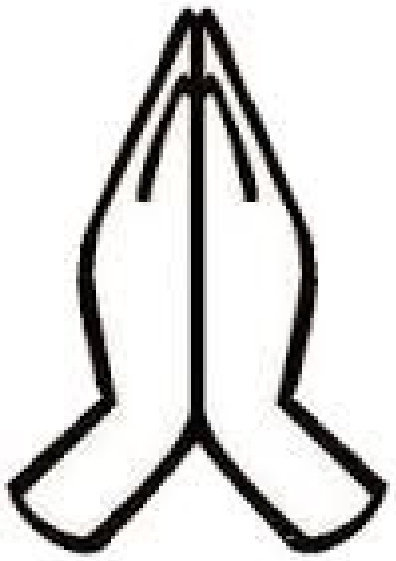


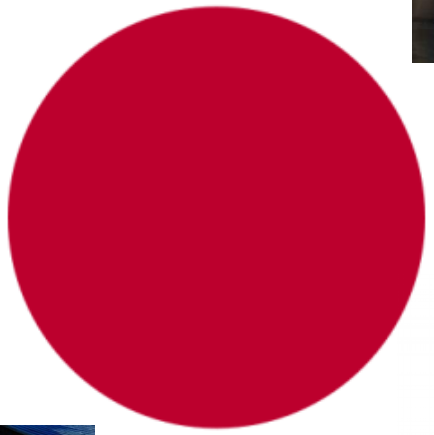
namaste

Incredible India

What India Dreams

India must master Western science and yet preserve its Culture and Heritage.


SUNTORY WHISKY
HIBIKI



City of Pune.

Population: 6 million.
Oxford of the East.

