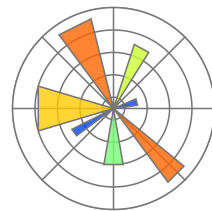
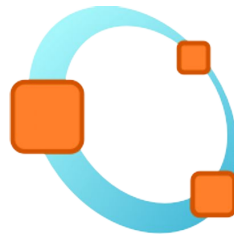
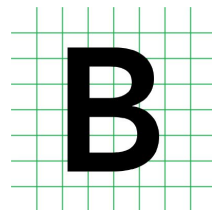




JavaScript



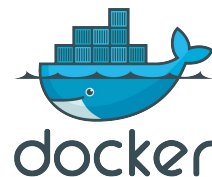
Project Jupyter és egyéb állatok



GitLab



Oroszlány László
ELTE -KRFT



WHO IS OUR AUDIENCE?

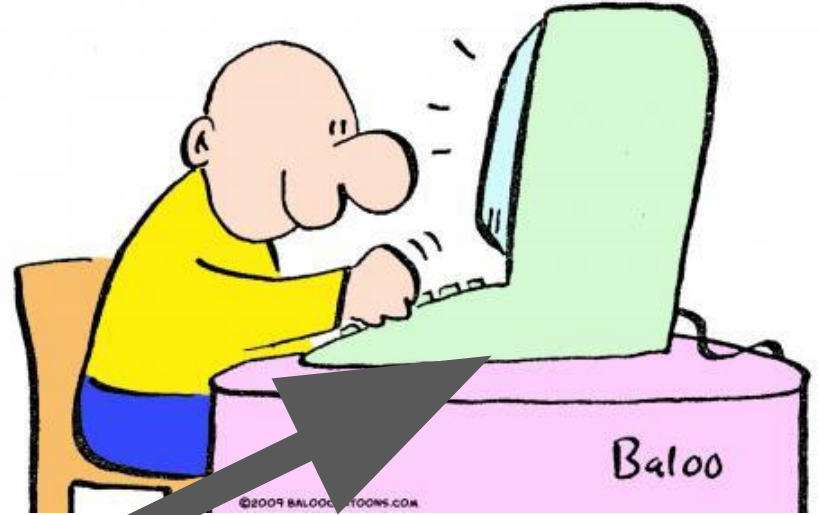


Miről is lesz szó?

- A Jupyter notebook formátum
 - **Read Evaluate Print Loop**
 - Notebook ötlet
 - Nyelv függetlenség
 - Reprodukálható tudomány
- Jupyterhub platform
 - A számítógépes oktatás problematikái
 - Architektúrális komponensek a jupyter mellett
 - Jupyterhub oktatási tapasztalatok az elmúlt pár évből
 - Nbgrader és a granuláris oktatás
- Kooplex egy saját fejlesztésű kooperatív keretrendszer
 - Kollaboráció notebookokkal
 - Statikus Reportok
 - Dashbordok

Hogyan programozunk?

I program, therefore I am....



