

Programmazione 1

Introduzione al corso

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Blog: <http://stegua.github.io>

Due questionari

1. Raccolta dati anagrafici per creazione account nei laboratori di ingegneria
2. Questionario conoscitivo perchè capire le vostre conoscenze in ambito informatico
3. Andare all'indirizzo:
<http://mate.unipv.it/gualandi/programming/>

Informazioni generali

- **Siti del corso**

- <http://matematica.unipv.it/gualandi/programming>

- <https://github.com/mathcoding/programming>

- **Orario lezioni:**

- Lunedì 14h00/16h00 – Aula B2

- Mercoledì 14h00/15h00 – Laboratorio didattico

- Venerdì 11h00/13h00 – Aula C3 o Laboratorio didattico

- **Tutorato:** sarà attivato a partire da metà ottobre

Informazioni generali

- **Esame:**

- Prova di programmazione in aula informatica
- Durata 2 ore
- A breve, saranno online i testi degli esercizi d'esame dell'anno precedente (2017-18)

- **Ricevimento:**

- In qualsiasi momento potete richiedere ricevimento via email (usate l'email **@universitadipavia.it!**)
- Appena possibile stabilisco un giorno e orario in cui non avete lezione

Comunicazioni con il docente

- Usare sempre l'email di ateneo
nome.cognome@universitadipavia.it
- Cercare di essere precisi nel fare le domande
- Non avere timore di venire a ricevimento

Testi di riferimento

Slides e script usati a lezione
(in italiano), reperibili sul sito

Materiale didattico

Gli script Python usati a lezioni sono continuamente aggiornati su GitHub al repository seguente: [Programmazione 1](#)

Lucidi usati a lezione (per i notebooks python consultare il sito su github):

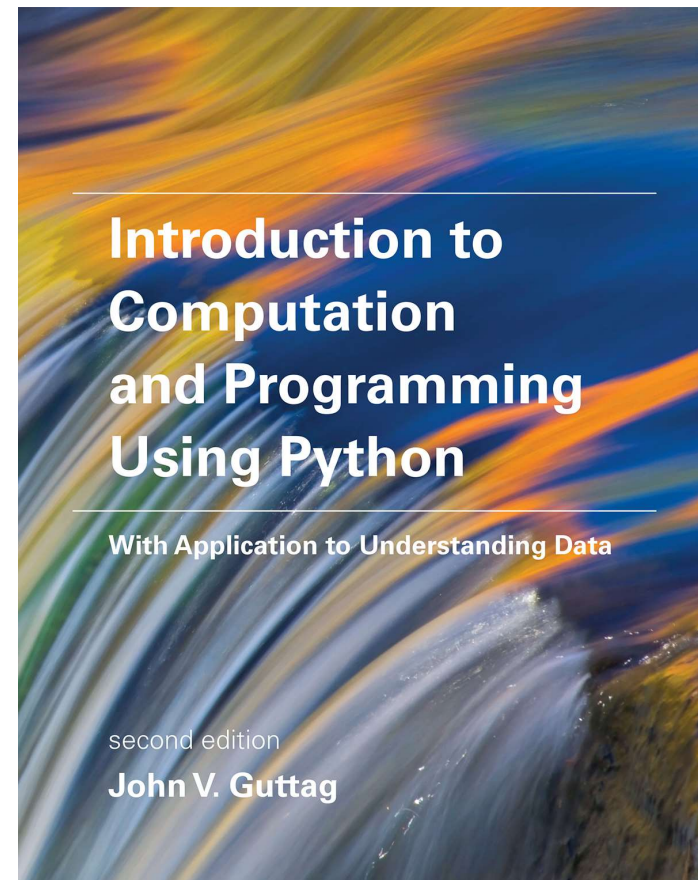
- Lucidi di introduzione al corso ...

Lecture Consigliate

Links Utili

- Versione di Python consigliata: [Anaconda](#)
- Applicazione per connettersi a GitHub: [GitHub Desktop](#)
- [GitHub Student Pack](#)
- Documentazione ufficiale di Python 3.x: [docs](#)

Testo di riferimento (in inglese)



Obiettivi del corso

1. Introdurre i concetti fondamentali di programmazione
2. Insegnare ad usare la programmazione come supporto alla risoluzione di problemi
3. Insegnare un linguaggio di programmazione multiparadigma (Python)
4. Stimolare la vostra curiosità e fantasia
5. Stimolare la vostra curiosità e fantasia
6. Stimolare la vostra curiosità e fantasia
- 7. *Coding is fun!***

<http://movielens.org>

movielens

Non-commercial, personalized movie recommendations.

[sign up now](#)

or [sign in](#)

recommendations

MovieLens helps you find movies you will like. Rate movies to build a custom taste profile, then MovieLens recommends other movies for you to watch.

The screenshot displays the MovieLens interface with two main sections: 'top picks' and 'recent releases'. Each section includes a 'see more' button and a row of movie cards. Each card shows the movie title, year, duration, and a star rating.

top picks [see more](#)

based on your ratings, MovieLens recommends these movies

Band of Brothers	Casablanca	One Flew Over the Cuckoo's Nest	The Lives of Others	Sunset Boulevard	The Third Man	Pat
2001 [R] 705 min	1942 [PG] 102 min	1975 [R] 133 min	2006 [R] 137 min	1950 [M] 110 min	1949 [M] 104 min	1957

recent releases [see more](#)

movies released in last 90 days that you haven't rated

CarlinPlus	Felony	What If	Frank	Sin City: A Dame to Kill	If I Stay	Are
2014 [PG] 106 min	2014	2014 [PG] 102 min	2014 [R] 96 min	2014 [R] 102 min	2014 [PG] 106 min	2014

Programma del corso

- Introduzione al linguaggio di programmazione Python
- Elementi di Programmazione funzionale
- Elementi di Programmazione procedurale
- Elementi di Programmazione orientata agli oggetti
- Cenni di complessità algoritmica
- Algoritmi di ricerca e di ordinamento
- Algoritmi di programmazione dinamica

