

R Shiny for Interactive Data Visualization: A Case Study



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Global Patent Explorer

The ShinyApp visualizes data on over 8 million patents published between 1980 and 2016.

D.S. Hain, R. Jurowetzki, T. Buchmann, P. Wolf (2018), A Vector Worth a Thousand Counts: A Temporal Semantic Similarity Approach to Patent Impact Prediction

Patent quality indicator: Future similarity based on technological distance computed using natural language processing

The app is a winner of the first IPSDM “Big Data Analytics” Challenge (2018)



UNIVERSITÄT
HOHENHEIM



EUIPO
EUROPEAN UNION
INTELLECTUAL PROPERTY OFFICE

Beaufort Sea



Shiny is an open source package for R

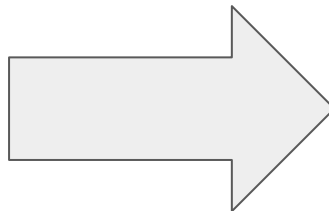


```
library(shiny)

ui <- fluidPage(
  ...
)

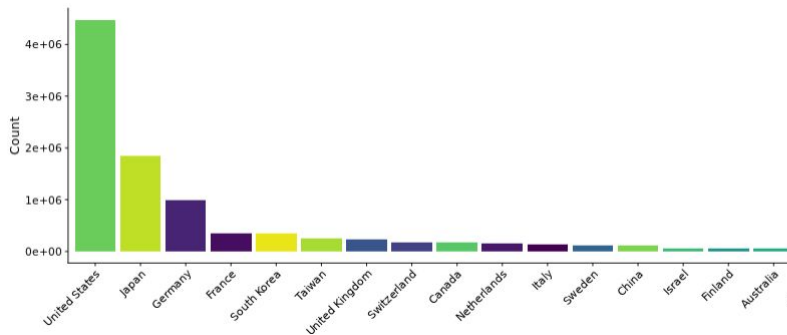
server <- function(input, output) {
  ...
}

shinyApp(ui, server)
```



Interactive visualizations with HTML widgets

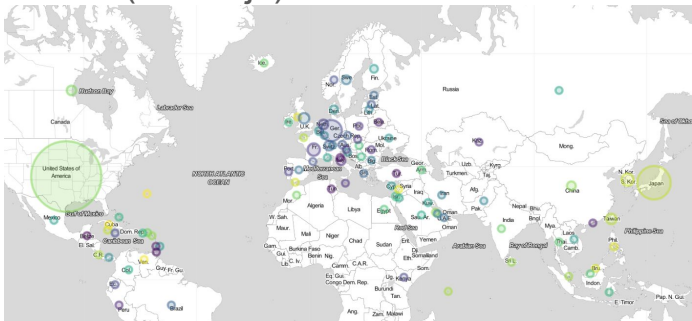
ggplot2 + ggiraph / plotly (plotly.js)



visNetwork (vis.js)



Leaflet (leaflet.js)



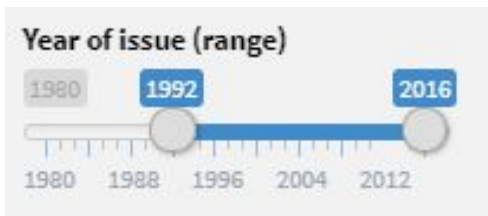
DT (datatables jquery plug-in)

Show 25 entries

Country	Count	Radicalness	Similarity all	Similarity past	Similarity present	Similarity future
Australia	51448	0.34	0.25	0.08	0.1	0.08
Austria	41015	0.34	0.2	0.06	0.09	0.06
Belgium	45308	0.34	0.32	0.06	0.15	0.07
Bermuda	5726	0.45	0.39	0.15	0.13	0.14
Brazil	6632	0.37	0.25	0.06	0.14	0.07
Canada	165827	0.39	0.31	0.09	0.13	0.1
Cayman Islands	6347	0.28	0.34	0.13	0.14	0.11
China	113866	0.35	0.41	0.12	0.22	0.1
Denmark	39408	0.34	0.26	0.07	0.12	0.07
Finland	61516	0.37	0.26	0.06	0.13	0.08
France	354405	0.32	0.21	0.06	0.1	0.06
Germany	988182	0.33	0.2	0.06	0.09	0.06
India	22054	0.34	0.29	0.1	0.12	0.09
Ireland	12722	0.37	0.3	0.09	0.14	0.09

