Информационные технологии в технической физике

#05 Библиотеки и инструменты

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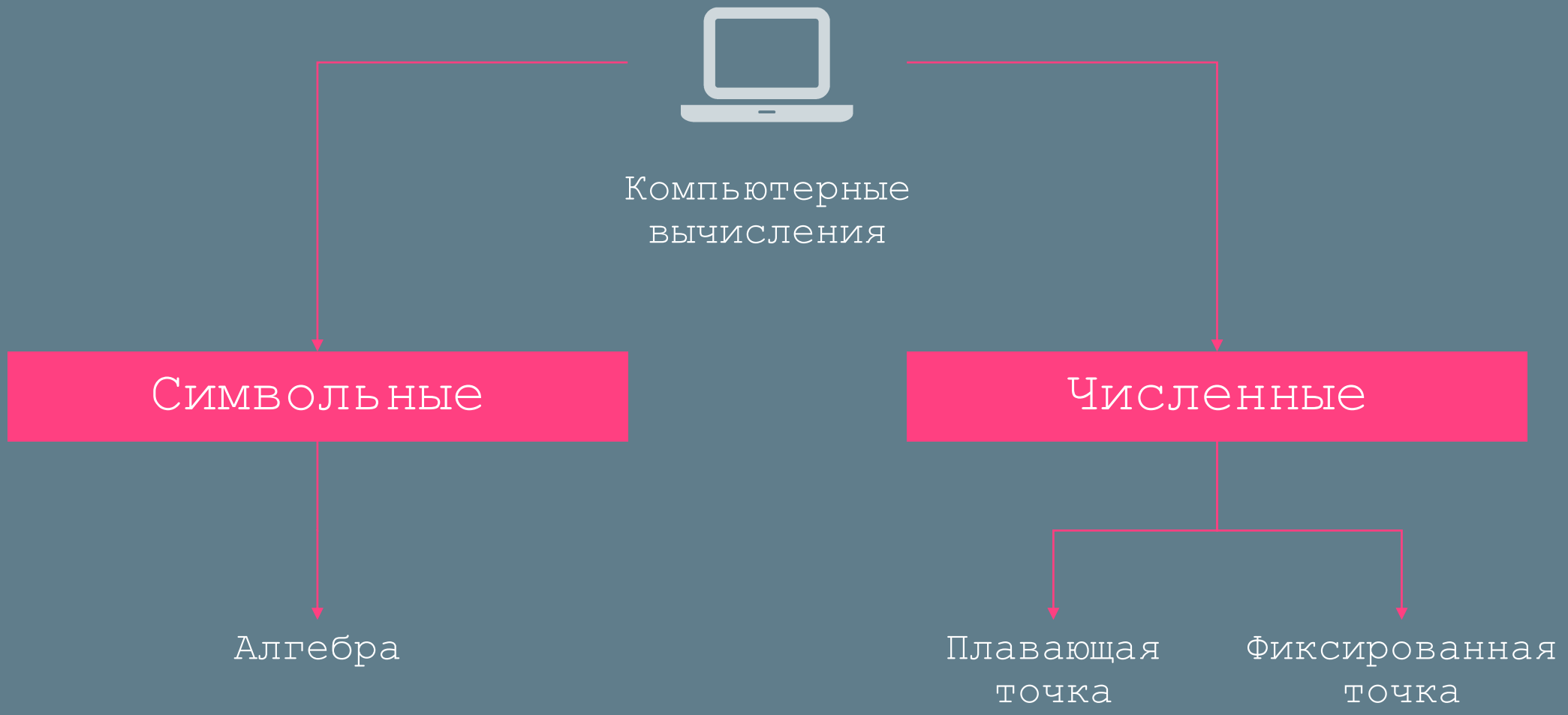
Библиотеки и инструменты


Компьютерные вычисления
Символьные
Численные
Алгебра
Плавающая точка
Фиксированная точка

SymPy

> SymPy is a Python library for symbolic mathematics. It aims to become a full-featured computer algebra system (CAS) while keeping the code as simple as possible in order to be comprehensible and easily extensible. SymPy is written entirely in Python and does not require any external libraries.

sympy.org
бесплатно
python

Symbolic C++

> SymbolicC++ is a general purpose computer algebra system embedded in the programming language C++.

issc.uj.ac.za/symbolic/symbolic.html

бесплатно

c++

GiNaC

> GiNaC is a C++ library. It is designed to allow the creation of integrated systems that embed symbolic manipulations together with more established areas of computer science (like computation- intense numeric applications, graphical interfaces, etc.) under one roof. It is distributed under the terms and conditions of the GNU general public license (GPL). GiNaC is an iterated and recursive acronym for GiNaC is Not a CAS, where CAS stands for Computer Algebra System.

ginac.de

бесплатно

c++

Eigen

> Eigen is a C++ template library for linear algebra: matrices, vectors, numerical solvers, and related algorithms.

eigen.tuxfamily.org/

бесплатно

c++

Blaze

> Blaze is an open-source, high-performance C++ math library for dense and sparse arithmetic. With its state-of-the-art Smart Expression Template implementation Blaze combines the elegance and ease of use of a domain-specific language with HPC-grade performance, making it one of the most intuitive and fastest C++ math libraries available.

code.google.com/p/blaze-lib/

бесплатно

c++

Armadillo

> Armadillo is a high quality C++ linear algebra library, aiming towards a good balance between speed and ease of use; the syntax (API) is deliberately similar to Matlab

arma.sourceforge.net/

бесплатно

c++

BLAS (Basic Linear Algebra Subprograms)

> The BLAS (Basic Linear Algebra Subprograms) are routines that provide standard building blocks for performing basic vector and matrix operations. The Level 1 BLAS perform scalar, vector and vector-vector operations, the Level 2 BLAS perform matrix-vector operations, and the Level 3 BLAS perform matrix-matrix operations. Because the BLAS are efficient, portable, and widely available, they are commonly used in the development of high quality linear algebra software, LAPACK for example.

netlib.org/blas

бесплатно

fortran

LAPACK (Linear Algebra PACKage)

> LAPACK is written in Fortran 90 and provides routines for solving systems of simultaneous linear equations, least-squares solutions of linear systems of equations, eigenvalue problems, and singular value problems. The associated matrix factorizations (LU, Cholesky, QR, SVD, Schur, generalized Schur) are also provided, as are related computations such as reordering of the Schur factorizations and estimating condition numbers. Dense and banded matrices are handled, but not general sparse matrices. In all areas, similar functionality is provided for real and complex matrices, in both single and double precision.

netlib.org/lapack

бесплатно

fortran

GSL - GNU Scientific Library

> The GNU Scientific Library (GSL) is a numerical library for C and C++ programmers. The library provides a wide range of mathematical routines such as random number generators, special functions and least-squares fitting. There are over 1000 functions in total with an extensive test suite.

gnu.org/software/gsl

бесплатно

c++

Odeint

> Odeint is a modern C++ library for numerically solving Ordinary Differential Equations. It is developed in a generic way using Template Metaprogramming which leads to extraordinary high flexibility at top performance. The numerical algorithms are implemented independently of the underlying arithmetics. This results in an incredible applicability of the library, especially in non-standard environments. For example, odeint supports matrix types, arbitrary precision arithmetics and even can be easily run on CUDA GPUs.

headmyshoulder.github.io/odeint-v2/

бесплатно

c++

Boost

> Boost is a set of libraries for the C++ programming language that provide support for tasks and structures such as linear algebra, pseudorandom number generation, multithreading, image processing, regular expressions, and unit testing. It contains over eighty individual libraries.

boost.org
бесплатно
c++

NumPy

> NumPy is the fundamental package for scientific computing with Python. It contains among other things:
>
> - a powerful N-dimensional array object
> - sophisticated (broadcasting) functions
> - tools for integrating C/C++ and Fortran code
> - useful linear algebra, Fourier transform, and random number capabilities

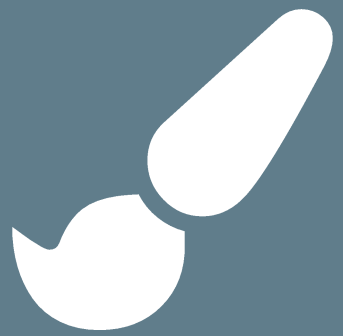
numpy.org
бесплатно
python

SciPy

- NumPy, the fundamental package for numerical computation. It defines the numerical array and matrix types and basic operations on them.
- The SciPy library, a collection of numerical algorithms and domain-specific toolboxes, including signal processing, optimization, statistics and much more.
- Matplotlib, a mature and popular plotting package, that provides publication-quality 2D plotting as well as rudimentary 3D plotting pandas, providing high-performance, easy to use data structures.
- SymPy, for symbolic mathematics and computer algebra.
- IPython, a rich interactive interface, letting you quickly process data and test ideas. The IPython notebook works in your web browser, allowing you to document your computation in an easily reproducible form.
- nose, a framework for testing Python code.

