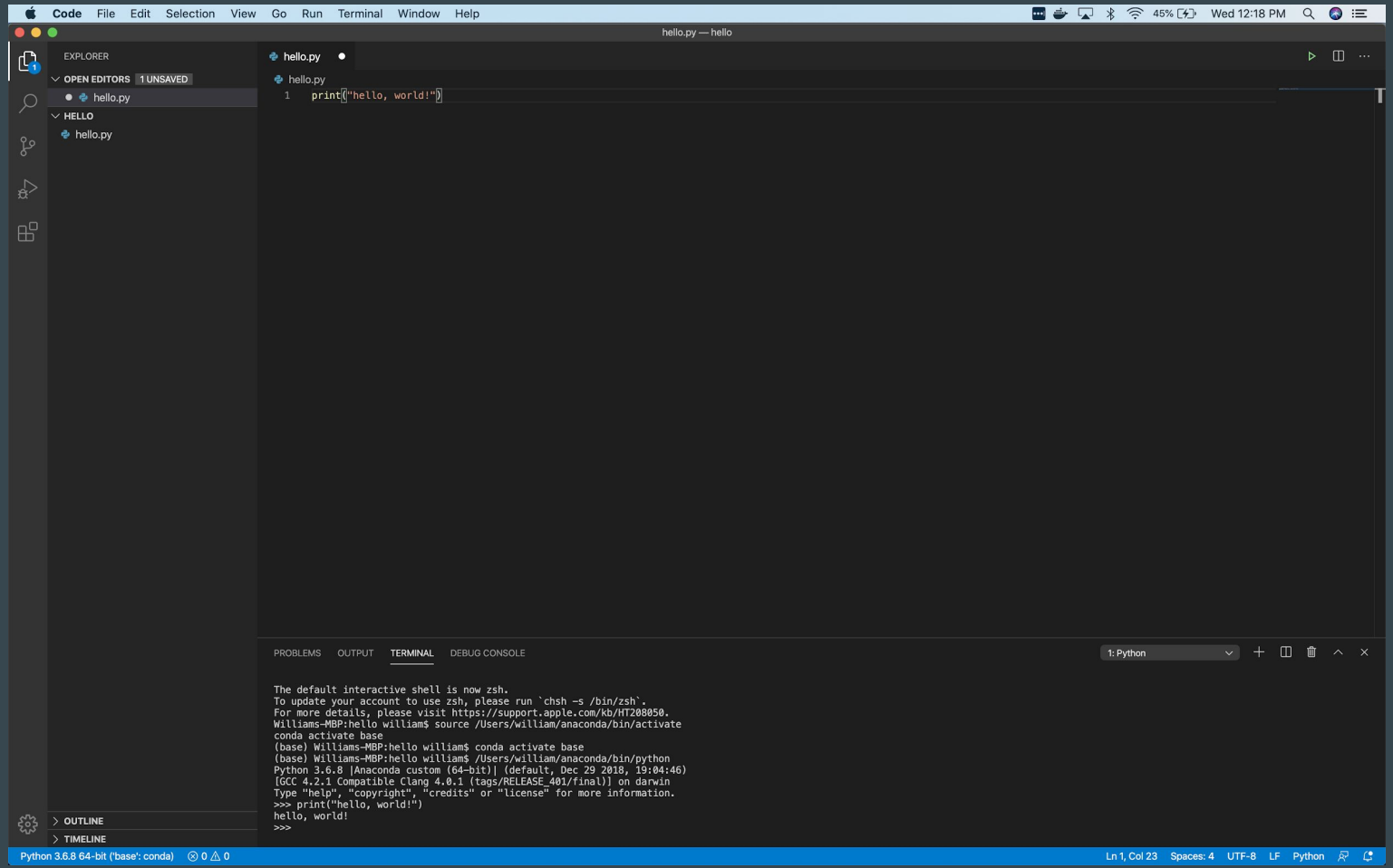
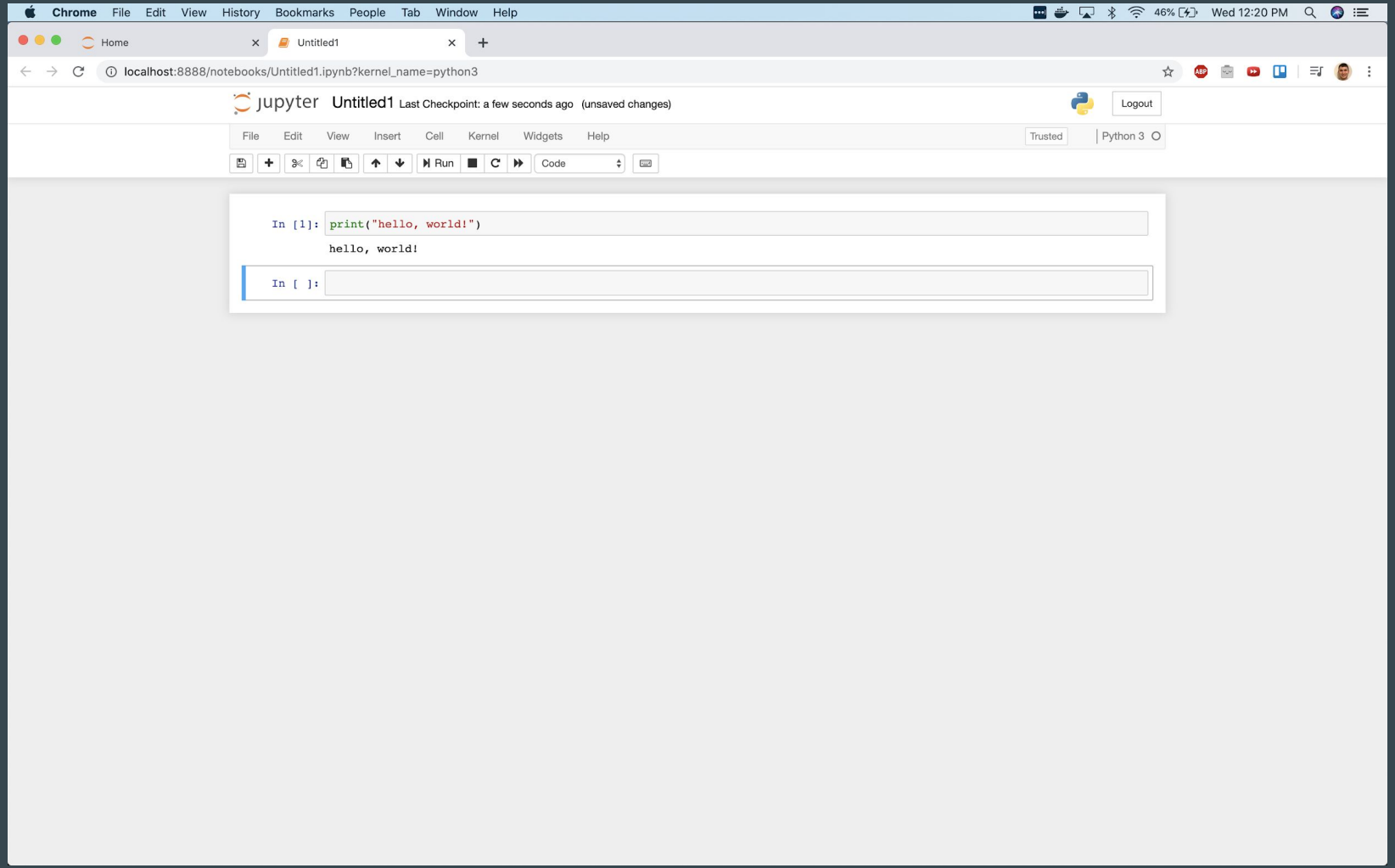
A Brief History of Jupyter Notebooks

William Horton

Two different worlds of Python


Code File Edit Selection View Go Run Terminal Window Help
45% Wed 12:18 PM
hello.py — hello
EXPLORER
OPEN EDITORS 1 UNSAVED
hello.py
HELLO
hello.py
hello.py
hello.py
1 print("hello, world!")
PROBLEMS OUTPUT TERMINAL DEBUG CONSOLE
1: Python
The default interactive shell is now zsh.
To update your account to use zsh, please run `chsh -s /bin/zsh`.
For more details, please visit https://support.apple.com/kb/HT208050.
Williams-MBP:hello william$ source /Users/william/anaconda/bin/activate
conda activate base
(base) Williams-MBP:hello william$ conda activate base
(base) Williams-MBP:hello william$ /Users/william/anaconda/bin/python
Python 3.6.8 |Anaconda custom (64-bit)| (default, Dec 29 2018, 19:04:46)
[GCC 4.2.1 Compatible Clang 4.0.1 (tags/RELEASE_401/final)] on darwin
Type "help", "copyright", "credits" or "license" for more information.
>>> print("hello, world!")
hello, world!
>>>
OUTLINE
TIMELINE
Python 3.6.8 64-bit ('base': conda)
Ln 1, Col 23 Spaces: 4 UTF-8 LF Python


Chrome File Edit View History Bookmarks People Tab Window Help
46% Wed 12:20 PM
Home
Untitled1
localhost:8888/notebooks/Untitled1.ipynb?kernel_name=python3
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Logout
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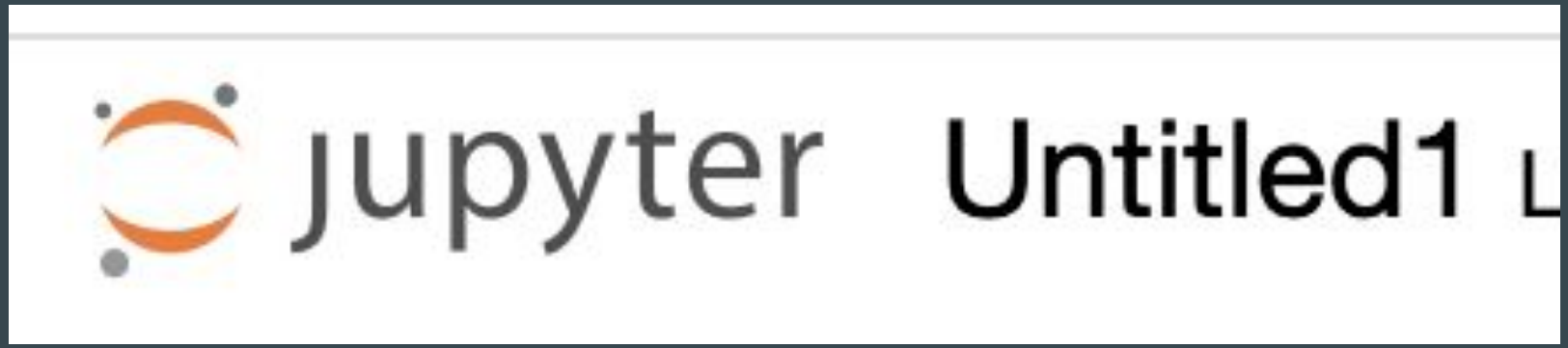
Trusted
Python 3
Run
Code
In [1]: print("hello, world!")
hello, world!
In [ ]:


jupyter
Untitled1

What is a Jupyter Notebook?

