Logging and Analyzing Events in Complex Shiny Apps

with **shinyEventLogger**

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UseR! - Toulouse - 2019

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Why to log?

Why to log?

- logging in development:
  - shows which events are firing (or not)
  - shows in what sequence events are firing
  - shows why events fired & within what context
  - helps with **debugging & development**
- logging in production:
  - shows how users use the app
  - helps to see usage patterns
  - helps with app **evaluation & optimization**

What do we need?

What do we need?

- logging tool **dedicated to** complex **shiny apps**
- ability to see most recent events in **real-time**
- quick & easy **access** to eventlogs
- **permanent storage** for eventlogs
- tools to **analyse** the eventlogs

shinyEventLogger

R Package for Logging Events in Complex Shiny Apps

What type of events to log?

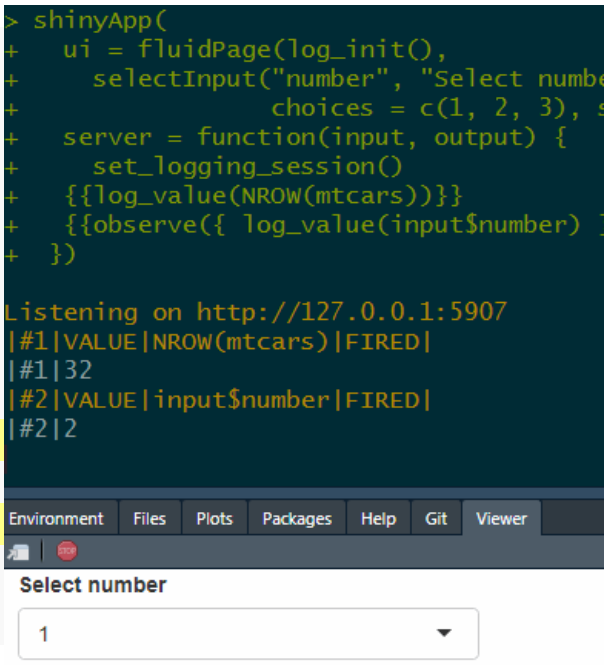
Logging **generic events**

```
library(shiny)
library(shinyEventLogger)
set_logging()
shinyApp(
  ui = fluidPage(log_init()),
  server = function(input, output) {
    set_logging_session()
    log_event("Event body", name = "Event name")
    log_event("Event without explicit name")
    x <- "123"
    log_event("Event", x)
  }
)
```

```
|#1|EVENT|Event name|FIRED|
|#1|Event body
|#2|EVENT|Event without explicit name|FIRED|
|#3|EVENT|Event 123|FIRED|
```


Logging **values**

```
set_logging()
shinyApp(
  ui = fluidPage(log_init(),
    selectInput("number",
                "Select number",
                choices = c(1, 2, 3),
                selected = 2)),
  server = function(input, output) {
    set_logging_session()
    log_value(NROW(mtcars))
  observe({
     log_value(input$number)
  })
 })
```




```
|#1|VALUE|NROW(mtcars)|FIRED|
|#1|32
|#2|VALUE|input$number|FIRED|
|#2|2
```

Logging function **outputs**

```
set_logging()
shinyApp(
  ui = fluidPage(log_init()),
  server = function(input, output) {
    set_logging_session()
   log_output(head(mtcars, 2))
   log_output(str(mtcars[, 1:3]))
 })
```

```
|#1|OUTPUT|head(mtcars, 2)|FIRED|
|#1|               mpg cyl disp  hp drat    wt  qsec vs am gear carb
|#1|Mazda RX4        21   6  160 110  3.9 2.620 16.46  0  1    4    4
|#1|Mazda RX4 Wag    21   6  160 110  3.9 2.875 17.02  0  1    4    4
|#2|OUTPUT|str(mtcars[, 1:3])|FIRED|
|#2|'data.frame':    32 obs. of  3 variables:
|#2| $ mpg : num  21 21 22.8 21.4 18.7 18.1 14.3 24.4 22.8 19.2 ...
|#2| $ cyl : num  6 6 4 6 8 6 8 4 4 6 ...
|#2| $ disp: num  160 160 108 258 360 ...
```


Logging outcomes of **unit tests**

```
set_logging()
shinyApp(
  ui = fluidPage(log_init()),
  server = function(input, output) {
    set_logging_session()
   log_test(testthat::expect_true(TRUE))
   log_test(testthat::expect_true(FALSE))
 })
```

```
|#1|TEST|testthat::expect_true(TRUE)|SUCCESS|
|#2|TEST|testthat::expect_true(FALSE)|ERROR|
|#2|Error: FALSE isn't true.
```

Logging traditional **diagnostic messages**

```
set_logging()
shinyApp(
  ui = fluidPage(log_init()),
  server = function(input, output) {
    set_logging_session()
   log_message("Example of a message")
   log_warning("Example of a warning")
   log_error("Example of an error")
 })
```

