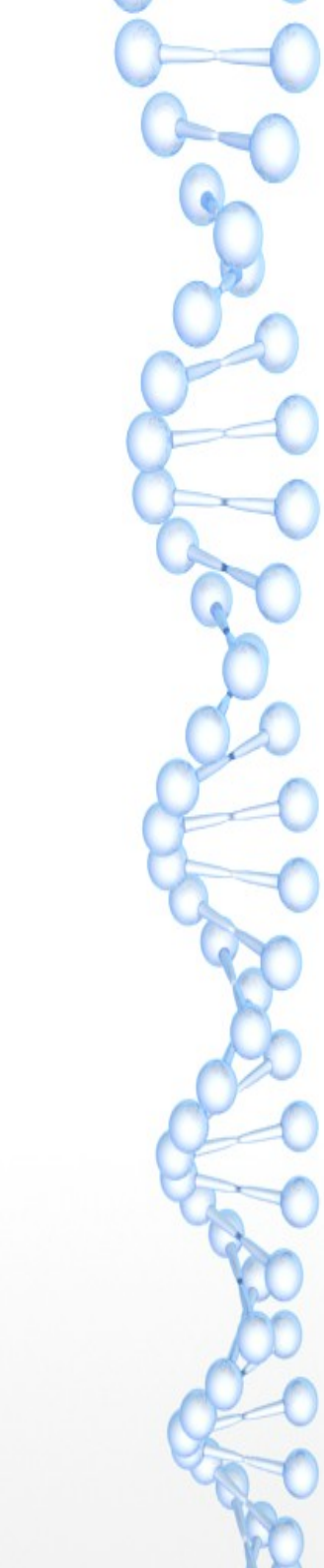

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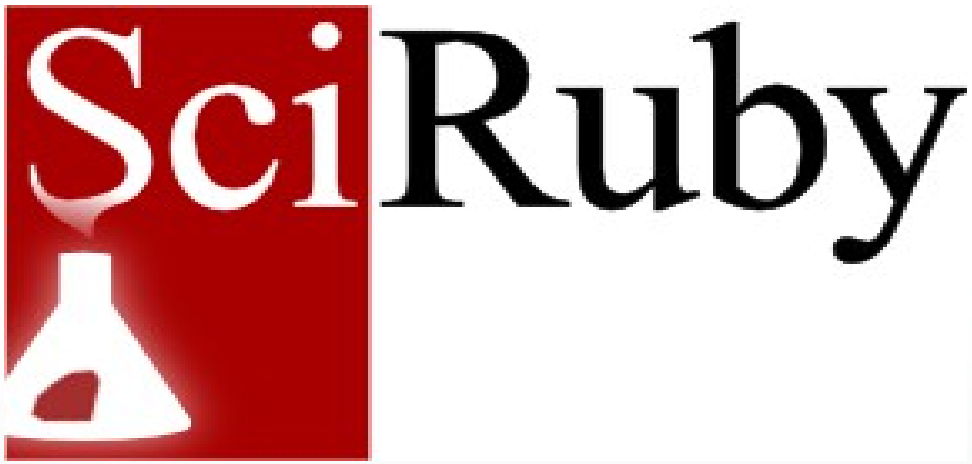
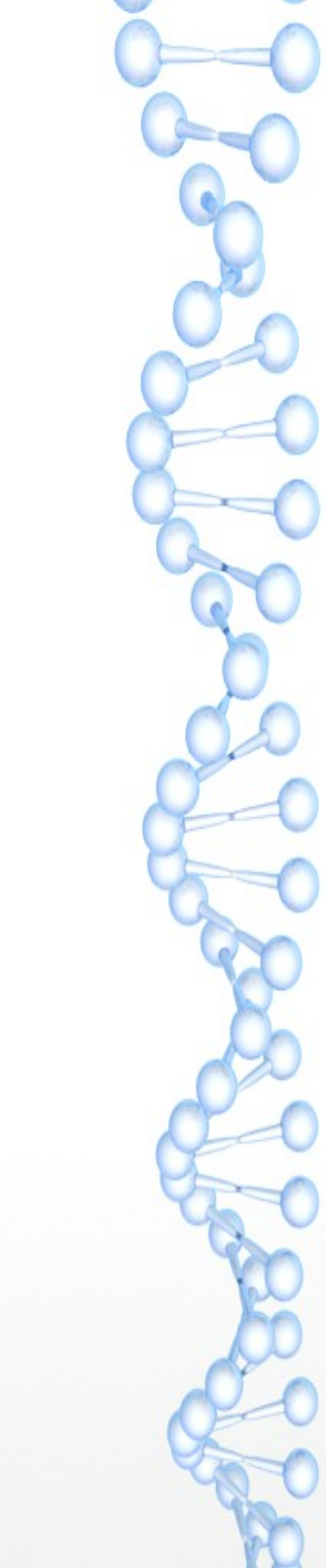
Tools for Scientific Computation in Ruby