Why?

My personal journey

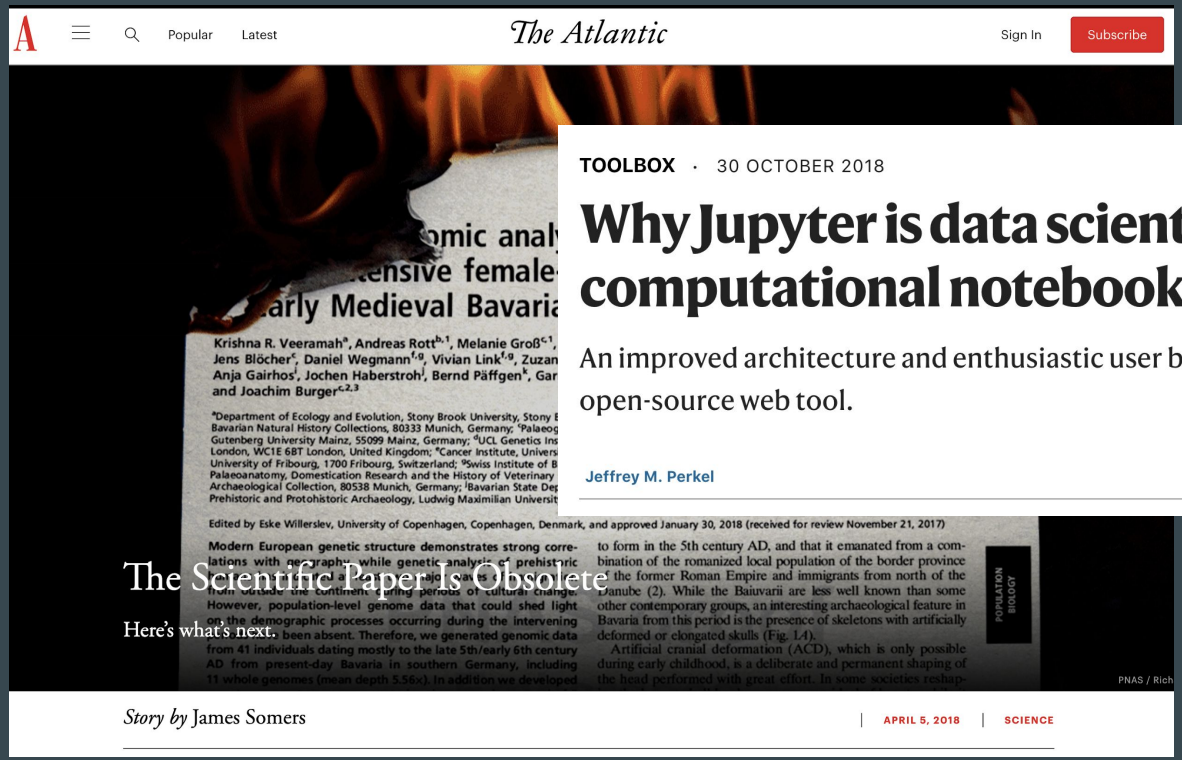
Jeremy #Masks4All Howard
@jeremyphoward

I do think Mathematica doesn't get the credit it deserves for pioneering notebooks
news.ycombinator.com/item?id=222788...

> williamstein 2 hours ago | unvote | parent | flag | favorite | on: Colab Pro
>
> Mathematica's notebook definitely strongly inspired Colab's notebook. Colab is an implementation of the Jupyter notebook format and UI. Jupyter, which launched around 2011, itself was strongly inspired by (1) the IPython console from around 2003, and (2) the Sage Notebook which I launched around 2006.
>
> I can tell you definitively that Sage Notebook is very Mathematica inspired. The IPython console looked a lot like Mathematica, mainly because Fernando Perez (who was a physicist) had used Mathematica a lot and wanted something similar but (much) better. In 2005 there was a project to make an IPython notebook interface as an OS X graphical application, which got demoed at Sage Day 1 (in Feb 2006). That motivated me to get interested in doing something similar, but using Javascript and HTML instead. I hired Alex Clemesha, who just finished his physics undergrad and was a *heavy* Mathematica user to work on Sage fulltime. He did a lot of work with me during 2006 to create a web-based notebook interface (and also to provide a mathematica-like graphics compatibility layer for Python, which is in Sage). The Sage notebook felt pretty similar in 2007 to what Jupyter notebook feels like, and it definitely inspired the UI. We developed Sage notebook heavily and then all sort of lost interest and moved on to other things (e.g., Jason Grout, who was involved a lot with the Sage notebook went to work at Bloomberg, where he did a massive amount of work on JupyterLab). Fortunately, Fernando Perez and others got incredible grant support and many fantastic engineers together built the Jupyter notebook. Jupyter notebook provided the same sort of cell/output UI as we had with the Sage notebook, but was much more general purpose (many kernels) and used more "modern" implementation techniques, by 2011 standards at least.
>
> There's a lot of amazing things about the Mathematica notebook that we never even tried to implement. For example, Mathematica has a much more sophisticated nested structure. Also, by default Mathematica shares one kernel across multiple notebooks (or at least it did last time I tried it).

8:01 PM · Feb 8, 2020 · Twitter Web App

Jupyter Notebooks go mainstream



This talk:

I. Past

II. Present

III. Future

What this talk is not about

How to use Jupyter Notebooks

Introductory material for Jupyter notebooks

Jupyter Notebook: An Introduction

by Mike Driscoll 5 Comments intermediate tools

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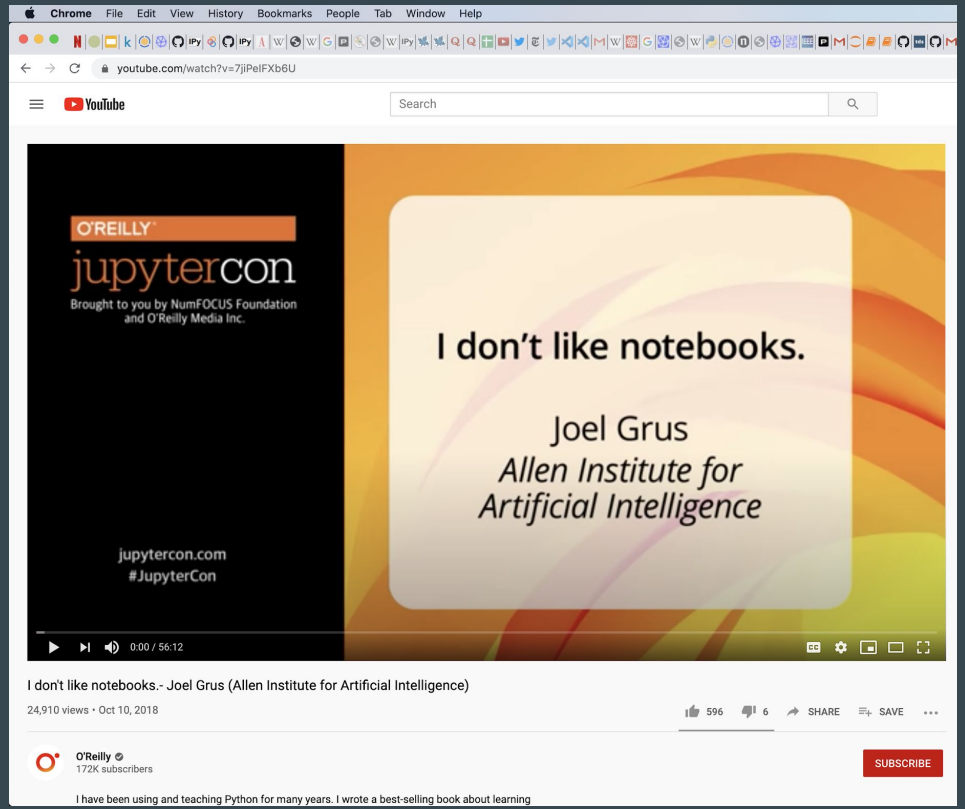
https://realpython.com/jupyter-notebook-introduction/