Sameer Deshmukh


github.com/v0dro

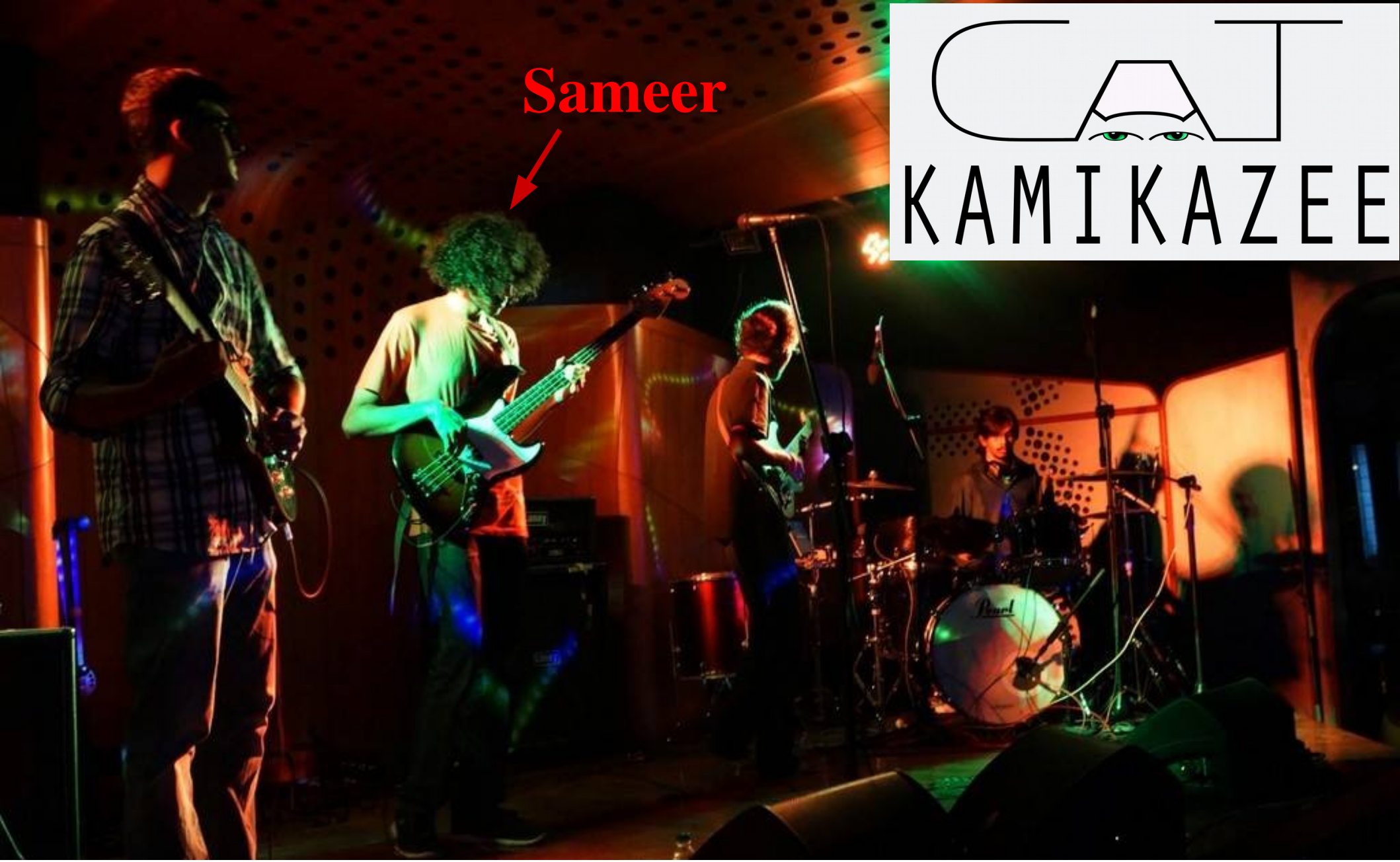

@v0dro

Dr. Gopal Deshmukh

Dr. Hemchandra Deshmukh

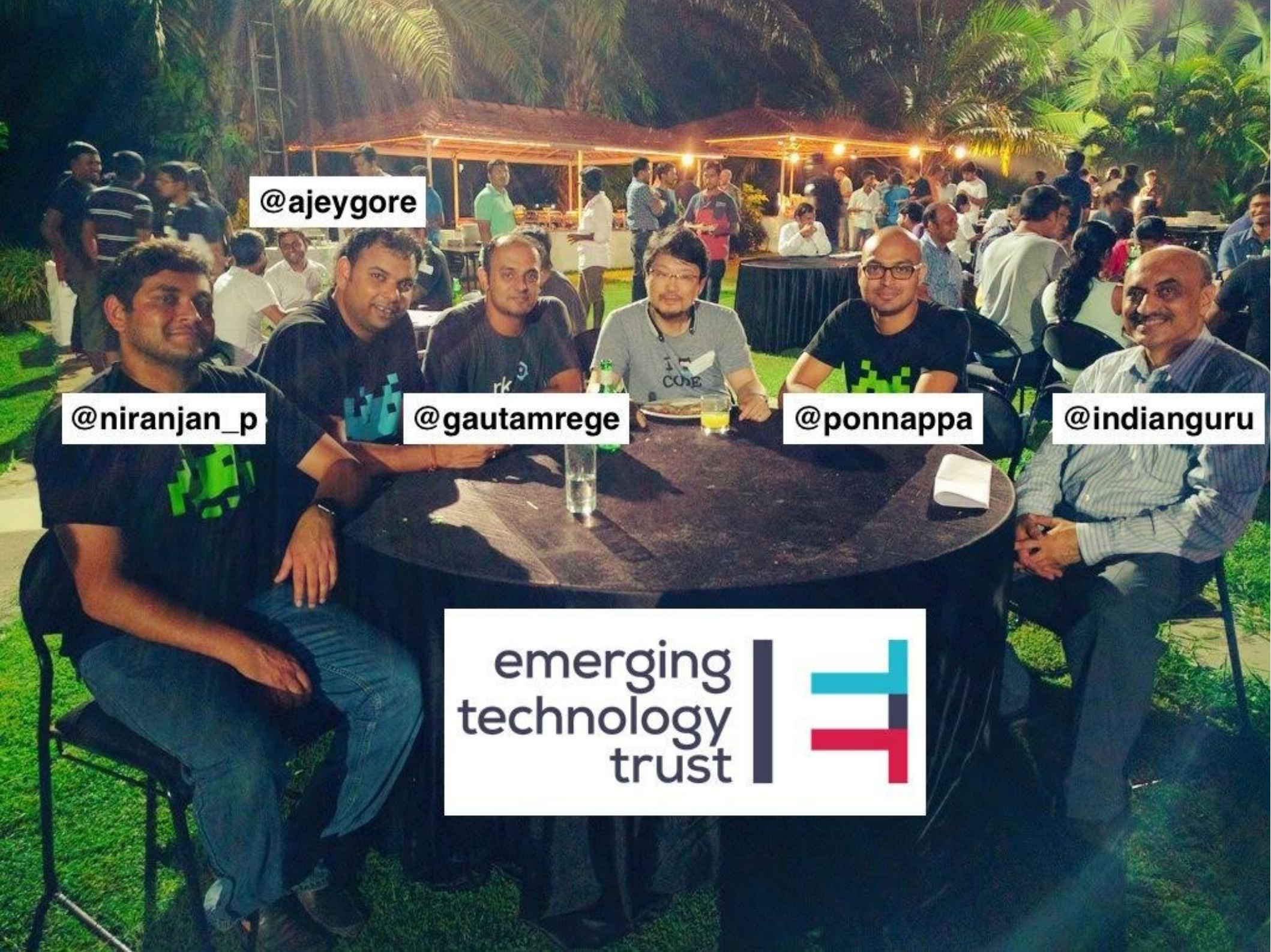
Dr. Satish Deshmukh

Sameer Desmukh



www.soundcloud.com/catkamikazee


emerging
technology
trust


@ajeygore
@niranjan_p
@gautamrege
@ponnappa
@indianguru
emerging
technology
trust