Az első próbálkozások

```
C:\WINDOWS\system32\cmd.exe
C:\Sai\TutAC-works>
C:\Sai\TutAC-works>
C:\Sai\TutAC-works>
C:\Sai\TutAC-works>
C:\Sai\TutAC-works>
C:\Sai\TutAC-works>
C:\Sai\TutAC-works>
C:\Sai\TutAC-works>
C:\Sai\TutAC-works>
C:\Sai\TutAC-works>
C:\Sai\TutAC-works>
C:\Sai\TutAC-works>
C:\Sai\TutAC-works>
C:\Sai\TutAC-works>
C:\Sai\TutAC-works>
C:\Sai\TutAC-works>cfx5mkext TStat_Control.F
A fatal error has occurred in cfx5mkext:

Essential (non-synthesisable) configuration parameter fc <'"/OS:winnnt
amd64/fc"> missing from configuration file cfx5mkext.ccl

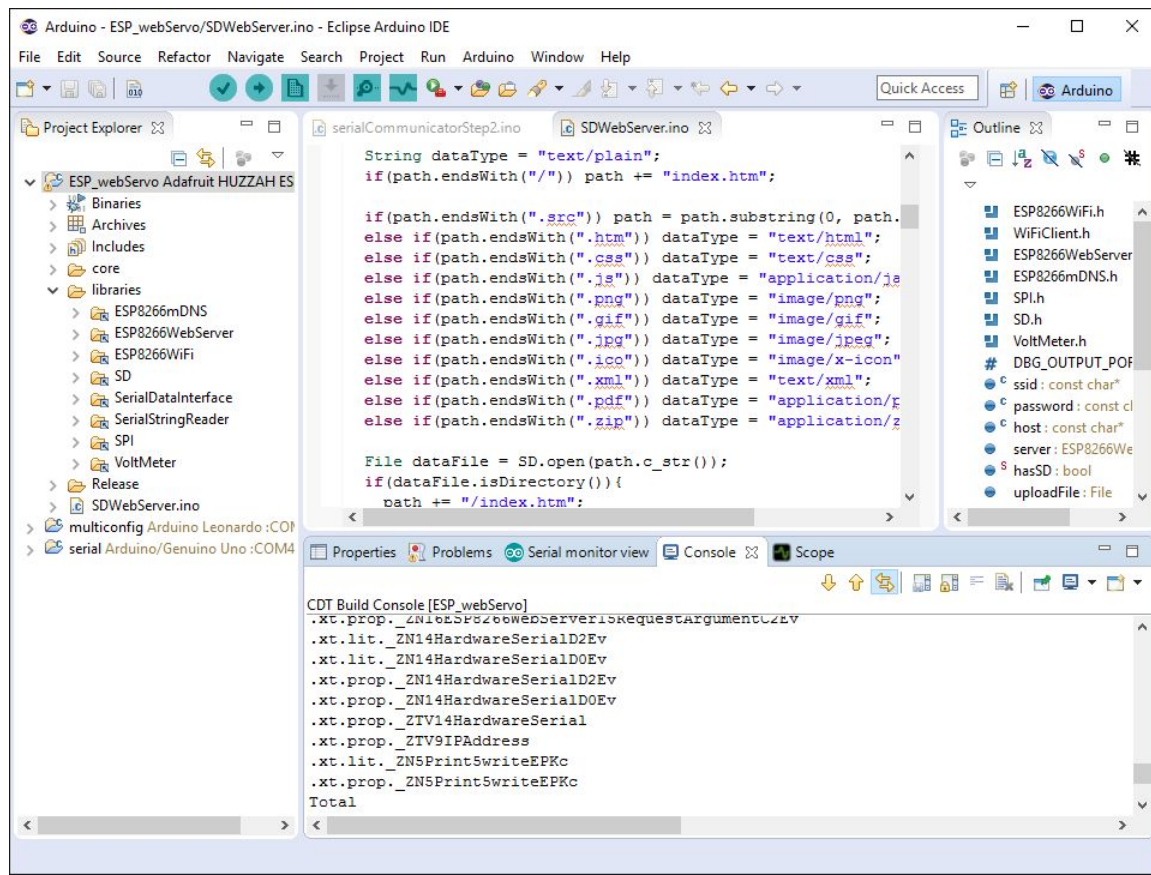
C:\Sai\TutAC-works>
C:\Sai\TutAC-works>
```

```
cfx5mkext.ccl - WordPad
File Edit View Insert Format Help

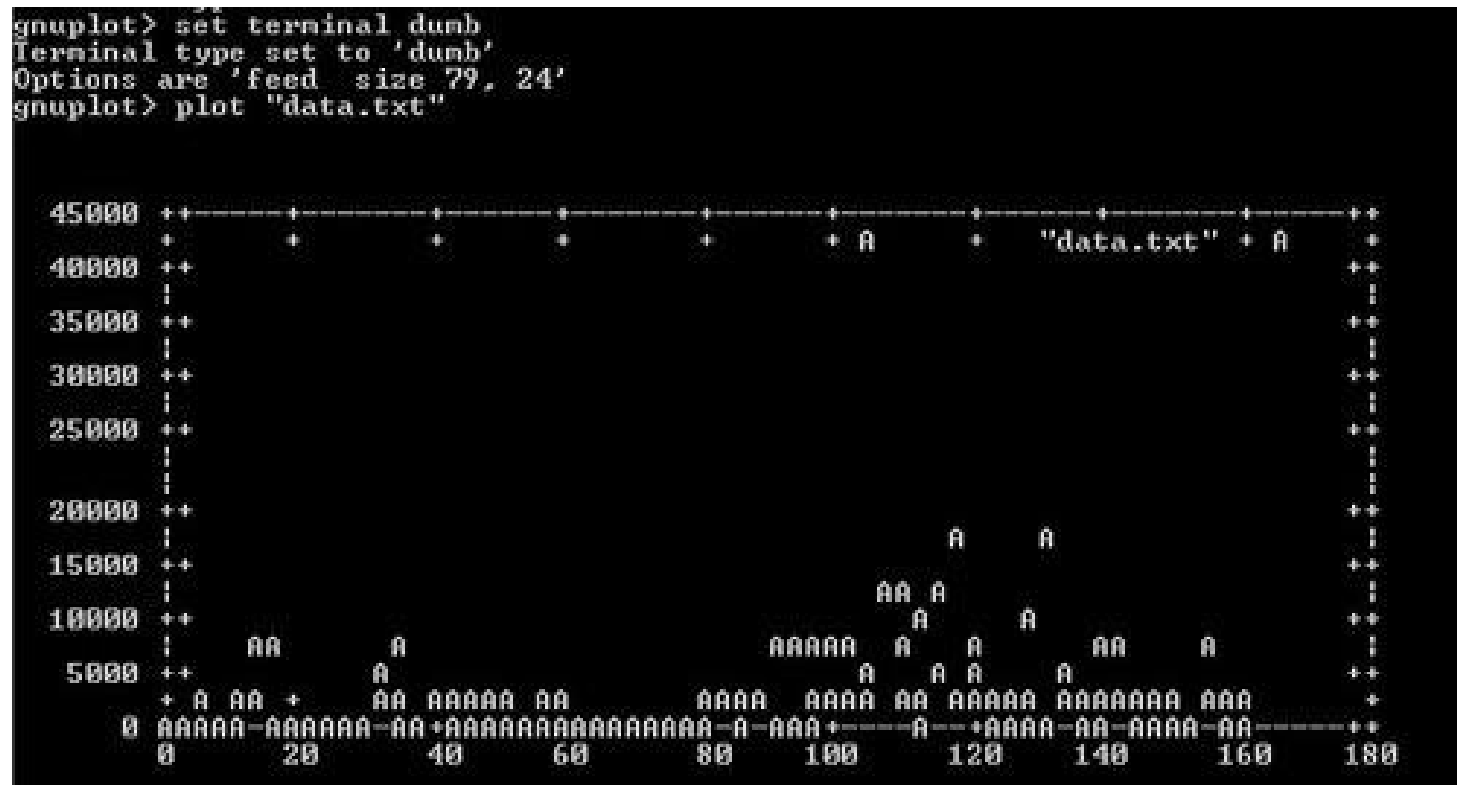
##### Compaq Visual Fortran
OS: winnt
cc = cl
fc = df!
ld = link
cxx = cl
ext build cflags = -MD
ext link ldflags = -threads
# ext link lib5files = solver-pvm.lib
# ext link lib5files = solver-hpmpi.lib
ext link lib5files = solver-mpich2.lib
cppincflag f = -include:
cppflags f = -fpp:-m
fc outopt obj = -object:
fc outopt exec = -dll:
cc outopt obj = -Fo
ext lib suffix = dll
ext lib pattern = %s.dll
ATTRS: double
    cppflags = -DDOUBLE_PRECISION
    ext build fflags = -integer_size:32 -real_size:64 -MD
    ext link lib5files = solver-hpmpi.lib
# ext link lib5files = solver-mpich2.lib
END
END

For Help, press F1
```

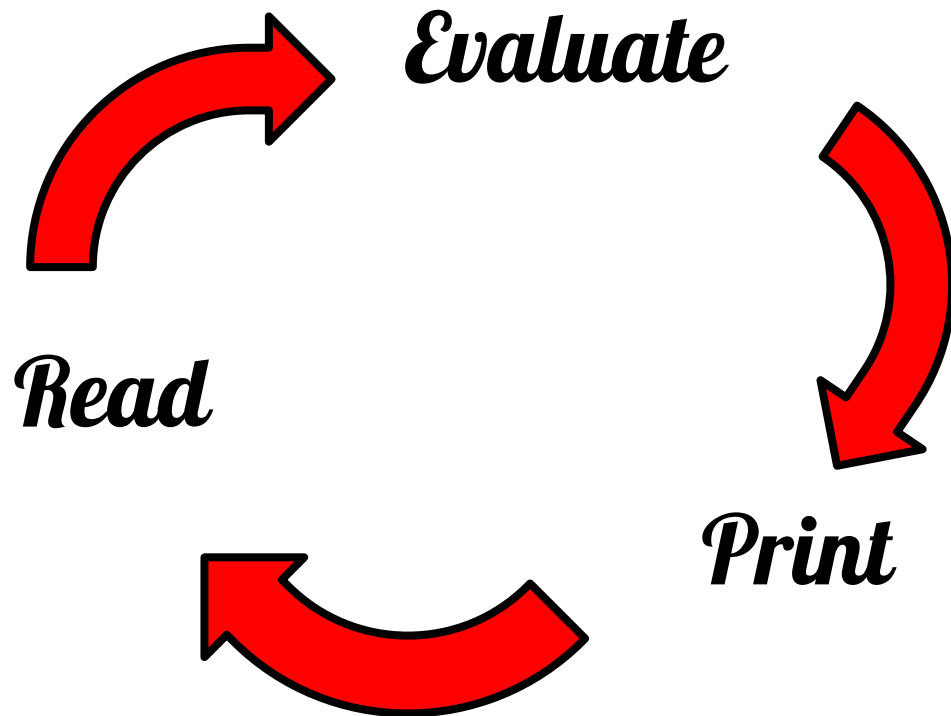
Egy tipikus haladó programozói környezet IDE



Ez is programozás ?