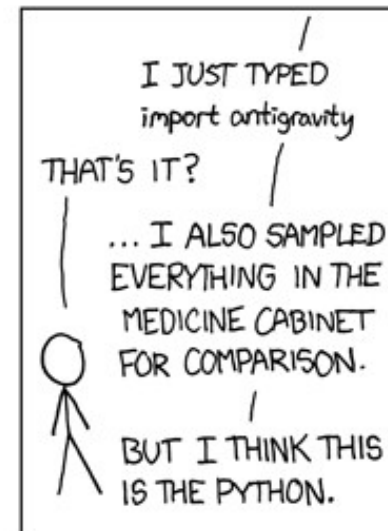
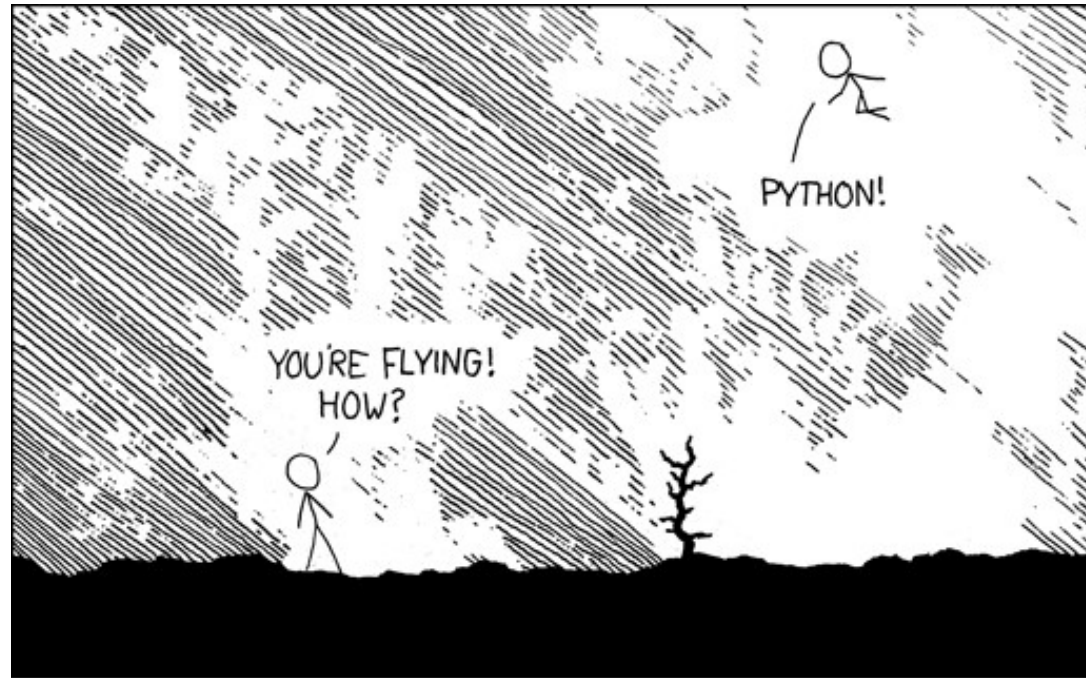
Risoluzione di problemi

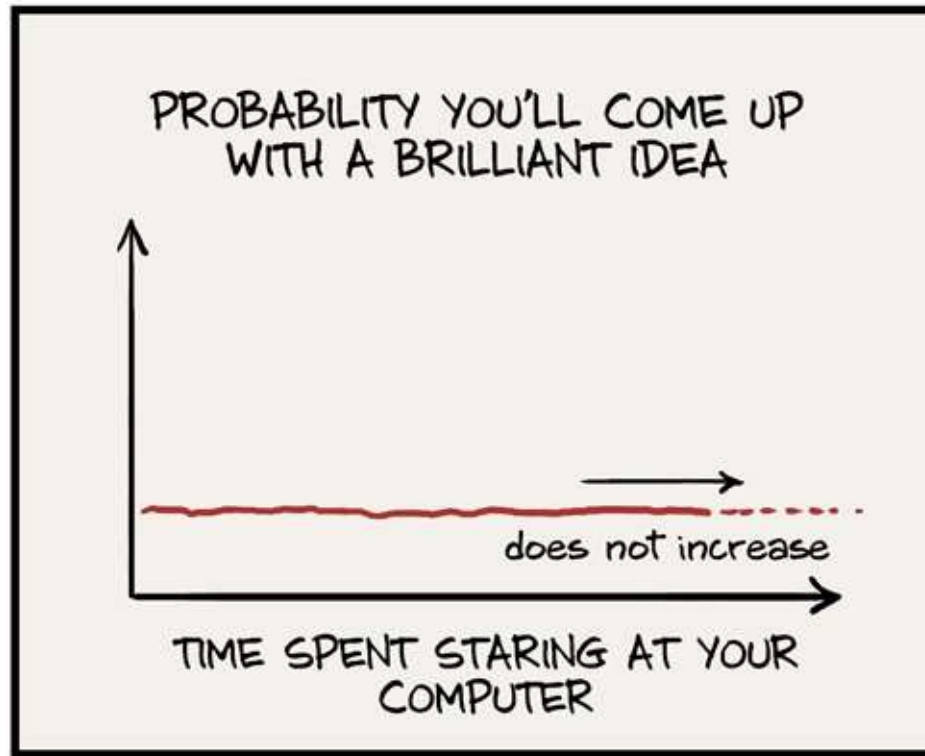
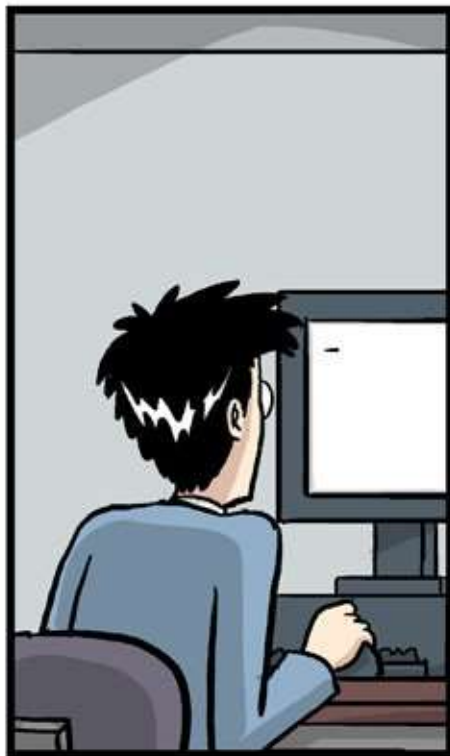
- Formalismo per rappresentare un problema (e.g. grafi)
- Definizione formale del problema e degli obiettivi (e.g., quale funzione obiettivo?)
- Soluzione ammissibile, soluzione ottima
- Problema risolvibile/non risolvibile al calcolatore (complessità computazionale)
- Tempo di esecuzione vs. tempo di sviluppo

