



Article from

## **Predictive Analytics and Futurism**

April 2018

Issue 17

# Shiny: Another Step Forward in Data Democratization

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## RSTUDIO AND SHINY

Years ago, RStudio gave the R user community a better way to interact with R than the R graphical user interface (GUI). There were and are other GUIs available, but RStudio combines so many features that it's been a no-brainer for our team and countless others: project files, visual folder structures, seamless connection to CRAN repositories, easy update of R and package versions, integration with Markdown and Sweave, a customizable interface including plot and help features, history and environment maps, and seamless integration with Git and GitHub.

Through that easy-to-use interface, with a little writing of code, RStudio let us connect with our data in a transparent way—pull it in, analyze it, visualize it, fit models to it, make predictions, validate our models, save our scripts, and easily document which scripts were important, what they did, and what the results were.

In a nutshell, it let us be *real* data scientists, with an emphasis on enabling that gold standard: reproducible research.

With all that RStudio has let us streamline, it still requires that users know how to code in order to learn from data.

In comes Shiny, the next step in democratization of data science from the makers of RStudio.

What is Shiny? It is an R package described as “a web application framework for R.” In short, Shiny lets those of us who know how to code create user-friendly interfaces to share with our friends who would rather not. It comes with some samples to get you started, and as you would expect for an R package, and anything from RStudio, it has a great user community for support and ideas.

## OUR FIRST PAF SECTION WEB APPLICATION

Rather than simply tell you how great Shiny is (I promise I'm not being paid by RStudio for this), I wanted to show you. I'm

using as a guinea pig the newly minted *Predictive Analytics and Futurism (PAF) Newsletter* Catalogue. The catalogue is here <https://www.soa.org/sections/pred-analytics-futurism/index-of-paf-articles.xlsx>. I confess I did some non-reproducible editing of the list in order to make it more fun to play with, so this will not update seamlessly as new articles are added to the index. I'll save that for a future iteration. I have also supplemented the catalogue with some metadata pulled for more recent articles by the Society of Actuaries (SOA) staff.

I created a Shiny app to visualize what our section members have been writing about for the past nine years. I built in three features—a histogram to display frequencies by author, newsletter edition, topic, etc.; a word cloud to visualize the relative frequency of various keywords; and a table to allow sorting, filtering to a single author or edition, and searching by text string.

Then, to give my application its first important use, I used the features to make sure I wasn't writing a repeat of a prior *PAF Newsletter* article.

Using the word cloud (Figure 1), I got a handle on what the biggest topics have been. Visualization tools certainly haven't made a huge splash to date.

Using the search function on the data table (Figures 2 and 3), I can see there have been no mentions of Shiny or Git (with this meaning anyway). There are only four mentions of “visual” and eight of “language.” I've put it on my to-do list to go back to those four articles that mention visuals!

Figure 1  
Word Cloud of PAF Article Keywords



Figure 2  
Table of PAF Articles

Date	First	Last	Article	Article.description	Comments	Keywords	Author.email.address	Link.to.Newsletter
2009-09	Dave	Snell	Forecasting & Futurism Newsletter —A New Name and a New Dimension for Our Section	No metadata	Overview of the issue, with editorial on reason for the new name of the section - this was the beginning of the section's reorientation towards predictive analytics (then called forecasting).	No metadata	No metadata	https://www.soa.org/Library/Newsletters/Forecasting-Futurism/2009/September/fn-2009-iss1.pdf
2009-09	Ben	Wolzenski	Introducing the New Forecasting and Futurism Professional Interest Section	No metadata	New mission of the new section	No metadata	No metadata	https://www.soa.org/Library/Newsletters/Forecasting-Futurism/2009/September/fn-2009-iss1.pdf
2009-09	Alan	Mills	Introduction to Forecasting Methods for Actuaries	No metadata	Comparison of various forecasting methods (including predictive modeling)	No metadata	No metadata	https://www.soa.org/Library/Newsletters/Forecasting-Futurism/2009/September/fn-2009-iss1.pdf
2009-09	Scott	McInturff	The Delphi Method	No metadata	Detailed description of Delphi method with an actual case study	No metadata	No metadata	https://www.soa.org/Library/Newsletters/Forecasting-Futurism/2009/September/fn-2009-iss1.pdf
2009-09	Alan	Mills	White, Gray and Black Swans - IDENTIFYING, FORECASTING AND MANAGING MEDICAL EXPENDITURE TREND DRIVERS IN A COMPLEX WORLD	No metadata	Tail events, identifying and predicting them	No metadata	No metadata	https://www.soa.org/Library/Newsletters/Forecasting-Futurism/2009/September/fn-2009-iss1.pdf
2009-09	Dave	Snell	Fortune's Formula: The Untold Story of the Scientific Betting System That Beat the Casinos and Wall Street—by William Poundstone	No metadata	Dangers of implicit belief in mathematical models	No metadata	No metadata	https://www.soa.org/Library/Newsletters/Forecasting-Futurism/2009/September/fn-2009-iss1.pdf
2009-09	Alan	Mills	Should Actuaries Get Another Job? - NASSIM TALEB'S WORK AND ITS SIGNIFICANCE FOR ACTUARIES	No metadata	Why forecasts fail, and how to avoid the classic mistakes	No metadata	No metadata	https://www.soa.org/Library/Newsletters/Forecasting-Futurism/2009/September/fn-2009-iss1.pdf
2010-07	Dave	Snell	Judgmental Methods, Collaboration, Contests and More!	No metadata	Overview of the issue, and editorial on judgmental forecasting methods	No metadata	No metadata	https://www.soa.org/Library/Newsletters/Forecasting-Futurism/2010/July/fn-2010-iss2.pdf
2010-07	Alan	Mills	Want to Win an iPad?	No metadata	Forecasting contest	No metadata	No metadata	https://www.soa.org/Library/Newsletters/Forecasting-Futurism/2010/July/fn-2010-iss2.pdf
2010-07	Alan	Mills	Best Methods and Practices in Judgmental Forecasting	No metadata	Summary of types of bias, and comparison of various judgmental forecasting results	No metadata	No metadata	https://www.soa.org/Library/Newsletters/Forecasting-Futurism/2010/July/fn-2010-iss2.pdf