Scientific Computing

- Using computers and mathematical techniques to analyse and solve scientific problems
- Generally requires a large amount of computer time and memory
- Involves performing various operations on a large quantity of numbers

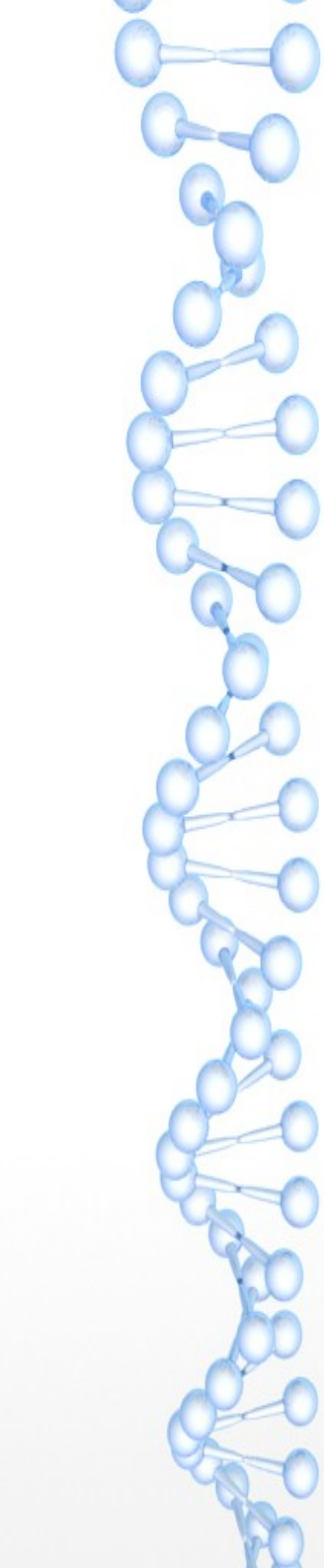


Ruby and scientific computing

- We've dominated the web.
- Little or no presence in academia, high performance computing or data processing.
- Several reasons – lack of libraries, good interfaces to other low level languages other than C, language is inherently slow.
- Scientific libraries are a must if Ruby is to stay relevant.

iruby

- Web notebook interface for Ruby
- Fancy browser based rendering of generated Ruby objects
- Uses a simple Read-Eval-Print mechanism
- Great for presenting code and data in a human-friendly format



NMatrix

- A library for efficient storage and linear algebra on large sets of numerical data
- Creates an interface for Ruby programmers to store numbers in C data types
- Support for 8,16,32 and 64 bit signed integers; 32 and 64 bit floats, complex numbers and rational numbers
- Interface with battle tested, bullet proof C libraries for actual computation

Example – matrix inversion in C

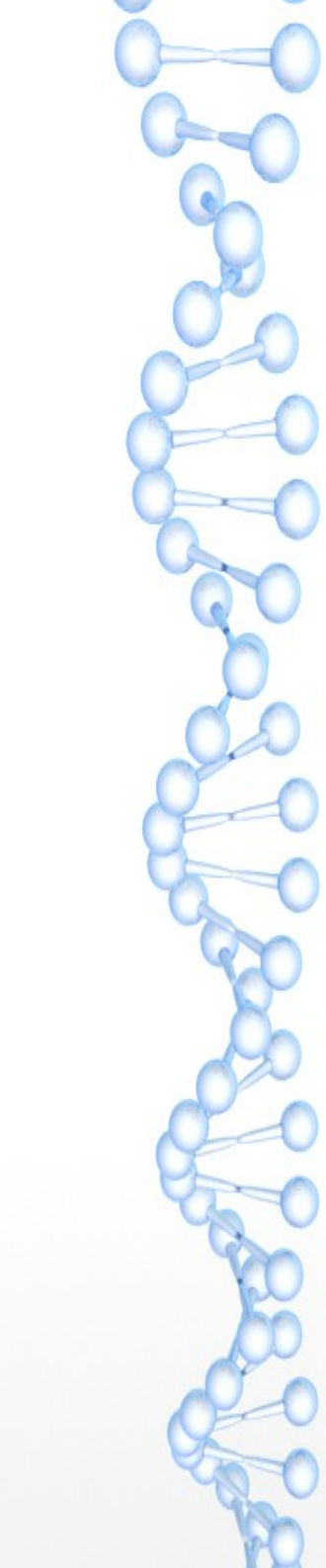
```
double A [2*2] = {
  1,2,
  3,4
};
int *IPIV = new int[N+1];
int LWORK = N*N;
double *WORK = new double[LWORK];
int INFO;

dgetrf_(&N,&N,A,&N,IPIV,&INFO);

dgetri_(&N,A,&N,IPIV,WORK,&LWORK,&
INFO);
```