REPL



REPL notebookok a h  skorban



Visualize Series Expansions

Calculate the expansion for $\sin(x)$ to degree 5:

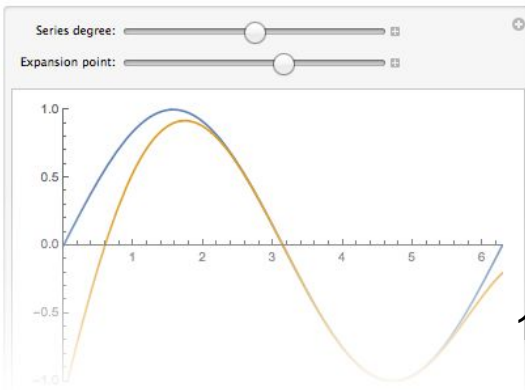
`Normal@Series[Sin[x], {x, 0, 5}]`

$$x - \frac{x^3}{6} + \frac{x^5}{120}$$

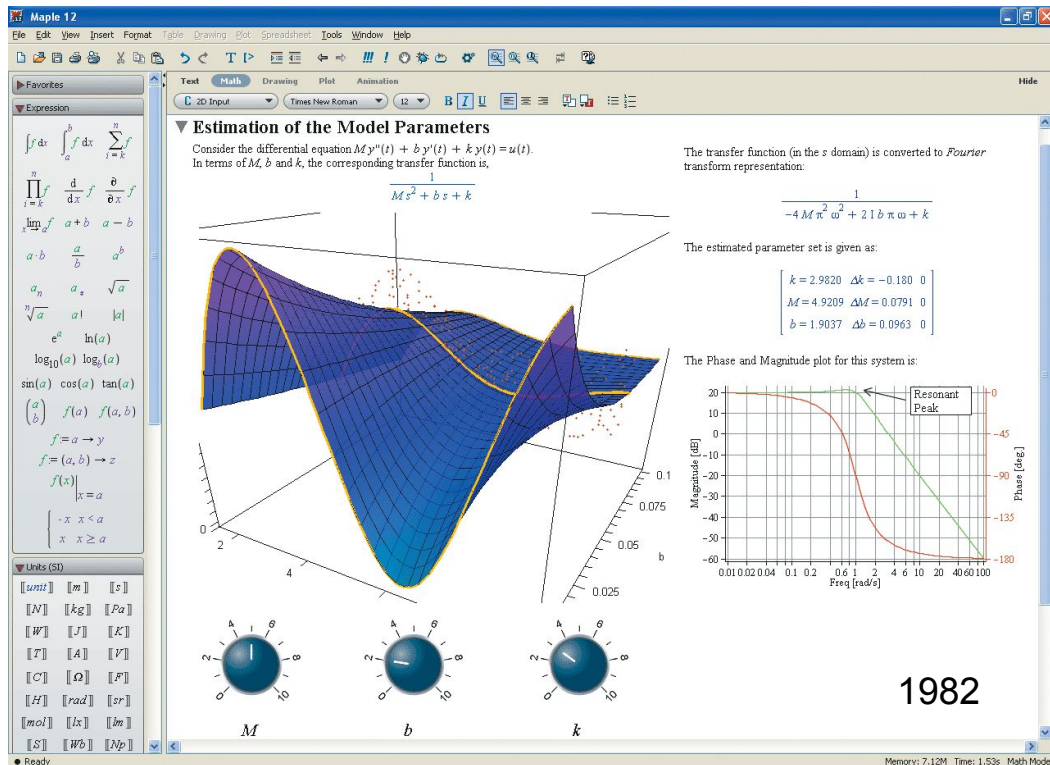
Visualize the effects of changing parameters:

`Manipulate[Plot[{Sin[x], Normal@Series[Sin[x], {x, 0, 2 Pi}], PlotRange -> {{0, 2 Pi}, {-1, 1}}, {deg, 3, "Series degree:"}, {1, 9, 2}, {y0, Pi, "Expansion point:"}, 0, 2 Pi, Pi/4]]`

Wolfram
Mathematica



1988



1982

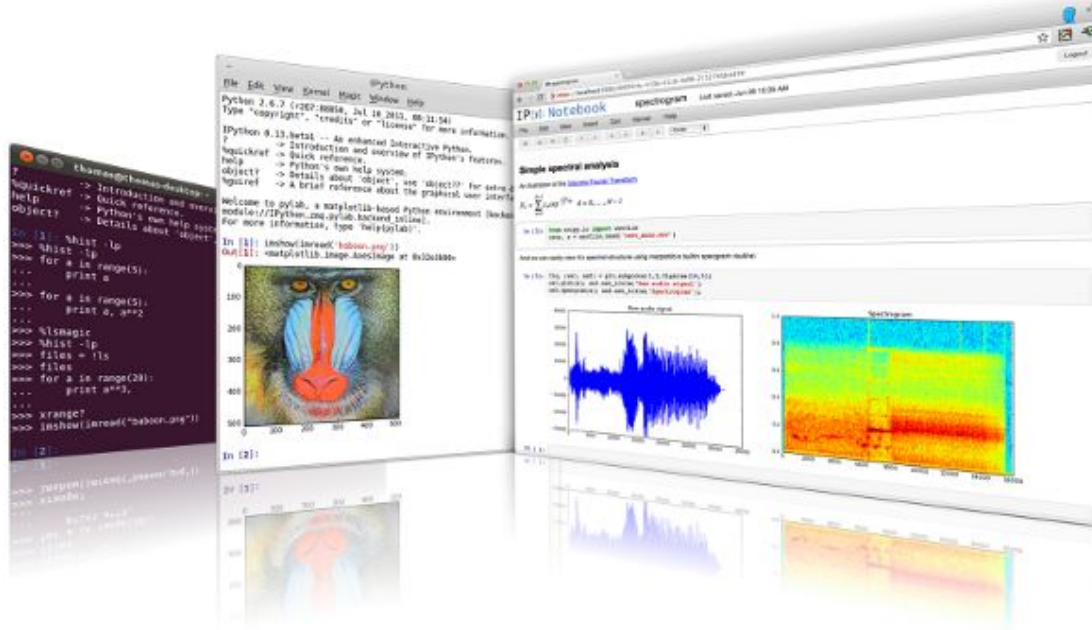
A korszellem ihlette business model...

As the majority of hobbyists must be aware, most of you steal your software. Hardware must be paid for, but software is something to share. Who cares if the people who worked on it get paid?