Linguaggi di programmazione

- Perchè Python?
 - Semplice e divertente!
- Alternative:
 - C++ - <http://en.cppreference.com>
 - Julia - <http://julialang.org/>
 - Haskell - <http://www.haskell.org/>
 - R - <http://www.r-project.org/>
 - C# - **google-it-yourself**
 - Java - <http://www.java.com>

import antigravity





JORGE CHAM © 2012

WWW.PHDCOMICS.COM

Perchè Python?

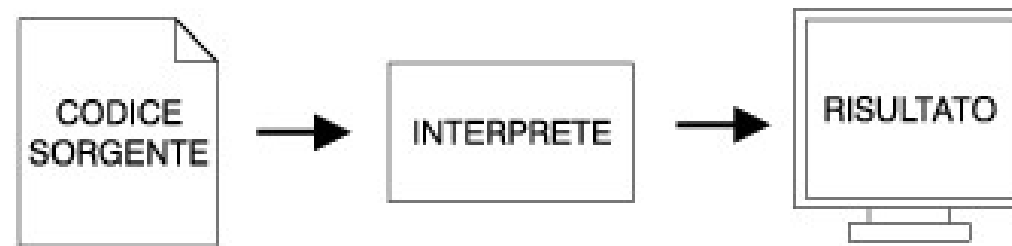
PRO:

- È interattivo (interpretato, non compilato)
- È semplice (no gestione diretta della memoria)
- È semplice *programmare* delle visualizzazioni
- È un linguaggio multiparadigma
- Ha un elevato numero di librerie semplici da installare

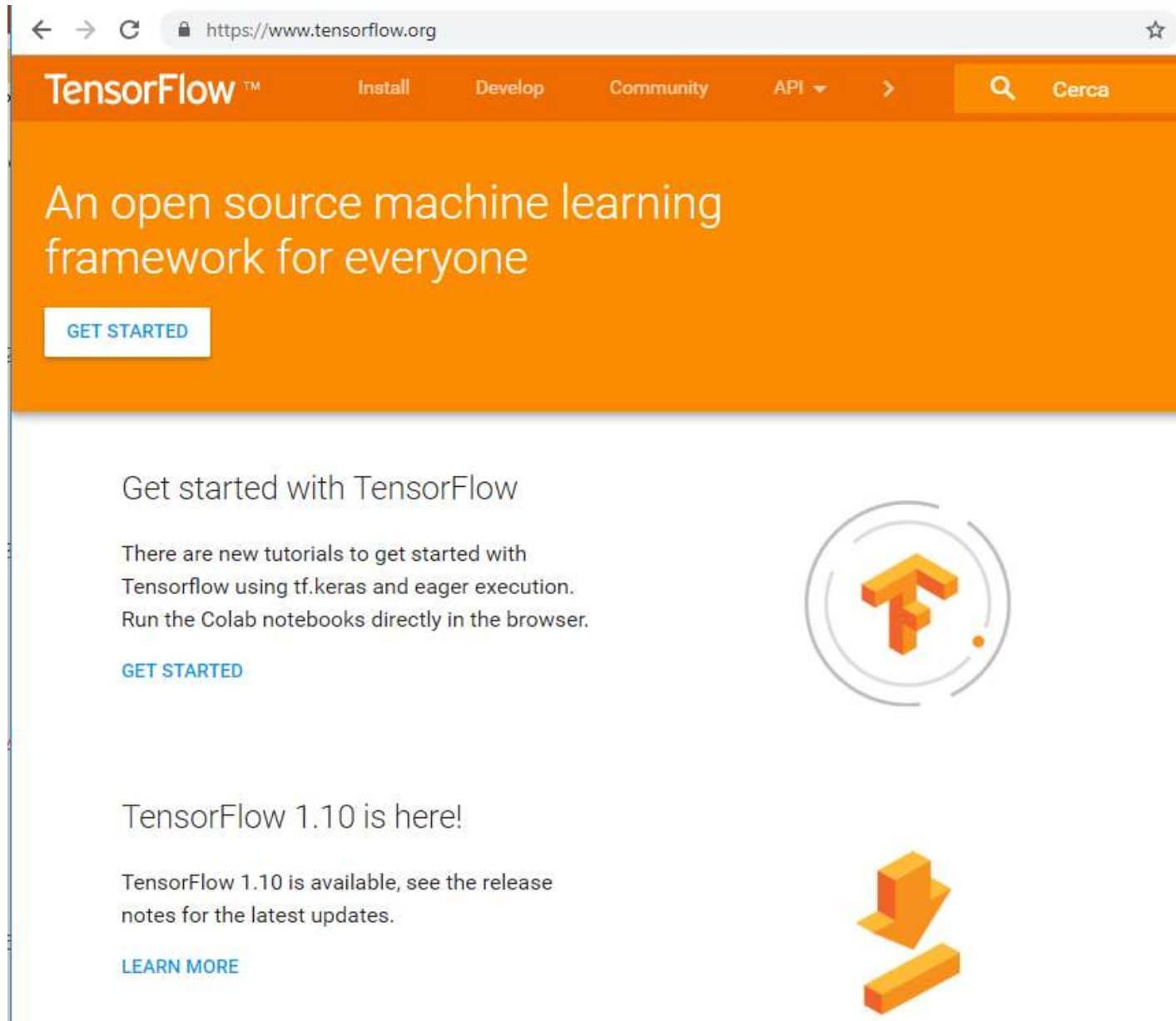
CONTRO:

1. Non é efficiente come un linguaggio compilato
2. L'indentazione del codice fa parte della semantica
3. L'indentazione del codice fa parte della semantica
4. L'indentazione del codice fa parte della semantica

Linguaggio Interpretato vs. Compilato



Machine Learning (at Google)



Ambiente di lavoro Python

- A lezione e in laboratorio si farà riferimento a Python ≥ 3.4 (**attenzione a non scaricare o usare la versione di Python 2.7**)
- Ambiente di riferimento Anaconda/Python ≥ 3.4 :
<https://www.continuum.io/downloads>
- Editors:
 - **CONSIGLIATO: Spyder3** (installato con Anaconda)
 - Vim o Emacs
 - Visual Studio (windows) o Visual Code
 - Sublime Text - <http://www.sublimetext.com/>
 - Rodeo - <http://www.yhat.com/products/rodeo>



Download Anaconda Distribution

Version 5.2 | Release Date: May 30, 2018

Download For:   

High-Performance Distribution

Easily install 1,000+
[data science
packages](#)

Package Management

Manage packages,
dependencies and
environments with
[conda](#)

Portal to Data Science

Uncover insights in
your data and create
interactive
visualizations

Download for Your Preferred Platform

Per provare Python rapidamente

<https://jupyter.org/try>

“E' l'istess...”

Spyder3 1/3

The screenshot displays the Spyder Python IDE interface. The main editor window shows a Python script with the following content:

```
1# -*- coding: utf-8 -*-
2"""
3Created on Wed Oct 4 10:00:29 2017
4
5@author: gualandi
6"""
7
8
```

The Variable explorer panel on the right shows the following variables:

Name	Type	Size	Value
a	int	1	1
x	tuple	2	(1, 3)

The IPython console at the bottom shows the following output:

```
Python 3.5.3 |Anaconda custom (64-bit)| (default, Feb 22 2017, 21:28:42) [MSC v.1900 64 bit (AMD64)]
Type "copyright", "credits" or "license" for more information.

IPython 5.1.0 -- An enhanced Interactive Python.
?                -> Introduction and overview of IPython's features.
%quickref        -> Quick reference.
help             -> Python's own help system.
object?         -> Details about 'object', use 'object??' for extra details.

Restarting kernel...

In [1]: a = 1
In [2]: x = (1, 3)
In [3]: print(x)
(1, 3)
In [4]:
```

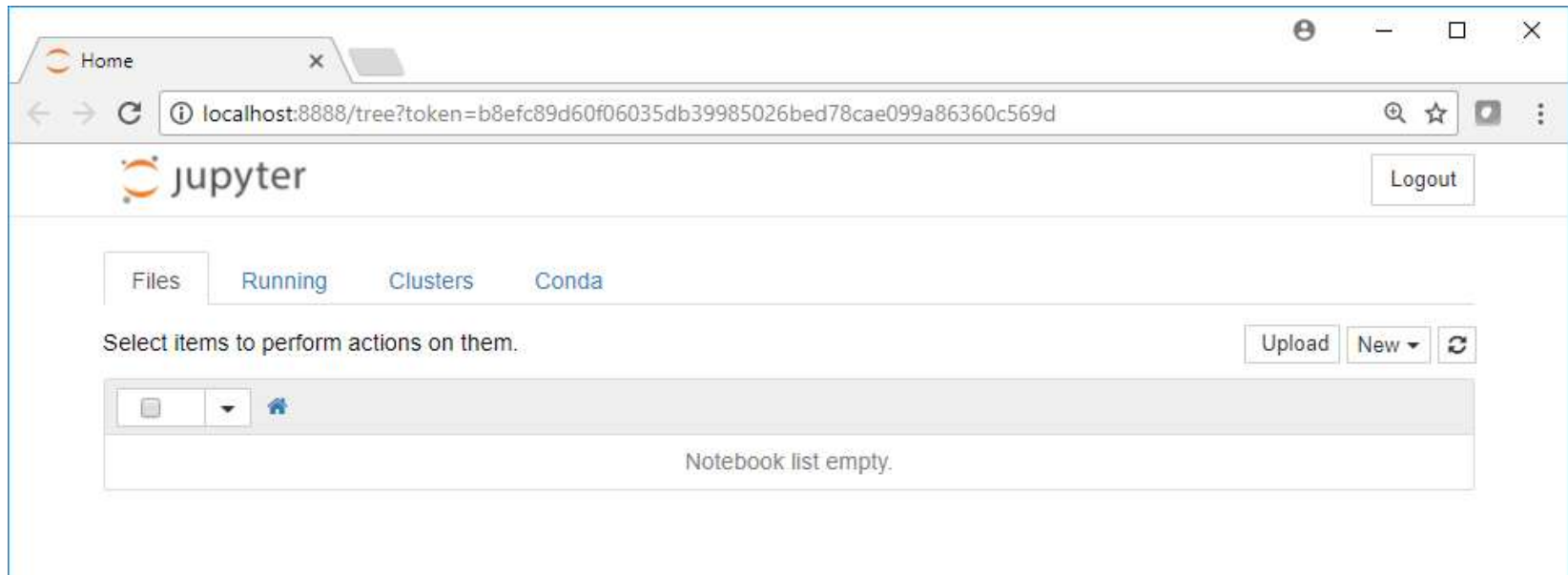
“E' l'istess...”