Pune Ruby Users Group

@punerb

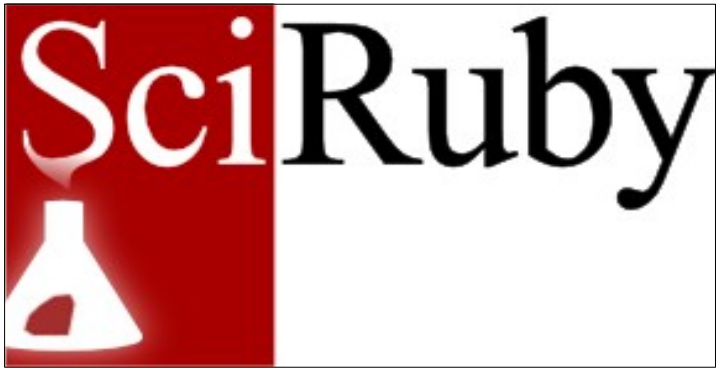
@punerb

@deccanrubyconf

www.punerb.org

www.deccanrubyconf.org

Ruby Science Foundation



 @sciruby

 @sciruby

www.sciruby.com


Google
SUMMER
of
CODE
2015


Ruby Association

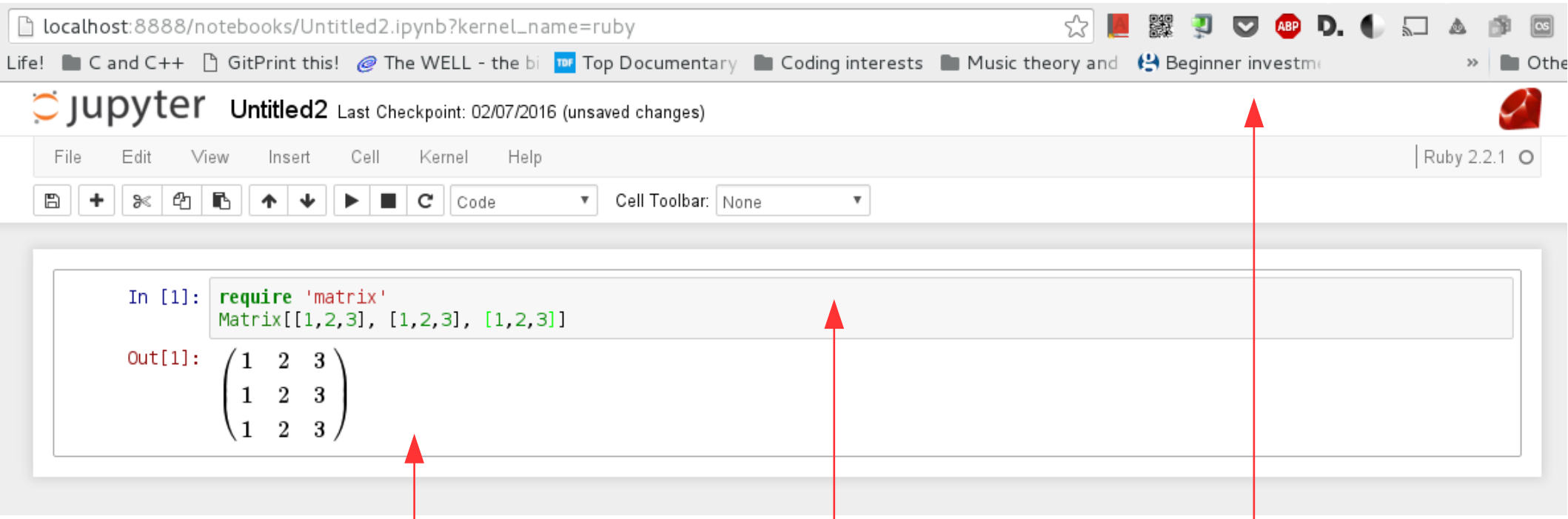

Google
SUMMER
of
CODE
2016

Scientific Computing In Ruby

iruby notebook

Browser based Ruby REPL

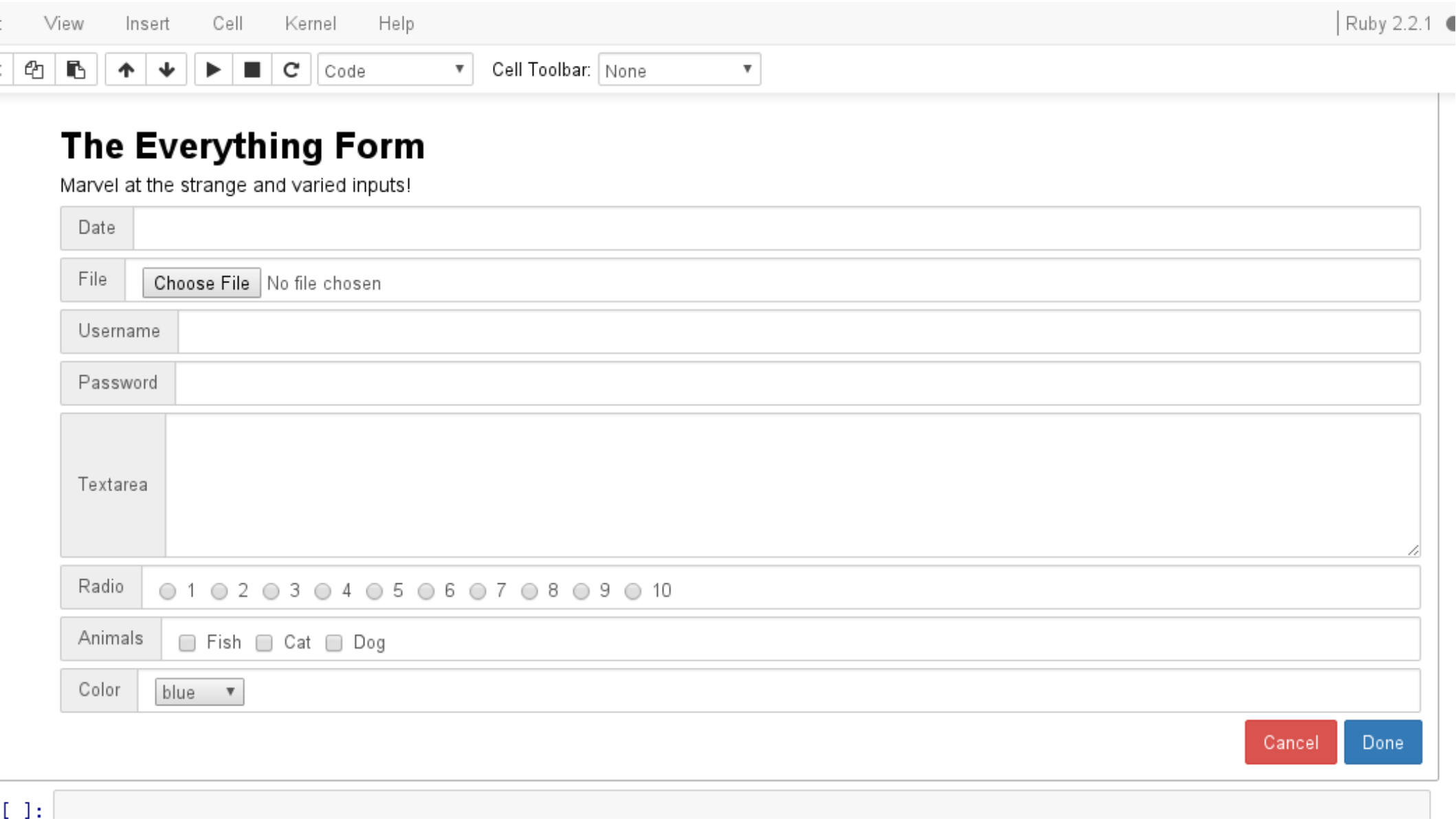
for interactive computing.



