

Alati za obradu astronomskih opažanja

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Stručni skup učitelja i nastavnika
Kompetencije učitelja i nastavnika za provedbu programa astronomije
V. gimnazija, Zagreb, 17. lipnja 2016.

Prirodna znanost je sustav naših **ideja** o tome kako funkcionira svijet.

Ali te ideje moraju biti **provjerljive** (eksperimentom ili opažanjem) odnosno moramo ih moći potvrditi ili opovrgnuti.

Općenito, ideje moraju biti u **skladu** s prirodom.

Konkretno, postupak provjeravanja je li ideja (izražena u obliku matematičkog modela) u skladu s mjerenjima (skupom eksperimentalnih podataka) nazivamo **usklađivanjem krivulje** (engl. curve fitting).

usklađivanje krivulje

skraćeni oblik naziva

usklađivanje

definicija

matematički postupak nalaženja krivulje koja najbolje opisuje niz točaka

istoznačnice

dopušteni naziv: prilagodba krivulje, pripasivanje krivulje

nepreporučeni naziv: fitanje, fitovanje

istovrijednice

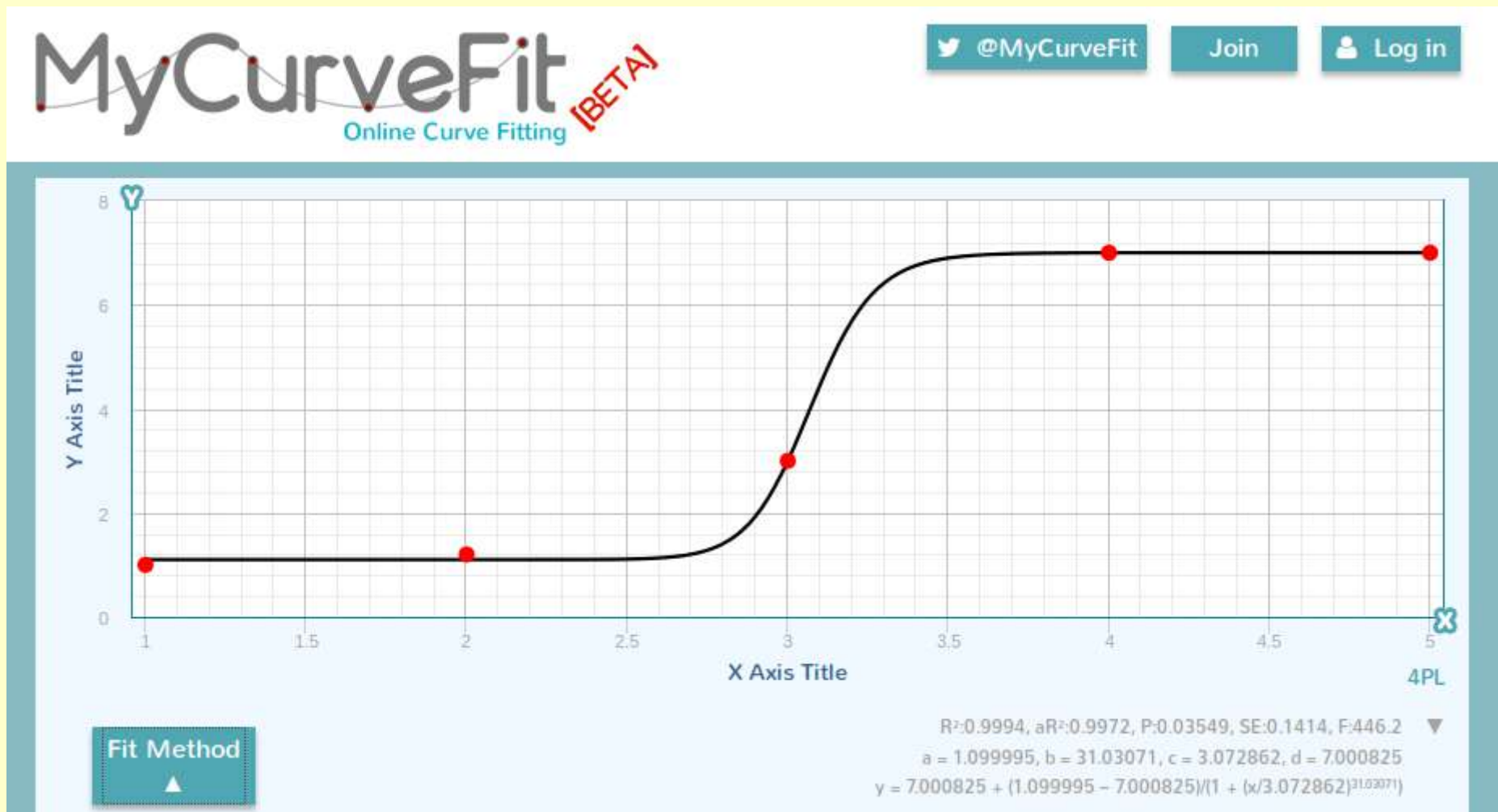
engleski: curve fitting

francuski: ajustement de courbe

MyCurveFit

besplatna mrežna aplikacija za usklađivanje krivulje

<https://mycurvefit.com/>



Podaci za vježbu

http://www.physics.nyu.edu/pine/pymanual/html/chap8/chap8_fitting.html#exercises

```
Size of growing aggregate
Date: 19-Nov-2013
Data taken by M. D. Gryart and M. L. Waites
time (m)   size (nm)   unc (nm)
0.12      115         10
0.18      130         12
0.42      202         14
0.90      335         18
2.10      510         20
6.00      890         30
18.00     1700        40
42.00     2600        50
```

0.12	115	10
0.18	130	12
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Goodness Measures [What's this?](#)

R²	0.9994