scipy.org
бесплатно
python

Библиотеки и инструменты



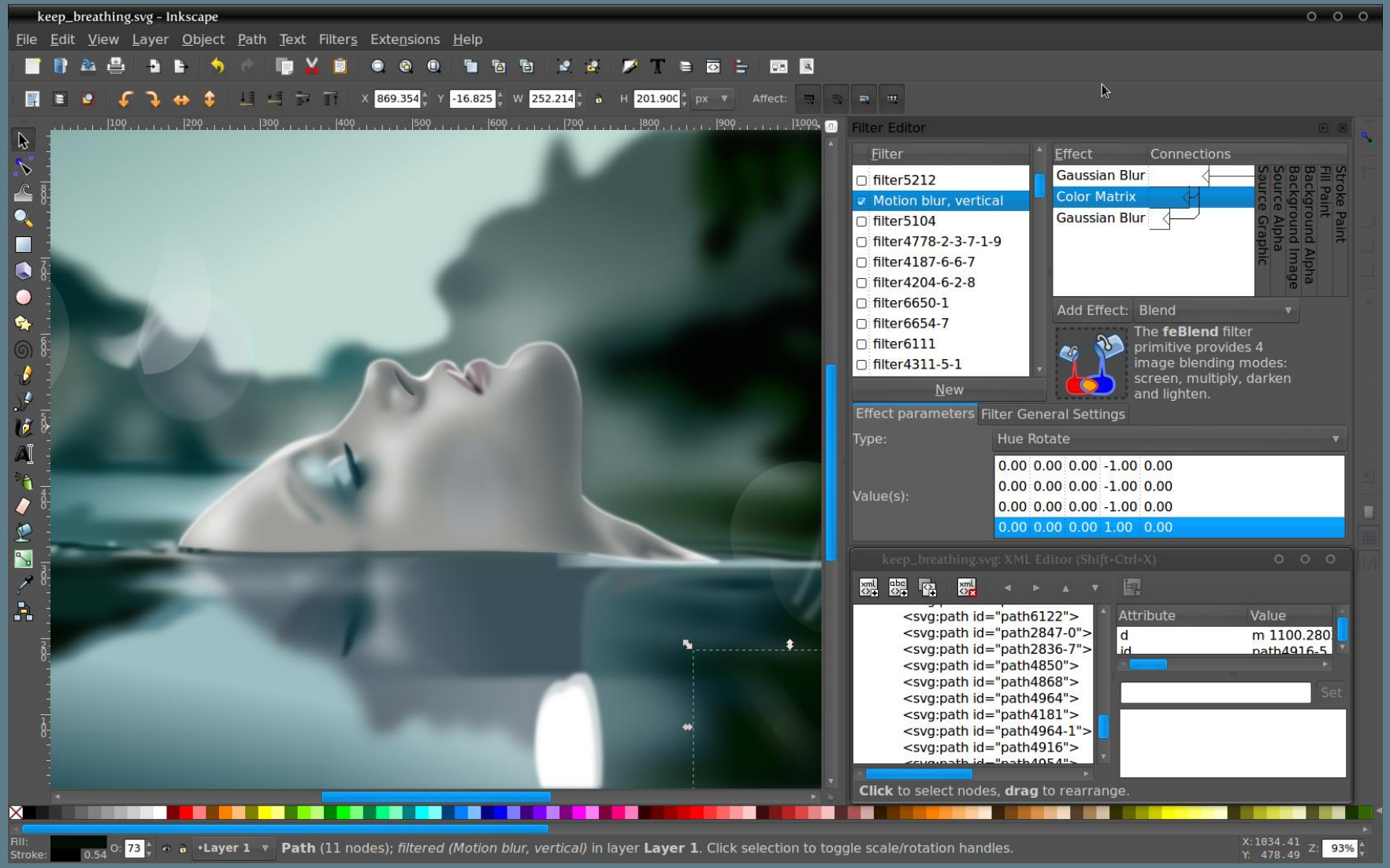
Программы

Инструменты

Графики

Библиотеки

Inkscape

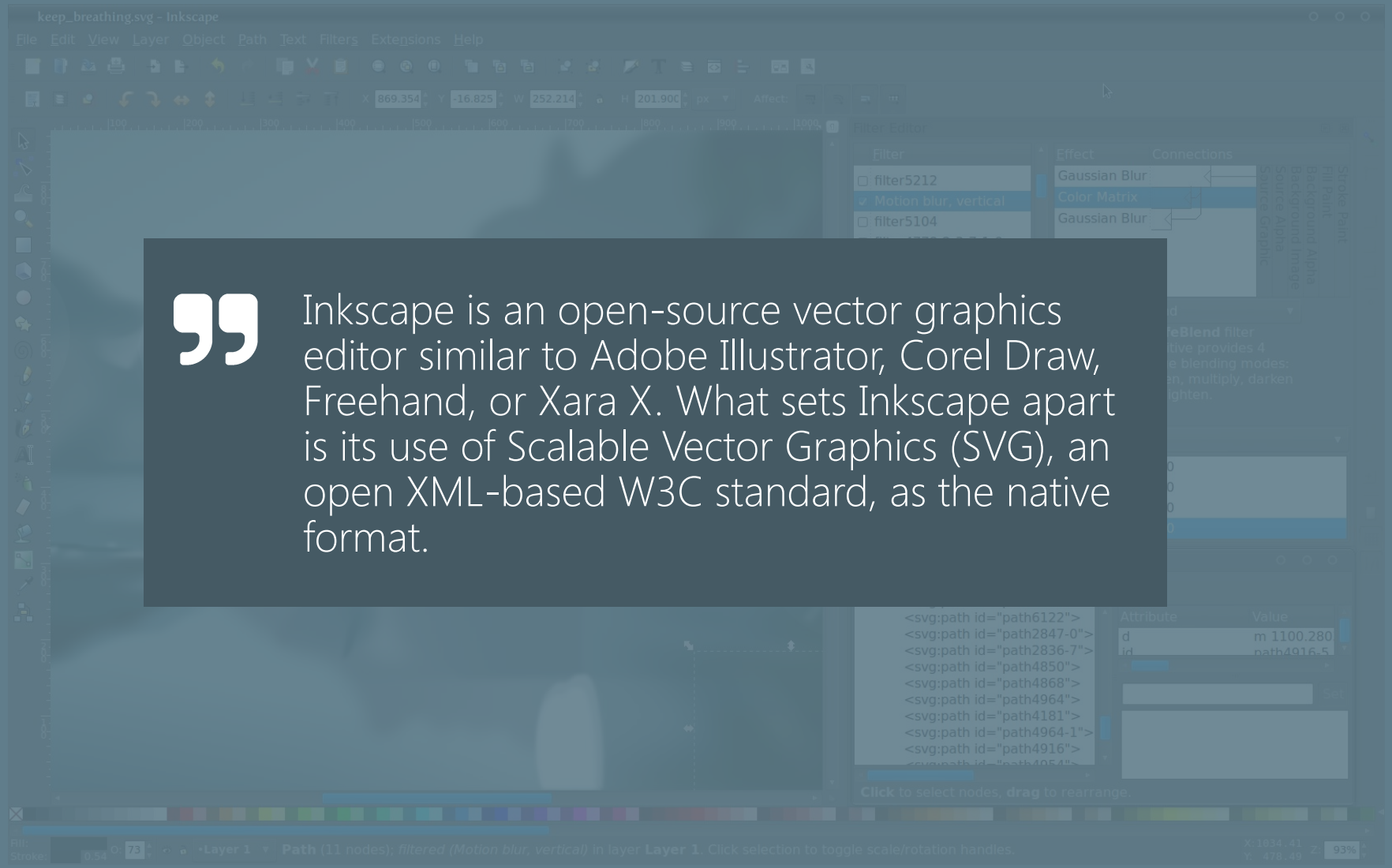


inkscape.org

векторный редактор

бесплатно

Inkscape



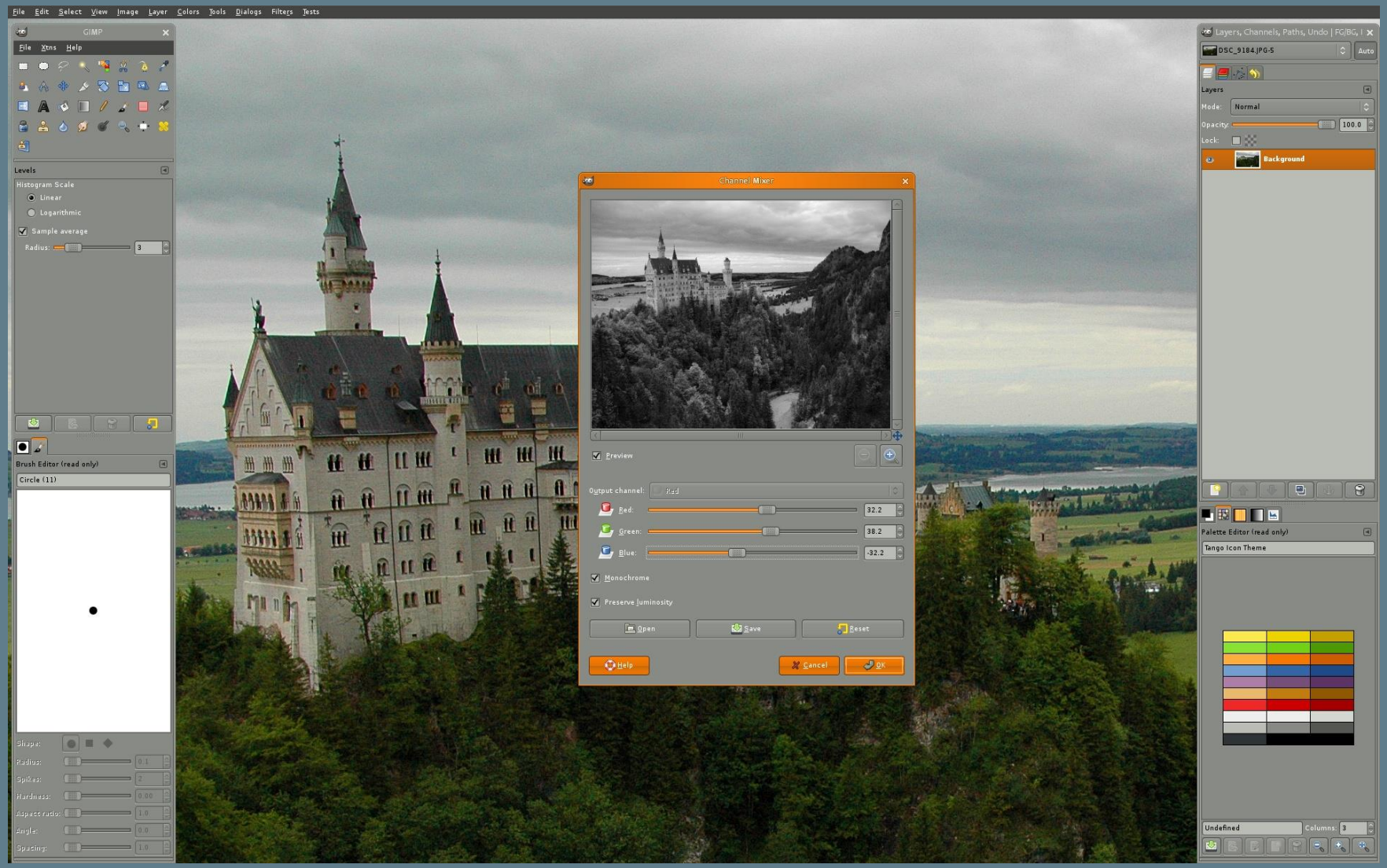
> Inkscape is an open-source vector graphics editor similar to Adobe Illustrator, Corel Draw, Freehand, or Xara X. What sets Inkscape apart is its use of Scalable Vector Graphics (SVG), an open XML-based W3C standard, as the native format.

inkscape.org

векторный редактор

бесплатно

GIMP



gimp.org

растровый редактор

бесплатно

GIMP

> GIMP is the GNU Image Manipulation Program. It is a freely distributed piece of software for such tasks as photo retouching, image composition and image authoring. It works on many operating systems, in many languages.

gimp.org

растровый редактор

бесплатно

ImageMagick

```
Last login: Wed Jan  7 21:02:44 on ttys000
home:~ magic$ convert -v
Version: ImageMagick 6.8.9-1 Q16 x86_64 2014-08-05 http://www.imagemagick.org
Copyright: Copyright (C) 1999-2014 ImageMagick Studio LLC
Features: DPC Modules
Delegates: bzlib djvu fftw fontconfig freetype gslib jng jpeg lcms ltdl lzma png

Usage: convert [options ...] file [ [options ...] file ...] [options ...] file

Image Settings:
  -adjoin                  join images into a single multi-image file
  -affine matrix           affine transform matrix
  -alpha option            activate, deactivate, reset, or set the alpha channel
  -antialias               remove pixel-aliasing
  -authenticate password
                           decipher image with this password
  -attenuate value         lessen (or intensify) when adding noise to an image
```

imagemagick.org

конвертер изображений

бесплатно

Визуализация

ImageMagick

> ImageMagick is a software suite to create, edit, compose, or convert bitmap images. It can read and write images in a variety of formats (over 200) including PNG, JPEG, JPEG-2000, GIF, TIFF, DPX, EXR, WebP, Postscript, PDF, and SVG. Use ImageMagick to resize, flip, mirror, rotate, distort, shear and transform images, adjust image colors, apply various special effects, or draw text, lines, polygons, ellipses and Bézier curves.

imagemagick.org

конвертер изображений

бесплатно

Визуализация

FFmpeg

```
roger@roger-laptop: ~/Music
File  Edit  View  Terminal  Help
roger@roger-laptop:~/Music$ ffmpeg -i Peter-Gabriel-Shock-The-Monkey.mp3 \
> -ab 192000 -ar 44100 Peter-Gabriel-Shock-The-Monkey-new.mp3
FFmpeg version SVN-r0.5.1-4:0.5.1-1ubuntu1.3, Copyright (c) 2000-2009 Fabrice Be
llard, et al.
  configuration: --extra-version=4:0.5.1-1ubuntu1.3 --prefix=/usr --enable-avfil
ter --enable-avfilter-lavf --enable-vdpau --enable-bzlib --enable-libgsm --enabl
e-libschroedinger --enable-libspeex --enable-libtheora --enable-libvorbis --enab
le-pthreads --enable-zlib --disable-stripping --disable-vhook --enable-runtime-c
pudetect --enable-gpl --enable-postproc --enable-swscale --enable-x11grab --enab
le-libdc1394 --enable-shared --disable-static
  libavutil     49.15. 0 / 49.15. 0
  libavcodec    52.20. 1 / 52.20. 1
  libavformat   52.31. 0 / 52.31. 0
  libavdevice   52. 1. 0 / 52. 1. 0
  libavfilter    0. 4. 0 /  0. 4. 0
  libswscale     0. 7. 1 /  0. 7. 1
  libpostproc   51. 2. 0 / 51. 2. 0
  built on Dec 21 2011 18:41:38, gcc: 4.4.3
Input #0, mp3, from 'Peter-Gabriel-Shock-The-Monkey.mp3':
  Duration: 00:03:58.30, start: 0.000000, bitrate: 128 kb/s
    Stream #0.0: Audio: mp3, 44100 Hz, stereo, s16, 128 kb/s
```