Figure 3  
Table of PAF Articles Filtered to Show One Article with “Shiny” Mentioned in Comments

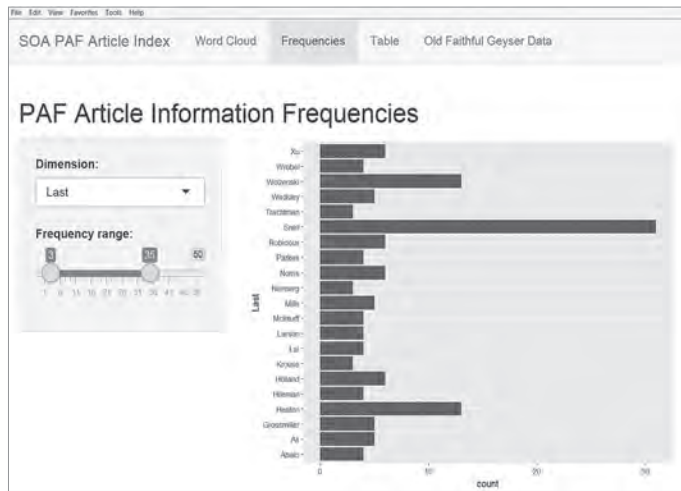
Date	First	Last	Article	Article.description	Comments	Keywords	Author.email.address	Link.to.Newsletter
2013-12	Dave	Snell	Embrace the Future—But Beware the Smug	Introduction to the topics of the issue; and anecdote regarding the value classical versus newer techniques	Essay on the need to keep the classical tool set even though the new complexity tools seem shiny and great	Bayesian methods, Cancer, Futurism, Generalized linear model, Genetic algorithms, Neural networks, Predictive modeling, Risk modeling	Dave@ActuariesAndTechnology.com	https://www.soa.org/Library/Newsletters/Forecasting-Futurism/2013/December/fn-2013-iss3.pdf

The bar plot (Figure 4, pg. 27) confirmed that Dave Snell is by far our most prolific author; the table can help me discover if he has a particular focus outside of his contributions as our editor.

Could I have found all of these answers in Excel? Absolutely. Ultimately, that’s where the information came from. I love Excel,

but going forward, I won’t be using it to get those answers. With this app I’ll be able to more quickly visualize what’s been written about, when, by whom, and what’s ready for some more attention. I can share the app with my team so they can brainstorm what they’d like to add into the PAF dialogue. If I publish the app to an internal server, I can share it with more senior folks who don’t

Figure 4  
Bar Plot Displaying Distribution of Authorship



know the first thing about R, and they can use it to make suggestions. All of us can use it to identify past articles on topics relevant to our jobs. We've democratized the data on the *PAF Newsletter*.

### HOW TO USE THIS APP AT HOME

With just a few steps you can be up and running in Shiny:

1. Install RStudio if you haven't already.
2. Install the Shiny package in RStudio.
3. Create a new project under File -> new Project, and select Shiny Web Application.
  - a. You may or may not choose to create a Git repository.
4. Click Run App.

What you'll see is a simple interactive application based on Old Faithful geyser data.

If you want to go a few steps further and run *this* Shiny app, you can find it on Milliman's public GitHub account here: [https://github.com/milliman/SOA\\_PAF\\_Section\\_Newsletter\\_Catalogue](https://github.com/milliman/SOA_PAF_Section_Newsletter_Catalogue). The repository contains six key files (plus the standard README.md, LICENSE.txt, and .gitignore):

1. **Keywords.csv**. A list of the keywords referenced in the metadata for the more recent articles

2. **PAFCatalogueComplete.csv**. An augmented table based on the PAF catalogue referenced above
3. **loaddata.R**. An R script that loads the keywords and the article catalogue
4. **server.R**. Code for doing analysis and returning a figure or table
5. **ui.R**. Code for structuring the user interface
6. **SOA\_PAF\_Section\_Newsletter\_Catalogue.Rproj**. The R project file that holds it all together

You'll notice this app contains the same Old Faithful geyser feature as the default Shiny app. I kept it in the app to show how easily you can switch to a layout that has a navigation bar to flip between multiple features.

### NEXT STEPS

While newsletter data makes for a useful jumping-off point, there are clearly more compelling applications for actuaries with access to large data sets and related business questions. It helps to start with a question and an idea for what data visualizations will help you answer it, but you don't have to come up with all of the ideas yourself.

[Shiny.rstudio.com/gallery](https://shiny.rstudio.com/gallery) is a good place to go to see what other users are doing with Shiny. It pointed me to the word cloud as a good option for immediately seeing frequently addressed topics. It can give you some great ideas for graphs, maps, tables, dynamic input options and layouts.

If you get really into it and want to share your work, [Shinyapps.io](https://shinyapps.io) is there for you. For a richer experience, I recommend engaging with the broader R user community. I recently attended an R user group meeting in Seattle dedicated solely to sharing web applications built with Shiny. My team has been building Shiny apps for years, and I still came away with new ideas.

There is nearly no end to how sophisticated you can go, or how many data-based insights you can offer those using your applications. ■



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