



# WebR

R compiled for WebAssembly and running in the  
browser

George Stagg

RStudio

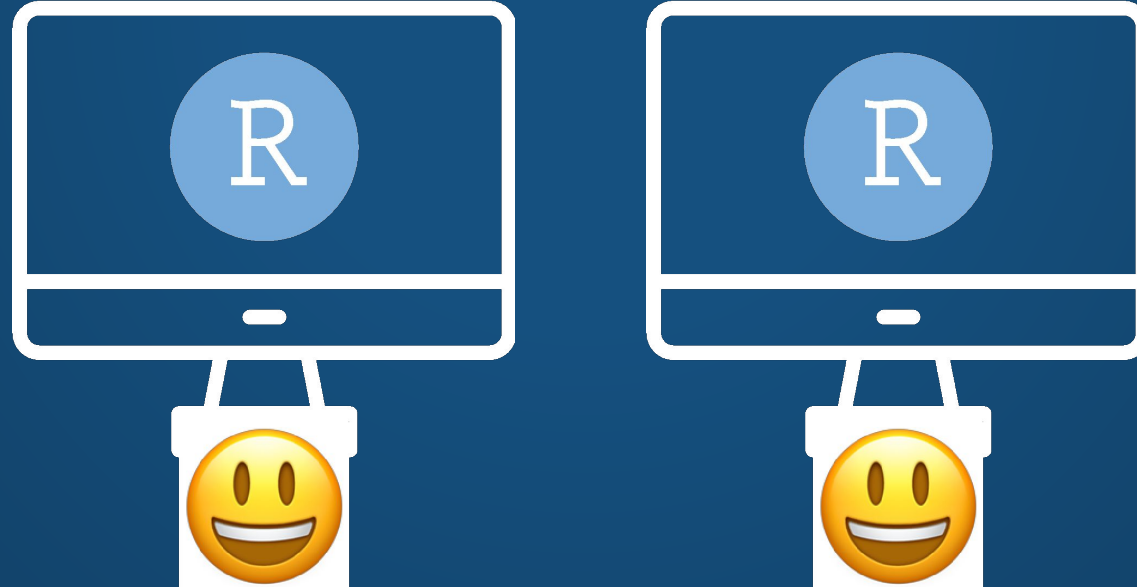
# Why run software in a browser?