Loving or Hating Jupyter Notebooks

Joel Grus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Brought to you by NumFOCUS Foundation and O'Reilly Media Inc.
I don't like notebooks.
Joel Grus
Allen Institute for Artificial Intelligence
jupytercon.com
#JupyterCon
0:00 / 56:12
I don't like notebooks.- Joel Grus (Allen Institute for Artificial Intelligence)
24,910 views • Oct 10, 2018
596
6
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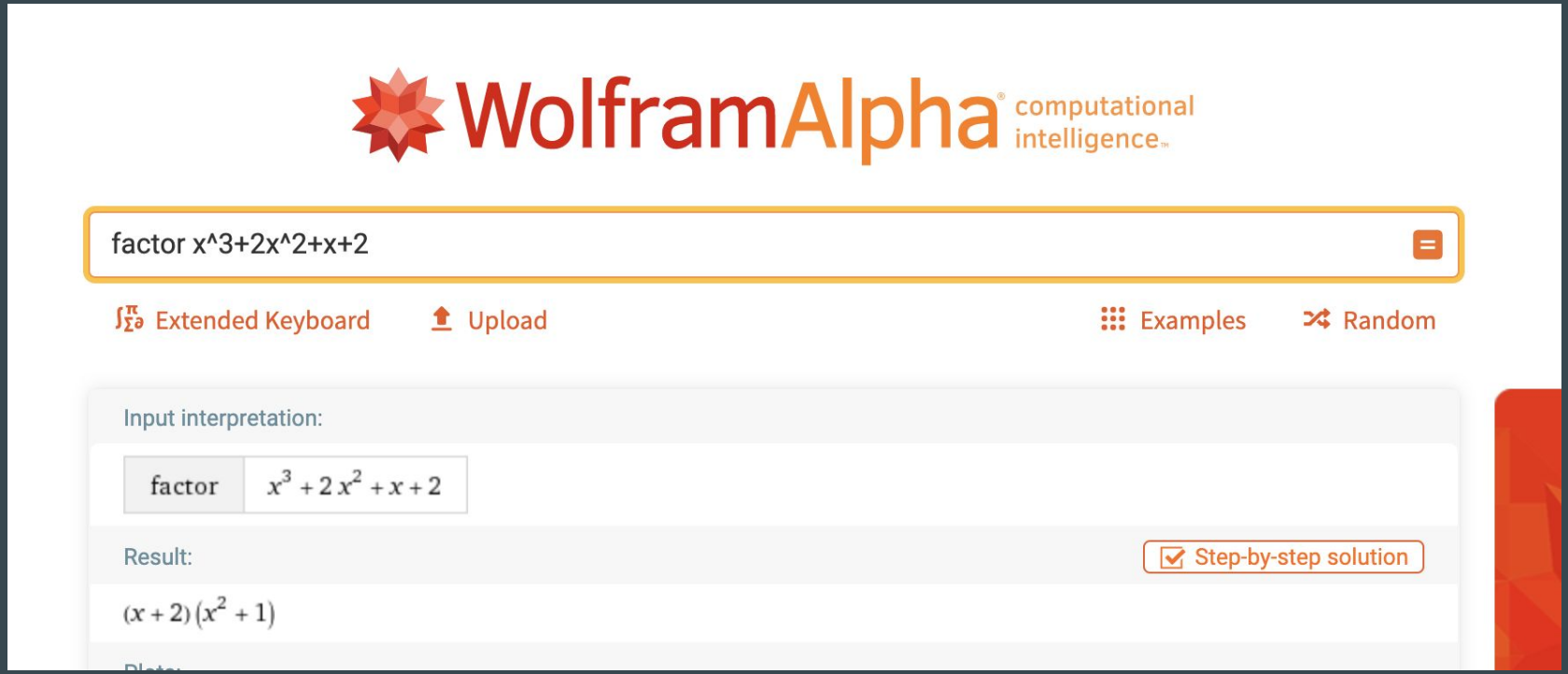
I have been using and teaching Python for many years. I wrote a best-selling book about learning

The First Notebook War

https://www.youtube.com/watch?v=QR7gR3njNWw

Past

(Apologies to all the former science Ph.D’s out there)


WolframAlpha computational intelligence
factor x^3+2x^2+x+2
Extended Keyboard
Upload
Examples
Random
Input interpretation:
factor
$x^3 + 2x^2 + x + 2$
Result:
Step-by-step solution
$(x + 2)(x^2 + 1)$

Mathematica (1988)

Created by Stephen Wolfram

Notebook interface designed by Theodore Gray

An all-in-one system: language (Wolfram), execution environment, scientific libraries

THE BYTE AWARDS

The First Annual BYTE Award Winners

In the course of a year, we see a lot of products at BYTE—the good, the bad, the ugly, the innovative, the inane, and the endlessly de-

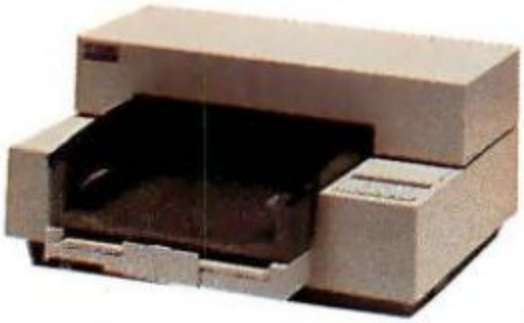
Mathematica

Mathematica is another breakthrough Macintosh application. It does for students of calculus, symbolic algebra, and some discrete mathematics what calculators did for those learning arithmetic. Confirmed mathphobic students may very well be drawn into Mathematica's impressive displays and its ability to solve equations quickly and display graphical results. It could enable you to absorb the algebra and calculus that seemed impossible to comprehend from a textbook.

EXCELLENCE

NeXT Computer

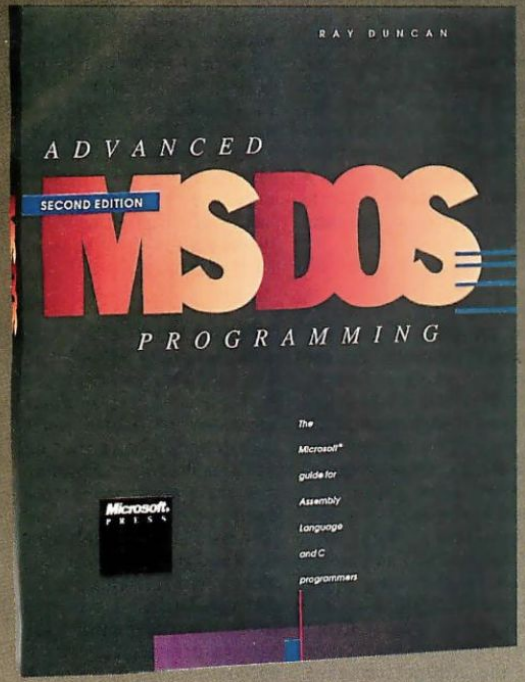
The NeXT Computer shows what can be done when a personal computer is designed as a system, and not a collection of hardware elements. It features the latest-generation high-speed components: Motorola's 25-MHz 68030 CPU and 68882 floating-point unit, and a 4-megabyte-per-second SCSI (small computer system



HP DeskJet Printer ▲

If you're looking for a truly silent printer, this HP ink-jet will suit you. The DeskJet's output is close to laser-printer quality at a much more tolerable price of $995. It comes

We couldn't have said it better.



"Advanced MS-DOS PROGRAMMING exemplifies how a highly technical book can be both informative and readable.... Duncan's strengths include a style that is at once easily read, a thorough coverage of the subject matter heretofore unknown, and the frequent use of examples in the form of assembly language programs and code fragments."

BYTE magazine
John Unger, IBM Issue 1986

"Makes good reading out of even the most elaborate technical descriptions."

Online Today

"One of the most authoritative in its field.... The book deserves a place on the shelf of everyone who has ever given a fleeting thought to programming the IBM PC and compatibles."

PC Magazine

Key architectural details of Mathematica Notebooks

Two parts to the system: kernel and front-end

The front-end sends the input to the kernel, which returns the result, which is displayed

Mathematica notebooks are objects that can be manipulated by Mathematica programs

The Mathematica Notebook Interface

Mathematica™

ALGEBRAIC COMPUTATIONS

```
In[1]:=
  Series[Exp[f[x + h] - f[x - h]], {h, 0, 6}]

Out[1]=
                               2  2
 1 + 2 f'[x] h + 2 f'[x]  h  +

                 3      (3)
       4 f'[x]         f    [x]    3
      (--------- + --------) h  +
           3             3

                 4                  (3)
       2 f'[x]         2 f'[x]  f    [x]    4
      (--------- + ----------------) h  +
           3                3

                 5                 2   (3)                 (5)
       4 f'[x]         2 f'[x]   f    [x]         f   [x]       5
      (--------- + ------------------ + --------) h  +
          15                  3                     60

          (3)      2                      (5)
         f    [x]         f'[x]  f   [x]
         ---------- + ---------------
             9                   15                        4 f'[x]  6
        (-------------------------------- + ----------- +
                           2                                   45

                             3    (3)
                 4 f'[x]   f    [x]     6         7
                 ----------------) h  + O[h]
                          9
```

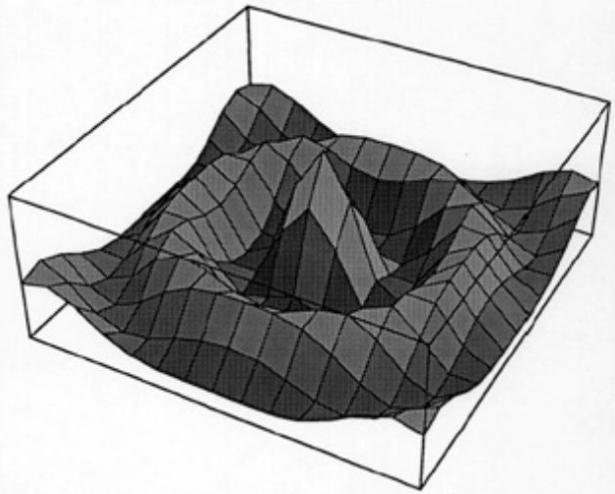
A power series expansion.

