into the backend program for any customization.

Setup

- ▶ Linux Server.
- ▶ Install R and Shiny packages.
- ▶ Useful R libraries like ggplot2, outliers, mvoutlier, reshape2, DT, rCharts, sas7bdat, dplyr and Hmisc .
- ▶ Rstudio for development and testing.
- ▶ Samba software to access windows files.
- ▶ Web Browser like (IE,Chrome) to access the application.

Understanding Your User

▶ Clinical Data Managers

- The primary Shiny application to be discussed, concerns a package of tools for data cleaning and review, specifically, when most of the variables under review are continuous rather than discrete.

▶ Statisticians

- Another example is a Shiny application that was designed for biostatisticians to provide exact inference, estimates and confidence intervals, for a Simon two-stage phase 2 clinical trial design that has had unplanned modifications in the stage 2 size resulting from either over or under enrollment.

▶ Medical monitor/Clinical Operation

- Our final example application was designed to assist the medical monitors in understanding the success criteria for hypotheses based on binomial endpoints.

Designing Your Application

Disclaimer

- ▶ All data used for demo is dummy and does not belong to any clinical trials.

Demo

- ▶ <http://10.10.10.218:3838/ShinyTest/>

Application 3

- ▶ The Simon two stage application allows the user to explore all possible two stage designs meeting the 4 design constraints.
- ▶ Multiple tab layout that provides a table of all two stage futility design meeting the four specified constraints:
 - 1. Type 1 error ,
 - 2. Type 2 error ,
 - 3. The response rate under the null hypothesis (an ineffective response rate), and
 - 4. The response rate of a successful drug candidate in the region of the alternate hypothesis.

Application 3

- ▶ A table of the optimal and minimax Simon two stage designs are provided from all candidate designs, and another tab provides an exact confidence interval for any specified design days, allowing for modifications in stage 2 enrollment.

Application 3

Simon design explorer

127.0.0.1:6305

Simon design inputs | All two stage designs | Distribution of Simon design | Two-stage futility design exact lower confidence bound

All two stage designs meeting specified criteria

Show 10 entries

Search:

	nt	n1	r1	r	actual.beta	power	actual.alpha	prob.stop.early	expect.ss
266	17	4	0	6	0.1974	0.8026	0.0348	0.4096	11.6752
268	17	5	0	6	0.1783	0.8217	0.0364	0.3277	13.0678
271	17	6	0	6	0.1704	0.8296	0.0371	0.2621	14.1164
274	17	7	0	6	0.1675	0.8325	0.0375	0.2097	14.9028
275	17	7	1	6	0.1881	0.8119	0.0351	0.5767	11.2328
277	17	8	0	6	0.1665	0.8335	0.0376	0.1678	15.4901
278	17	8	1	6	0.1744	0.8256	0.0366	0.5033	12.4702
281	17	9	0	6	0.1662	0.8338	0.0377	0.1342	15.9263
282	17	9	1	6	0.1688	0.8312	0.0373	0.4362	13.5103
283	17	9	2	6	0.1943	0.8057	0.0341	0.7382	11.0944

Showing 1 to 10 of 1,288 entries

Previous 1 2 3 4 5 ... 129 Next

Simon two stage optimal design

	nt	n1	r1	r	actual.beta	power	actual.alpha	prob.stop.early	expect.ss
338	18	8	2	6	0.1995	0.8005	0.0394	0.7969	10.0308

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Conclusion

- ▶ You can build great visualization applications using R & Shiny.
 - Quickly visualize the data , identify outliers and review other data of interest without requesting statistical programmers.
- ▶ You do not need to spend a lot of money.
 - Cost of maintaining this application is very less.
 - All the codes reside within the company server. Any changes or update can be done quickly.
- ▶ Build better application to bring data to life.

Name: Brian Munneke
Organization: Pharmacyclics LLC
Address: 999 East Arques Ave
City, State ZIP: Sunnyvale, CA 94085

E-mail: bmunneke@pcyc.com