Bill Gates, Open Letter to Hobbyists 1976



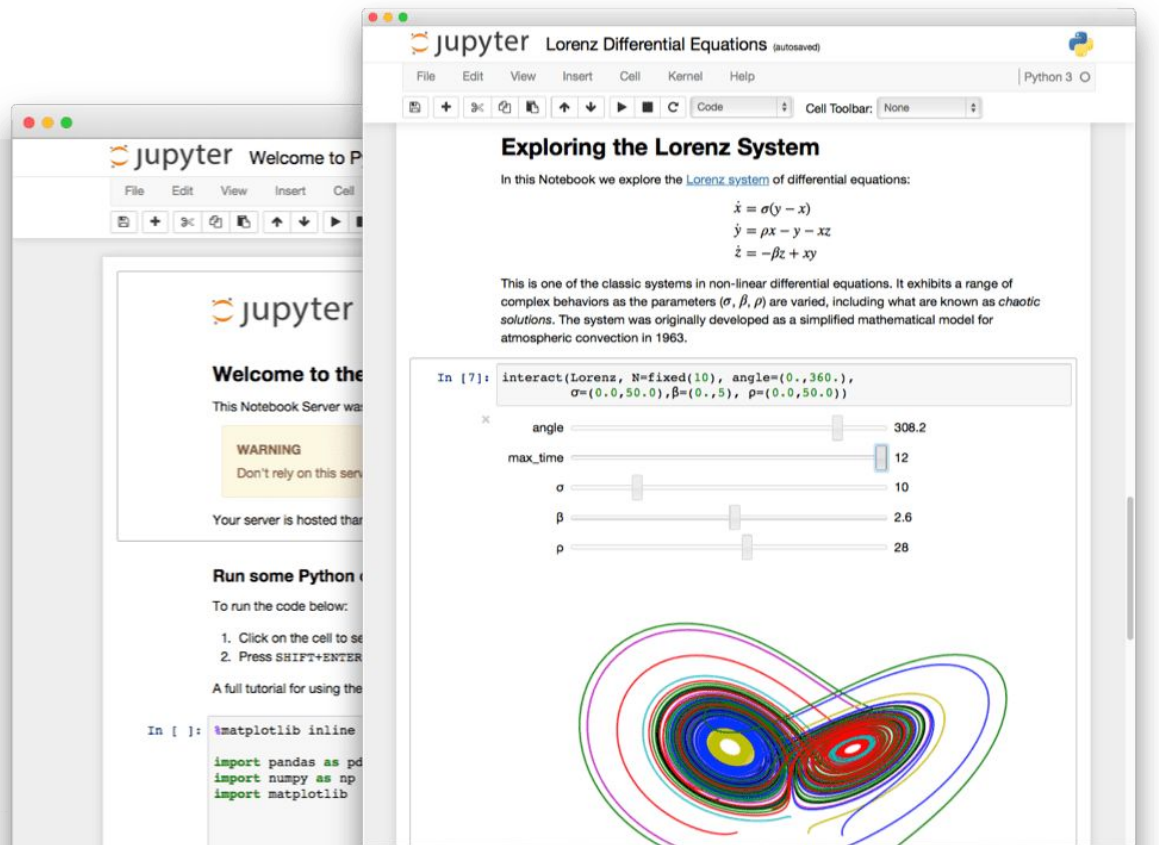
Fernando Pérez 2001: “an afternoon hack”



IPython: terminal, QT console, notebook



Project Jupyter: Notebook-ok akármilyen nyelven!



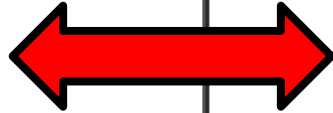
- Kód és web-es technológiák
- Interaktív widgetek
- Nyelv agnosztikus
- Open source
- Gazdag aktív fejlesztői tábor
- Lokális felhasználás
- Cloud-ban futtatható szolgáltatás

Jupyter kernelek



A Notebook formátum = JSON

```
1 {  
2   "cells": [  
3     {  
4       "cell_type": "code",  
5       "execution_count": 1,  
6       "metadata": {},  
7       "outputs": [  
8         {  
9           "name": "stdout",  
10          "output_type": "stream",  
11          "text": [  
12            "Populating the interactive namespace from numpy and matplotlib\n"  
13          ]  
14        }  
15      ],  
16      "source": [  
17        "%pylab inline"  
18      ]  
19    },  
20    {  
21      "cell_type": "code",  
22      "execution_count": 2,  
23      "metadata": {},  
24      "outputs": [  
25        {  
26          "data": {  
27            "text/plain": [  
28              "[<matplotlib.lines.Line2D at 0x7fa419be0208>]"  
29            ]  
30          },  
31          "output_type": "text",  
32          "rich_text": []  
33        }  
34      ]  
35    }  
36  ]  
37 }
```



jupyter pelda

File Edit View Insert Cell Kernel Widgets Help Trusted Python 3

In [1]: `%pylab inline`

Populating the interactive namespace from numpy and matplotlib

In [2]: `t=linspace(0,2*pi,314)`
`plot(t,sin(t))`

Out[2]: [`<matplotlib.lines.Line2D at 0x7fa419be0208>`]

1.00
0.75
0.50
0.25
0.00
-0.25
-0.50
-0.75
-1.00

0 1 2 3 4 5 6

[Nbconvert](#): Notebook -> py,pdf,html,reveal.js, ...

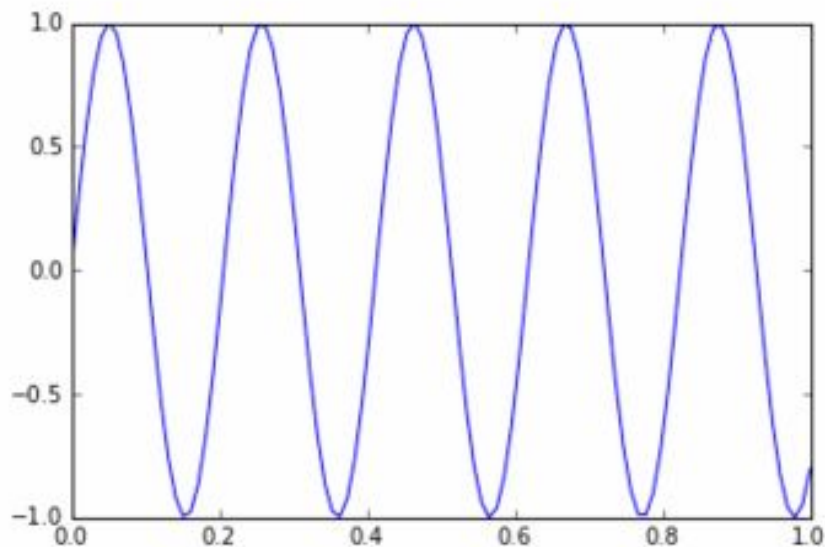
Widgetek

```
In [22]: from IPython.html.widgets import import *
t = arange(0.0, 1.0, 0.01)

def pltsin(f):
    plt.plot(x, sin(2*pi*t*f))
    plt.show()

interact(pltsin, f=(1,10,0.1))
```

✕ f  4.9



Dashboard-ok

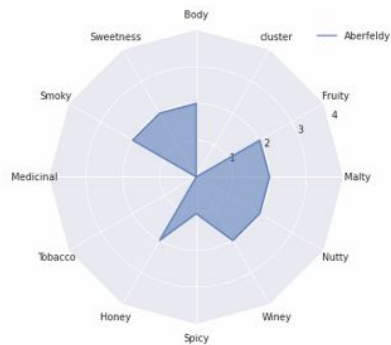
Got Scotch?

If you like Aberfeldy you might want to try these five brands. Click one to see how its taste profile compares.

Scotch

Aberfeldy

	Similarity
Benromach	0.972973
BlairAthol	0.972973
Benrinnes	0.962908
RoyalLochnagar	0.959202
Scapa	0.959043



Powered by data from https://www.mathstat.strath.ac.uk/outreach/nessie/nessie_whisky.html and inspired by analysis from <http://blog.revolutionanalytics.com/2013/12/k-means-clustering-86-single-malt-scotch-whiskies.html>. This dashboard originated as a Jupyter Notebook.