Output cell – can render HTML/CSS/JS

Input cell – accepts Ruby code

Runs in your browser


View
Insert
Cell
Kernel
Help
Ruby 2.2.1
Code
Cell Toolbar:
None
The Everything Form
Marvel at the strange and varied inputs!
Date
File
Choose File
No file chosen
Username
Password
Textarea
Radio
1
2
3
4
5
6
7
8
9
10
Animals
Fish
Cat
Dog
Color
blue
Cancel
Done
[ ]:

nmatrix

n-dimensional array object.

Interface Ruby with

high speed C libraries.

```
require 'nmatrix'

n = NMatrix.new(
  [2,2],
  [1,2,3,4],
  dtype: :float32,
  stype: :dense
  )
n[0,1] # => 2.0
```

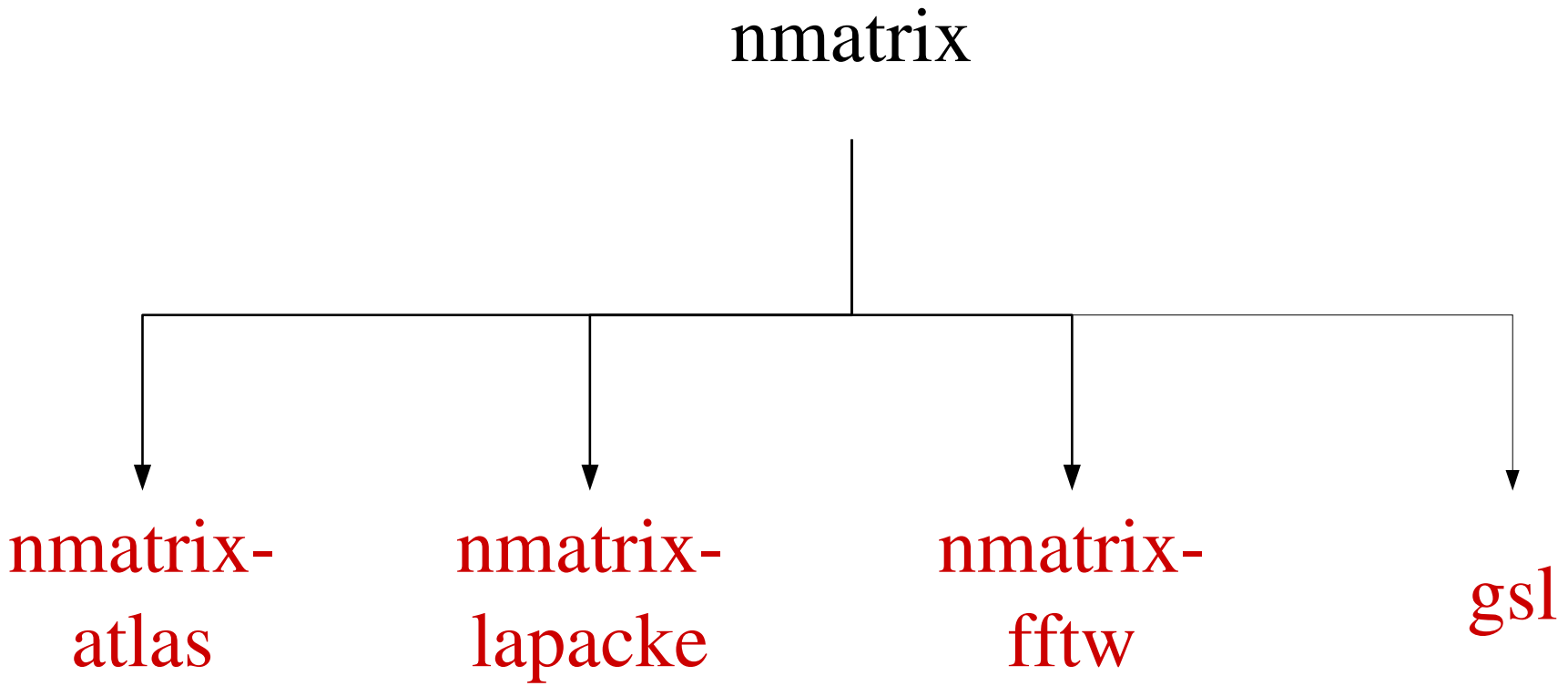
Data Types

`:int8`	`:float32`
`:int16`	`:float64`
`:int32`	`:complex64`
`:int64`	`:complex128`

Storage types

Dense	Dense matrix.
List	Sparse matrix type storing data as a linked list.
Yale	Sparse type storing data in the 'New Yale' format.