Mathematica™

GRAPHICS

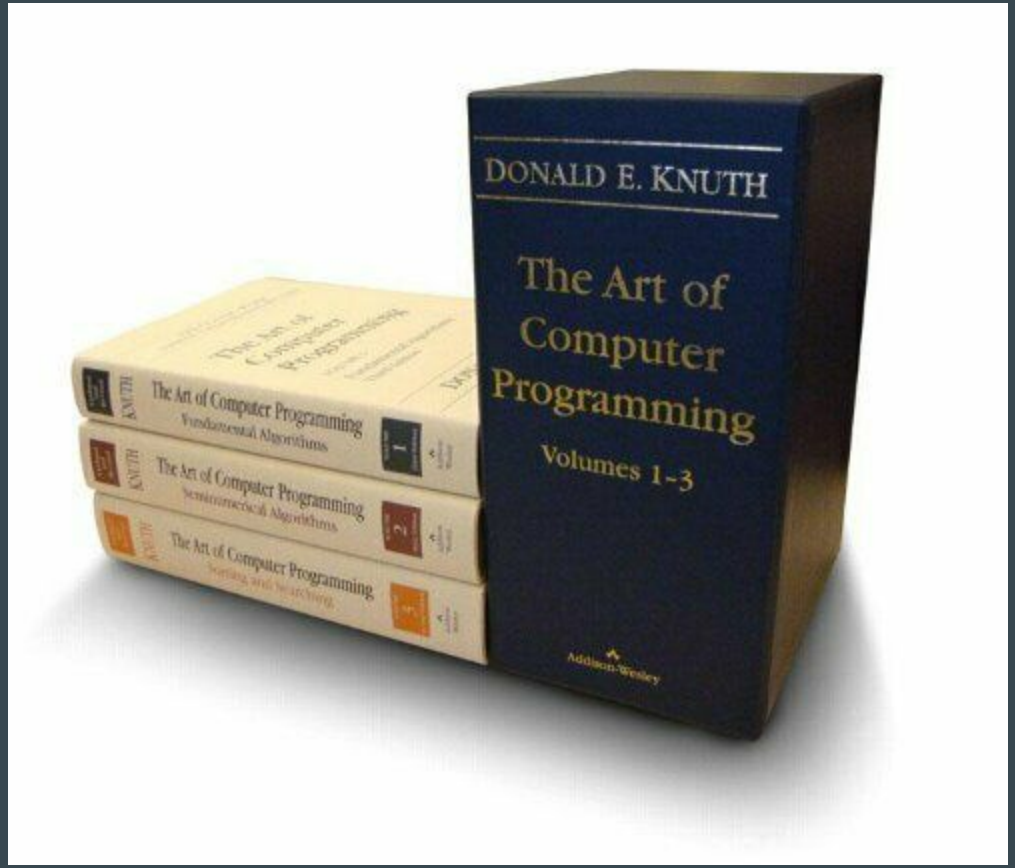
```
In[1]:=
  Plot3D[BesselJ[0, Sqrt[x^2 + y^2]], {x, -10, 10},
  {y, -10, 10}, PlotPoints->100]

Out[1]=
```



A three-dimensional plot of a Bessel function.

Going further back...


DONALD E. KNUTH
The Art of Computer Programming
Volumes 1-3
The Art of Computer Programming
Fundamental Algorithms
The Art of Computer Programming
Seminumerical Algorithms
The Art of Computer Programming
Sorting and Searching
Addison-Wesley

Literate Programming

Donald Knuth

Implemented the “WEB” system

Concepts of “tangled” and “woven”

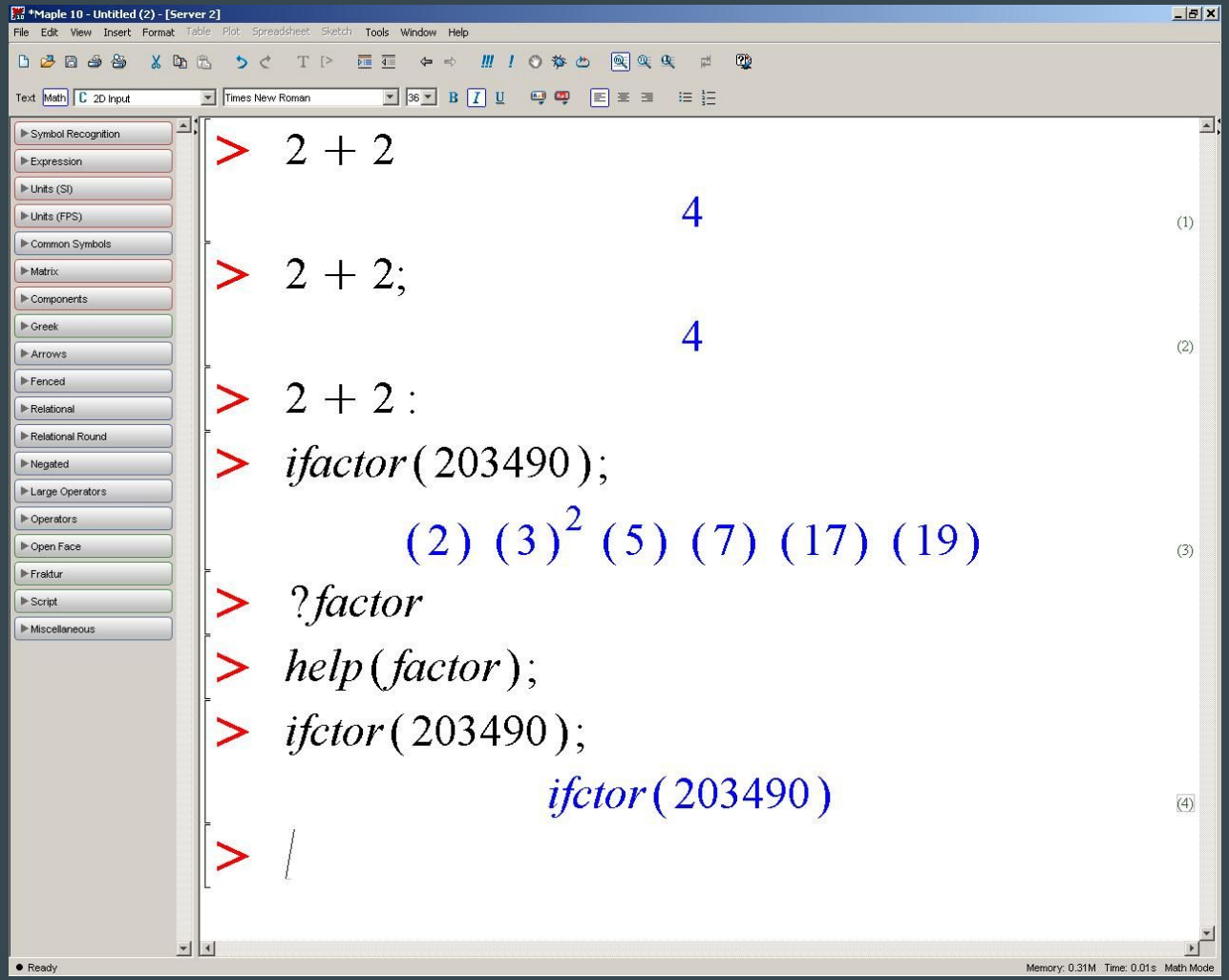
Maple

Scientific computing environment + programming language

First GUI for Maple released in 1989

1992 -- release of the “worksheet” interface:

“Beginning with the Macintosh user interface for Maple V, the new user interfaces will all support the concept of a "worksheet" which integrates text, Maple input commands, Maple output, and graphics into one document.”


*Maple 10 - Untitled (2) - [Server 2]
File Edit View Insert Format Table Plot Spreadsheet Sketch Tools Window Help
Text Math 2D Input Times New Roman 36
Symbol Recognition
Expression
Units (SI)
Units (FPS)
Common Symbols
Matrix
Components
Greek
Arrows
Fenced
Relational
Relational Round
Negated
Large Operators
Operators
Open Face
Fraktur
Script
Miscellaneous
> 2 + 2
4 (1)
> 2 + 2;
4 (2)
> 2 + 2 :
> ifactor(203490);
(2) (3)^2 (5) (7) (17) (19) (3)
> ?factor
> help(factor);
> ifctor(203490);
ifctor(203490) (4)
>
Ready
Memory: 0.31M Time: 0.01s Math Mode

*Maple 10 - Untitled (2) - [Server 2]

File Edit View Insert Format Table Plot Spreadsheet Sketch Tools Window Help

Text Math Maple Plot Times New Roman 12

Symbol Recognition
Expression
Units (SI)
Units (FPS)
Common Symbols
Matrix
Components
Greek
Arrows
Fenced
Relational
Relational Round
Negated
Large Operators
Operators
Open Face
Fraktur
Script
Miscellaneous

```
> with(plots);
```

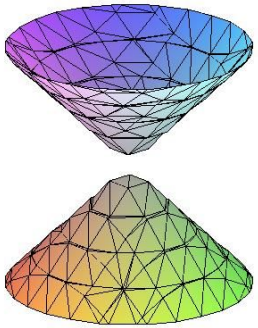
```
Warning, the name changecoords has been redefined
```

[*Interactive, animate, animate3d, animatecurve, arrow, changecoords, complexplot, complexplot3d, conformal, conformal3d, contourplot, contourplot3d, coordplot, coordplot3d, cylinderplot, densityplot, display, display3d, fieldplot, fieldplot3d, gradplot, gradplot3d, graphplot3d, implicitplot, implicitplot3d, inequal, interactive, interactiveparams, listcontplot, listcontplot3d, listdensityplot, listplot, listplot3d, loglogplot, logplot, matrixplot, multiple, odeplot, pareto, plotcompare, pointplot, pointplot3d, polarplot, polygonplot, polygonplot3d, polyhedra_supported, polyhedraplot, replot, rootlocus, semilogplot, setoptions, setoptions3d, spacecurve, sparsematrixplot, sphereplot, surfdata, textplot, textplot3d, tubeplot*] (1)

```
> A := x^2 + y^2 = z^2;
```

$$A := x^2 + y^2 = z^2 \quad (2)$$

```
> implicitplot3d(A, x = -2..2, y = -2..2, z = -2..2);
```



Ready

Memory: 3.56M Time: 0.68s Text Mode

https://sites.math.rutgers.edu/courses/251/Maple/Help/errors2.html

Maple vs Mathematica

Standard Math Notation

Entering mathematical expressions that look like mathematical expressions is very easy in Maple. The equation editor automatically formats fractions and exponents as you type. You can enter the expression the same way you would write it down, and it appears in Maple as it would when written in your textbook. This makes the mathematics easy to enter and easy to read. Mathematica, however, uses some non-standard notation which requires the user to translate back and forth between standard mathematics and Mathematica syntax.