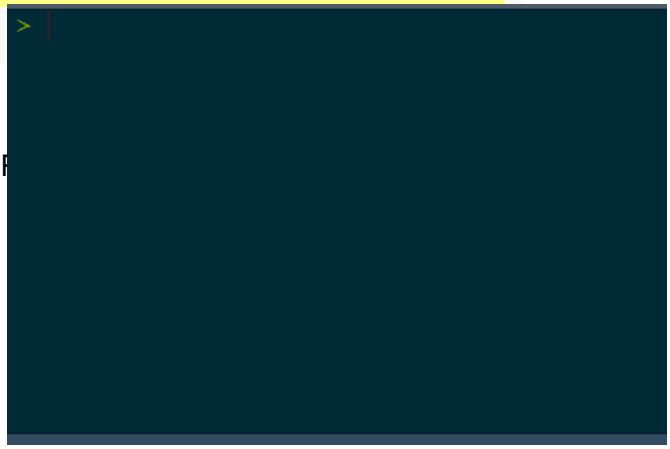
```
|#1|MESSAGE|Example of a message|FIRED|
Example of a message
|#2|WARNING|Example of a warning|FIRED|
Warning in log_warning("Example of a warning") : Example of a warning
|#3|ERROR|Example of an error|FIRED|
Warning: Error in log_error: Example of an error
  52: stop
```


Timing events

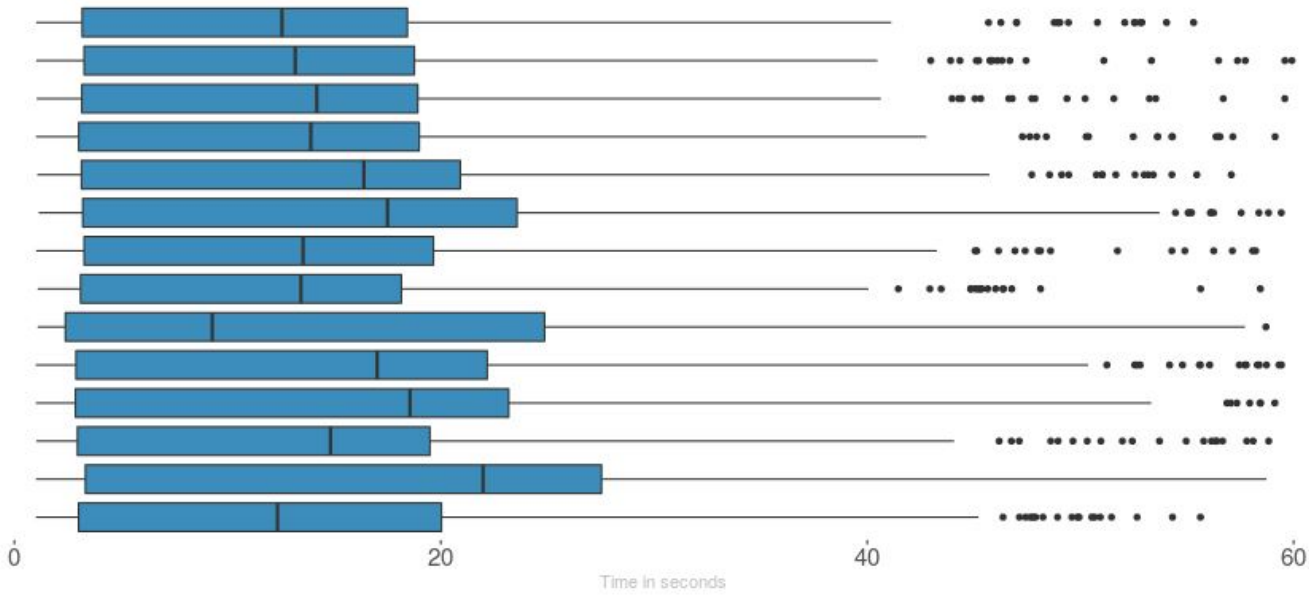
Logging & **timing events**

```
shinyApp(
  ui = shiny::fluidPage(log_init()),
  server = function(input, output) {
    set_logging_session()
    log_started("Event 1")
      log_event("Sleeping for 3 secs...")
      Sys.sleep(3)
    log_done("Event 1")
 })
```

```
|#1|EVENT|Event 1|STARTED|
|#2|EVENT|Sleeping for 3 secs...|FI
|#1|EVENT|Event 1|DONE|
|#1|PARAMS|list(secs = 3)
```