Notebooks 2/3

```
Windows PowerShell
Copyright (C) 2016 Microsoft Corporation. All rights reserved.

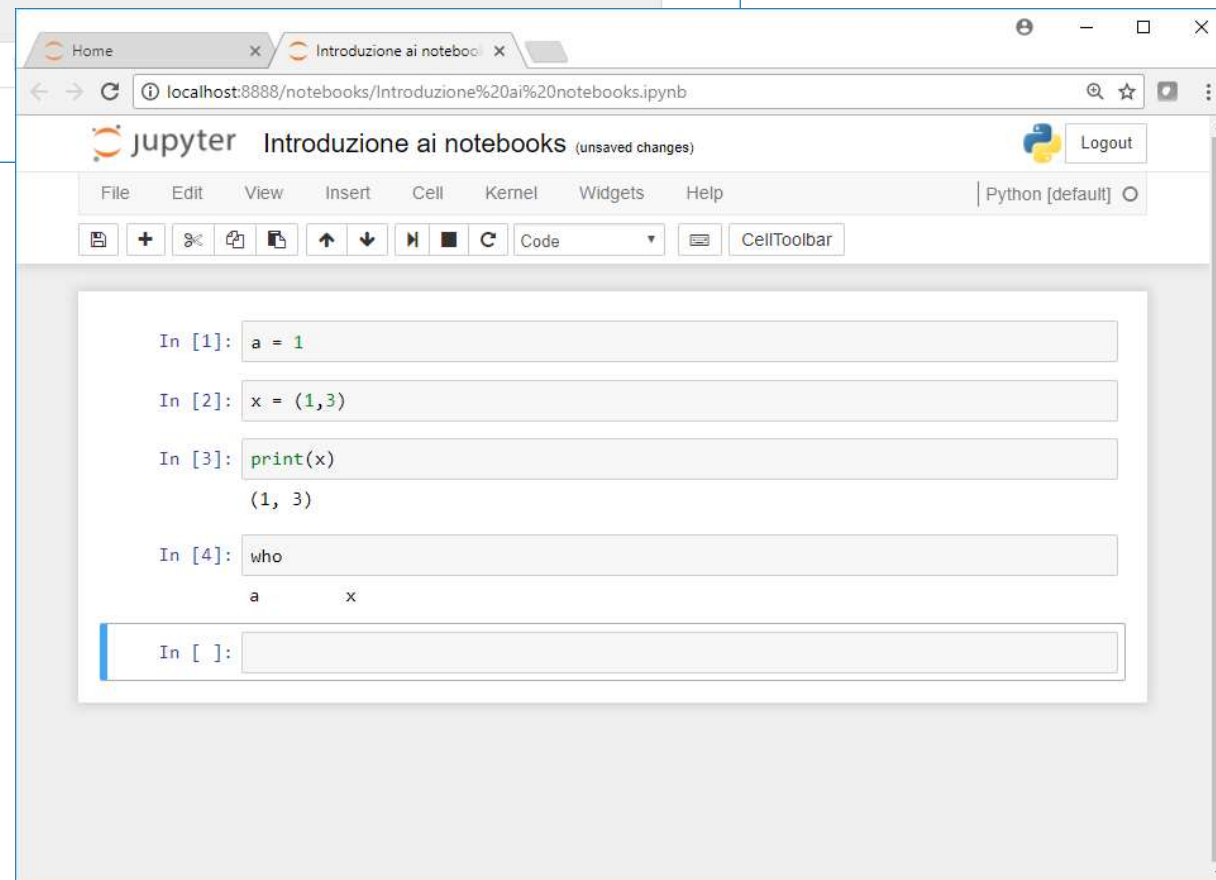
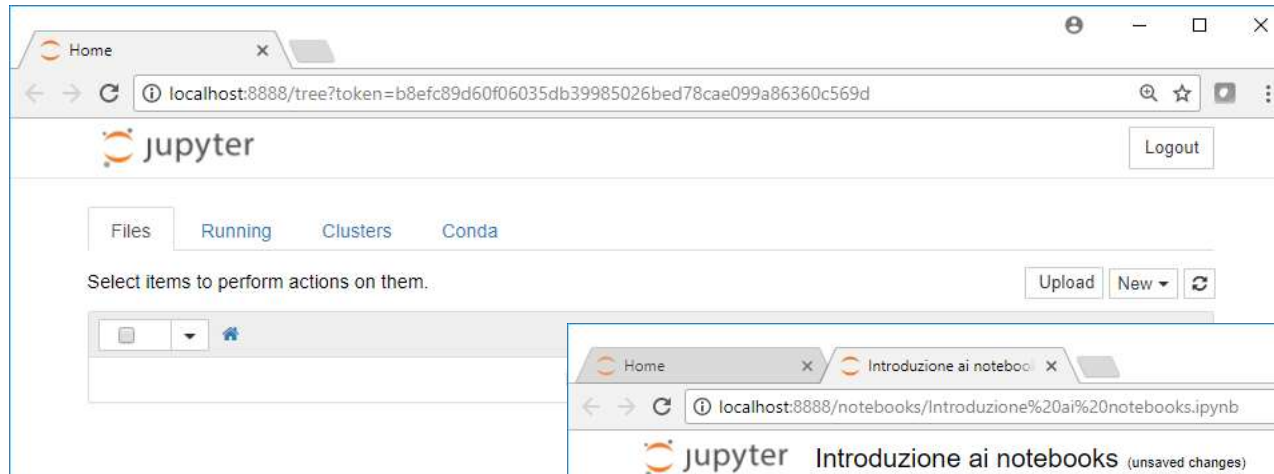
PS C:\Users\gualandi> cd D:\UnIPV\Lezioni\Programmazione1\notebooks\
PS D:\UnIPV\Lezioni\Programmazione1\notebooks> jupyter notebook
[I 10:49:37.857 NotebookApp] [nb_conda_kernels] enabled, 2 kernels found
[I 10:49:38.232 NotebookApp] [nb_anacondacloud] enabled
[I 10:49:38.232 NotebookApp] [nb_conda] enabled
[I 10:49:38.279 NotebookApp] \u2713 nbpresent HTML export ENABLED
[W 10:49:38.279 NotebookApp] \u2717 nbpresent PDF export DISABLED: No module named 'n
[I 10:49:38.357 NotebookApp] Serving notebooks from local directory: D:\UnIPV\Lezioni
[I 10:49:38.357 NotebookApp] 0 active kernels
[I 10:49:38.357 NotebookApp] The Jupyter Notebook is running at: http://localhost:888
[I 10:49:38.357 NotebookApp] Use Control-C to stop this server and shut down all kern
[C 10:49:38.373 NotebookApp]

Copy/paste this URL into your browser when you connect for the first time,
to login with a token:
http://localhost:8888/?token=84ce09cacc0a05df1c69830947ac5dc53c0c4fe05988d050
[I 10:49:38.525 NotebookApp] Accepting one-time-token-authenticated connection from :
```