Here are examples of expressions entered using the default settings in both systems.

Maple	VS	Mathematica
$\sin(2\,x)$	See notes 1 and 2.	`Sin[2 x]`
$5\,x - 7 = 3\,x + 2$	See notes 3.	`5 x - 7 == 3 x + 2`
$2\,x^2 + \cos\left(\frac{x}{2}\right)$	See notes 4.	`2 x^2 + Cos[x / 2]`
$\lim_{x \to 0} \frac{\sin(x)}{x}$	See notes 5.	`Limit[Sin[x] / x, x → 0]`

Combining Text and Results

In Maple, it is very easy to combine text and mathematics in the same sentence. You can even have calculated results appear in the middle of a sentence, so that the sentence changes automatically if the results are updated.

$$\text{The function } \frac{1}{(x-1)^2} \text{ has an essential discontinuity at } x = 1.$$

By changing the definition of the function and re-executing the document, the new discontinuity is found and the statement is updated appropriately:

$$\text{The function } \frac{1}{(x-3)^2} \text{ has an essential discontinuity at } x = 3.$$

In Mathematica, it is not possible to combine text and mathematics results in this way. You can combine text and static math in the same cell, but you cannot display calculated results. If your results change, you must edit your statement by hand.

Enter vs. Shift Enter

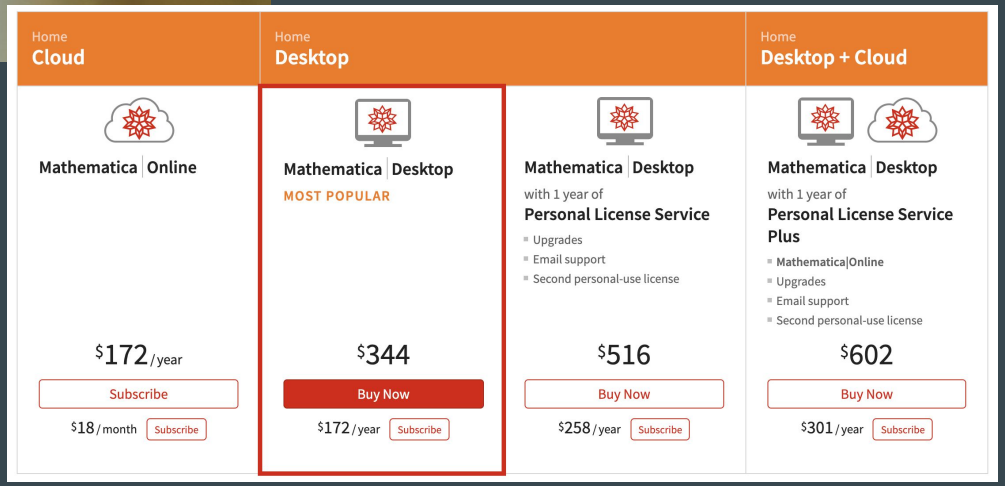
In Maple, once you have entered your problem, you press the <Enter> key to tell Maple to perform the computation and give you the result. Typing “2+2 <Enter>” results in 4.

In Mathematica, typing “2+2 <Enter>” moves the cursor to the next line, without calculating anything. To ask Mathematica to perform the computation, you must press <Shift>+<Enter>. This non-standard interaction requires users to adapt their normal behavior.

Maple Personal Edition. Because it's fun.

Maple Personal Edition for people who use Maple to experiment, explore and play.

Buy Maple Personal Edition for $239*



Rise of Open Source

SciPy + IPython + Matplotlib

SciPy (2001): Created by Travis Oliphant, Eric Jones, and Pearu Peterson, it was a combination of scientific libraries for Python on top of the Numeric array type (later replaced by NumPy)

IPython (2001): “The IPython project provides on enhanced interactive environment that includes, among other features, support for data visualization and facilities for distributed and parallel computation” (from “IPython: A System for Interactive Scientific Computing”, 2007)

SciPy + IPython + Matplotlib (cont.)

Matplotlib (2003): “It was conceived by John Hunter in 2002, originally as a patch to IPython to enable interactive MatLab-style plotting via gnuplot from the IPython command-line. Fernando Perez was, at the time, scrambling to finish his PhD, and let John know he wouldn’t have time to review the patch for several months. John took this as a cue to set out on his own, and the matplotlib package was born, with version 0.1 released in 2003.” (https://jakevdp.github.io/blog/2013/03/23/matplotlib-and-the-future-of-visualization-in-python/)

Fernando Perez

Created IPython in 2001 as a graduate student

Currently: Associate Professor, Statistics, UC Berkeley and Berkeley Institute for Data Science Senior Fellow

Recipient of the 2012 Award for the Advancement of Free Software from the Free Software Foundation, and the 2017 ACM Software System Award

Sage (2005)

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. Access their combined power through a common, Python-based language or directly via interfaces or wrappers.

Mission: *Creating a viable free open source alternative to Magma, Maple, Mathematica and Matlab*.

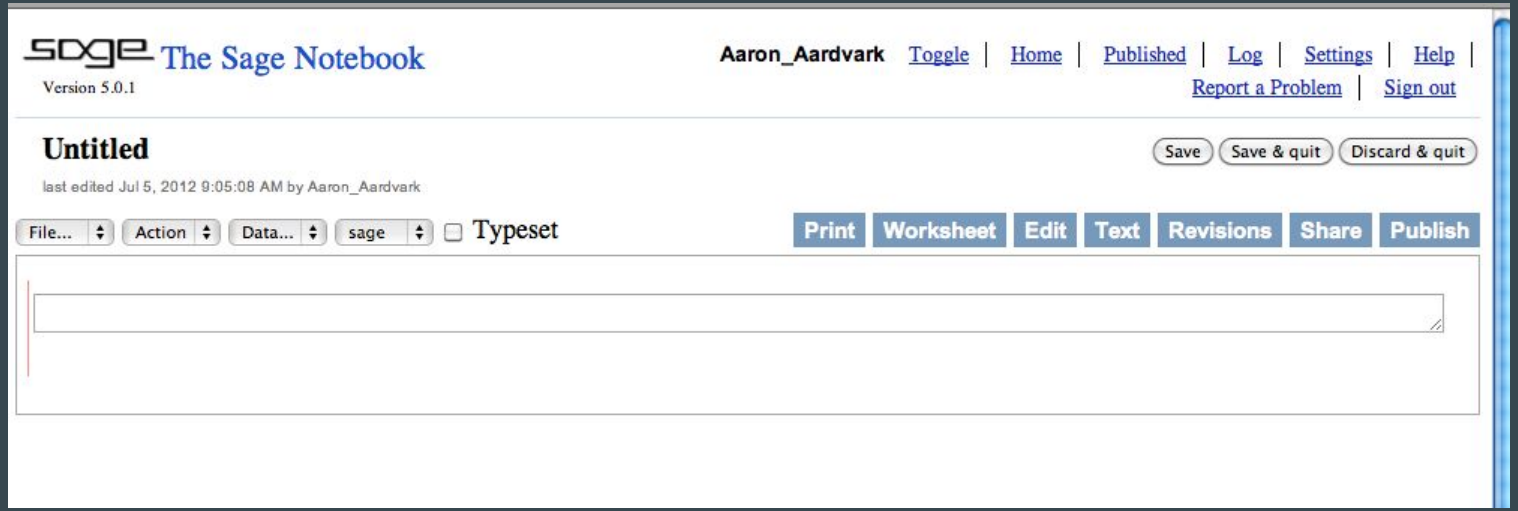
Sage cont.

Created by William Stein

Implemented in Python and Cython

Open Source license (GPLv3)

Sage Notebook/Worksheets



Screenshots from a tutorial circa 2012 (

http://doc.sagemath.org/html/en/prep/Intro-Tutorial.html#sagenbcommands)

The Sage Notebook

Version 5.0.1

Aaron_Aardvark

Untitled

last edited Jul 5, 2012 9:05:08 AM by Aaron_Aardvark

File... Action Data... sage Typeset

```
2+2
```

4

Paragraph Font Family Font Size

Why is $2+3=5$ and not 1? I thought Sage did everything modulo 4...