Logging & timing in **parallel R processes**



Logging the context of the events

Logging events with parameters

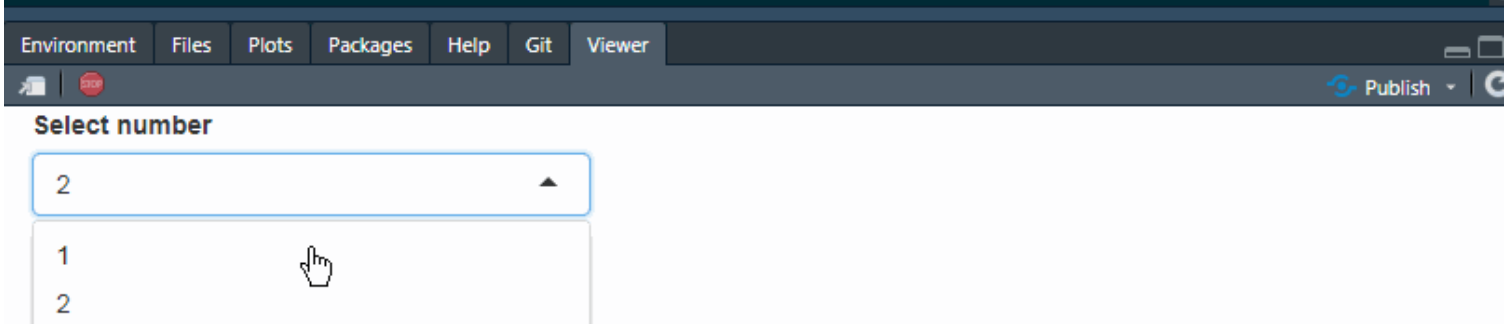
```
set_logging(app = "demo")
shinyApp(
  ui = fluidPage(log_init(),
    selectInput("number", "Select number", choices = c(1, 2))
  server = function(input, output) {
     set_logging_session(unique_id = runif(1))
    observe({
       log_event("number changed",
                 params = list(number = input$number))
})})
```

```
|#1|EVENT|number changed|FIRED|
|#1|PARAMS|list(number = "2", unique_id = 0.104973568115383, app = "d
```

Logging events with parameters

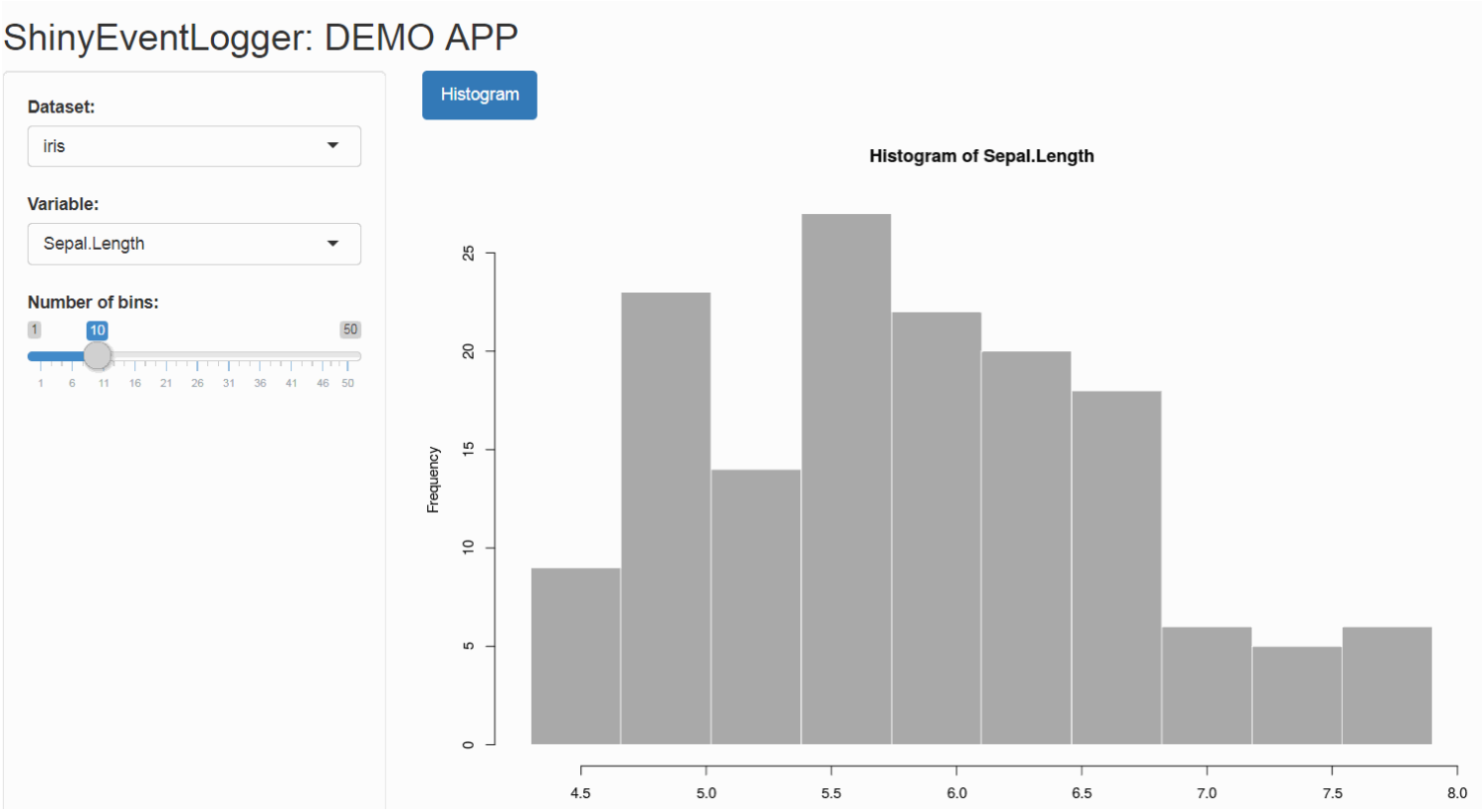
```
+     log_init(),
+     selectInput("number", "Select number", choices = c(1, 2, 3), selected = 2)),
+   server = function(input, output) {
+     {{set_logging_session(unique_id = runif(1))}}
+     observe({
+     {{log_event("number changed", params = list(number = input$number))}}
+     })
+ })

Listening on http://127.0.0.1:7185
|#1|EVENT|number changed|FIRED|
|#1|PARAMS|list(number = "2", unique_id = 0.54154440946877, app = "demo")
```



Where to log?