Reprodukálható tudomány



Getting Started

Data

Events

Bulk Data

Tutorials

Software

Detector Status

Timelines

My Sources

GPS ↔ UTC

About the detectors

Projects

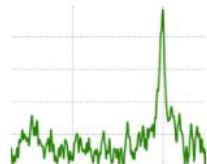
Acknowledge LOSC

Tutorials

Each tutorial will lead you step-by-step through some common data analysis tasks. While LIGO data can be used in these tutorials, they use Python. See also the [software examples page](#) for more examples.

See the [software setup page](#) for help installing software to run these tutorials.

Binary Black Hole Events



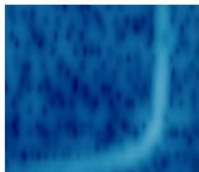
Use matched filtering to find signals hidden in noise.

Run: [Azure](#) | [mybinder \(Beta\)](#)

View: [GW150914](#) | [LVT151012](#) | [GW151226](#) | [GW170104](#)

Download: [zip file with data](#) | [Jupyter notebook](#) | [python script](#)

Quickview Notebook



Make summary plots for any short segment of LIGO data.

Run: [Azure](#) | [mybinder \(Beta\)](#)

Download: [IPython 4](#)



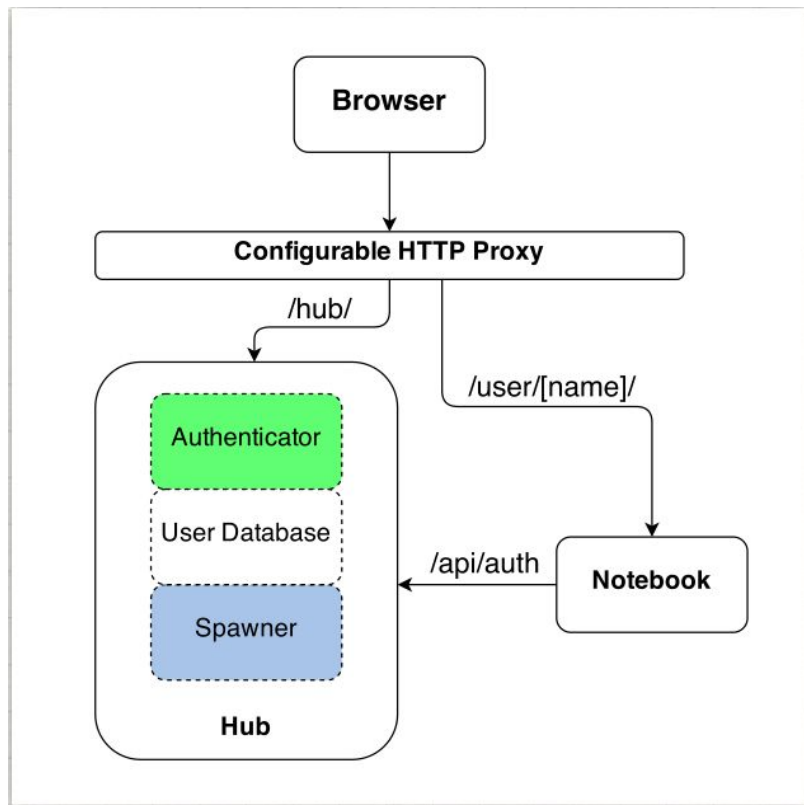
<https://mybinder.org/>

A számítógépes oktatás problémái

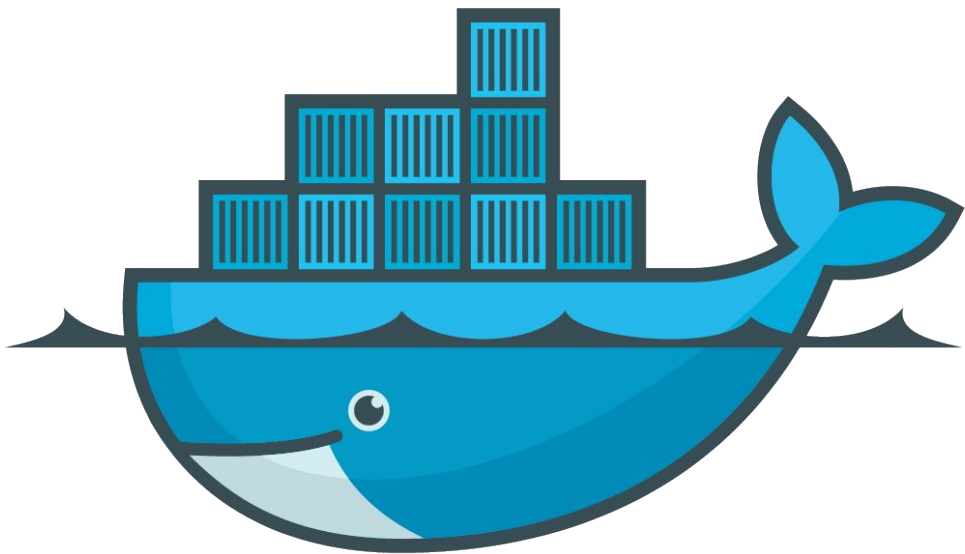
- Különböző számítógépes háttér/affinitás
- Különböző számítógépek/operációs rendszerek (telepítési rémálom)
- Gépteremi infrastruktúra (csak egy gépterem van 3000 diákra)
- Új körülmények
 - Mindenhol van internet
 - Mindenkinek van számítógépe ÉS okostelefonja ÉS ***BÖNGÉSZŐJE!***
 - Nem csak az iskolában/az órán kell/lehet tanulni