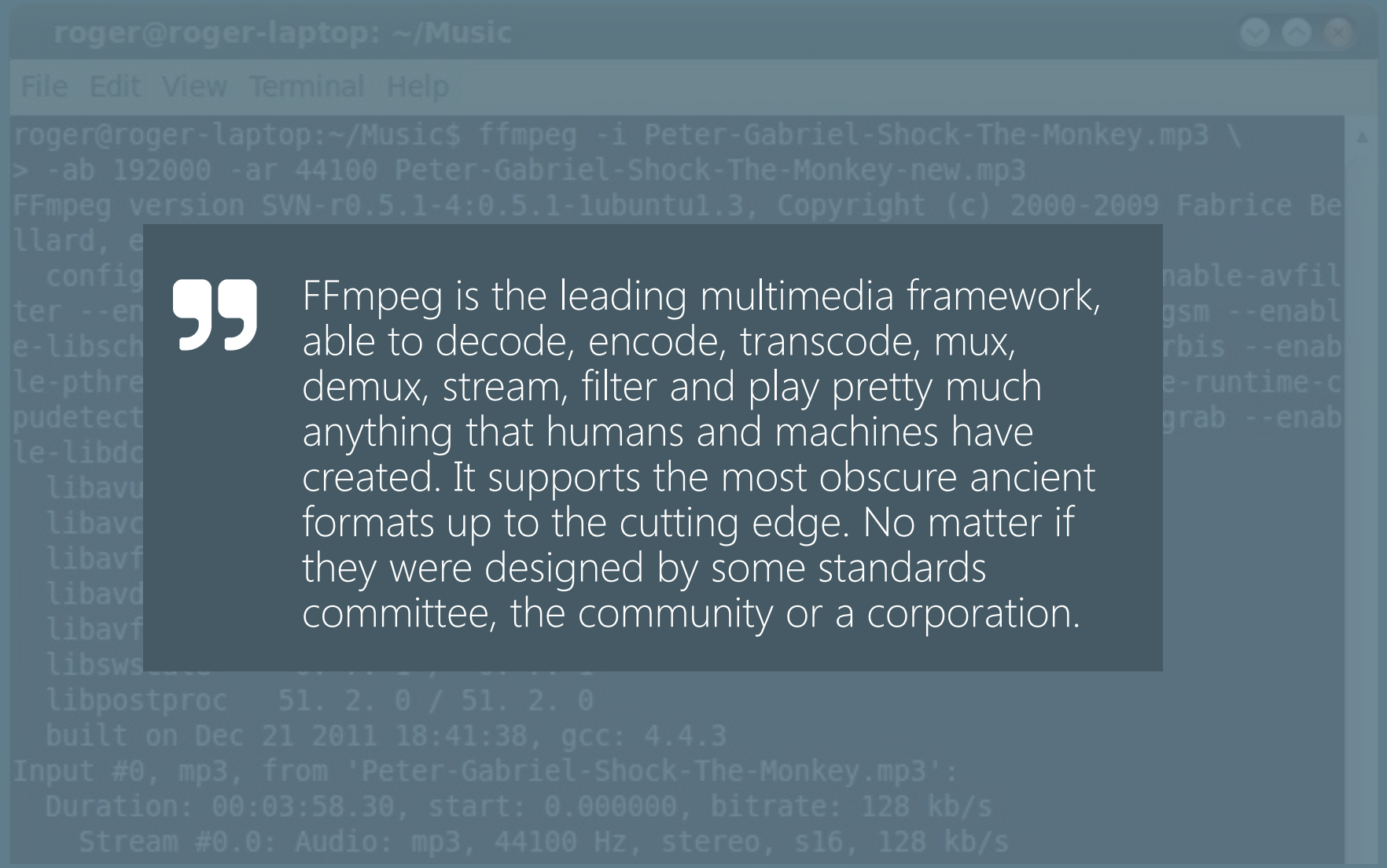
ffmpeg.org

конвертер видео/аудио

бесплатно

Визуализация

FFmpeg



> FFmpeg is the leading multimedia framework, able to decode, encode, transcode, mux, demux, stream, filter and play pretty much anything that humans and machines have created. It supports the most obscure ancient formats up to the cutting edge. No matter if they were designed by some standards committee, the community or a corporation.

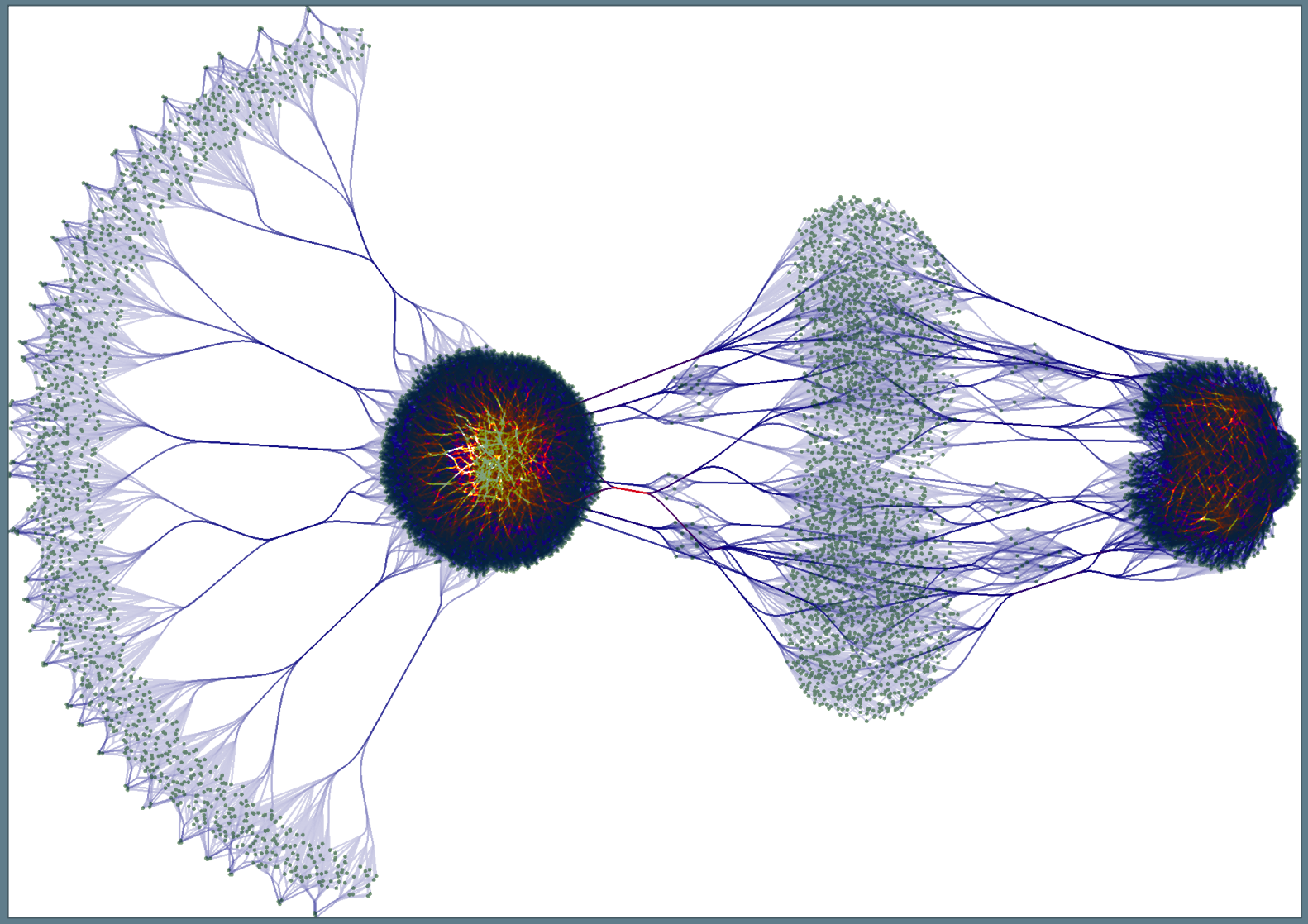
ffmpeg.org

конвертер видео/аудио

бесплатно

Визуализация

Graphviz



graphviz.org

визуализация графов

бесплатно

Graphviz

graphviz.org

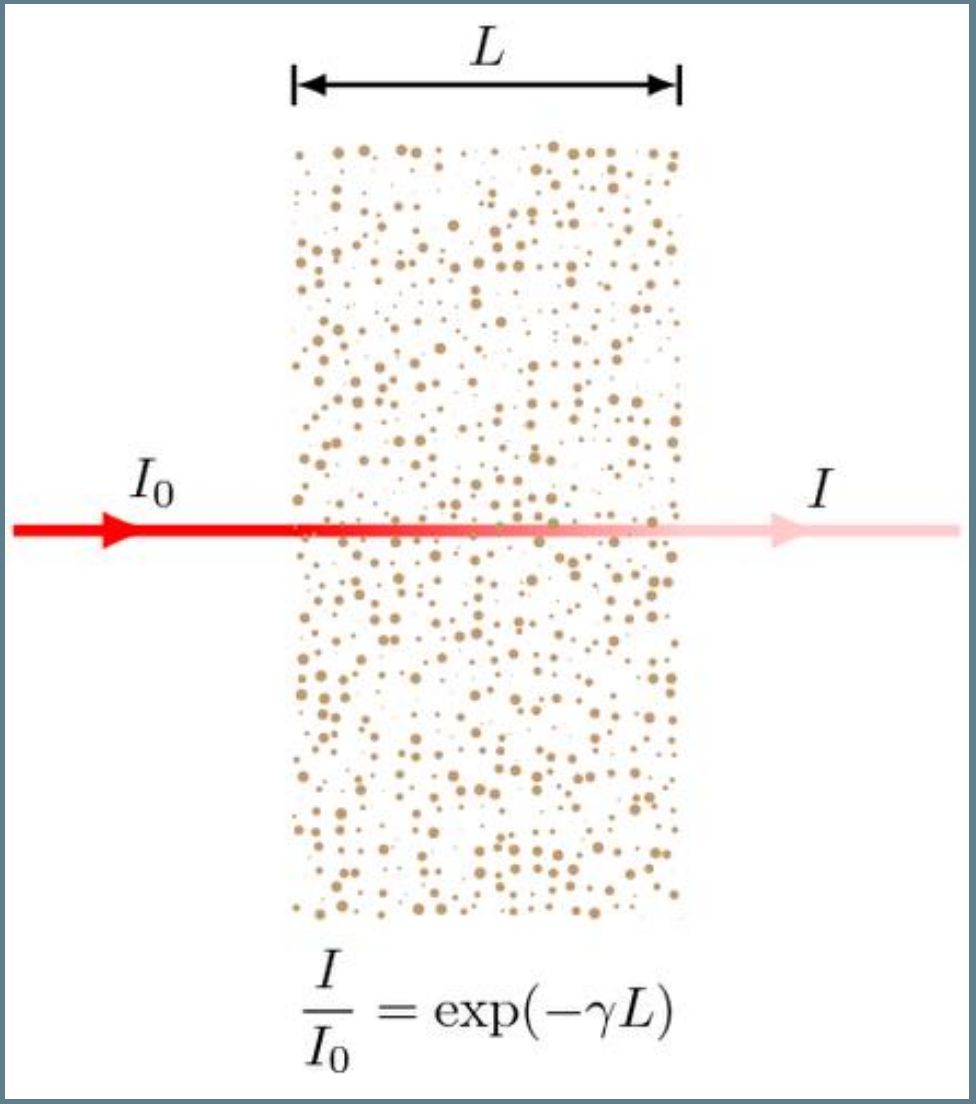
визуализация графов

бесплатно

> Graphviz is open source graph visualization software. Graph visualization is a way of representing structural information as diagrams of abstract graphs and networks. It has important applications in networking, bioinformatics, software engineering, database and web design, machine learning, and in visual interfaces for other technical domains.