Demo app with event logging

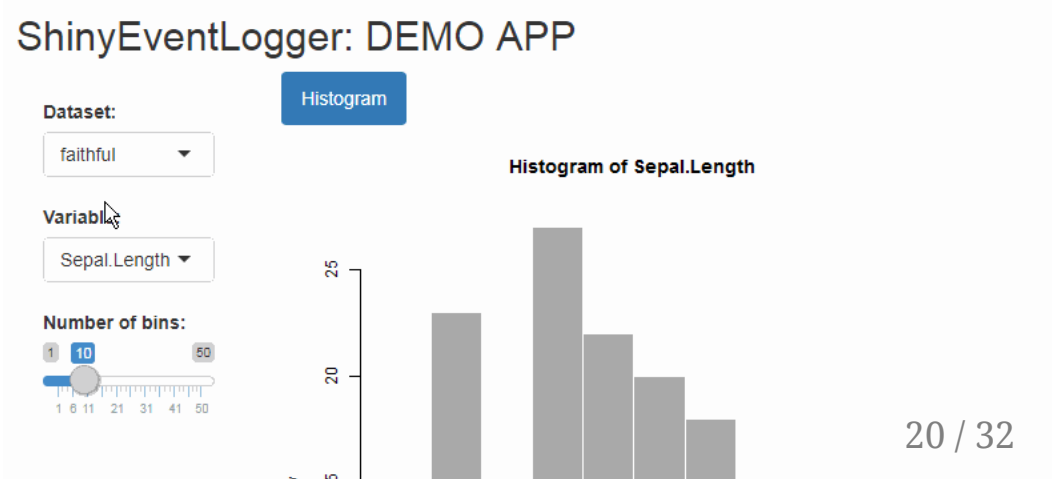


R console

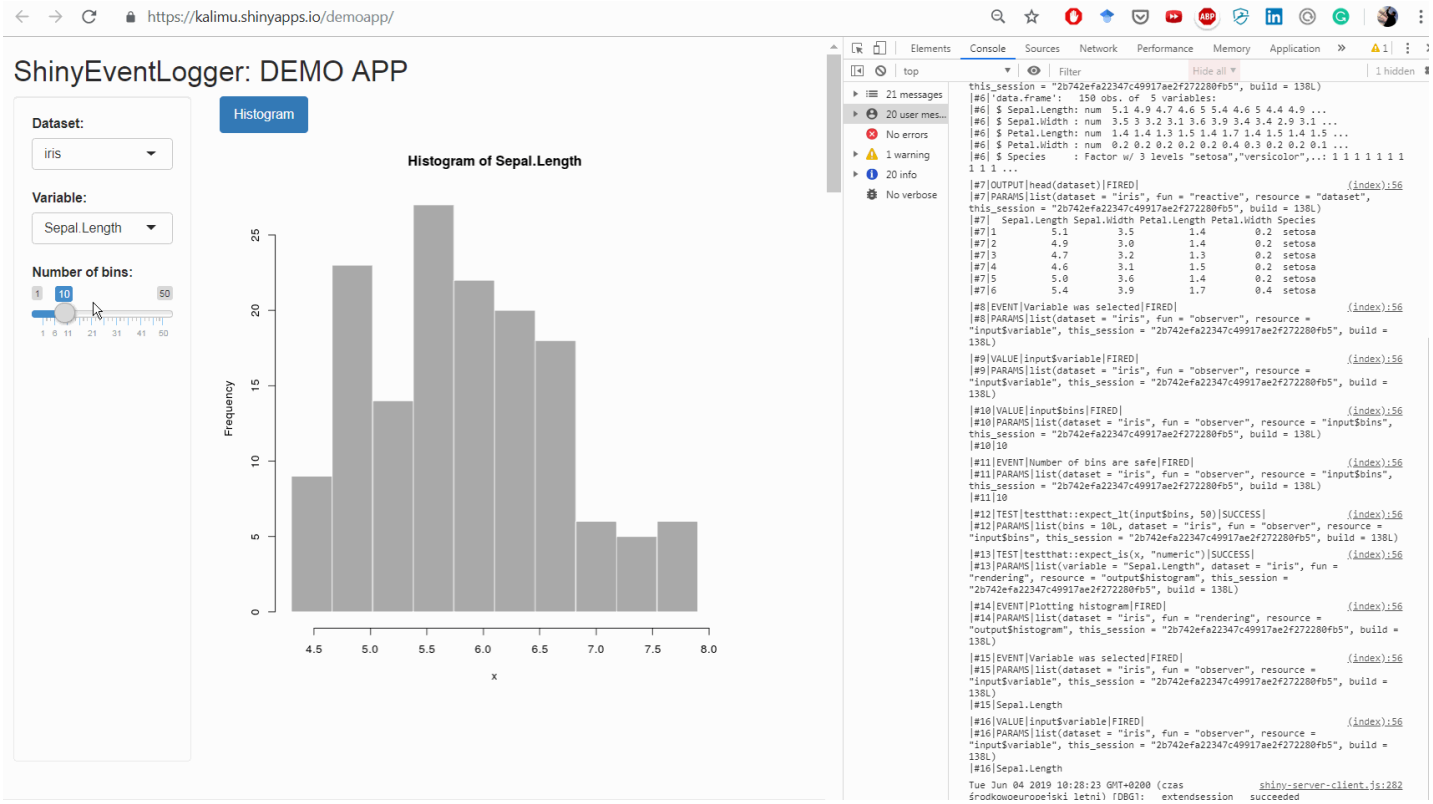
```
|#62|VALUE|input$bins|FIRED|
|#62|PARAMS|list(dataset = "iris", fun = "observer", resource = "input$bins")
|#62|10
|#63|EVENT|Number of bins are safe|FIRED|
|#63|PARAMS|list(dataset = "iris", fun = "observer", resource = "input$bins")
|#63|10
|#64|TEST|testthat::expect_lt(input$bins, 50)|SUCCESS|
|#64|PARAMS|list(bins = 10L, dataset = "iris", fun = "observer", resource = "inpu
t$bins")
|#65|TEST|testthat::expect_is(x, "numeric")|SUCCESS|
|#65|PARAMS|list(variable = "Sepal.Length", dataset = "iris", fun = "rendering",
 resource = "output$histogram")
|#66|EVENT|Plotting histogram|FIRED|
|#66|PARAMS|list(dataset = "iris", fun = "rendering", resource = "output$histogra
m")
|#67|EVENT|Variable was selected|FIRED|
|#67|PARAMS|list(dataset = "iris", fun = "observer", resource = "input$variable")
|#67|Sepal.Length
|#68|VALUE|input$variable|FIRED|
|#68|PARAMS|list(dataset = "iris", fun = "observer", resource = "input$variable")
|#68|Sepal.Length
```