Jupyterhub architectura



A konténer forradalom

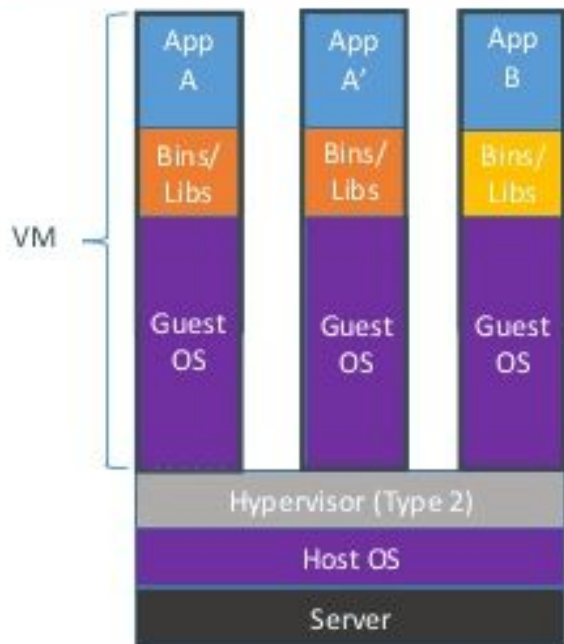


docker

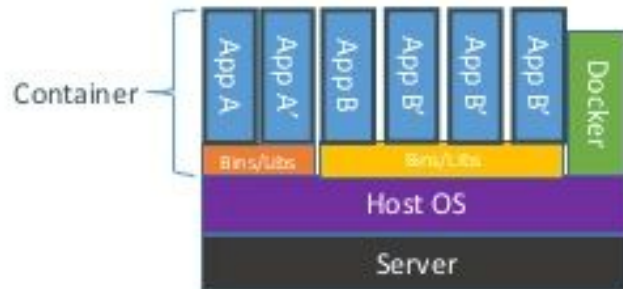


kubernetes

Containers vs. VMs



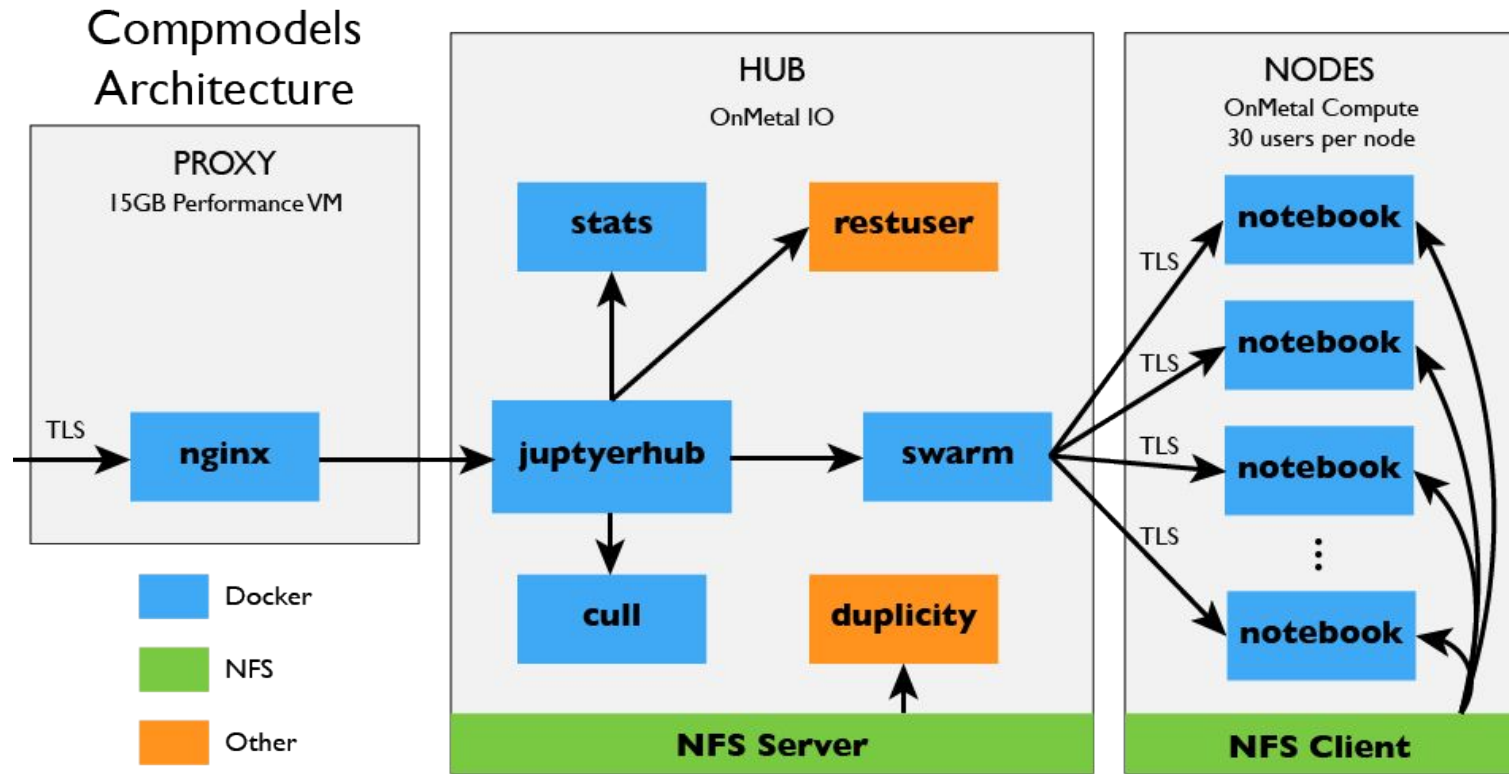
Containers are isolated, but share OS and, where appropriate, bins/libraries



Startup ~100 s

~300ms

Jupyterhub oktatási referencia [setup](#), [zero2jupyter](#)



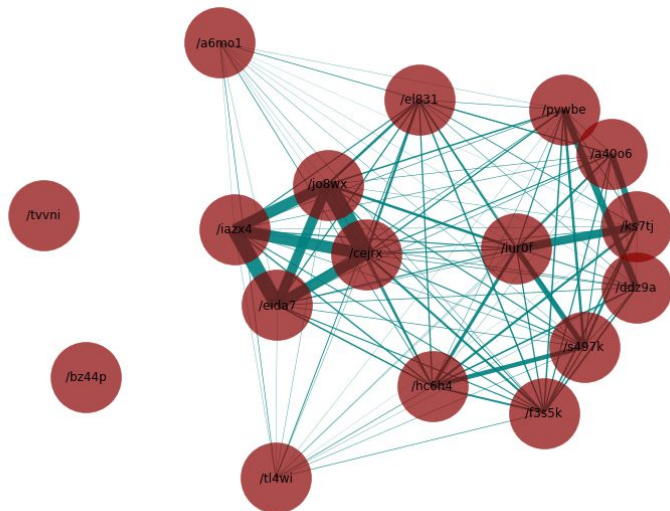
Tapasztalatok: Fiznum1/Szamprob/Digilabor

Notebookok

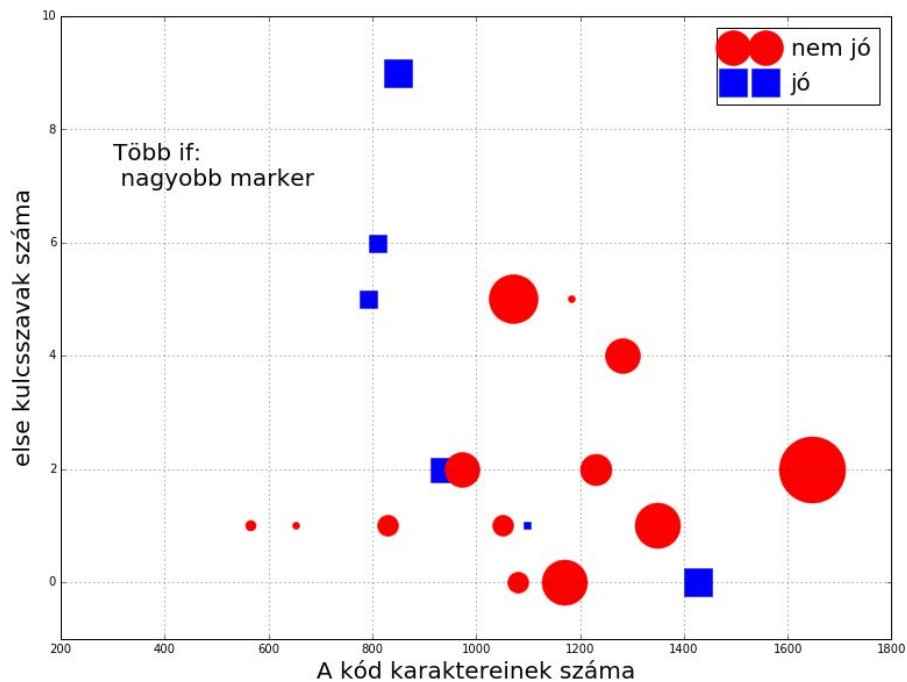
Az alábbi táblázat tartalmazza statikus(.html) és notebook (.ipynb) formátumban az órai és a házi feladat IPython notebook-okat. Továbbá néhány rövid összefoglaló puskát is a melyek alapvető feladatok megoldásában nyújthatnak némi segítséget.