Визуализация

PGF/TikZ - Graphic systems for TeX



pgf.sourceforge.net

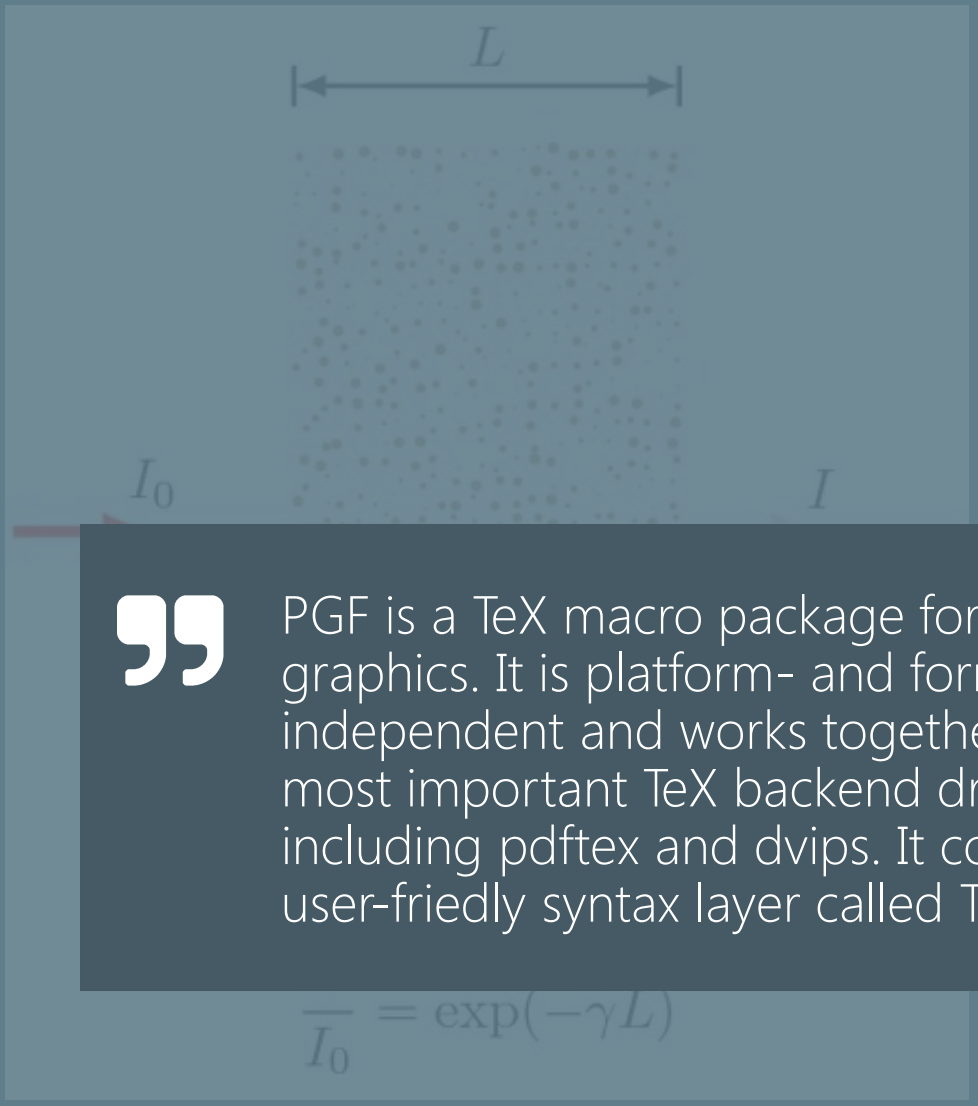
скриптовый векторный редактор

бесплатно

texample.net/tikz/examples/lambert-beer-law/

Визуализация

PGF/TikZ – Graphic systems for TeX



pgf.sourceforge.net

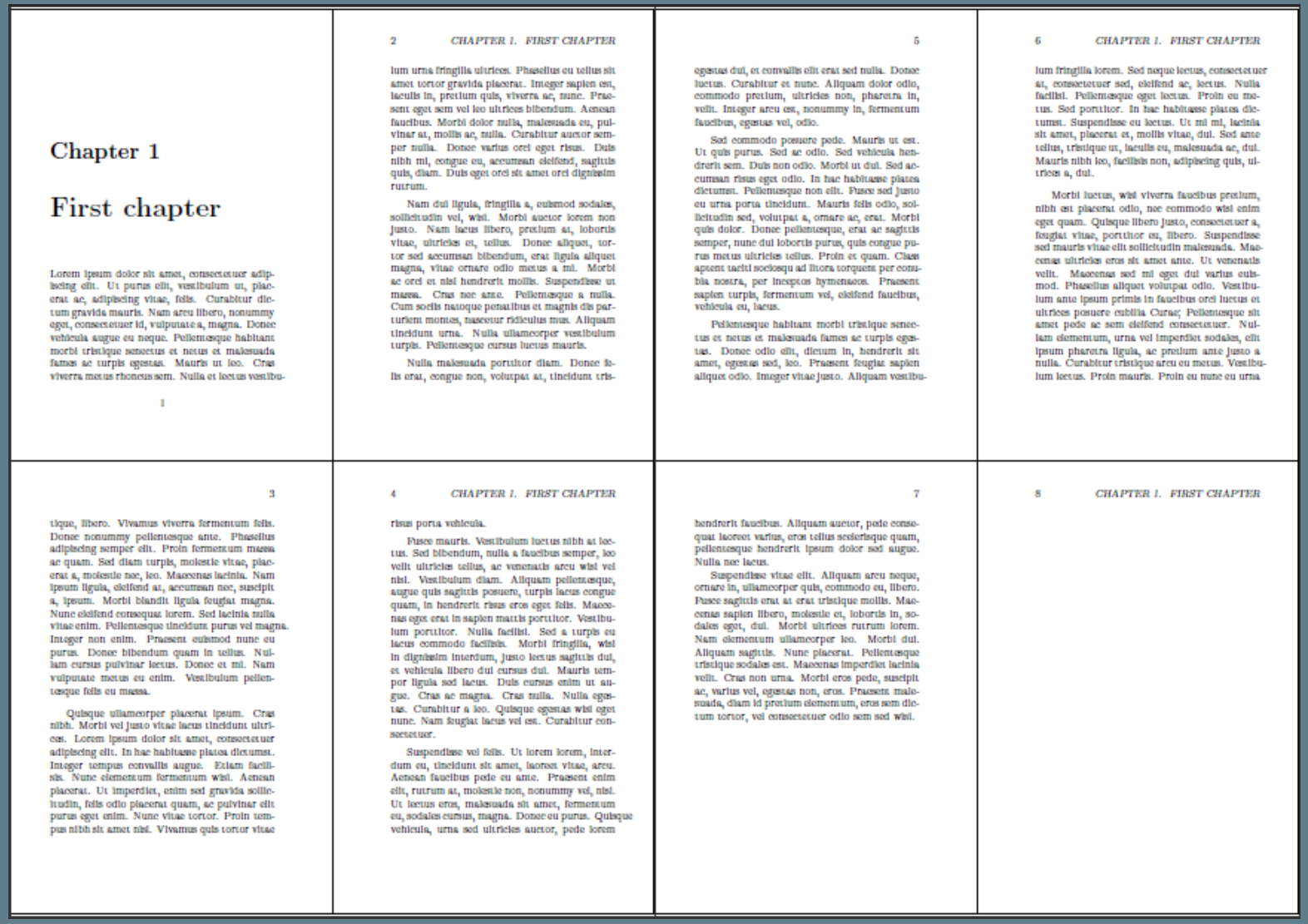
скриптовый векторный редактор

бесплатно

texample.net/tikz/examples/lambert-beer-law/

> PGF is a TeX macro package for generating graphics. It is platform- and format-independent and works together with the most important TeX backend drivers, including pdftex and dvips. It comes with a user-friedly syntax layer called TikZ.

PDFjam



Chapter 1

First chapter

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2 CHAPTER 1. FIRST CHAPTER

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6 CHAPTER 1. FIRST CHAPTER

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4 CHAPTER 1. FIRST CHAPTER

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hendrerit faucibus. Aliquam auctor, pede consequat laoreet varius, eros tellus scelerisque quam, pellentesque hendrerit ipsum dolor sed augue. Nulla nec lacus.

Suspendisse vitae elit. Aliquam arcu neque, ornare in, ullamcorper quis, commodo eu, libero. Fusce sagittis erat at erat tristique mollis. Maecenas sapien libero, molestie et, lobortis in, sodales eget, dui. Morbi ultrices rutrum lorem. Nam elementum ullamcorper leo. Morbi dui. Aliquam sagittis. Nunc placerat. Pellentesque tristique sodales est. Maecenas imperdiet lacinia velit. Cras non urna. Morbi eros pede, suscipit ac, varius vel, egestas non, eros. Praesent malesuada, diam id pretium elementum, eros sem dictum tortor, vel consectetuer odio sem sed wisi.