Environment | Files | Plots | Packages | Help | Build | Git | Viewer

Republish

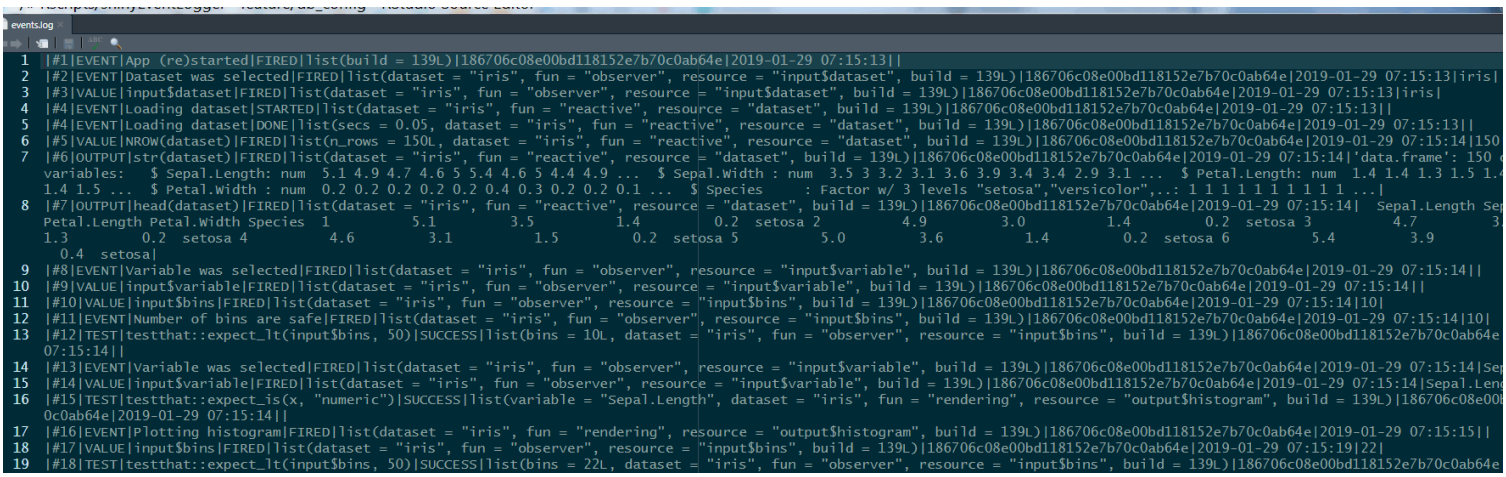


JavaScript console



Text file

```
|#1|EVENT|App (re)started|FIRED|list(build = 139L)|186706c08e00bd1181
|#2|EVENT|Dataset was selected|FIRED|list(dataset = "iris", fun = "ob
|#3|VALUE|input$dataset|FIRED|list(dataset = "iris", fun = "observer"
|#4|EVENT|Loading dataset|STARTED|list(dataset = "iris", fun = "react
|#4|EVENT|Loading dataset|DONE|list(secs = 0.05, dataset = "iris", fu
|#5|VALUE|NROW(dataset)|FIRED|list(n_rows = 150L, dataset = "iris", f
```