Mintapéldák	00 (forrás)	01 (forrás)	02 (forrás)	03 (forrás)	04 (forrás)	05 (forrás) (adatok)	06 (forrás) (adatok)	07 (forrás) (adatok)	08 (forrás) (adatok)	09 (forrás) (adatok)	10 (forrás) (adatok)
Feladatok	00 (forrás)	01 (forrás)	02 (forrás)	03 (forrás)	04 (forrás)	05 (forrás)	06 (forrás)	07 (forrás)	08 (forrás)	09 (forrás)	10 (forrás)
Puskák	if,for def	Modulok ábrák	Osztályok	Matplotlib interact	sympy	Lineáris alebra	Integrálás Diff. egyenletek	File I/O	Fit,FFT	DB	kernelek

Ki kiról



Ha Ha Ha



Nbgrader

 **Problem 1** Last Checkpoint: a few seconds ago (autosaved)

File Edit View Insert Cell Kernel Help Python 3

Cell Toolbar: None

Part A (2 points)

Write code to compute the mean of a list of numbers.

```
In [ ]: def mean(x):  
        """Compute the mean of a list of numbers given in `x`"""  
        ## BEGIN SOLUTION  
        return sum(x) / len(x)  
        ## END SOLUTION
```

```
In [ ]: """Check that the `mean` function is correct."""  
assert mean([1]) == 1.0  
assert mean([1, 2]) == 1.5  
assert mean([5.5, 0, 2, 3.4]) == 2.725  
assert mean(range(100)) == 49.5  
assert mean(range(100, 0, -1)) == 50.5
```

Part B (3 points)

Describe the difference between an *arithmetic mean*, a *harmonic mean*, and a *geometric mean*.

Arithmetic mean:

$$\frac{1}{N} \sum_{i=1}^N x_i$$

Home

localhost:8889/tree?

jupyter Logout

Files Running Clusters Formgrader Assignments

Select items to perform actions on them.

	Name	Last Modified
	source	a month ago
	nbgrader_config.py	2 minutes ago

jupyter

Files Running Clusters Assignments

Select items to perform actions on them.

	classes
	cogphys
	config
	pyrb
	misc
	presentations
	publications
	research
	teaching
	tmp
	tools
	websites