NMatrix C API


nmatrix
nmatrix-atlas
nmatrix-lapacke
nmatrix-fftw
gsl

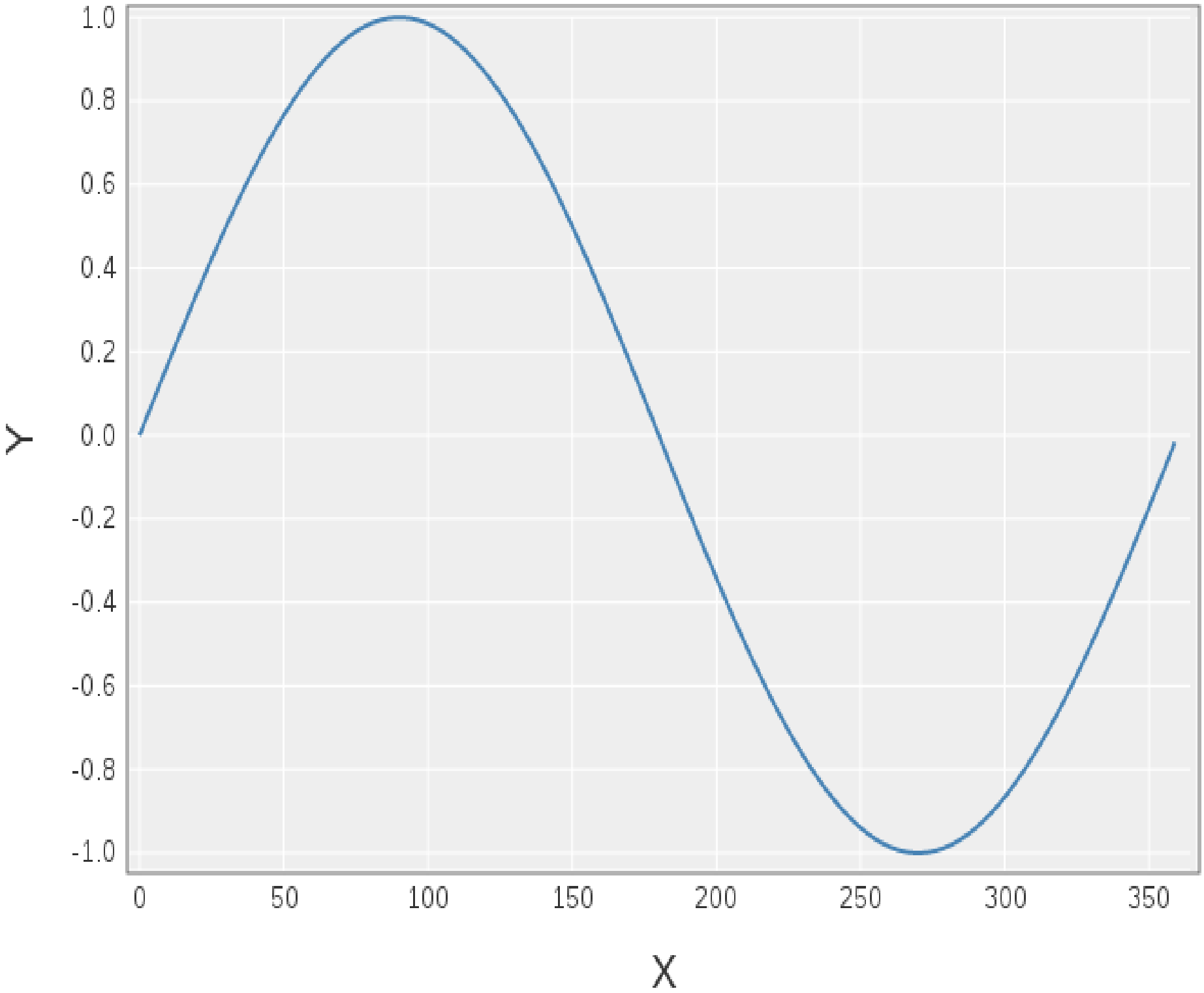
nyaplot

Interactive plotting
tool for Rubyists.

interactive

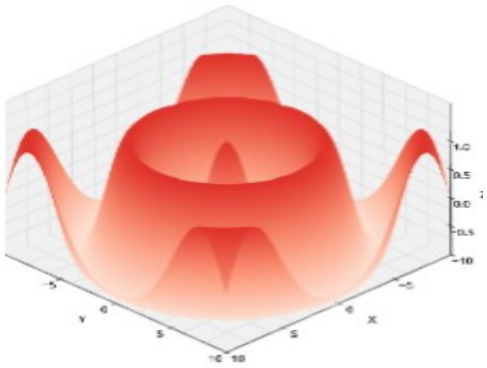
HTML and JavaScript plots

that can be displayed in your browser.


1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
Y
0
50
100
150
200
250
300
350
X

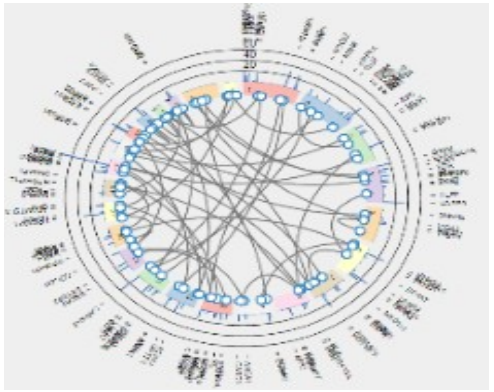
Mapnya

Map visualizations with inbuilt country charts.



Nyaplot3D

Three Dimensional interactive plots.



Bionya

Biology plots for visualizing relationships of genes.

daru
(Data Analysis in RUby)

daru

दारु

(Hindi)

=

alcohol

sake

library for
analysis, cleaning, manipulation and visualization
of data.