MongoDB

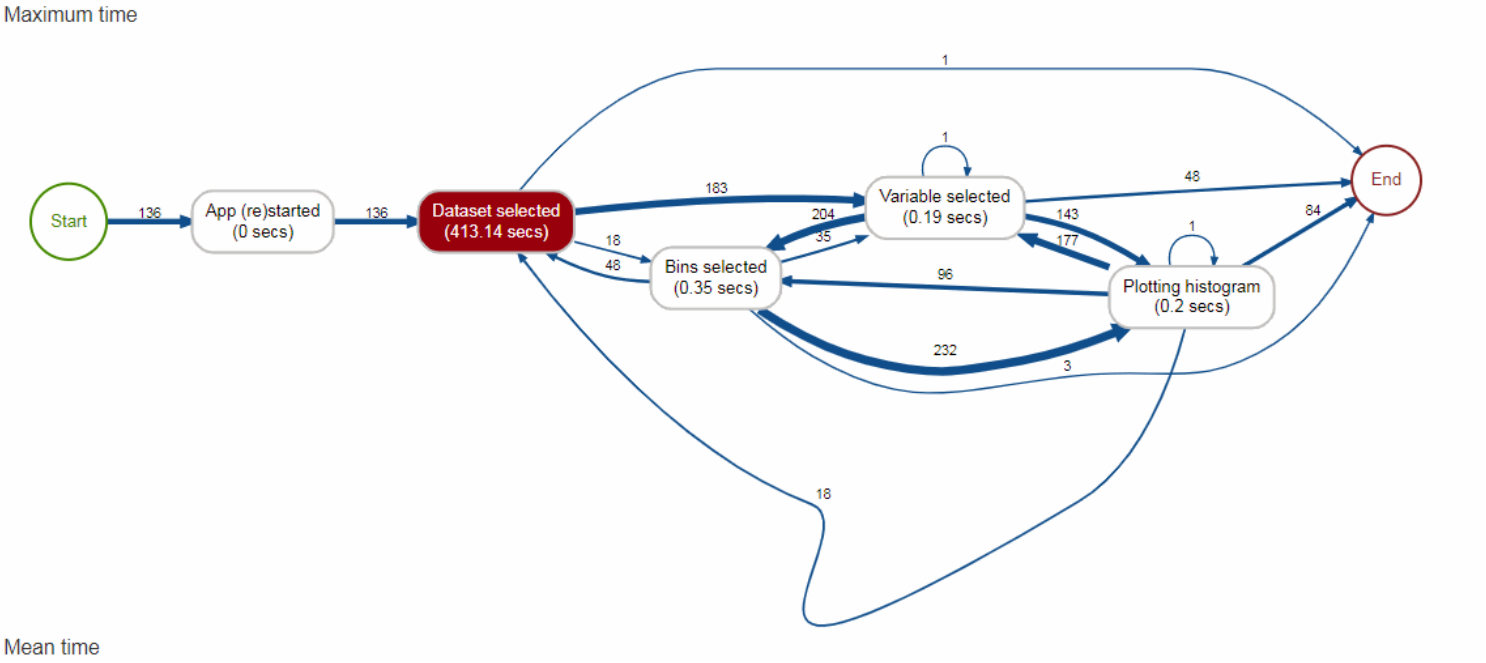

```
_id: ObjectId("5c4ffd81b44fe82424003df8")
event_counter: 2
event_type: "EVENT"
event_name: "Dataset was selected"
event_status: "FIRED"
event_params: Object
  dataset: Array
      0: "iris"
  fun: Array
      0: "observer"
  resource: Array
      0: "input$dataset"
  build: Array
      0: 139
event_body: "iris"
event_timestamp: 2019-01-29T07:15:13.772+00:00
session_id: "186706c08e00bd118152e7b70c0ab64e"
```


How to analyze the eventlog?

with process-mining techniques (bupaR package)