An infrastructure for flexible collaboration

<https://github.com/kooplex>



Csabai István



Funded by the Horizon 2020
Framework Programme of the
European Union



NATIONAL RESEARCH, DEVELOPMENT
AND INNOVATION OFFICE
HUNGARY



Dobos László



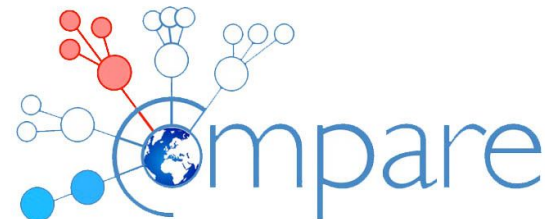
Visontai Dávid



Stéger József



Szalai-Gindl János Márk



The problem

lab scientist



project manager



field scientist



data scientist



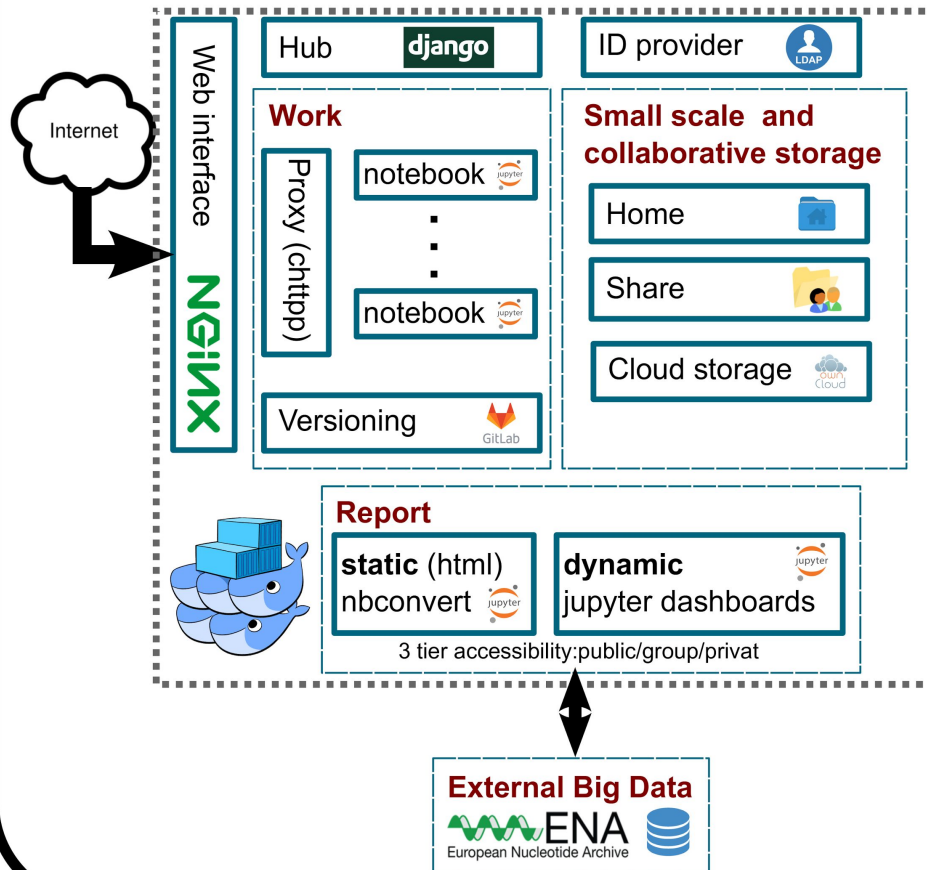
THE PUBLIC

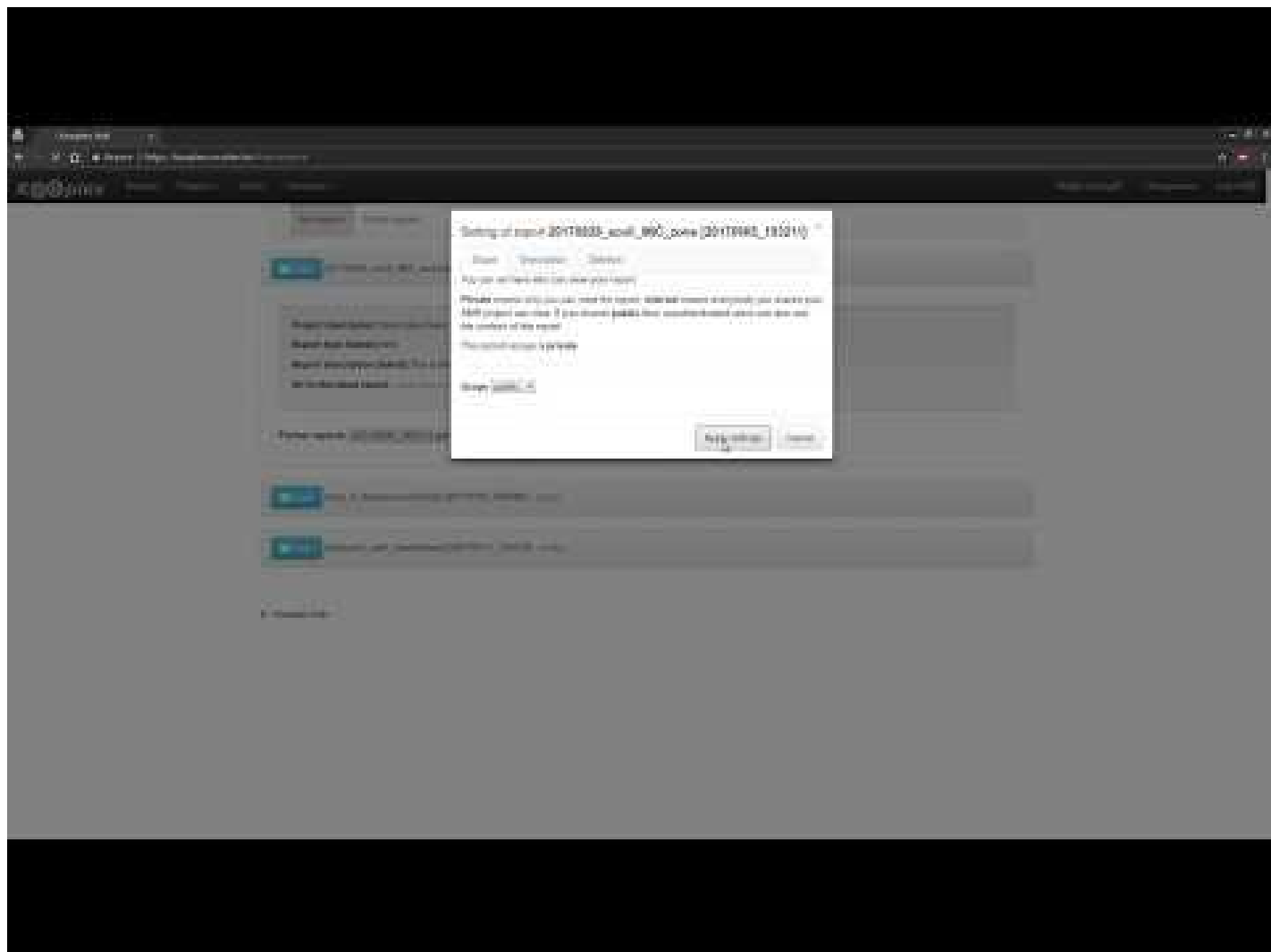


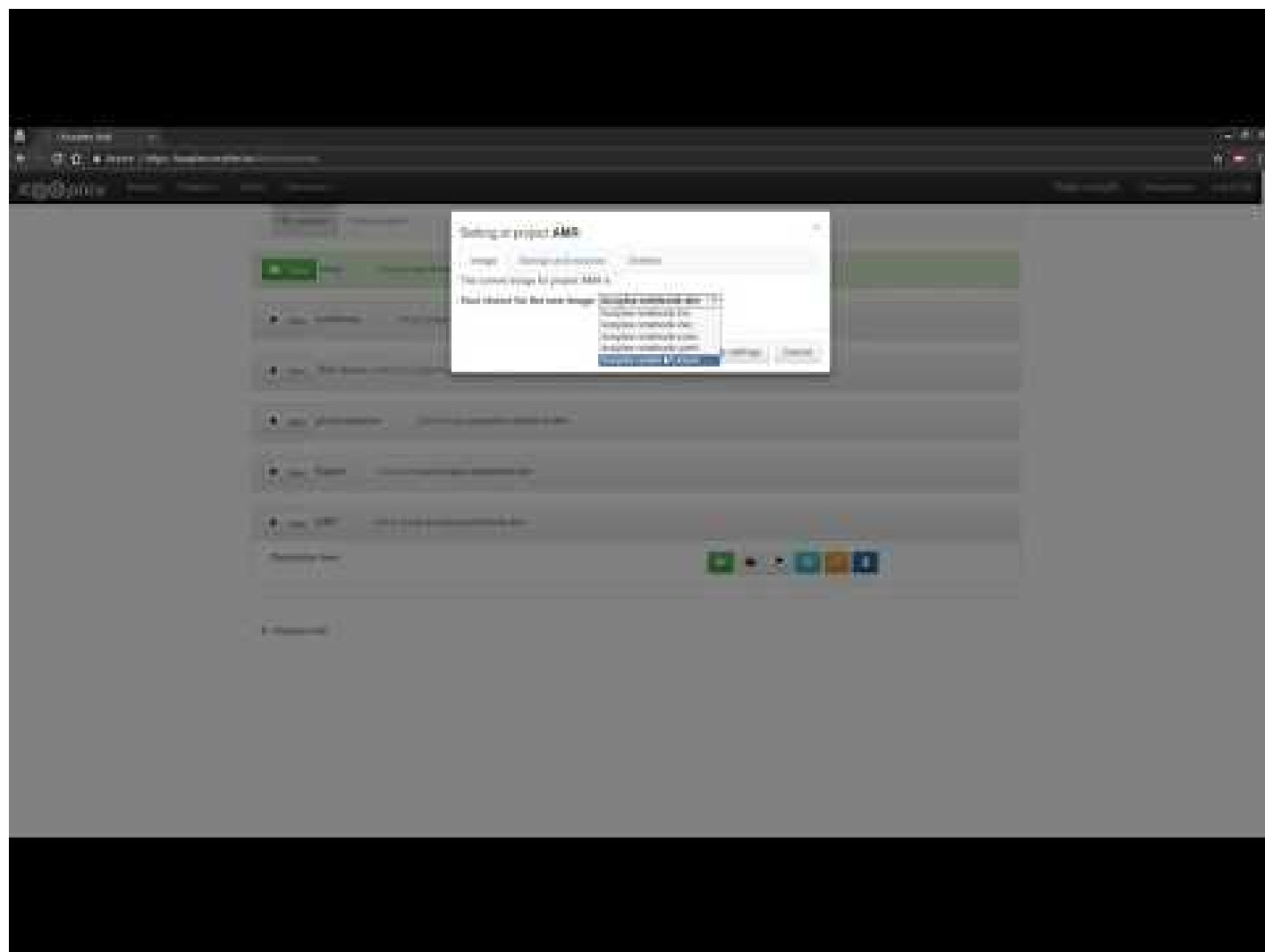


<https://kooplex.vo.elte.hu/hub/>

Architecture







Egy kis ízelítő



@



<https://novo2.vo.elte.hu/wigner/hub>



<https://mybinder.org/v2/gh/oroszl/wignerLMSP2017/master>

<https://github.com/oroszl/wignerLMSP2017>