Reactivity: Input and outputs are linked

1 User changes an input value



2 Dependent reactive values are invalidated and recalculated

Country	Count	Radicalness	Similarity all	Similarity past	Similarity present	Similarity future	Originality	Generality
Australia	46567	0.35	0.26		0.1	0.09	0.68	0.35
Austria	36825	0.34	0.2	0.06	0.09	0.06	0.66	0.23
Belgium	41810	0.34	0.33	0.08	0.09	0.07	0.68	0.29
Bermude	5713	0.45	0.3	0.15		0.14	0.76	0.4
Brazil	6293	0.37	0.2	0.06		0.07	0.65	0.24
Canada	148148	0.39	0.32	0.09	0.14	0.1	0.7	0.37
Cayman Islands	6288	0.28	0.34	0.13	0.14	0.11	0.65	0.29
China	113991	0.35	0.4	0.12		0.1	0.66	0.27
Denmark	36876	0.34	0.26	0.07		0.08	0.69	0.3
Finland	58224	0.37	0.26	0.06		0.08	0.72	0.32
France	292341	0.33	0.22	0.06	0.11	0.06	0.66	0.23
Germany	812794	0.34	0.2		0.09	0.06	0.67	0.24
India	21969	0.34	0.29	0.1	0.12	0.09	0.65	0.27

3 Updated output object is shown



It's easy to get data into Shiny

Bundle with the app



readr, readxl



RDS



$\leq 500\text{mb}$

Little/no data modification

Faster

No database needed

Connect a database



NoSQL



DBI, pool, RMySQL etc.



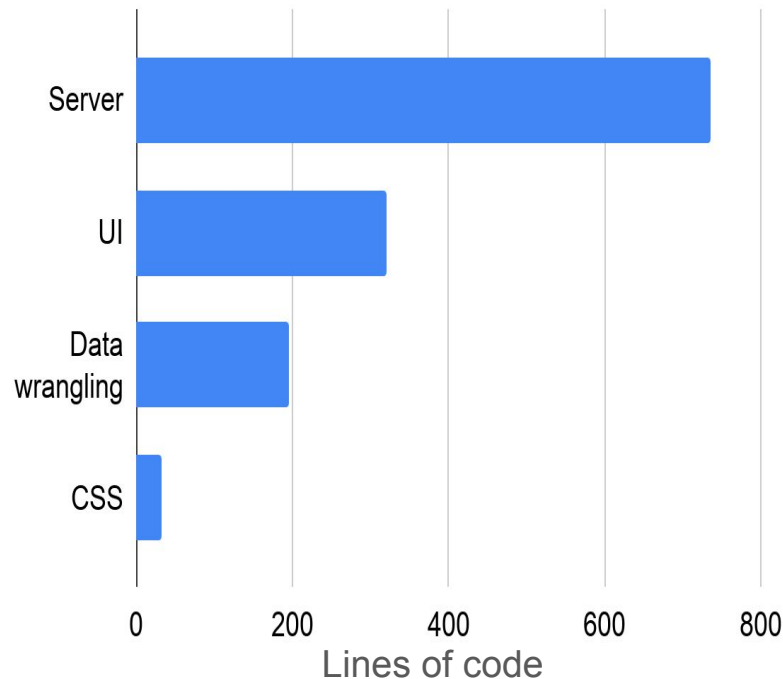
Any amount of data

Modify in-app or from outside

Shiny is great for rapid development

Global Patent Explorer took me
~ 80 hours

- Data: networks, dates, geolocations
- Visualizations: map, network, graphs
- Simple user interface
- Little customization of CSS (use Bootstrap theme)
- No formal unit testing or performance profiling



There are many ways to get a ShinyApp online

Hosting	Cost	Ease of use	Main advantages
shinyapps.io	Free, up to \$299/mo	Easy	Scaleable Ease of use
AWS + Shiny Server Open Source/Pro	AWS EC2 from \$9.50/mo Shiny Server Community is free, Pro is \$9995/yr	Medium	Customizability Independence
RStudio Connect	From \$14995/yr	Easy	Data science platform for teams
Offline (Electron)	Free	Feature in beta	Deploy on desktop

When to use Shiny (and when not to)

Use it if you...

- use R
- need statistical packages
- like free software
- want to develop rapidly
- need server side interactivity
(otherwise R Markdown + Crosstalk is enough)

Don't use it if you...

- use Python (use Dash)
- need maximum flexibility
(write your own JavaScript)
- need to scale to 1000+ users
- Prefer to build with a graphical user interface

Thank you!

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Global Patent Explorer: gpxp.org

Learn about Shiny: shiny.rstudio.com