“E' l'istess...”

2/3



“E' l'istess...”

3/3

```
stegua@DESKTOP-MH2Q2VS: ~  
stegua@DESKTOP-MH2Q2VS:~$ python3.5  
Python 3.5.2 (default, Nov 17 2016, 17:05:23)  
[GCC 5.4.0 20160609] on linux  
Type "help", "copyright", "credits" or "license" for more information.  
>>> a = 1  
>>> x = (1, 3)  
>>> print(x)  
(1, 3)  
>>> exit()  
stegua@DESKTOP-MH2Q2VS:~$
```

```
Windows PowerShell  
Copyright (C) 2016 Microsoft Corporation. All rights reserved.  
  
PS C:\Users\gualandi> ipython  
Python 3.5.3 |Anaconda custom (64-bit)| (default, Feb 22 2017, 21:28:42) [MSC  
Type "copyright", "credits" or "license" for more information.  
  
IPython 5.1.0 -- An enhanced Interactive Python.  
?                -> Introduction and overview of IPython's features.  
%quickref        -> Quick reference.  
help             -> Python's own help system.  
object?         -> Details about 'object', use 'object??' for extra details.  
  
In [1]: a = 1  
In [2]: x = (1,3)  
In [3]: print(x)  
(1, 3)  
In [4]: who  
a      x  
In [5]: exit()  
PS C:\Users\gualandi>
```

Corsi online (self-paced)

- Coursera:

<http://www.coursera.org/learn/python>

- Udacity:

<http://www.udacity.com/course/programming-foundations-with-python--ud036>

- EDX:

<http://www.edx.org/course/learn-program-using-python-utarlingtonx-cse1309x>

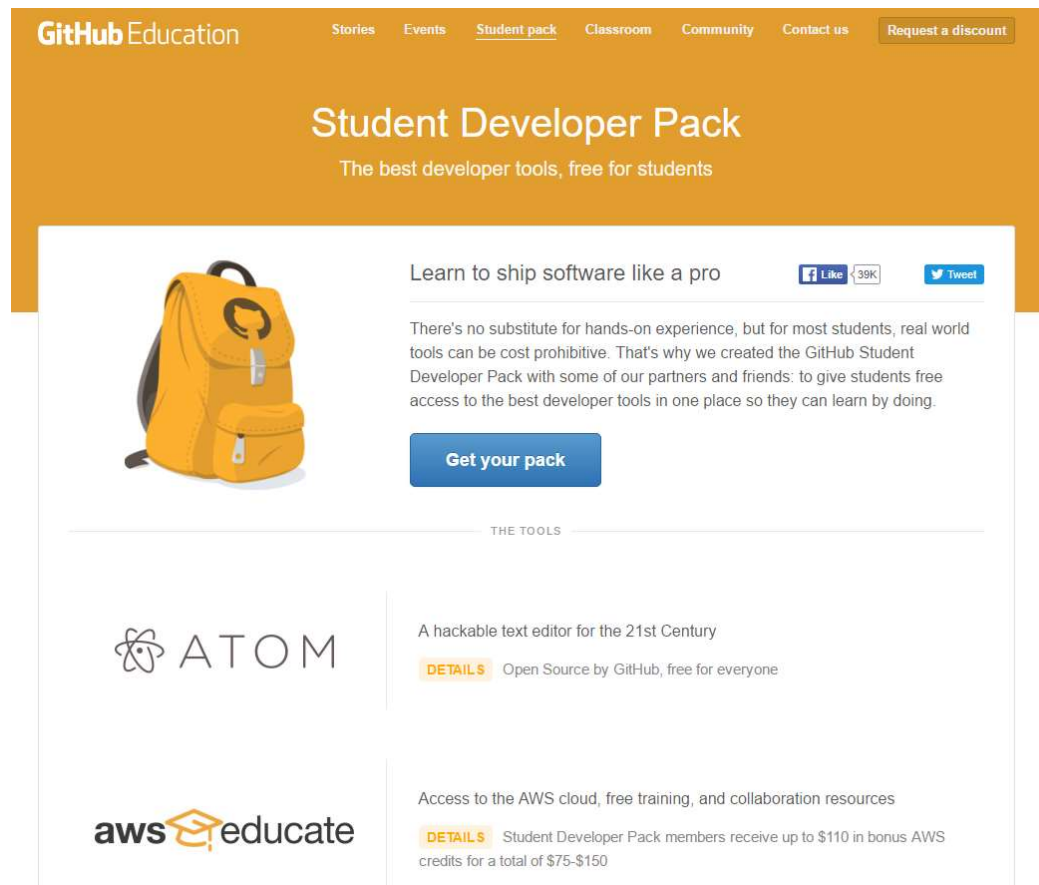
- Learn to code the hard way:

<http://learncodethehardway.org/python/>

Altre risorse utili 1/2

GitHub Education Pack:

<http://education.github.com/pack>




The screenshot shows the GitHub Education website's 'Student Developer Pack' page. The header is orange with the 'GitHub Education' logo and navigation links: 'Stories', 'Events', 'Student pack' (underlined), 'Classroom', 'Community', 'Contact us', and a 'Request a discount' button. The main heading is 'Student Developer Pack' with the subtitle 'The best developer tools, free for students'. Below this, there's a section with a yellow backpack icon and the text 'Learn to ship software like a pro'. To the right of this text are social media buttons for 'Like' (39K) and 'Tweet'. A paragraph explains that the pack provides free access to developer tools for students. A blue 'Get your pack' button is prominently displayed. Below this, a section titled 'THE TOOLS' lists two featured tools: 'ATOM' (a hackable text editor) and 'aws educate' (AWS cloud access and training). Each tool entry includes a 'DETAILS' link and a brief description of the benefits for students.

GitHub Education

Stories Events Student pack Classroom Community Contact us Request a discount

Student Developer Pack

The best developer tools, free for students




Learn to ship software like a pro

Like 39K Tweet

There's no substitute for hands-on experience, but for most students, real world tools can be cost prohibitive. That's why we created the GitHub Student Developer Pack with some of our partners and friends: to give students free access to the best developer tools in one place so they can learn by doing.


Get your pack

THE TOOLS



A hackable text editor for the 21st Century

DETAILS Open Source by GitHub, free for everyone



Access to the AWS cloud, free training, and collaboration resources

DETAILS Student Developer Pack members receive up to \$110 in bonus AWS credits for a total of \$75-\$150

Altre risorse utili 2/2

Amazon Web Services educate:

<http://aws.amazon.com/education/awseducate/>



Institutions

Provide educators and students with resources for cloud-related learning. Those at member institutions receive twice as many AWS credits, demos and special on-campus programs.

[Apply for AWS Educate for Institutions »](#)

[Already a Member?](#)



Educators

Professors, teaching assistants, and educators receive access to AWS technology, open source content for their courses, training resources, and a community of cloud evangelists.

[Apply for AWS Educate for Educators »](#)

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Students

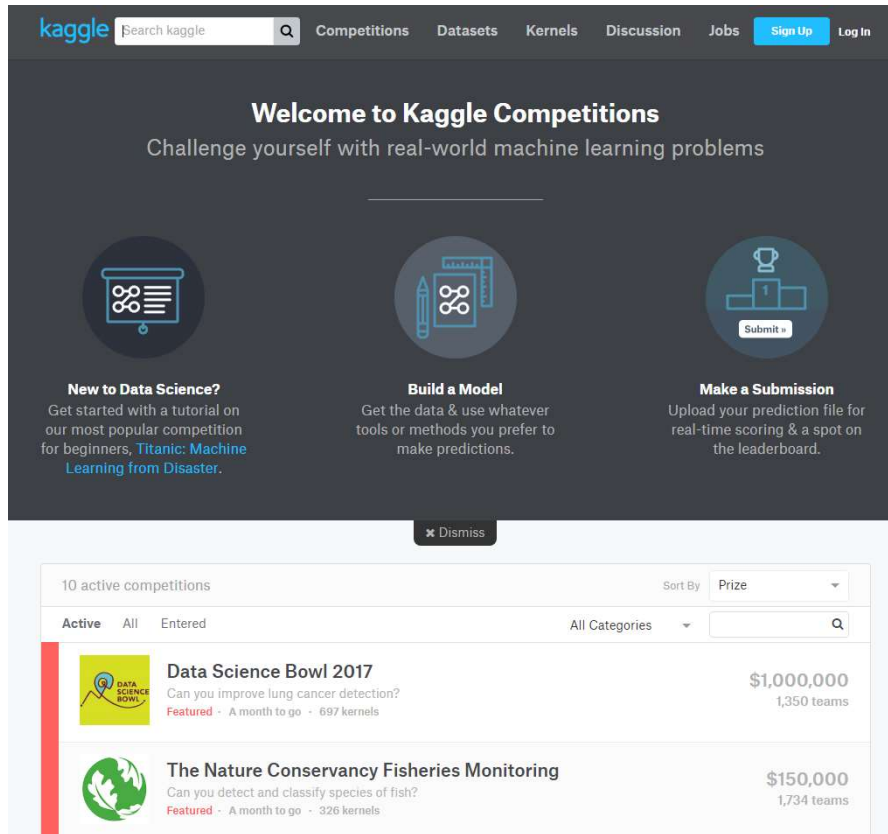
Students receive credits for hands-on experience with AWS technology, training, content, career pathways, and job board.

[Apply for AWS Educate for Students »](#)

[Already a Member? Check your welcome email.](#)

Competizioni

- <http://www.kaggle.com>
- <http://www.crowdanalytix.com>



The image shows the Kaggle Competitions homepage. At the top, there is a navigation bar with links for Competitions, Datasets, Kernels, Discussion, Jobs, and Sign Up. The main heading is "Welcome to Kaggle Competitions" with the subtitle "Challenge yourself with real-world machine learning problems". Below this, there are three main sections: "New to Data Science?", "Build a Model", and "Make a Submission". Each section has a brief description and a "Submit" button. At the bottom, there is a list of active competitions, including "Data Science Bowl 2017" and "The Nature Conservancy Fisheries Monitoring".

Welcome to Kaggle Competitions
Challenge yourself with real-world machine learning problems

New to Data Science?
Get started with a tutorial on our most popular competition for beginners, [Titanic: Machine Learning from Disaster](#).