aR²	0.9992
P	1.982*10⁻¹⁰
SE	23.4
F	5142

Coefficients

a	346.752	± 9.436
b	0.540839	± 0.00814

Equation

$$y = 346.752 * x^{0.540839}$$

A što s pogreškama mjerenja?

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uncertainties

0.12	115	10
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"For the Love of Physics captures Walter Lewin's extraordinary intellect, passion for physics, and brilliance as a teacher. Hopefully, this book will bring even more people into the orbit of this extraordinary educator and scientist."—Bill Gates

FOR THE LOVE OF PHYSICS



From the End of the Rainbow to the
Edge of Time—A Journey Through
the Wonders of Physics

Walter Lewin

with Warren Goldstein

"But there simply is no physics without measurements. And just as important, there are no meaningful measurements without their **uncertainties**."

Python-kod za usklađivanje krivulje

```
import numpy as np
import matplotlib.pyplot as plt
import scipy.optimize as opt

def nano(t, r0, n):
    return r0*t**n

time, size, d_size = np.loadtxt("podaci1.dat", skiprows=0, unpack=True)

parametri, pogreske = opt.curve_fit(nano, time, size, p0=[300.0,1.0], sigma=d_size)
size0, N = parametri
dsize0, dN = [np.sqrt(pogreske[i,i]) for i in range(parametri.size)]

Xfit = np.linspace(time.min(), time.max(), 200)
Yfit = nanoparticles(Xfit, size0, N)

plt.errorbar(time, size, d_size, fmt="bo")
plt.plot(Xfit, Yfit, "r-", zorder=-1)
plt.xlabel("$t$ (s)", size=18)
plt.ylabel("$r$ (nm)", size=18)

plt.text(5, 2500, "$r_0$ = ({0:.0f} $\pm$ {1:.0f}) nm".format(size0, dsize0), size=18)
plt.text(5, 2200, "$n$ = {0:.3f} $\pm$ {1:.3f}".format(N, dN), size=18)

plt.show()
```

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