Path: p

Save changes Cancel changes

```
2+3
```

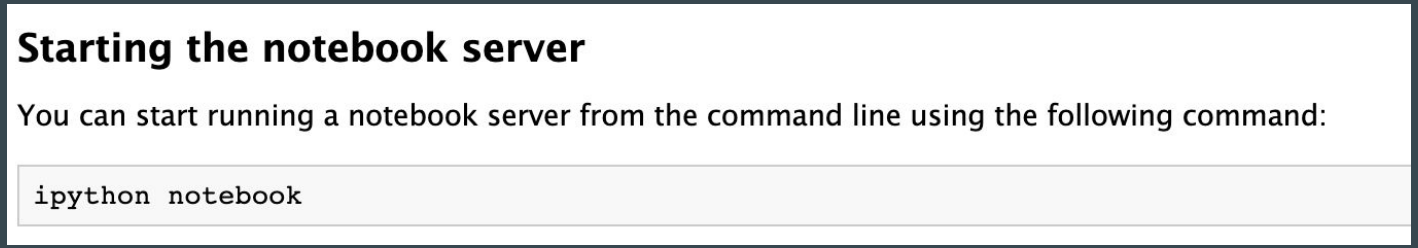
5

You can also evaluate a cell using a keyboard shortcut.

- If a cell isn't active (such as below, in the live documentation), click in it.
- Then hold down the Shift key while you press the Enter key.

We call this "Shift-Enter". Try doing Shift-Enter with this cell.

IPython Notebook (2011)



Starting the notebook server

You can start running a notebook server from the command line using the following command:

```
ipython notebook
```

The IPython Notebook

Introduction

The notebook extends the console-based approach to interactive computing in a qualitatively new direction, providing a web-based application suitable for capturing the whole computation process: developing, documenting, and executing code, as well as communicating the results. The IPython notebook combines two components:

A web application: a browser-based tool for interactive authoring of documents which combine explanatory text, mathematics, computations and their rich media output.

Notebook documents: a representation of all content visible in the web application, including inputs and outputs of the computations, explanatory text, mathematics, images, and rich media representations of objects.

Project Jupyter (2014)

Jupyter

Ju(lia) + Pyt(hon) + R

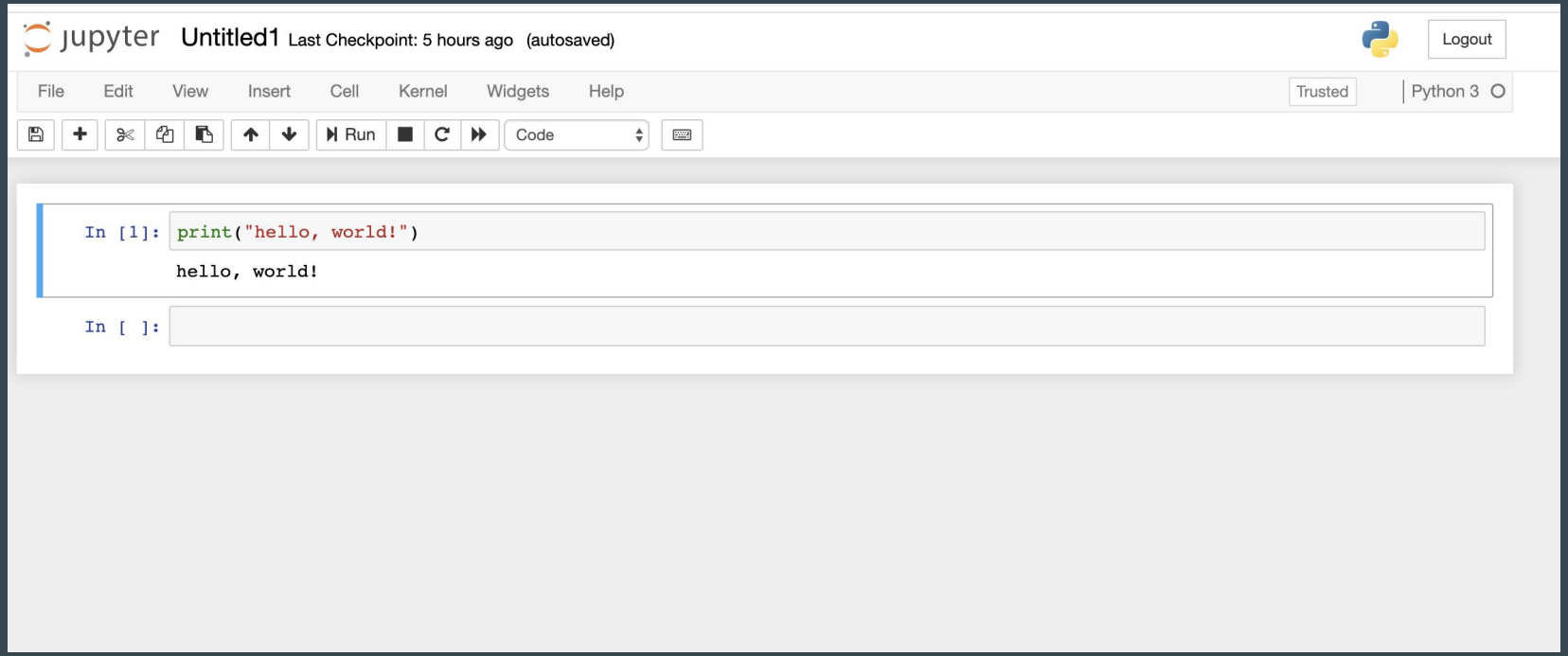
Project Jupyter (2014)

Spun off of IPython by Fernando Perez

Includes the Notebook interface and other language-agnostic parts of IPython

Present

Jupyter Notebook



JupyterLab

JupyterLab 1.0: Jupyter's Next-Generation Notebook Interface

JupyterLab is a web-based interactive development environment for Jupyter notebooks, code, and data. JupyterLab is flexible: configure and arrange the user interface to support a wide range of workflows in data science, scientific computing, and machine learning. JupyterLab is extensible and modular: write plugins that add new components and integrate with existing ones.

Chrome File Edit View History Bookmarks People Tab Window Help

54% Wed 5:35 PM

JupyterLab

hub.gke.mybinder.org/user/jupyterlab-jupyterlab-demo-xi8mcqc8/lab

File Edit View Run Kernel Tabs Settings Help

/ demo /

Name	Last Modified
data	13 hours ago
notebooks	13 hours ago
TCGA_Data	13 hours ago
big.csv	13 hours ago
jupyterlab-slides.pdf	13 hours ago
jupyterlab.md	13 hours ago
Lorenz.ipynb	13 hours ago
lorenz.py	13 hours ago
markdown_python.md	13 hours ago

Lorenz.ipynb

Markdown Download GitHub Binde

The Lorenz Differential Equations

Before we start, we import some preliminary libraries. We will also import (below) the accompanying `lorenz.py` file, which contains the actual solver and plotting routine.

```
%matplotlib inline
from ipywidgets import interactive, fixed
```

We explore the Lorenz system of differential equations:

$$\dot{x} = \sigma(y - x)$$
$$\dot{y} = \rho x - y - xz$$
$$\dot{z} = -\beta z + xy$$

Let's change (σ, β, ρ) with ipywidgets and examine the trajectories.

```
from lorenz import solve_lorenz
w=interactive(solve_lorenz,sigma=(0.0,50.0),rho=(0.0,50.0))
w
```

For the default set of parameters, we see the trajectories swirling around two points, called attractors.

The object returned by `interactive` is a `Widget` object and it has attributes that contain the current result and arguments:

```
t, x_t = w.result
```

```
w.kwargs
```

After interacting with the system, we can take the result and perform further computations. In this case, we compute the average positions in x, y and z.

```
xyz_avg = x_t.mean(axis=1)
```

```
xyz_avg.shape
```

Creating histograms of the average positions (across different trajectories) show that, on average, the trajectories swirl about the attractors.

JupyterLab Reference

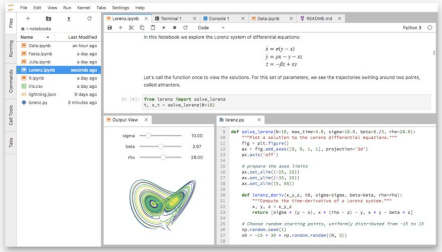
JupyterLab

Docs » JupyterLab Documentation

Jupyter | Edit on GitHub

JupyterLab Documentation

JupyterLab is the next-generation web-based user interface for Project Jupyter. Try it on Binder. JupyterLab follows the Jupyter Community Guides.



Getting Started

- Overview
- Installation
- Starting JupyterLab
- Reporting an issue
- Frequently Asked Questions (FAQ)
- JupyterLab Changelog