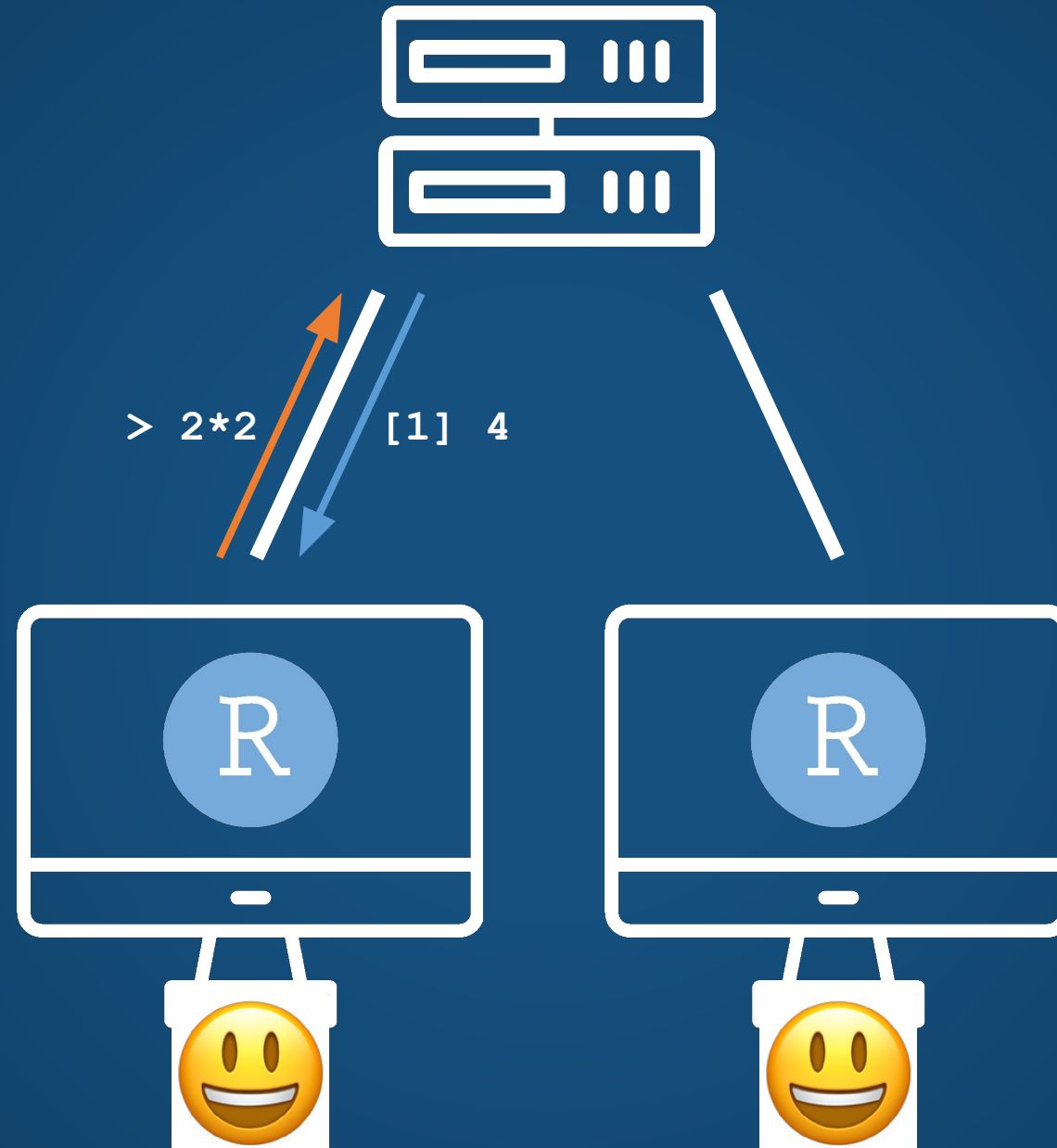
Lots of potential reasons!

