Flexible deep learning via the JuliaConnectoR

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Why julia?

- Speed
- Code gradually optimizable without transition to C
- Differentiable programming: Compute gradients from code
- Innovative packages, e. g. flexible deep learning with Flux (https://github.com/FluxML/Flux.jl)

Use Julia packages

Example: Import Julia package “Flux” and define a small neural network

What you would do in Julia:

```
julia> import Flux
julia> model = Flux.Chain(Flux.Dense(4, 4, Flux.relu),
                          Flux.Dense(4, 1))
```

The same in R with the JuliaConnectoR:

```
R> library(JuliaConnectoR)
R> Flux <- juliaImport("Flux")
R> model <- Flux$Chain(Flux$Dense(4L, 4L, Flux$relu),
                       Flux$Dense(4L, 1L))
```

Evaluating arbitrary Julia code

`juliaEval`

Define a Julia function, assign it in R and use it:

```
train_network <- juliaEval('
   function train_network!(model, x, y)
      opt = Flux.ADAM()
      loss(x, y) = Flux.crossentropy(model(x), y)
      Flux.train!(loss, Flux.params(model), [(x, y)], opt)
   end')
train_network(model, x, y)
```

Comparison of language bridges from R to Julia

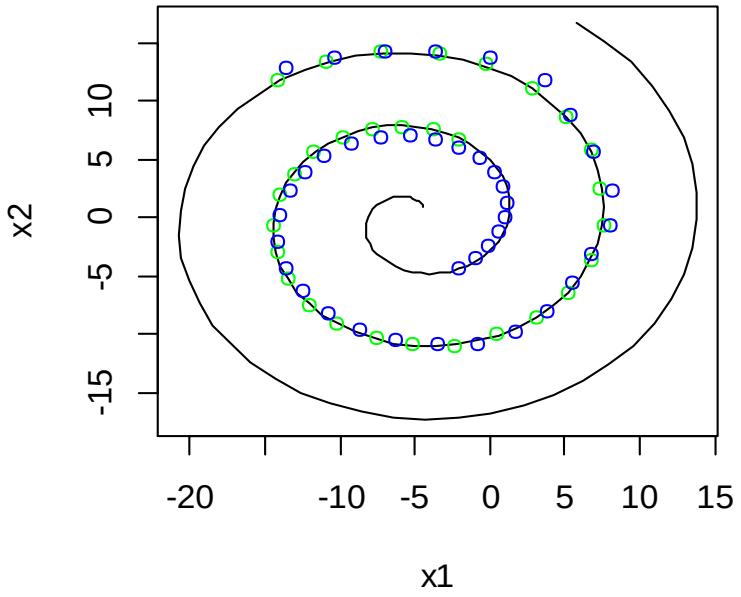
JuliaConnectoR vs. JuliaCall vs. XRJulia

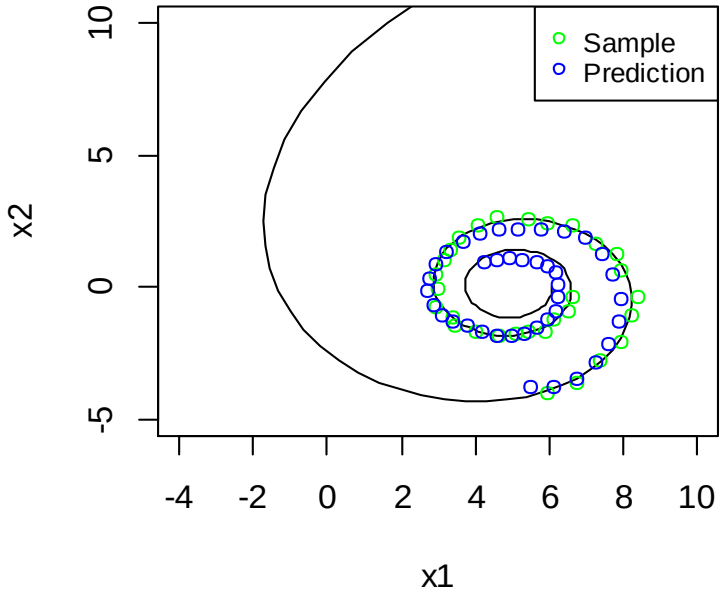
Feature	JuliaConnectoR	JuliaCall	XRJulia
Communication	TCP/binary	C-interface	TCP/JSON
Automatic importing of packages and modules	Yes	No	No
Specification for type translation	Yes	No	No
Reversible translation of Julia objects to R	Yes	No	No
Callbacks	Yes	Yes	No
Let-syntax	Yes	No	No
Show standard (error) output	Yes	No	Yes
Interruptible	Yes	No	Yes
Missing values	Yes	Yes	No
R data frames to Julia Tables	Yes	Yes	No

More details in the article

"The JuliaConnectoR: a functionally oriented interface for integrating Julia in R"

- Available on arXiv: https://arxiv.org/abs/2005.06334
- Includes an example for using neural ordinary differential equations





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Thank you for the attention!

If you have become interested, check it out:

https://github.com/stefan-m-lenz/JuliaConnectoR
https://arxiv.org/abs/2005.06334

```
R> install.packages("JuliaConnectoR")
R> library(JuliaConnectoR)
```