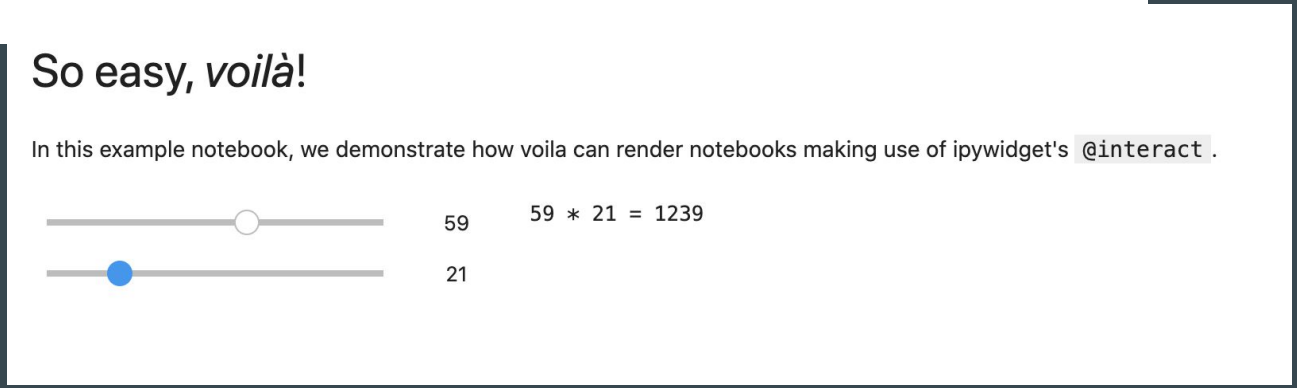
0 1 Python 3 | Idle

Mode: Command Ln 1, Col 1 Lorenz.ipynb

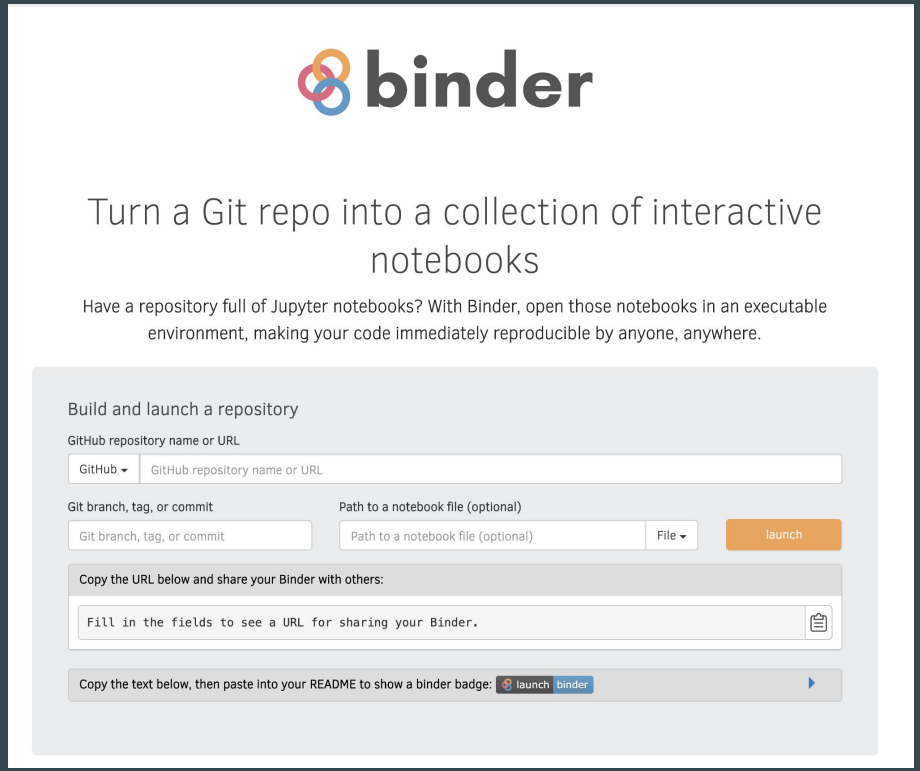
Voilà

Communicate your results with Voilà.

Voilà helps you communicate insights, by transforming a Jupyter Notebook into a stand-alone web application you can share. It gives you control over what your readers experience in a secure and customizable interactive dashboard.



Binder


binder
Turn a Git repo into a collection of interactive notebooks
Have a repository full of Jupyter notebooks? With Binder, open those notebooks in an executable environment, making your code immediately reproducible by anyone, anywhere.
Build and launch a repository
GitHub repository name or URL
GitHub
GitHub repository name or URL
Git branch, tag, or commit
Path to a notebook file (optional)
Git branch, tag, or commit
Path to a notebook file (optional)
File
launch
Copy the URL below and share your Binder with others:
Fill in the fields to see a URL for sharing your Binder.
Copy the text below, then paste into your README to show a binder badge:
launch
binder

Broad language support

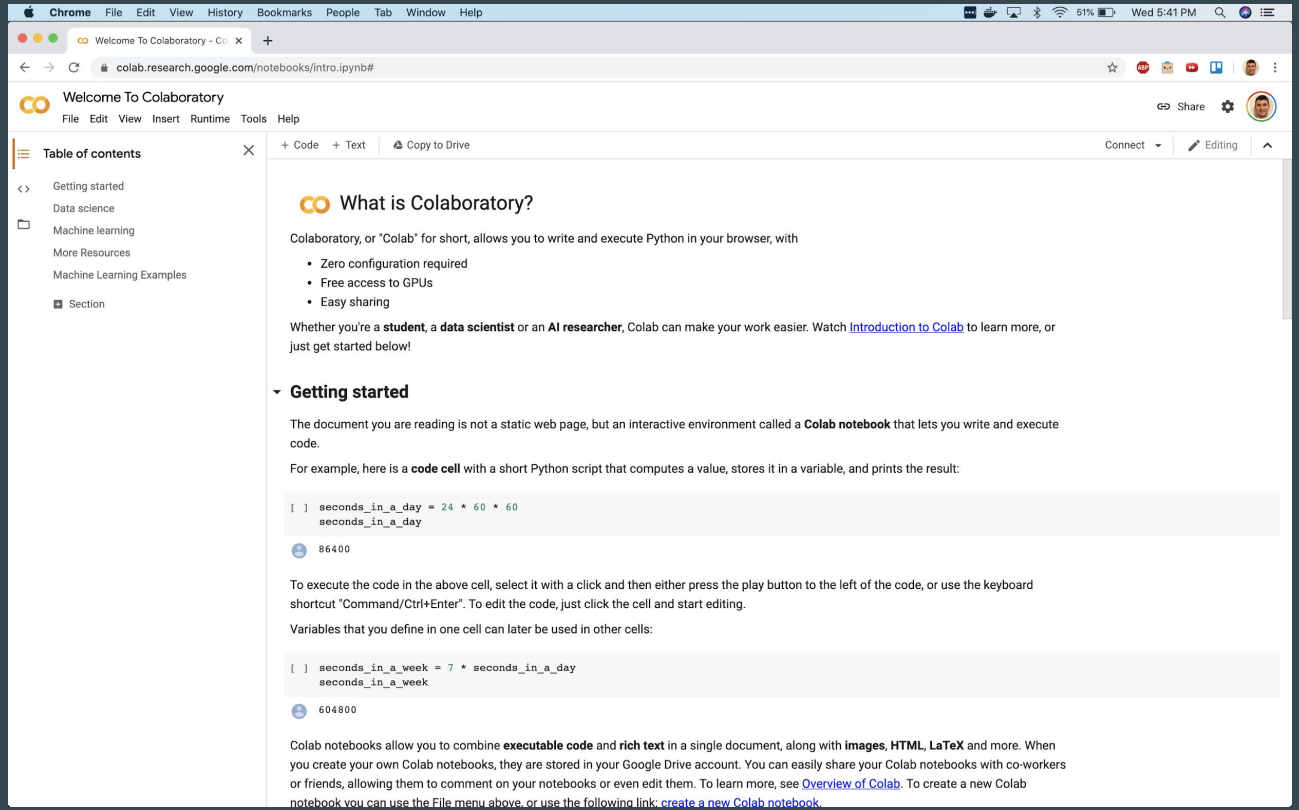
Jupyter kernels

Kernel Zero is IPython, which you can get through ipykernel, and is still a dependency of jupyter. The IPython kernel can be thought of as a reference implementation, as CPython is for Python.

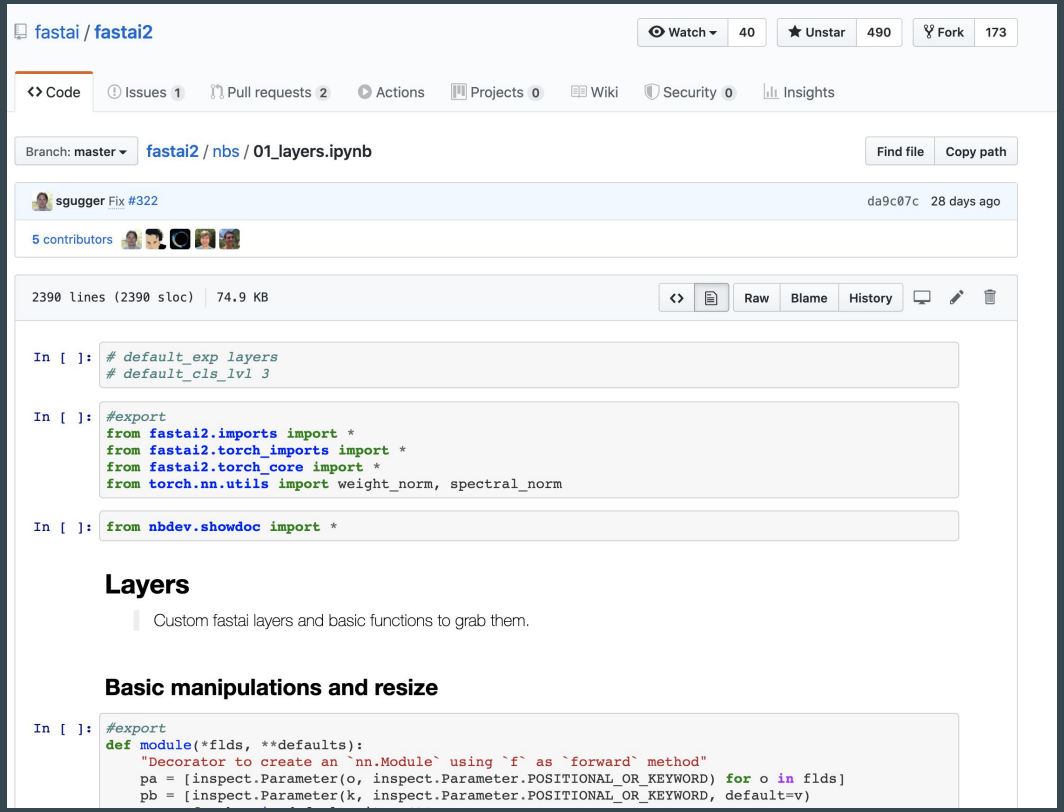
Here is a list of available kernels. If you are writing your own kernel, feel free to add it to the table!