Data indexing

Read/write many data sources

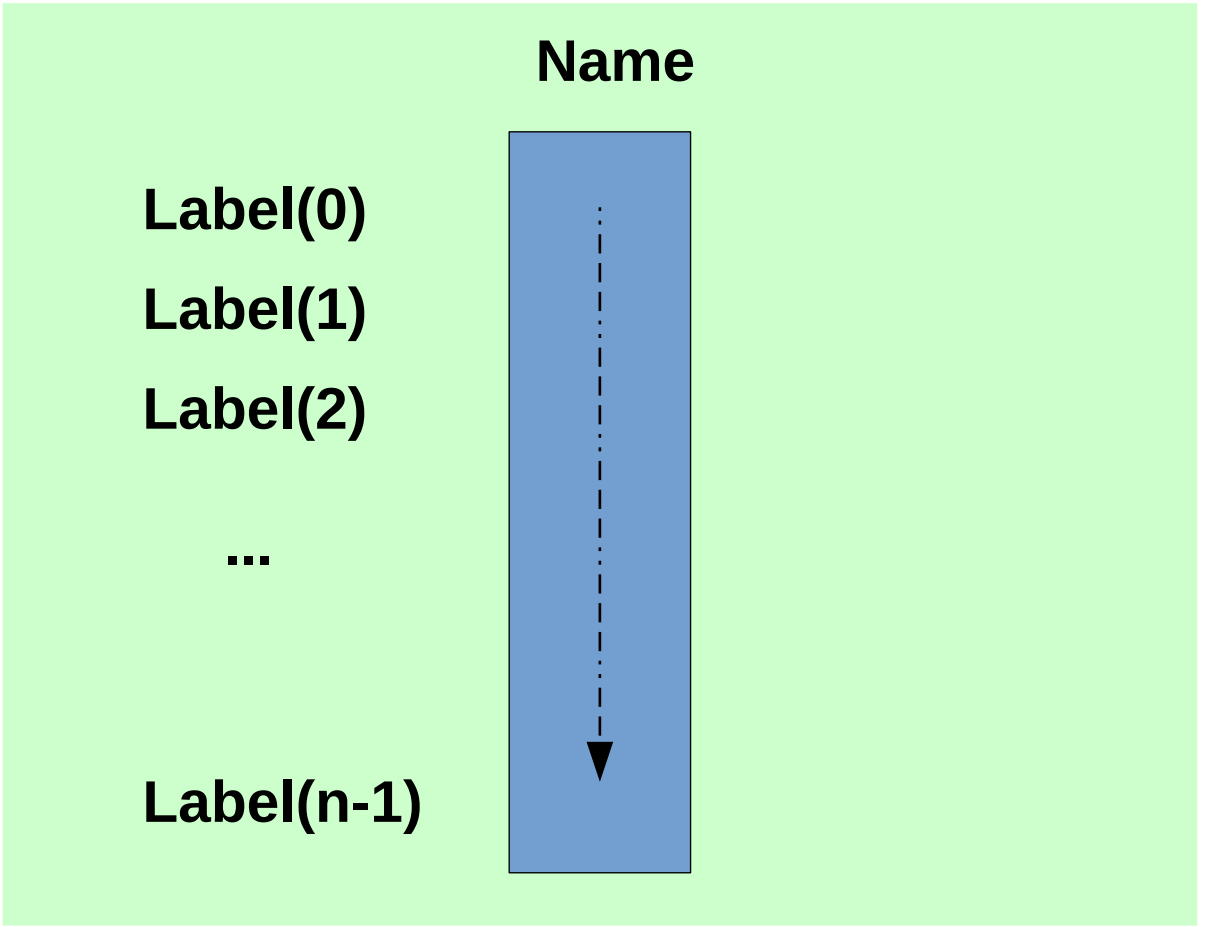
Works well with 'wild' data

Ephemeral statistics functions

Acts as glue between other SciRuby libraries.