8 CHAPTER 1. FIRST CHAPTER

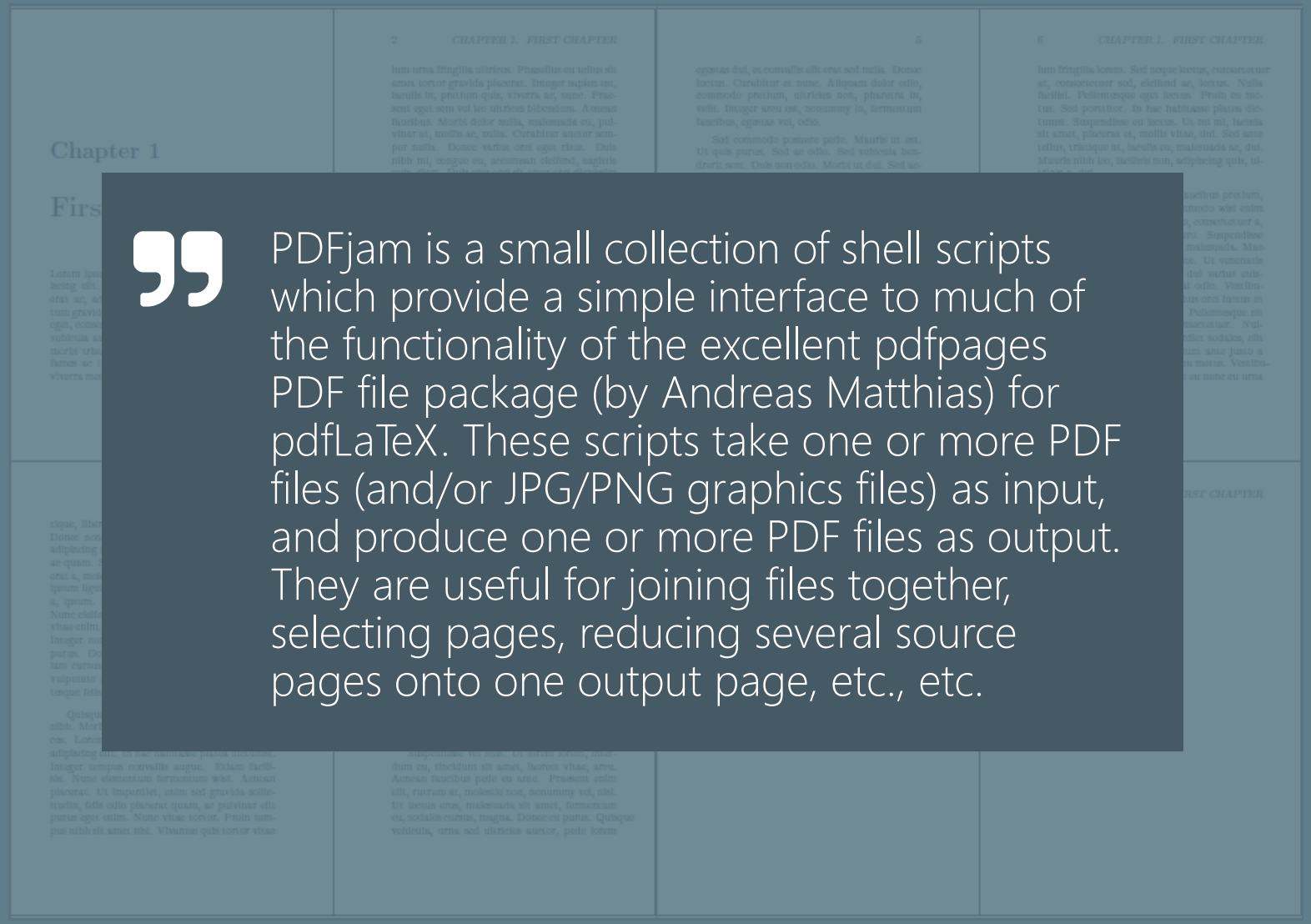
warwick.ac.uk/fac/sci/statistics/staff/academic-research/firth/software/pdfjam/

обработчик pdf файлов

бесплатно

Визуализация

PDFjam



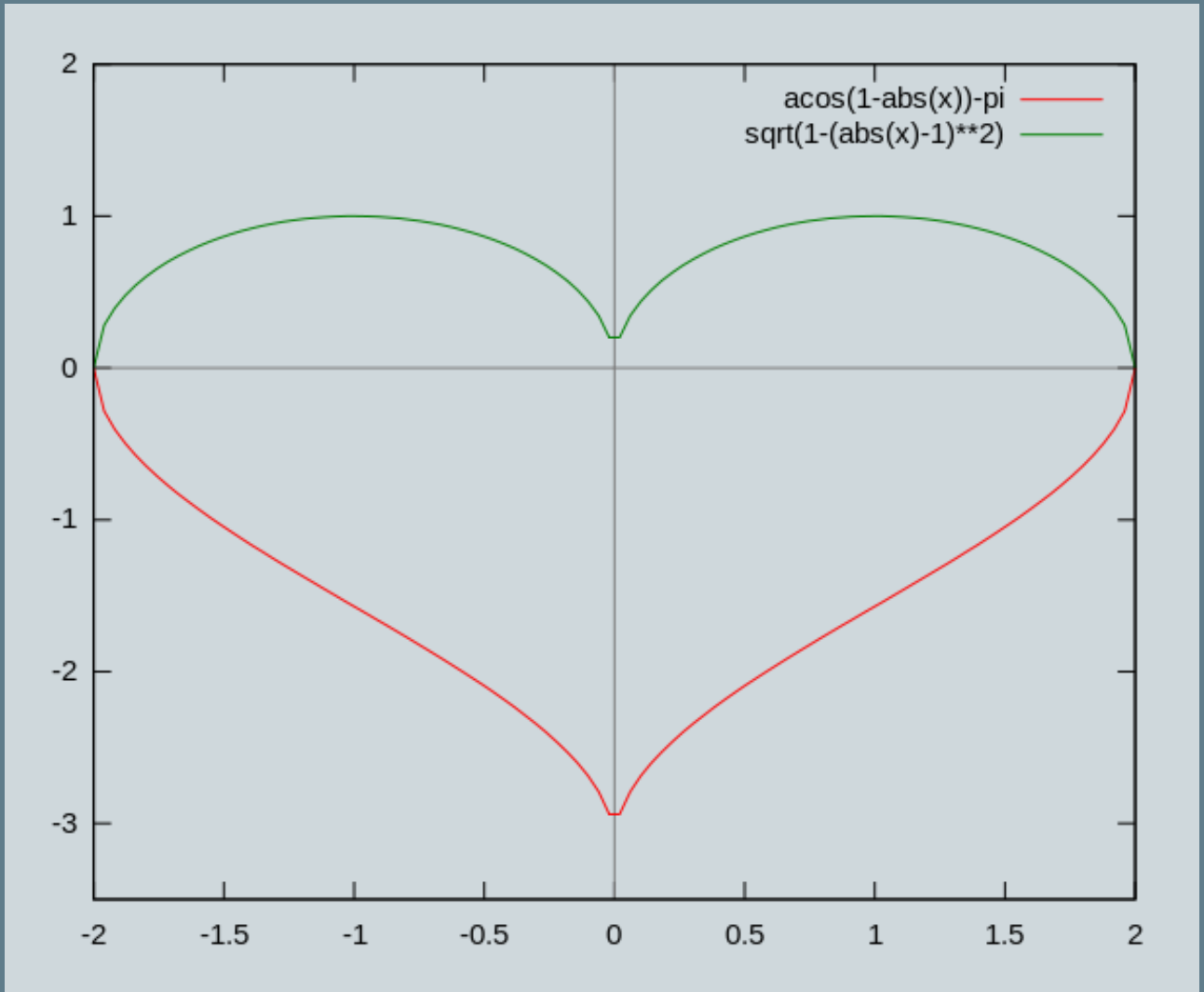
> PDFjam is a small collection of shell scripts which provide a simple interface to much of the functionality of the excellent pdfpages PDF file package (by Andreas Matthias) for pdfLaTeX. These scripts take one or more PDF files (and/or JPG/PNG graphics files) as input, and produce one or more PDF files as output. They are useful for joining files together, selecting pages, reducing several source pages onto one output page, etc., etc.

warwick.ac.uk/fac/sci/statistics/staff/academic-research/firth/software/pdfjam/

обработчик pdf файлов

бесплатно

gnuplot

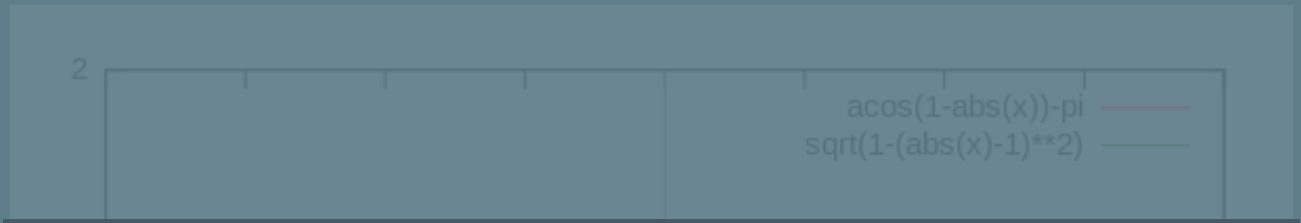


gnuplot.info

построение графиков

бесплатно

gnuplot



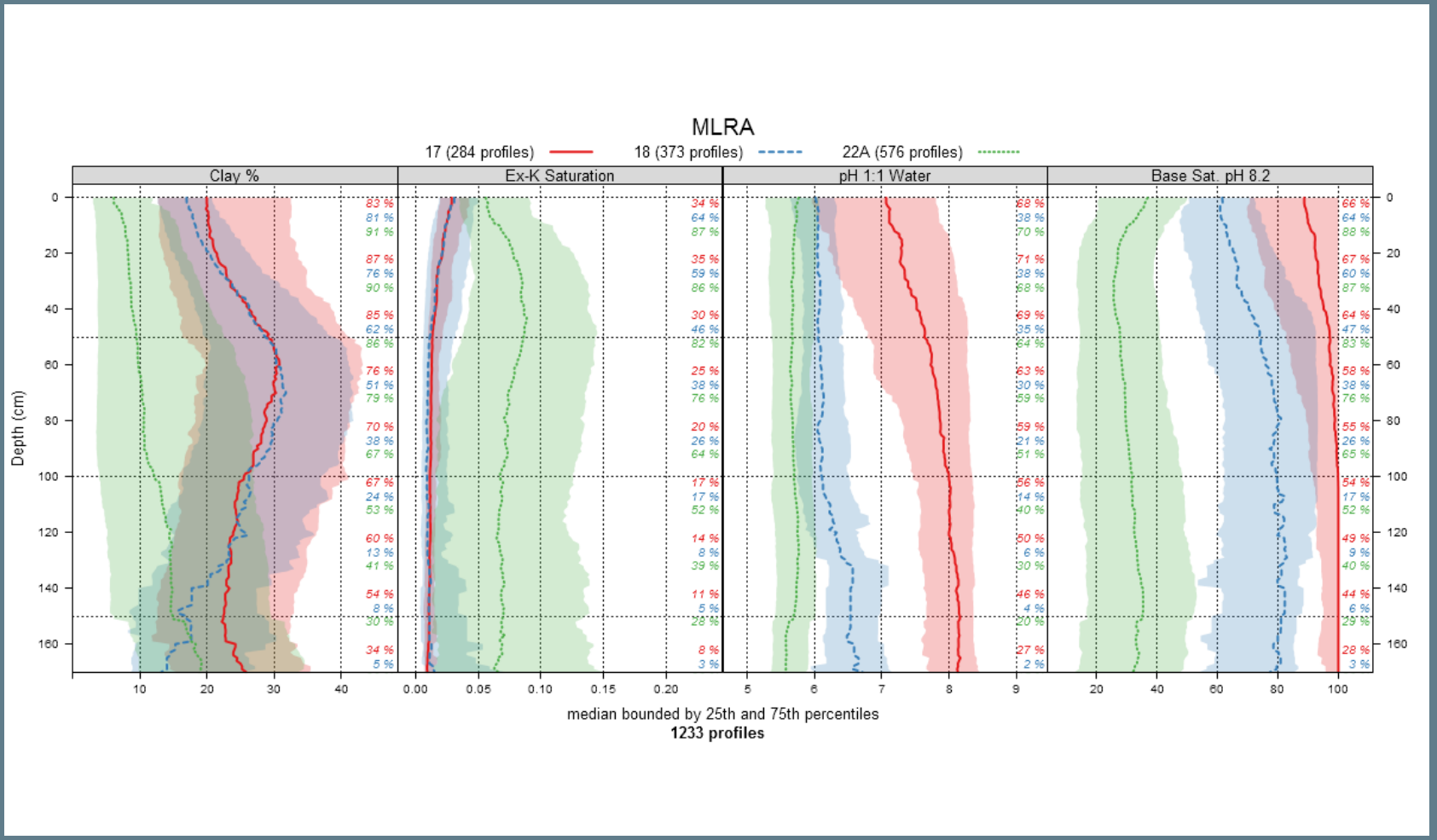
gnuplot.info

построение графиков

бесплатно

> Gnuplot is a portable command-line driven graphing utility for Linux, OS/2, MS Windows, OSX, VMS, and many other platforms. The source code is copyrighted but freely distributed (i.e., you don't have to pay for it). It was originally created to allow scientists and students to visualize mathematical functions and data interactively, but has grown to support many non-interactive uses such as web scripting. It is also used as a plotting engine by third-party applications like Octave. Gnuplot has been supported and under active development since 1986.