Build a Model
Get the data & use whatever tools or methods you prefer to make predictions.

Make a Submission
Upload your prediction file for real-time scoring & a spot on the leaderboard.

10 active competitions

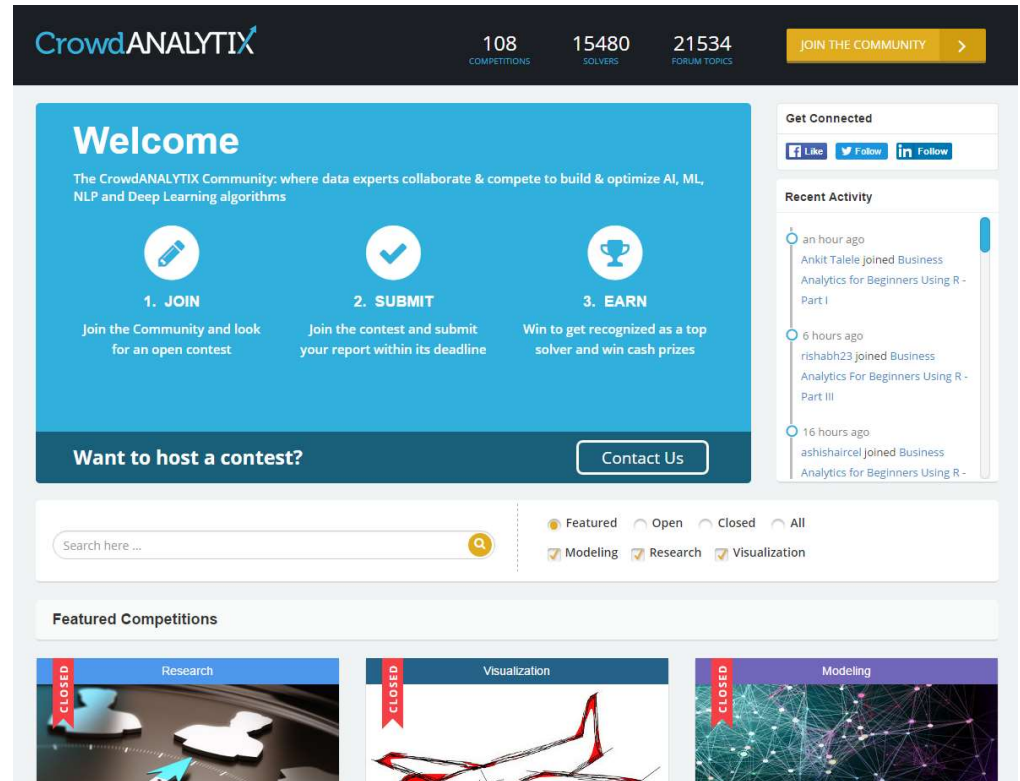
Sort By: Prize

Active All Entered

All Categories

Data Science Bowl 2017
Can you improve lung cancer detection?
Featured - A month to go - 697 kernels
\$1,000,000
1,350 teams

The Nature Conservancy Fisheries Monitoring
Can you detect and classify species of fish?
Featured - A month to go - 326 kernels
\$150,000
1,734 teams



The image shows the CrowdANALYTIX homepage. At the top, there is a navigation bar with links for Competitions, Datasets, Kernels, Discussion, Jobs, and Sign Up. The main heading is "Welcome" with the subtitle "The CrowdANALYTIX Community: where data experts collaborate & compete to build & optimize AI, ML, NLP and Deep Learning algorithms". Below this, there are three main sections: "1. JOIN", "2. SUBMIT", and "3. EARN". Each section has a brief description and a "Contact Us" button. At the bottom, there is a list of featured competitions, including "Research", "Visualization", and "Modeling".

Welcome
The CrowdANALYTIX Community: where data experts collaborate & compete to build & optimize AI, ML, NLP and Deep Learning algorithms

1. JOIN
Join the Community and look for an open contest

2. SUBMIT
Join the contest and submit your report within its deadline

3. EARN
Win to get recognized as a top solver and win cash prizes

Want to host a contest? [Contact Us](#)

Get Connected
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Recent Activity

- an hour ago
Ankit Talele joined Business Analytics for Beginners Using R - Part I
- 6 hours ago
rishabh23 joined Business Analytics For Beginners Using R - Part III
- 16 hours ago
ashishaircel joined Business Analytics for Beginners Using R -

Search here ...

Featured Open Closed All

Modeling Research Visualization


Featured Competitions

Research
CLOSED

Visualization
CLOSED

Modeling
CLOSED

SymPy: Symbolic Mathematics

 SymPy

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About

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.

[Get started with the tutorial](#) [Download Now](#)

Why SymPy

SymPy is...

- **Free:** Licensed under BSD, SymPy is free both as in speech and as in beer.
- **Python-based:** SymPy is written entirely in Python and uses Python for its language.
- **Lightweight:** SymPy only depends on [mpmath](#), a pure Python library for arbitrary floating point arithmetic, making it easy to use.
- **A library:** Beyond use as an interactive tool, SymPy can be embedded in other applications and extended with custom functions.

[See SymPy's features](#)

Projects using SymPy

This is an (incomplete) list of projects that use SymPy. If you use SymPy in your project, please let us know on our [mailinglist](#), so that we can add your project here as well.

- **Cadabra:** Tensor algebra and (quantum) field theory system using SymPy for scalar algebra.
- **SageMath:** Open source mathematics system that includes SymPy.
- **PyDy:** Multibody dynamics in Python.
- **galgebra:** Geometric algebra (previously [sympy.galgebra](#)).
- **yt:** Python package for analyzing and visualizing volumetric data ([yt.units](#) uses SymPy).

Compute with Gamma

[Compute](#)



Download Now

[Latest Version](#)
[Development Version](#)

Quick Links

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