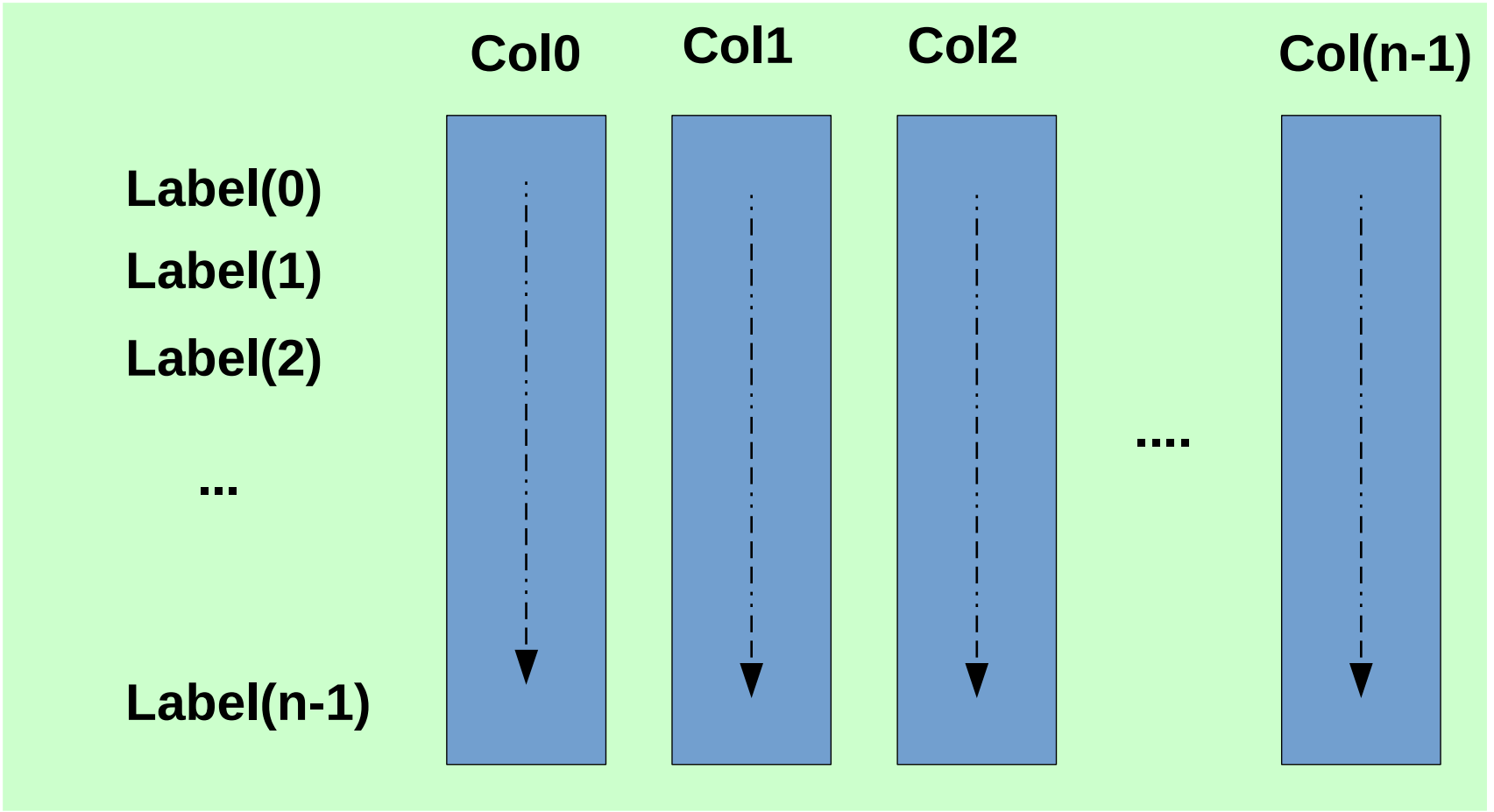
Daru::Vector

Heterogenous Array that can be indexed on any Ruby object.



Daru::DataFrame

2D spreadsheet like data structure indexed by rows or columns.



New Ideas for better Ruby

“Any sufficiently advanced technology is indistinguishable from magic.”

- Arthur C. Clarke

Writing C extensions

- FFI gem.
- Rice.
- SWIG.
- Writing C bindings manually.


Rubyist!
Write me a C extension!

```
def factorial n
  n > 1 ? n*factorial(n-1) : 1
end
```

```
unsigned long long int
calc_factorial(unsigned long long int n)
{
  return (n > 1 ? n*calc_factorial(n-1) : 1);
}

static VALUE
cfactorial(VALUE self, VALUE n)
{
  return ULL2FIX(
      calc_factorial(NUM2ULL(n)));
}
```

```
void Init_factorial()
{
  VALUE cFact = rb_define_class("Fact",
rb_cObject);

  rb_define_method(cFact, "factorial",
cfactorial, 1);
}
```

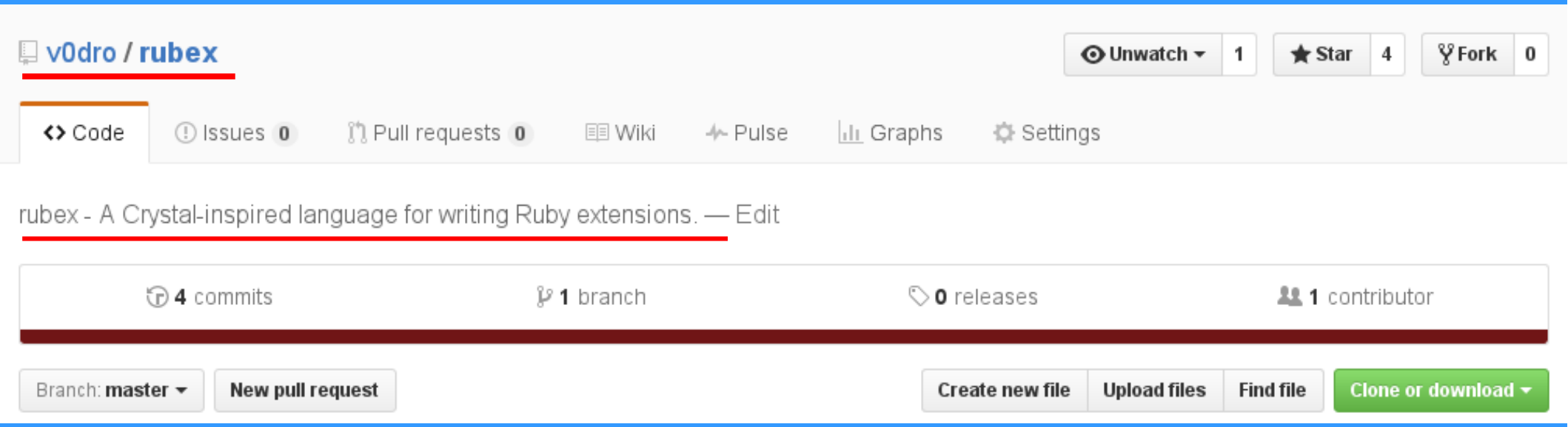
```
a = Fact.new
a.factorial(8000)
```

Big Problems

- Difficult and irritating to write.
- Time consuming to debug.
- Tough to trace memory leaks.
- Change mindset from high level to low level language.
- Need to care about small things.™*

*Matz – Keynote at Red Dot Ruby Conf 2016, Singapore.