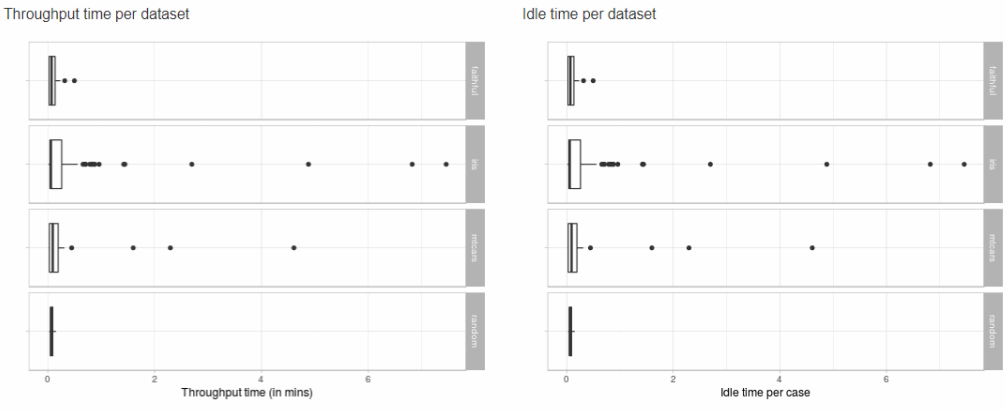
Process maps

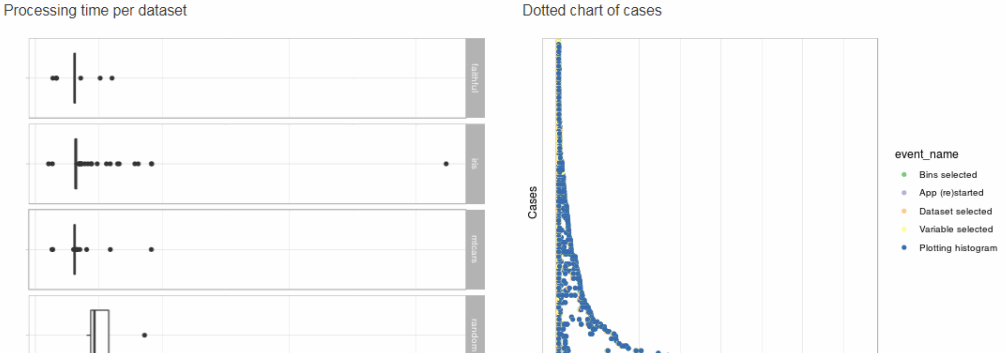
- patterns and paths in end-users behaviors