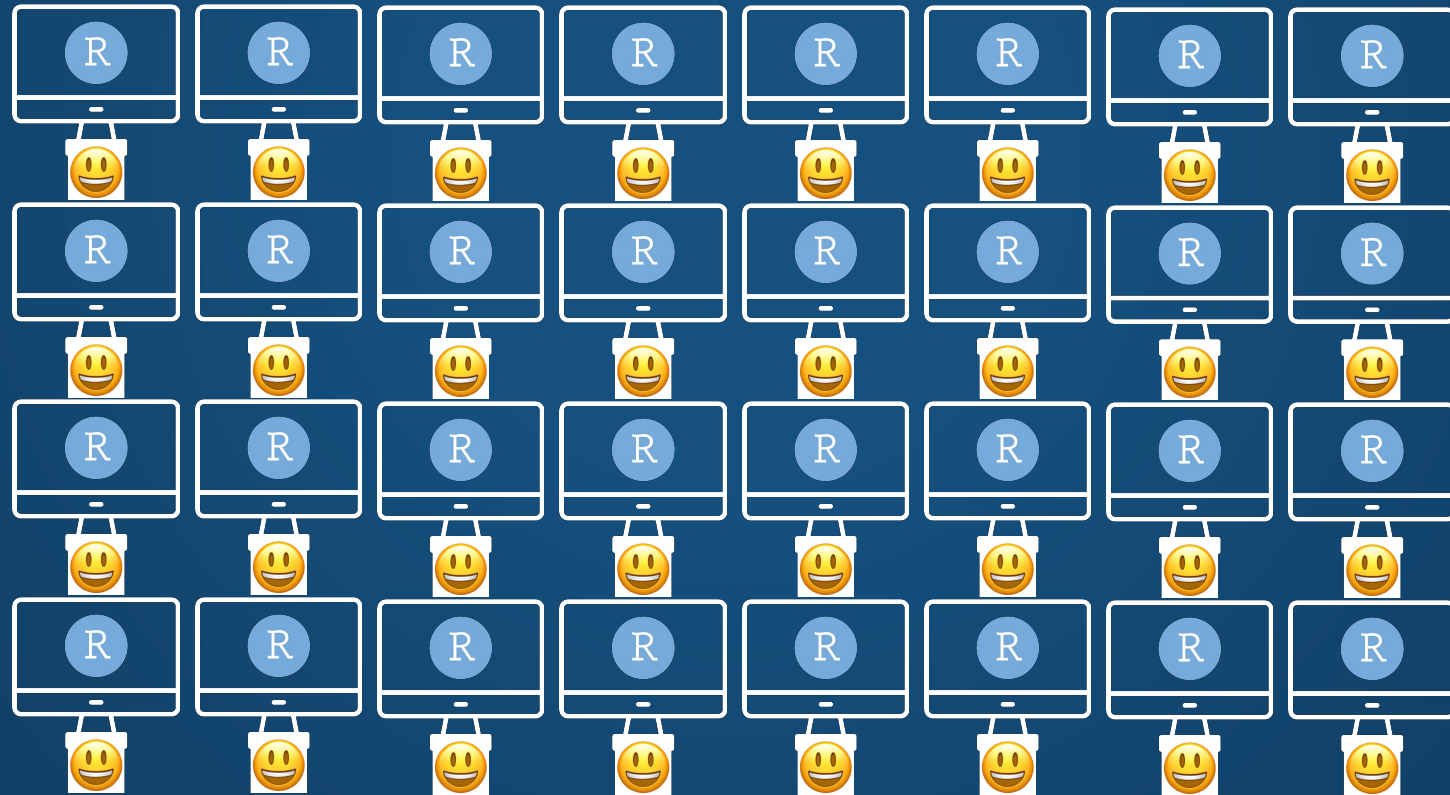
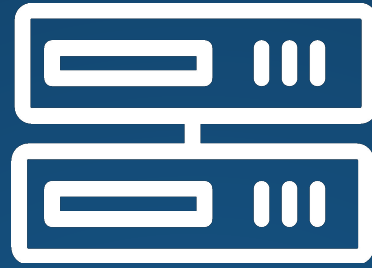
- Containerisation
- Notebook / Jupyter
- Universal binaries
- Sandboxing
- Reproducible output
- Mobile / Tablet development

Let me tell you my own reasons for creating webR...

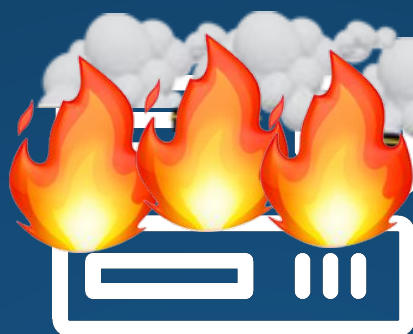
# How can we capture R code and evaluate it on devices outside of our control?