Rubex


v0dro / rubex
Unwatch 1
Star 4
Fork 0
Code
Issues 0
Pull requests 0
Wiki
Pulse
Graphs
Settings
rubex - A Crystal-inspired language for writing Ruby extensions. — Edit
4 commits
1 branch
0 releases
1 contributor
Branch: master
New pull request
Create new file
Upload files
Find file
Clone or download

Rubex is a Crystal-inspired superset of Ruby that compiles to C.

```
class Fact
  def factorial(unsigned long long int n)
    n > 1 ? n*factorial(n-1) : 1
  end
end
```

```
# Create a C static array and return a Ruby Array
def adder(n)
  a = StaticArray(i32, n)
  i32 i = 0
  i32 sum = 0

  a.each(n) { a[i] = i*5 }
  for 0 <= i < n do
    sum += a[i]
  end

  sum
end
```

Received the

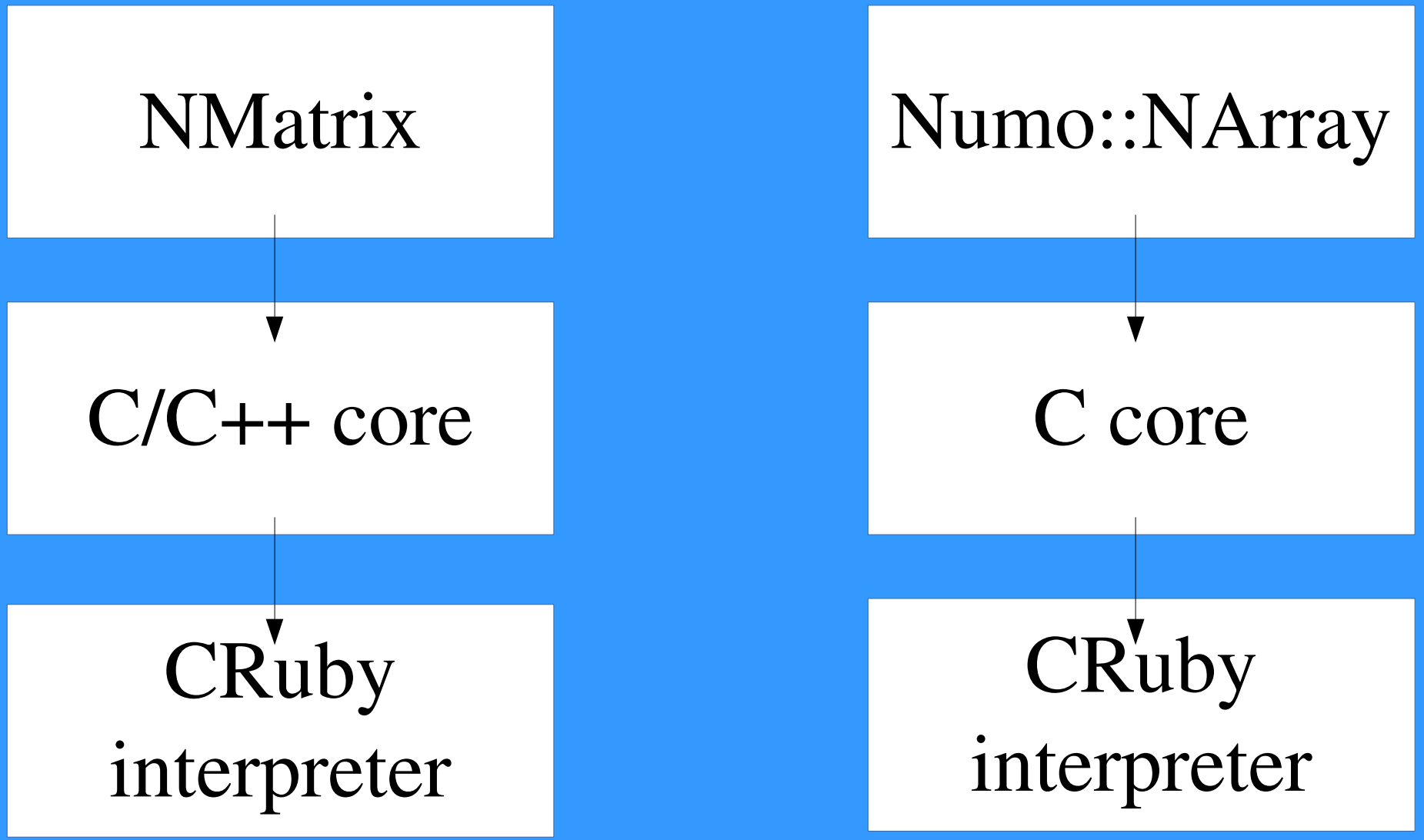
Ruby Association Grant 2016

for development of Rubex

https://github.com/v0dro/rubex

Scientific Computing on JRuby

NMatrix and NArray are a linear algebra libraries for Ruby similar to numpy.


NMatrix
C/C++ core
CRuby interpreter
Numo::NArray
C core
CRuby interpreter

JRuby backend for the NMatrix Ruby API – Sci. Computing on JVM.

Uses Apache Commons Math library for storage and operations on internal Java arrays.

Allows interfacing JRuby libraries with jBLAS for performance.

https://github.com/prasunanand/nmatrix/tree/jruby_port

Symbolic Computation in Ruby with `symengine.rb`

$$(x - y) * (x ** y / z)$$

```ruby
require 'symengine'

x = SymEngine::Symbol.new("x")
y = SymEngine::Symbol.new("y")
z = SymEngine::Symbol.new("z")

f = (x - y) * (x ** y / z)
f.expand.to_s
# x**(1 + y)/z - x**y*y/z

f == -(x**y*y/z) + (x**y*x/z)
# true
```

https://github.com/symengine/symengine.rb

Ruby in Space

NASA SPICE

Ruby wrapper `spice_rub`

```ruby
require 'spice_rub'

k_pool = SpiceRub::KernelPool.instance
k_pool.load_folder("spec/data/kernels")

epoch = SpiceRub::Time.now
moon = SpiceRub::Body.new(:moon)
earth  = SpiceRub::Body.now(:earth)

earth.position_at(epoch)
moon.distance_from(:earth, epoch)
# 395791.1464913574 (Km)
```

https://github.com/gau27/spice_rub

Cool SciRuby Stickers

Thank You

Ruby World Conf!

Any questions?