R



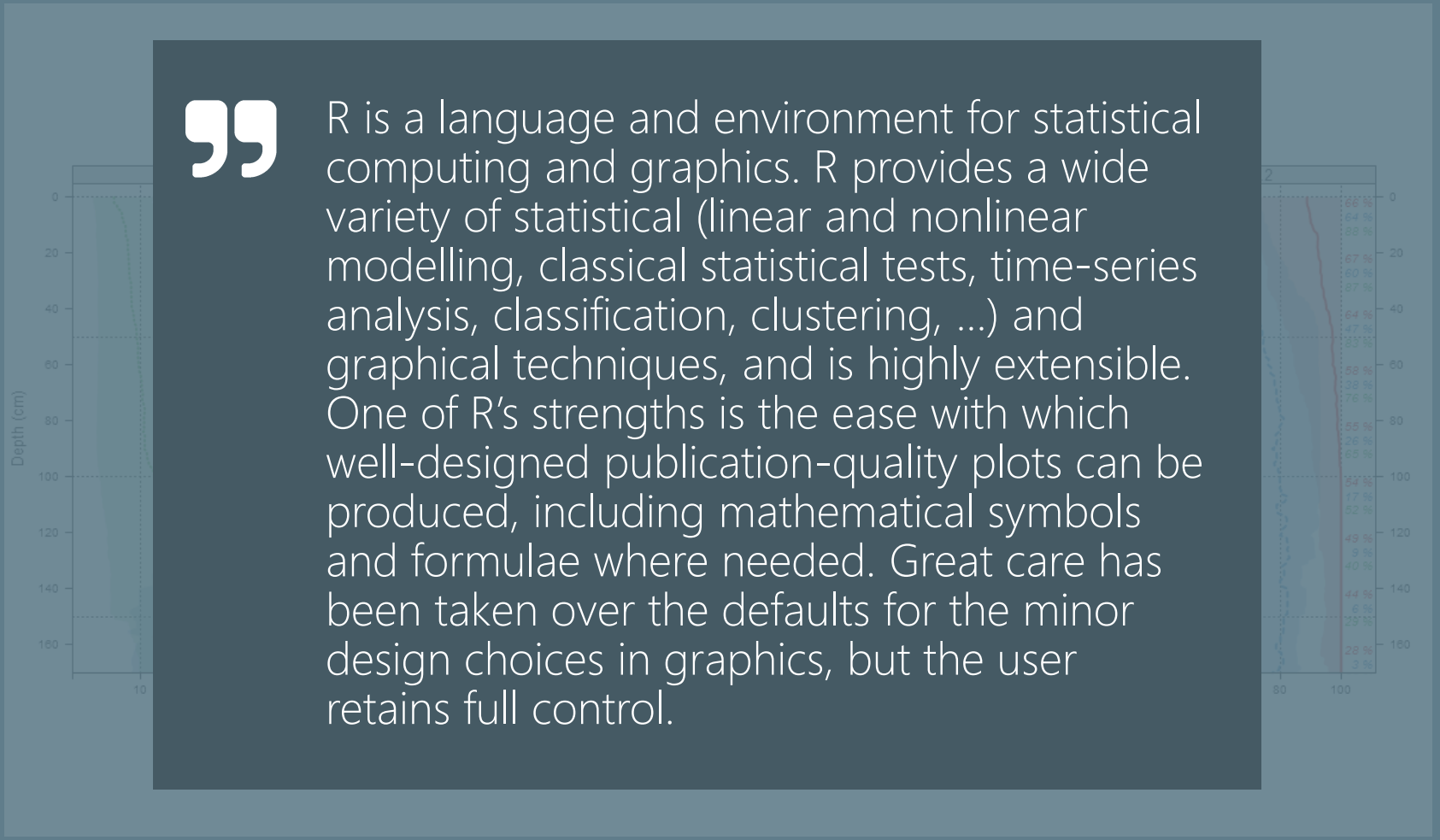
r-project.org

статистические вычисления

бесплатно

Визуализация

R



> R is a language and environment for statistical computing and graphics. R provides a wide variety of statistical (linear and nonlinear modelling, classical statistical tests, time-series analysis, classification, clustering, ...) and graphical techniques, and is highly extensible. One of R's strengths is the ease with which well-designed publication-quality plots can be produced, including mathematical symbols and formulae where needed. Great care has been taken over the defaults for the minor design choices in graphics, but the user retains full control.

r-project.org

статистические вычисления

бесплатно

matplotlib

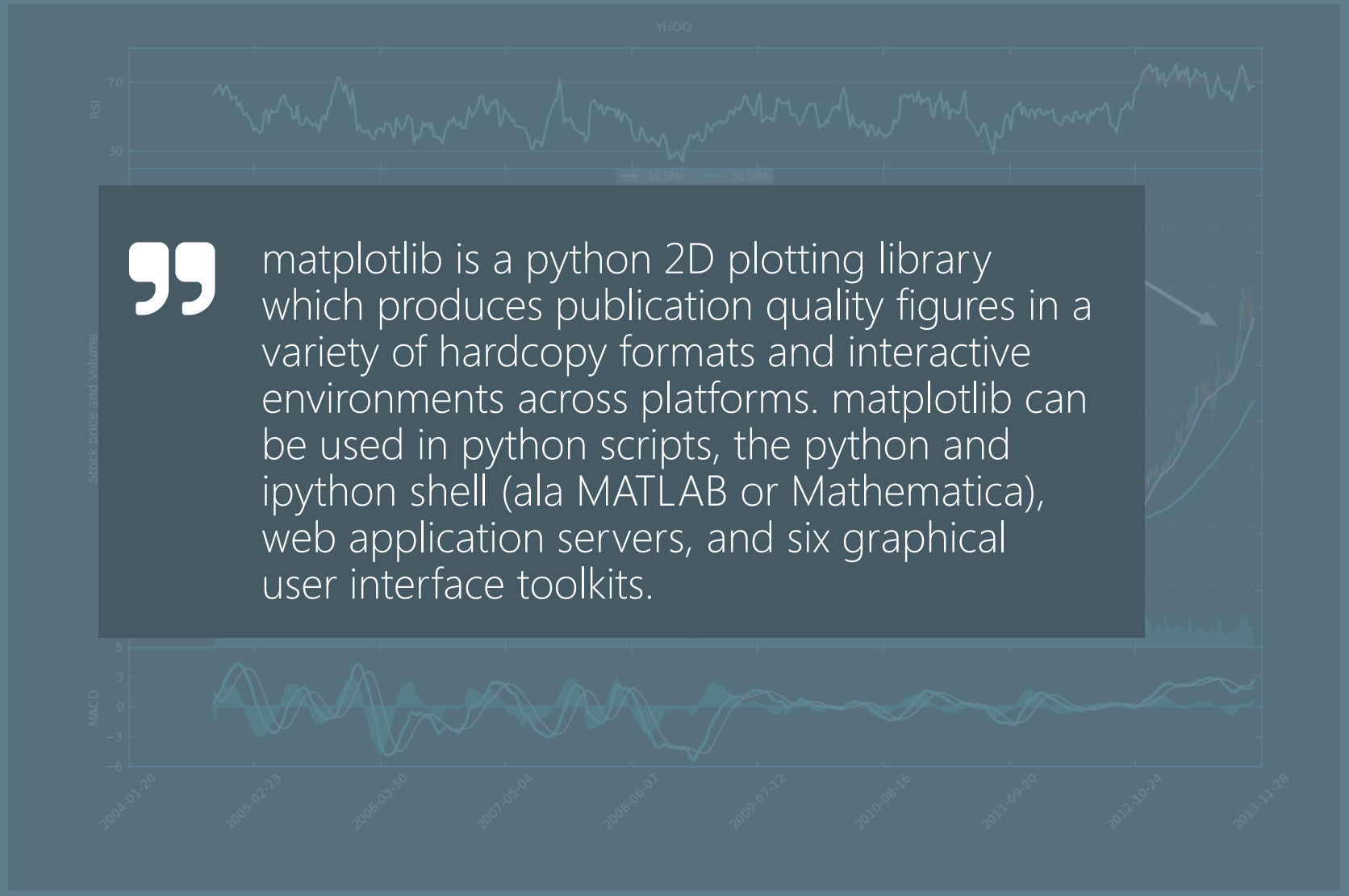
matplotlib.org

построение графиков

python

бесплатно

matplotlib



> matplotlib is a python 2D plotting library which produces publication quality figures in a variety of hardcopy formats and interactive environments across platforms. matplotlib can be used in python scripts, the python and ipython shell (ala MATLAB or Mathematica), web application servers, and six graphical user interface toolkits.