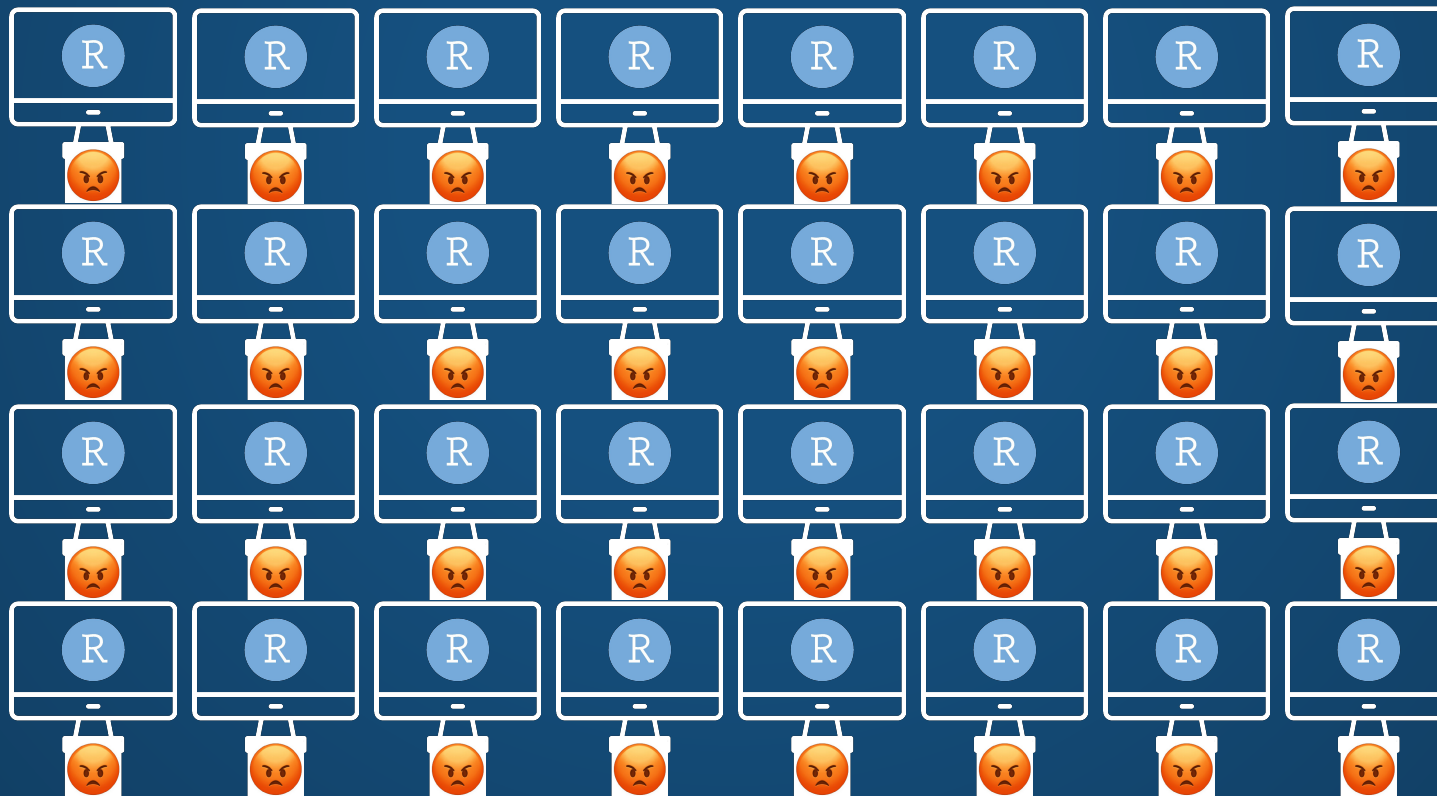




```
> df$prop[100]  
> hist(data)
```



```
> rnorm(10, 20, 5)  
> x^5
```



**Solution: Evaluate the R code locally inside a web browser!**



# WebAssembly (2017)

- Portable binary code format
- Enables high-performance applications on web pages
- Near-native execution speed
- Supported by most modern browsers

The logo consists of a purple square with a white semi-circular notch at the top center. Inside the square, the letters 'WA' are written in a bold, white, sans-serif font. The logo is positioned on the right side of the slide, overlapping a large, faint, light-blue hexagonal shape that serves as a background element.