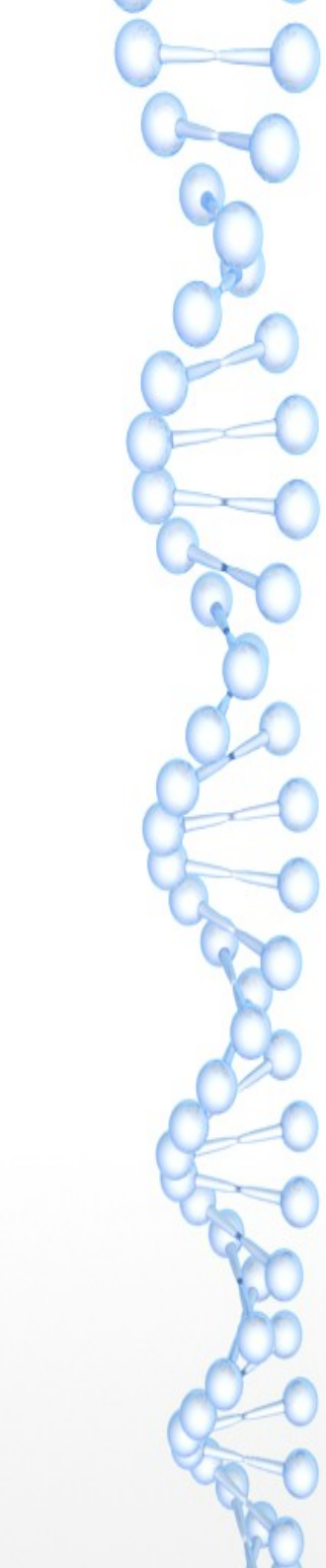
Nyaplot & statsample

- Nyaplot is an Interactive browser-based plotting and data visualization library
- Statsample is a statistical analysis suite written purely in Ruby



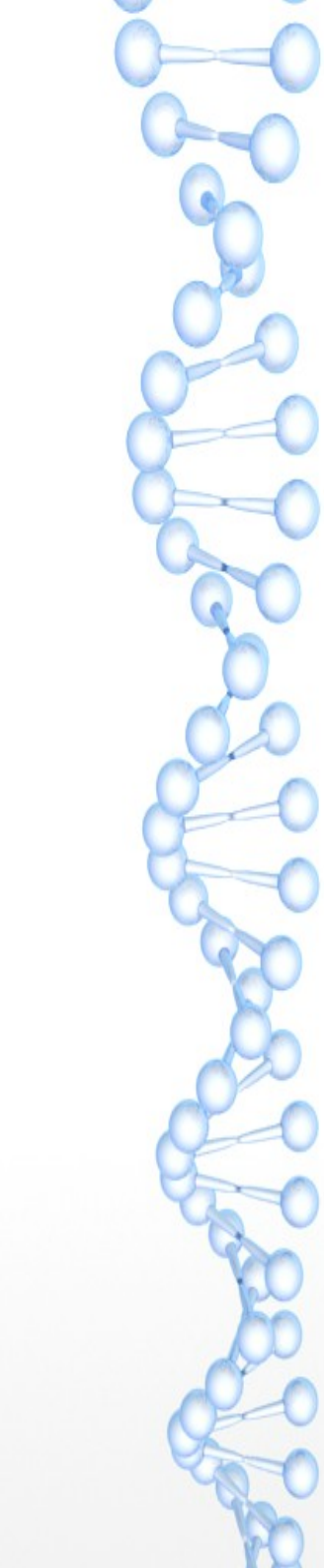
Data Analysis in Ruby

- Ruby is the primary language of the web and one of the major functions of future applications will be to make sense of large sets of data.
- This makes it important to a have a library dedicated to analysis, visualization, manipulation and cleaning of data.



daru

- Library for easy analysis, cleaning, plotting and manipulation of data from a variety of data sources
- Named, indexed data structures
- Integrates with iruby for visualizing data, statsample for statistical analysis, NMatrix for fast computation and nyaplot for plotting



Why Ruby over any other language

- VERY simple and intuitive to use
- Ability to create powerful DSLs for performing any sort of computation
- Can be easily interfaced with low level languages to provide speed (C for MRI, java for JRuby, etc.)
- Ultimately reduces the complexity of code for scientific computation

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