matplotlib.org

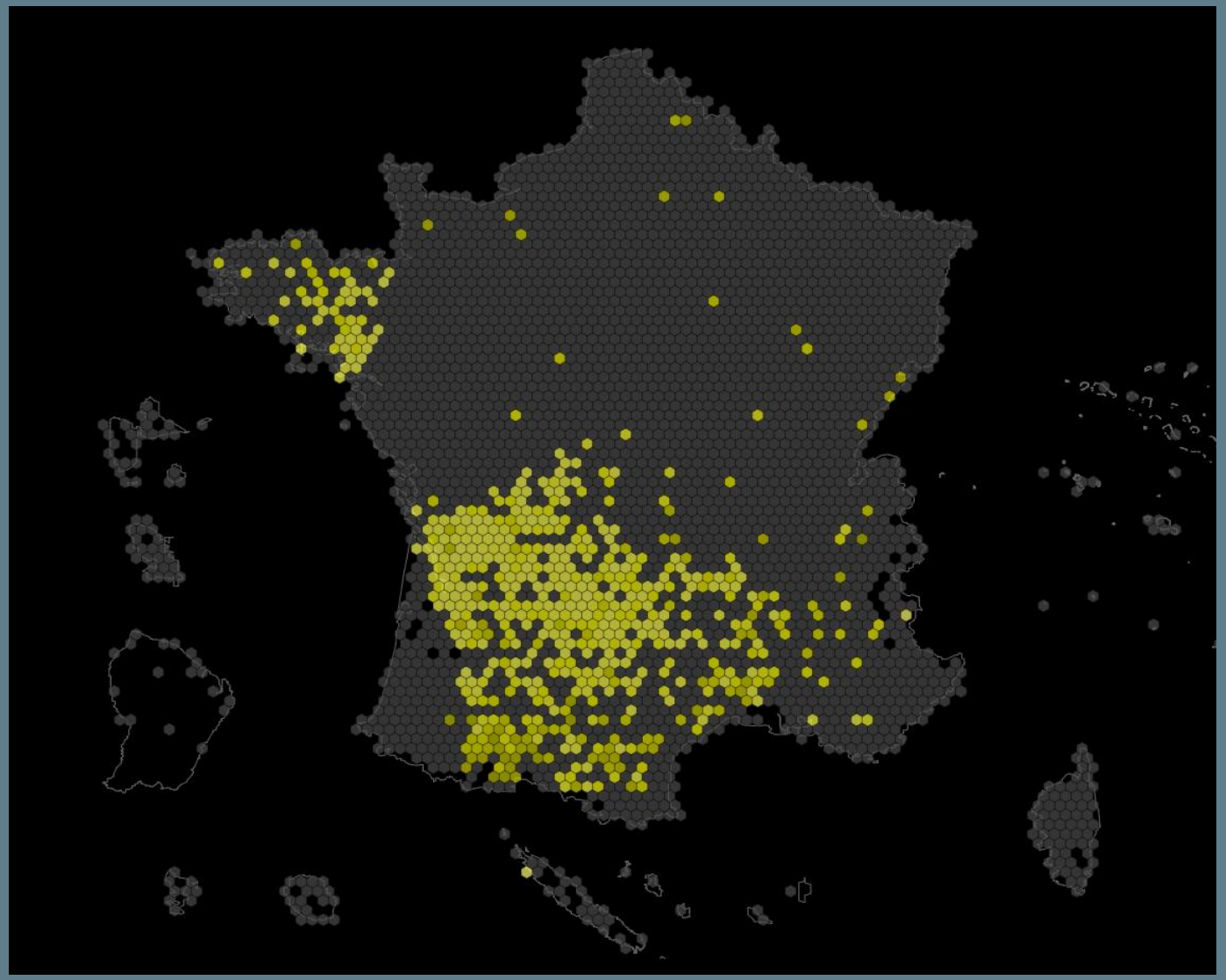
построение графиков

python

бесплатно

Визуализация

D3



d3js.org

динамическая визуализация

javascript

бесплатно

D3

d3js.org

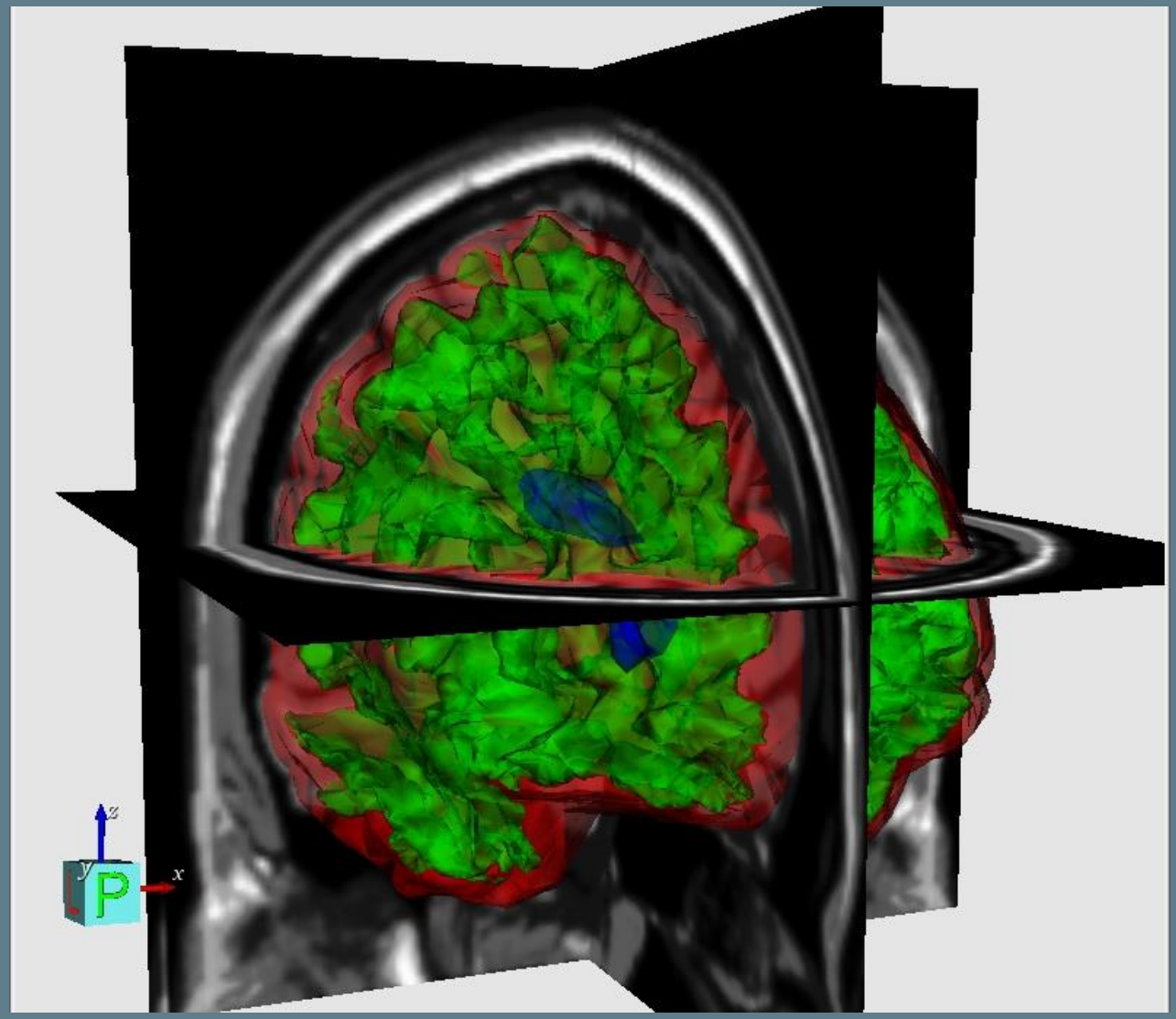
построение графиков

javascript

бесплатно

> D3.js is a JavaScript library for manipulating documents based on data. D3 helps you bring data to life using HTML, SVG, and CSS. D3's emphasis on web standards gives you the full capabilities of modern browsers without tying yourself to a proprietary framework, combining powerful visualization components and a data-driven approach to DOM manipulation.

Visualization Toolkit



vtk.org

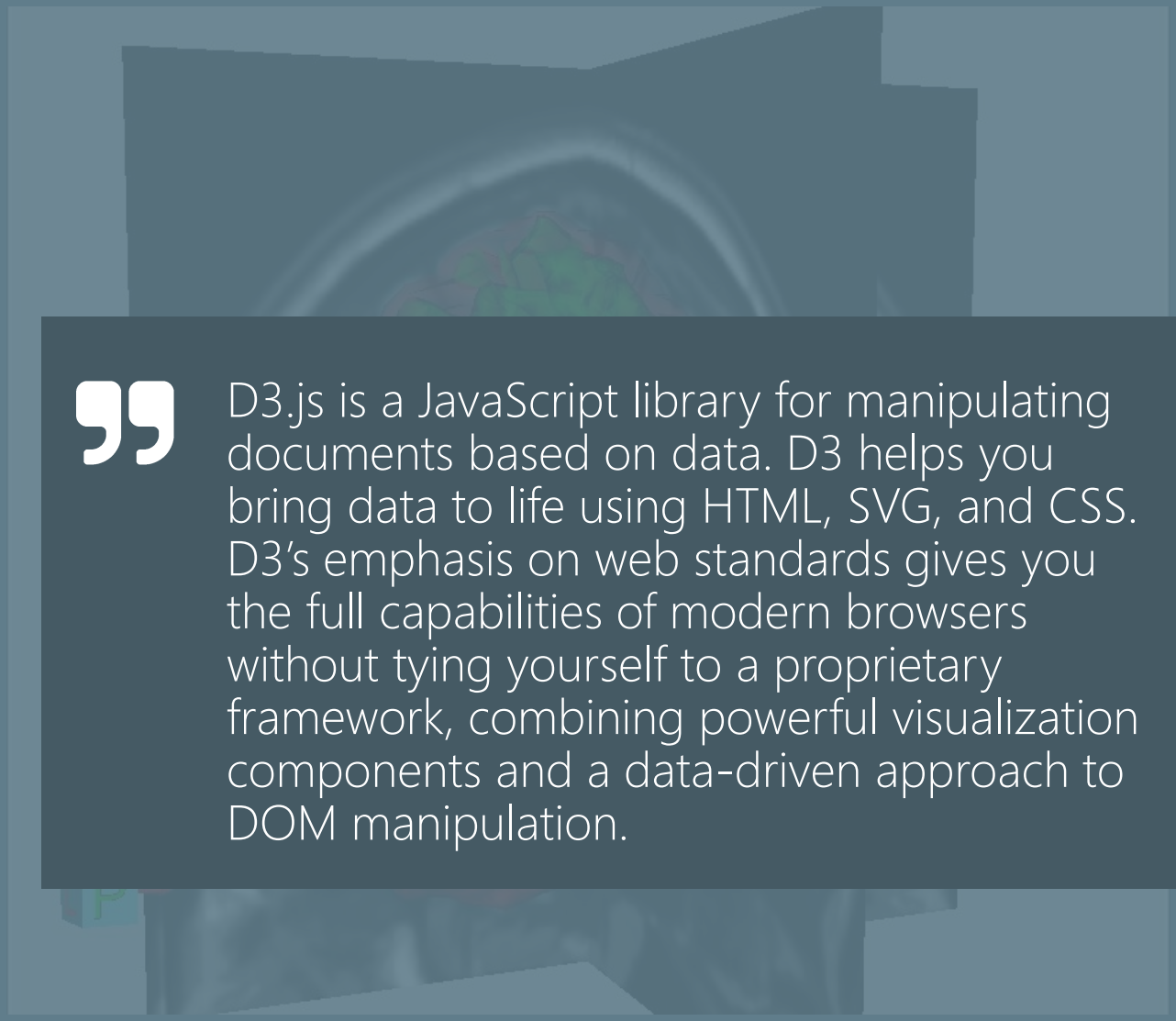
3D визуализация

c++, python, Tcl/Tk, Java

бесплатно

Визуализация

Visualization Toolkit



vtk.org

3D визуализация

c++, python, Tcl/Tk, Java

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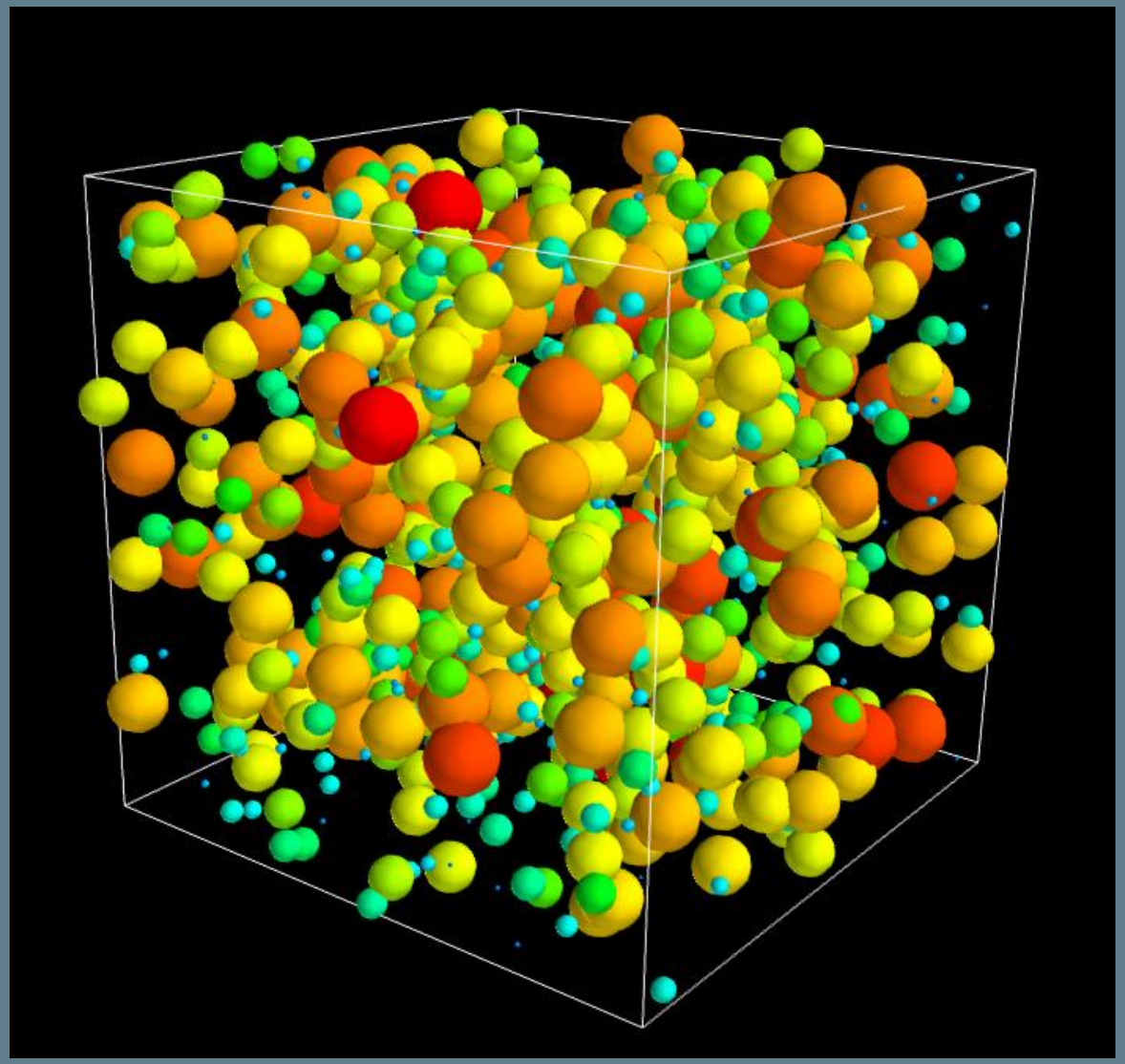
Визуализация