**WA**

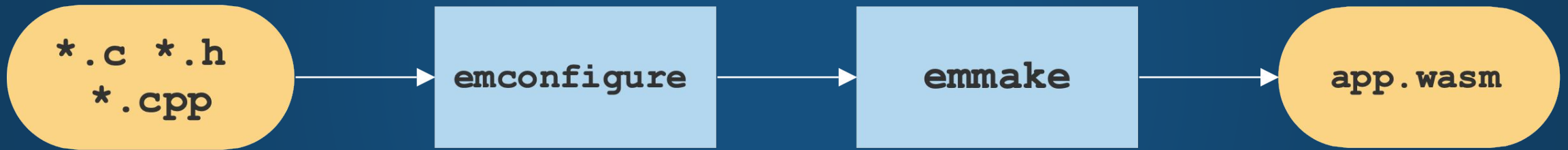


# Emscripten (2012)

- C/C++ compiler for WebAssembly
- Based on LLVM/Clang
- Originally designed for ASM.js in web browsers
- DOSBox, SQLite, CPython



# How building with Emscripten should work



## However... R uses FORTRAN code

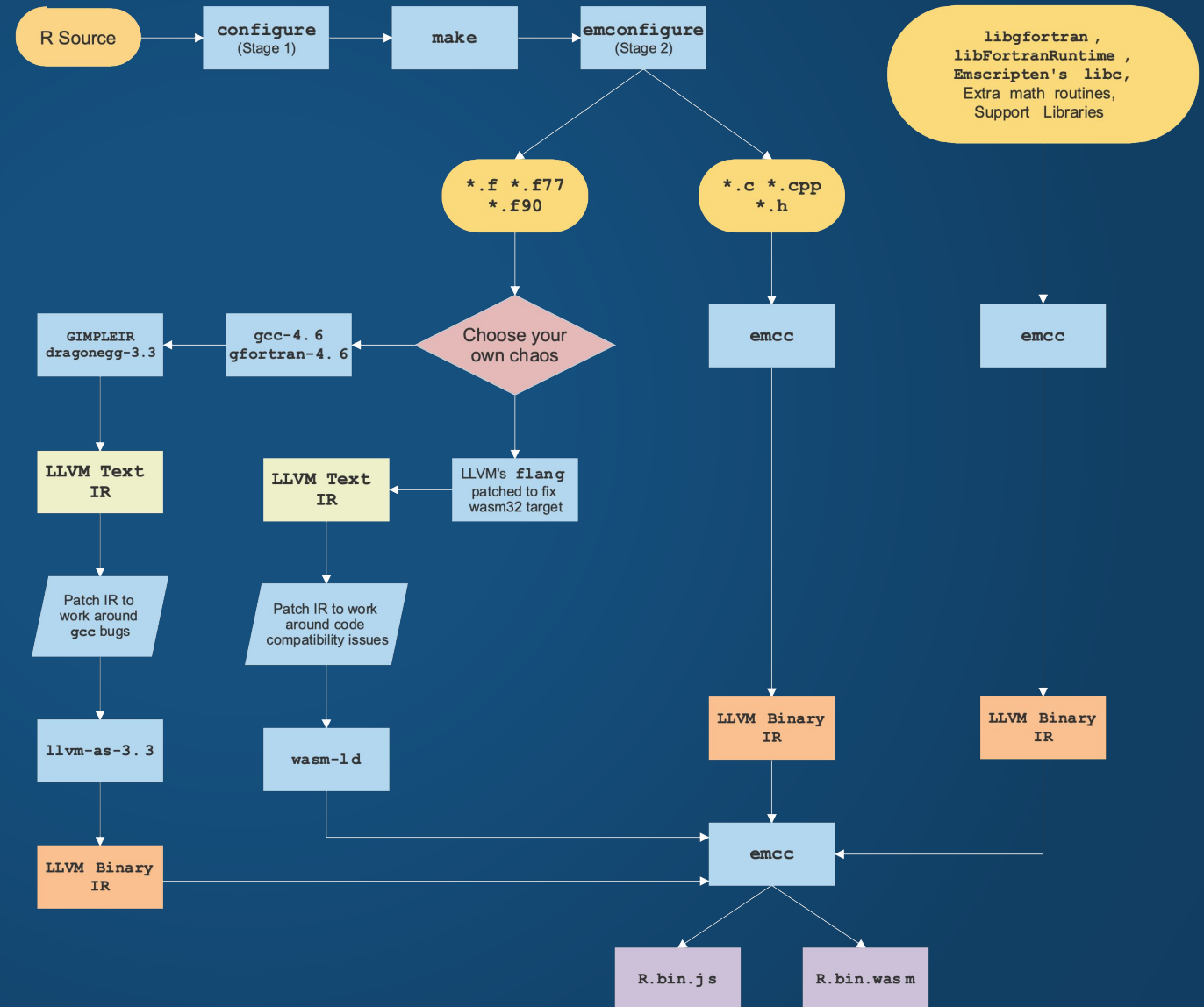
- BLAS (1979)
- LAPACK (1992)
- Various other subroutines...