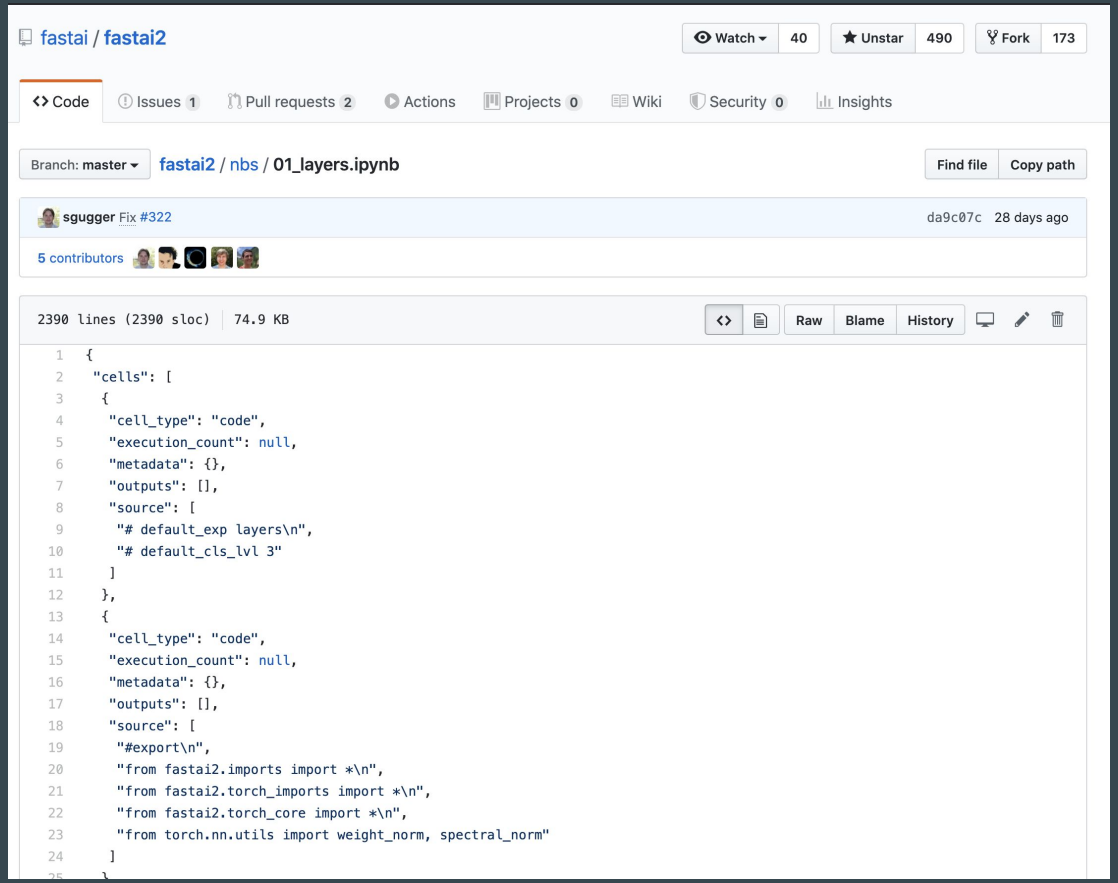
SageMath	Jupyter 4	Any	many	
Wolfram Language for Jupyter		Wolfram Engine, i.e., a Wolfram Desktop or Mathematica installation; `wolframscript` is optional but recommended		

Google Colab



Github rendering




fastai / fastai2
Watch 40
Unstar 490
Fork 173
Code
Issues 1
Pull requests 2
Actions
Projects 0
Wiki
Security 0
Insights
Branch: master
fastai2 / nbs / 01_layers.ipynb
Find file
Copy path
sgugger Fix #322
da9c07c 28 days ago
5 contributors
2390 lines (2390 sloc) 74.9 KB
Raw
Blame
History
{
"cells": [
{
"cell_type": "code",
"execution_count": null,
"metadata": {},
"outputs": [],
"source": [
"# default_exp layers\n",
"# default_cls_lvl 3"
]
},
{
"cell_type": "code",
"execution_count": null,
"metadata": {},
"outputs": [],
"source": [
"#export\n",
"from fastai2.imports import *\n",
"from fastai2.torch_imports import *\n",
"from fastai2.torch_core import *\n",
"from torch.nn.utils import weight_norm, spectral_norm"
]

Future(?)

More IDE-like Jupyter and more Jupyter in IDEs

JupyterLab 2.0 -- released April 2020

Added JupyterLab Language Server Protocol + Debugger

VSCode shipping improved native support for Jupyter Notebooks

Hosted solutions/notebook as an interface to compute

kaggle

Real-time collaboration

The notebook you'll love to use

Deepnote is a new kind of data science notebook. Jupyter-compatible with real-time collaboration and easy deployment. Oh, and it's free.

Enter your email... Get early access

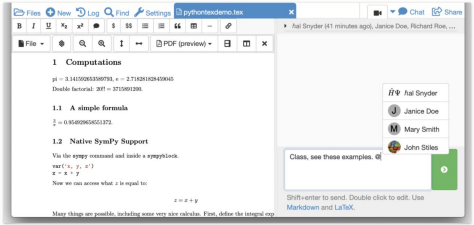
Live collaborative editing

Multiple users can collaborate on a project. As soon as a collaborator is added to a a project (see Notes on Managing Courses) they share both the project and the associated files.

Live collaborative editing is possible in CoCalc. If one of your collaborators updates a notebook, the rest can see the changes as they are being made (similar to Google Docs).

@Mention collaborators in chat

CoCalc chats support an `@mentions` feature, where you type `@` and a list appears of collaborators, which you can select from. Anybody mentioned there will get emailed (unless they are mentioned again in the next few hours, since we don't want to spam people). This helps ensure people know about chats. Any chat will cause the notification count to go up in the bell in the upper right, whether or not you are mentioned.



@mentioning names in course shared project chat

How to review & work with git?

fastai / nbdev

<> Code Issues 1 Pull requests 2 Actio

Create delightful python projects using Jupyter Noteb

ReviewNB DOCS BLOG PRICING FAQ SUPPORT LOGIN

Diff & Commenting for Jupyter Notebooks

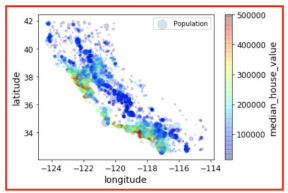
Say Goodbye to annoying JSON diffs!

Install GitHub App

Need to Self Host? Fill the Form

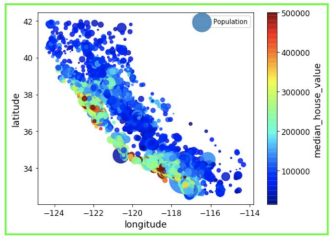
```
housing.plot(kind="scatter", x="longitude", y="latitude", alpha=0.2,
    s=housing["population"]/88, label="Population", figsize=(6,4),
    c="median_house_value", cmap=plt.get_cmap("jet"), colorbar=True,
    sharex=False)
plt.legend()
save_fig("housing_prices_scatterplot")
```

```
Saving figure housing_prices_scatterplot
```




```
housing.plot(kind="scatter", x="longitude", y="latitude", alpha=0.8,
    s=housing["population"]/21, label="Population", figsize=(7,5),
    c="median_house_value", cmap=plt.get_cmap("jet"), colorbar=True,
    sharex=False)
plt.legend()
save_fig("housing_prices_scatterplot")
```

```
Saving figure housing_prices_scatterplot
```

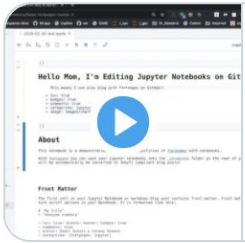


Hamel Husain
@HamelHusain

So excited about @github Codespaces. You can edit Jupyter Notebooks directly on GitHub, and serve arbitrary web applications on various ports.

Sign up for the beta if you have not already
github.com/features/codes...

Here is a demo with fastpages:



JupyterOnGitHub fastpages
Demo of GitHub Codespaces w/fastpages. Shows you how you can edit a notebook with VSCode, and see updates on ...
youtube.com

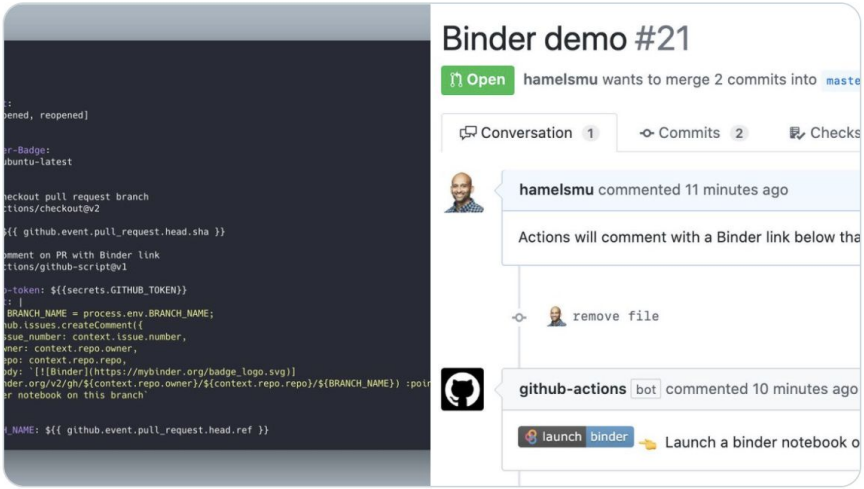
10:27 AM · May 20, 2020 · Twitter Web App

Julien Chaumond liked

Hamel Husain
@HamelHusain

📢 Automatically drop links to a Jupyter notebook with **the right dependencies** in your PRs with this simple Actions workflow 👇.
Powered by @mybinderteam . It's also free 💸 to use.

Instructions: gist.github.com/hamelsmu/f8f98...



5:49 PM · May 20, 2020 · Twitter Web App

3 Retweets **13** Likes

Conclusion

@hortonhearsafoo