Mayavi



docs.enthought.com/mayavi/mayavi

3D визуализация

python

бесплатно

Визуализация

Mayavi

Mayavi2 is a general purpose, cross-platform tool for 3-D scientific data visualization. Its features include:

- Visualization of scalar, vector and tensor data in 2 and 3 dimensions.
- Easy scriptability using Python.
- Easy extendibility via custom sources, modules, and data filters.
- Reading several file formats: VTK (legacy and XML), PLOT3D, etc.
- Saving of visualizations. Saving rendered visualization in a variety of image formats.
- Convenient functionality for rapid scientific plotting via mlab (see mlab: Python scripting for 3D plotting).

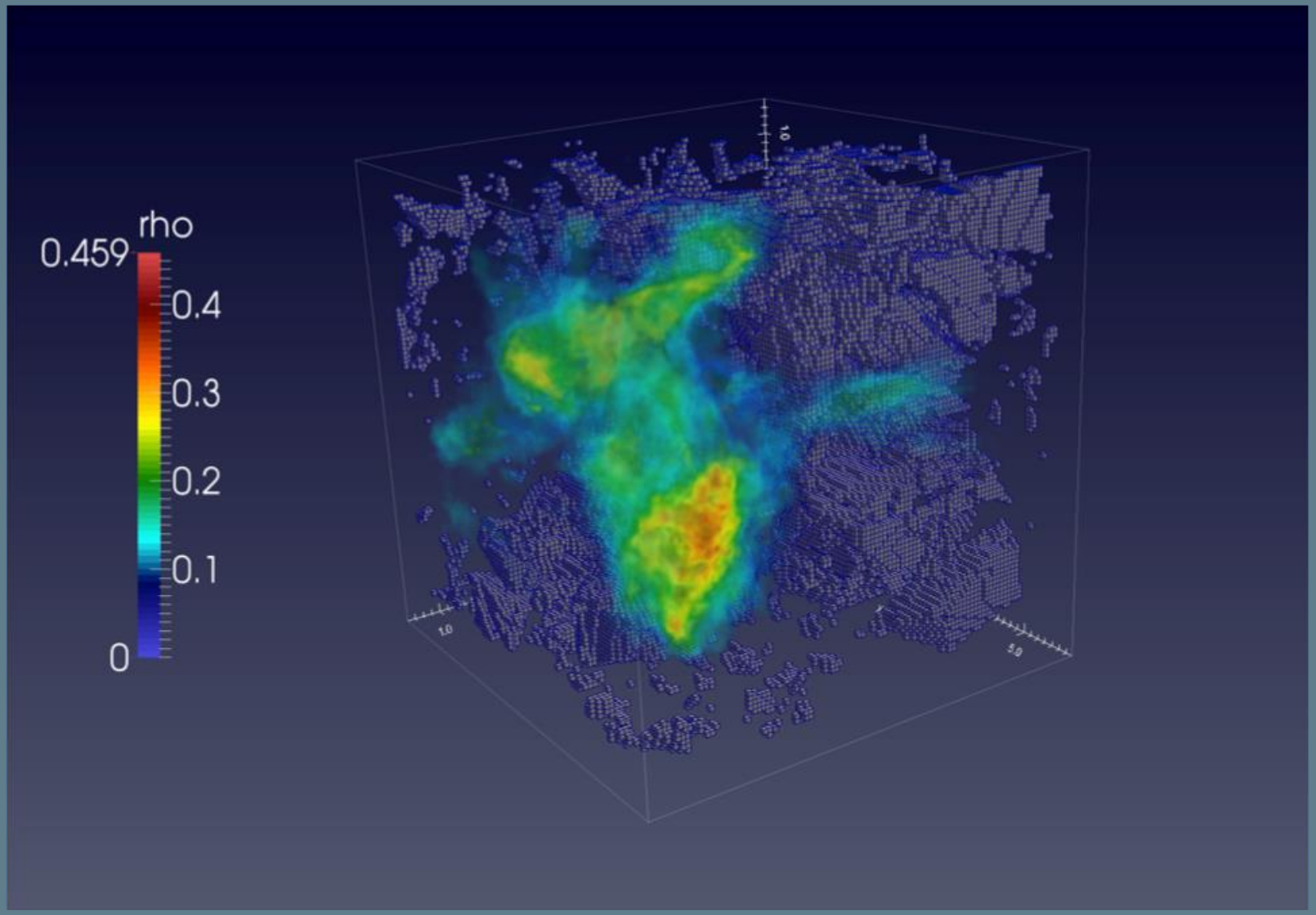
s.enthought.com/mayavi/mayavi

визуализация

thon

платно

ParaView



paraview.org

3D визуализация

бесплатно

Визуализация

ParaView

> ParaView is an open-source, multi-platform data analysis and visualization application. ParaView users can quickly build visualizations to analyze their data using qualitative and quantitative techniques. The data exploration can be done interactively in 3D or programmatically using ParaView's batch processing capabilities. ParaView was developed to analyze extremely large datasets using distributed memory computing resources. It can be run on supercomputers to analyze datasets of petascale as well as on laptops for smaller data. ParaView is an application framework as well as a turn-key application.

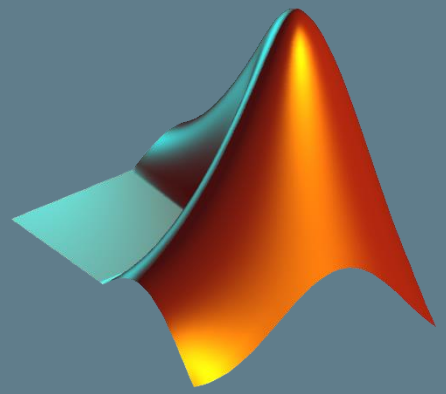
paraview.org

3D визуализация

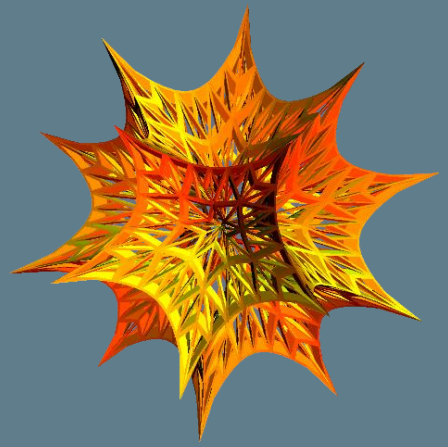
бесплатно

Визуализация

Библиотеки и инструменты



Matlab



Mathematica

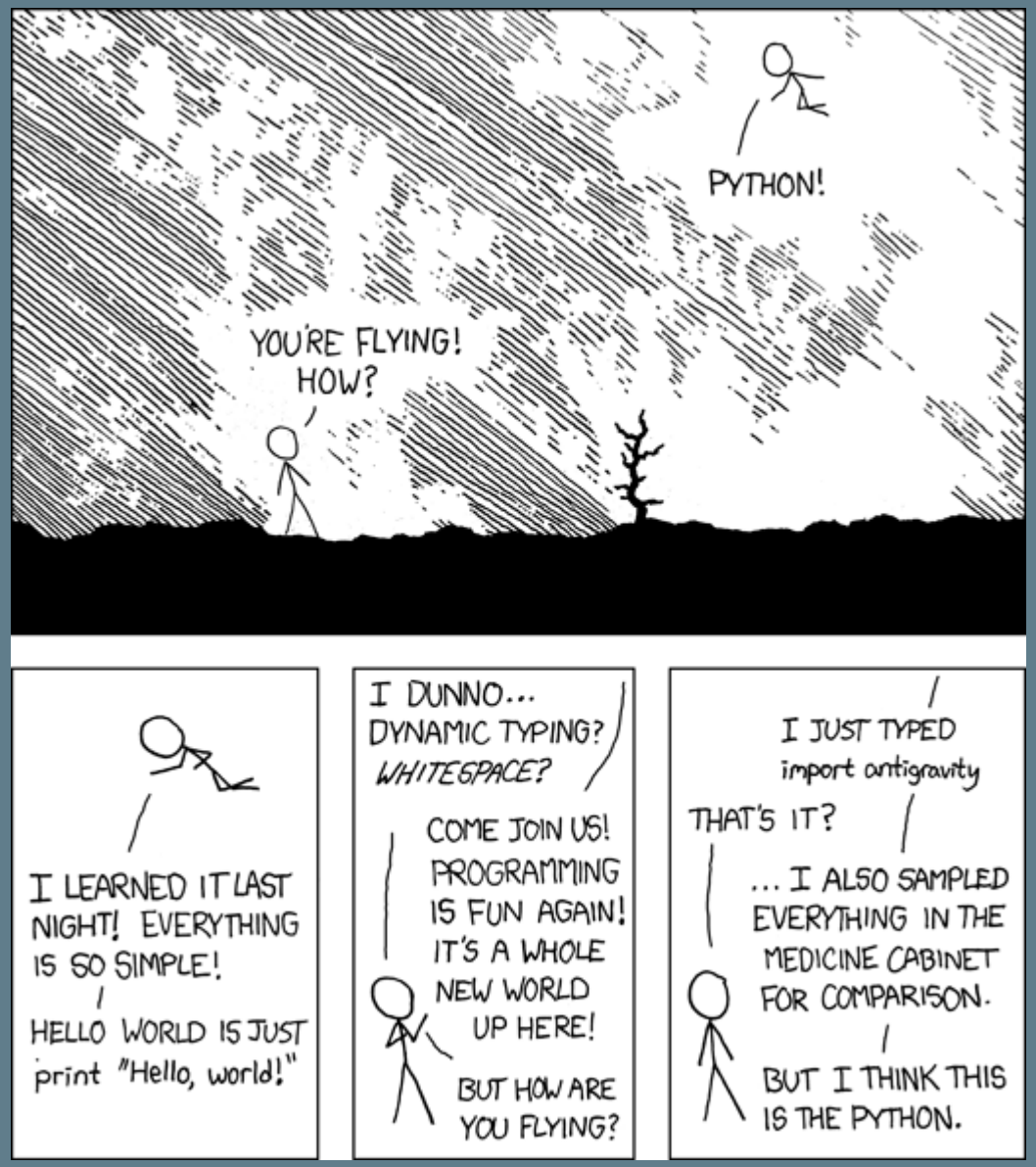
Maple

Sage

sagemath.org

> SageMath is a free open-source mathematics software system licensed under the GPL. It builds on top of many existing open-source packages: NumPy, SciPy, matplotlib, Sympy, Maxima, GAP, FLINT, R and many more.

Библиотеки и инструменты



xkcd.com/353/

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