## Not directly supported by Emscripten

# How building R with Emscripten *actually* works:

I won't go into detail,  
it's a little messy...

Learn more @  
<https://chrz.de/2020/04/21/fortran-in-the-browser/>



# ...but it works!

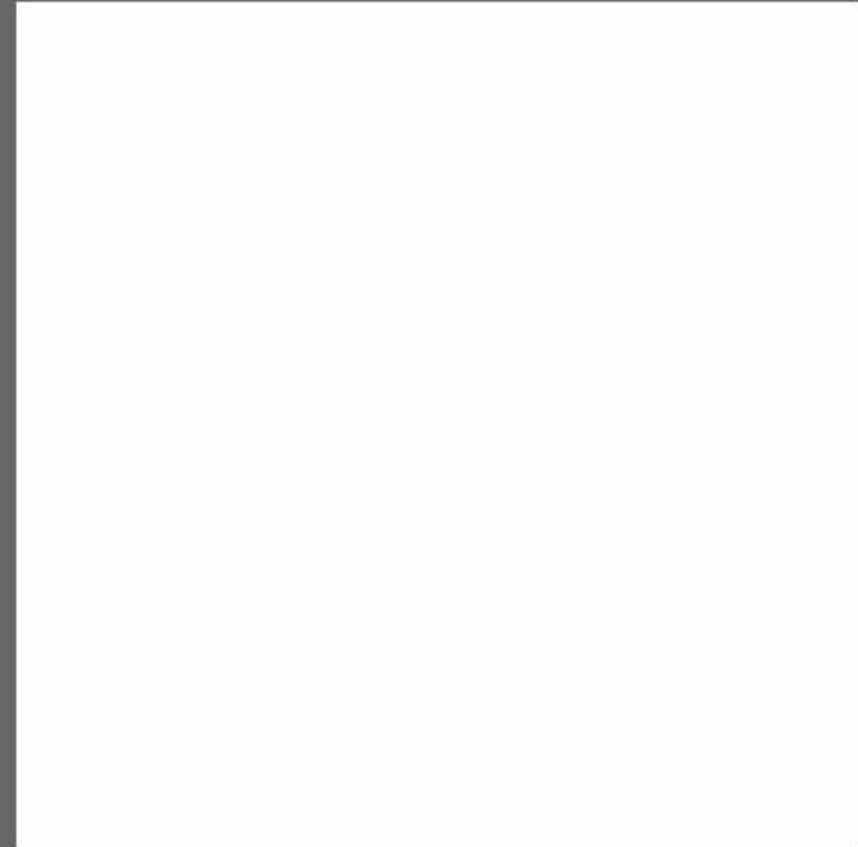
```
R version 4.1.3 (2022-03-10) -- "One Push-Up"  
Copyright (C) 2022 The R Foundation for Statistical Computing  
Platform: wasm32-unknown-emscripten (32-bit)  
  
R is free software and comes with ABSOLUTELY NO WARRANTY.  
You are welcome to redistribute it under certain conditions.  
Type 'license()' or 'licence()' for distribution details.  
  
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.  
  
>
```



Plotting

Files

Save Plot



Try it for yourself @ <https://webr.gwstagg.co.uk>



# WebR

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browser

Try it for yourself @

<https://webr.gwstagg.co.uk>

Source code @

<https://github.com/georgestagg/webR>

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