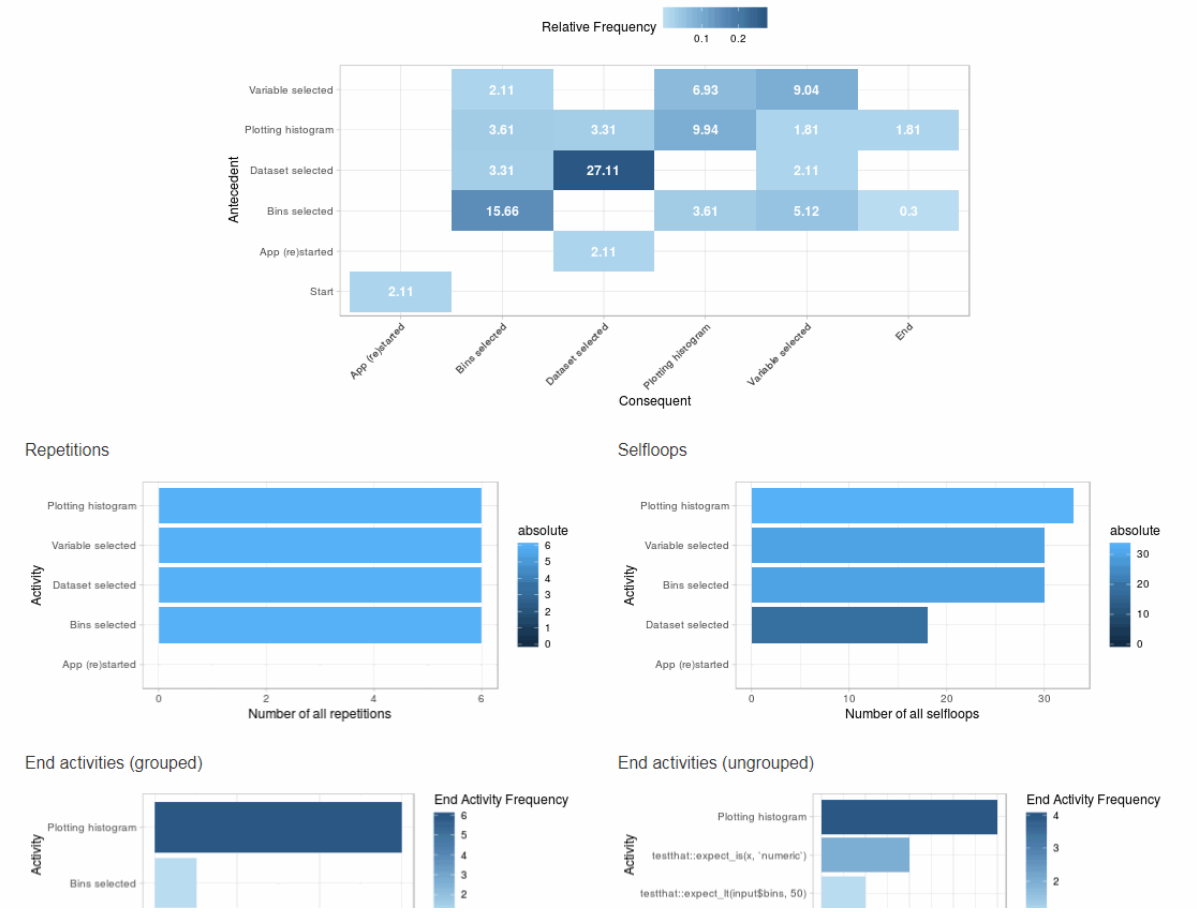
Time analysis

- throughput, idle, and processing time per dataset

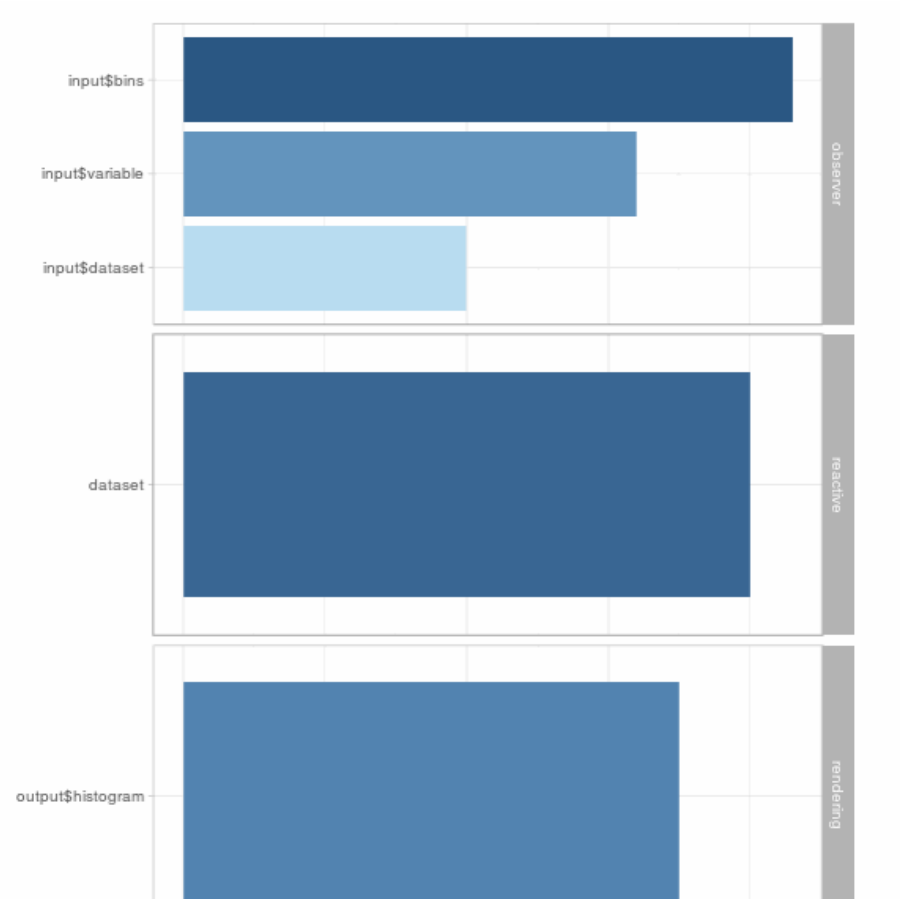




Sequence analysis

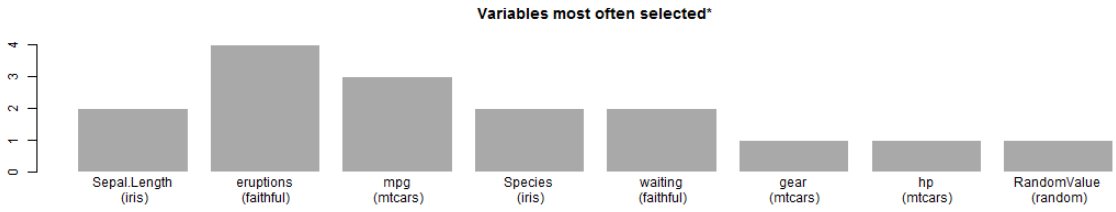


Resource analysis

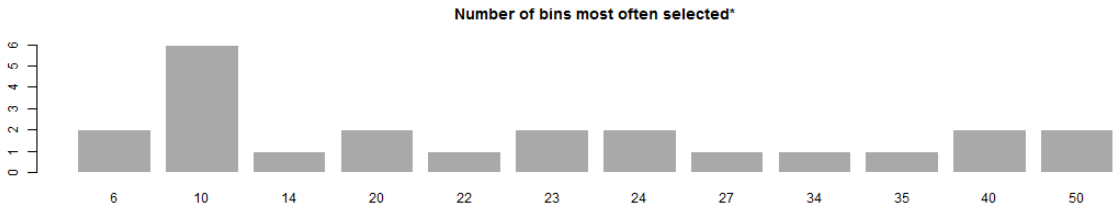


Top users' actions

(*) without iris dataset selected by default



(*) without Sepal.Length selected by default



(*) without 10 bins selected by default

What's next?

Roadmap

- adding catching and logging **unexpected errors**
- adding **JSON** as default serialization format for storing events (also in a file)
- improving integration with **MongoDB**
- adding ability to **show or hide** selected part of event data
- adding a method for dynamically selecting which events should be logged **where and when**
    - permanently to a database **vs.** temporarily to a console
    - during developing & debugging **vs.** in production environment

Thank you!

- github.com/kalimu/shinyEventLogger - package repository
- kalimu.github.io/shinyEventLogger/ - package documentation

Contact:

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