lokaverk

April 23, 2022

1 stærðfræði og reiknifræði - lokaverkefni

1.1 VV7 lágmörkun rosenbrock-fallsins

1.1.1 1

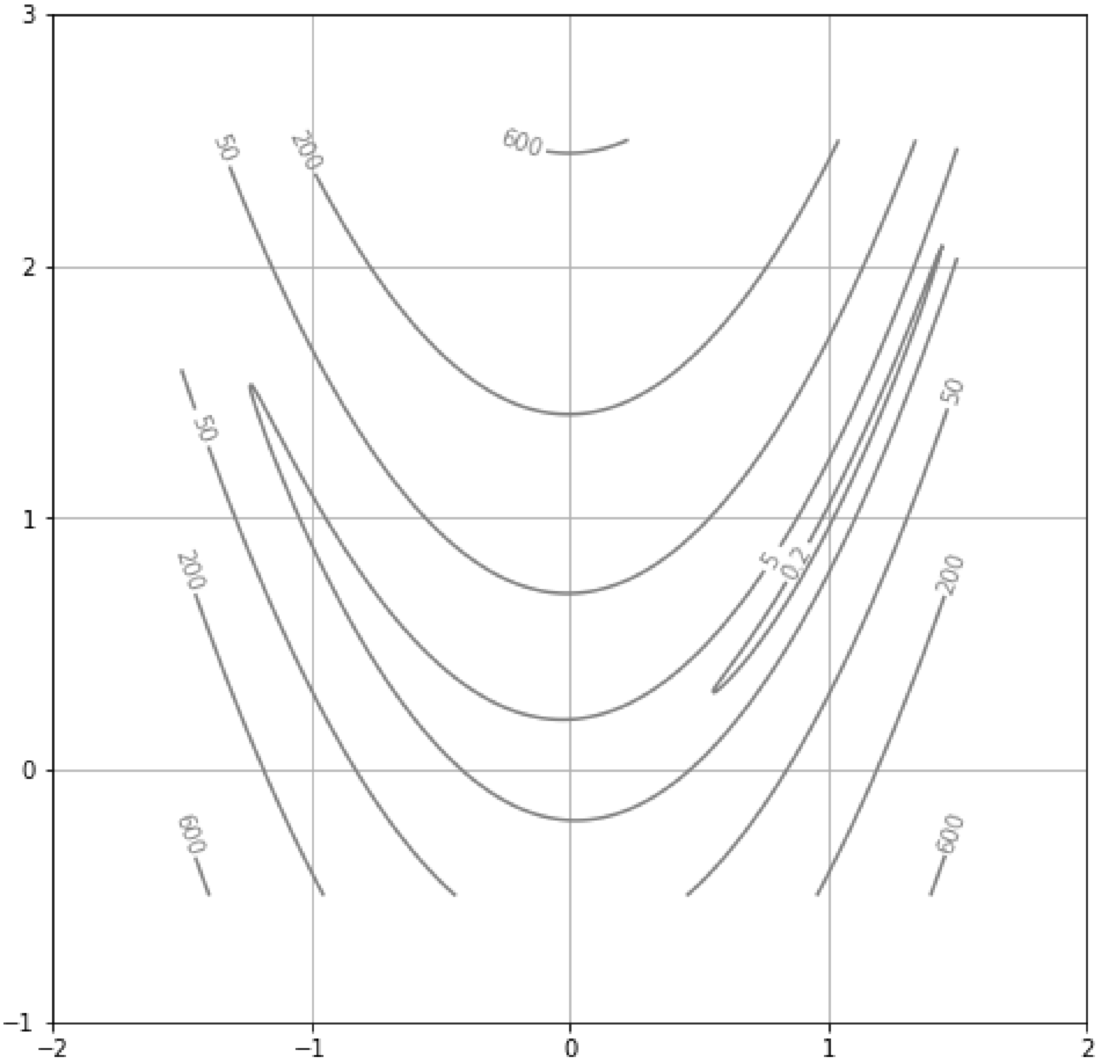
[ ]:

```
import matplotlib.pyplot as plt
import numpy as np

def rosen(x):
  res = (1-x[0])**2 + 100*(x[1] - x[0]**2)**2
  return res

plt.figure(figsize=(8,8))
x = np.linspace(-1.5,1.5,400)
y = np.linspace(-0.5,2.5,400)
[X,Y] = np.meshgrid(x,y)
Z = rosen([X,Y])
levels = [0.2, 5, 50] + list(range(200,2300,400))
c = plt.contour(X, Y, Z, levels = levels, colors = 'gray')
levstr = {l:str(l) for l in levels}
plt.clabel(c, fmt=levstr)
plt.xticks(range(-2,3))
plt.yticks(range(-1,4))
plt.grid("True")
plt.show()

print(rosen((-1.2,1)))
print(rosen((1,1)))
```



```
24.199999999999996
0
```

1.1.2 2

```
[ ]: import scipy.optimize as opt

     result = opt.minimize(rosen,(-1.2,1))
     xmin = result.x

     print(result)
```

```
      fun: 2.154544078116627e-11
 hess_inv: array([[0.50998325, 1.02085757],
       [1.02085757, 2.04855586]])
```

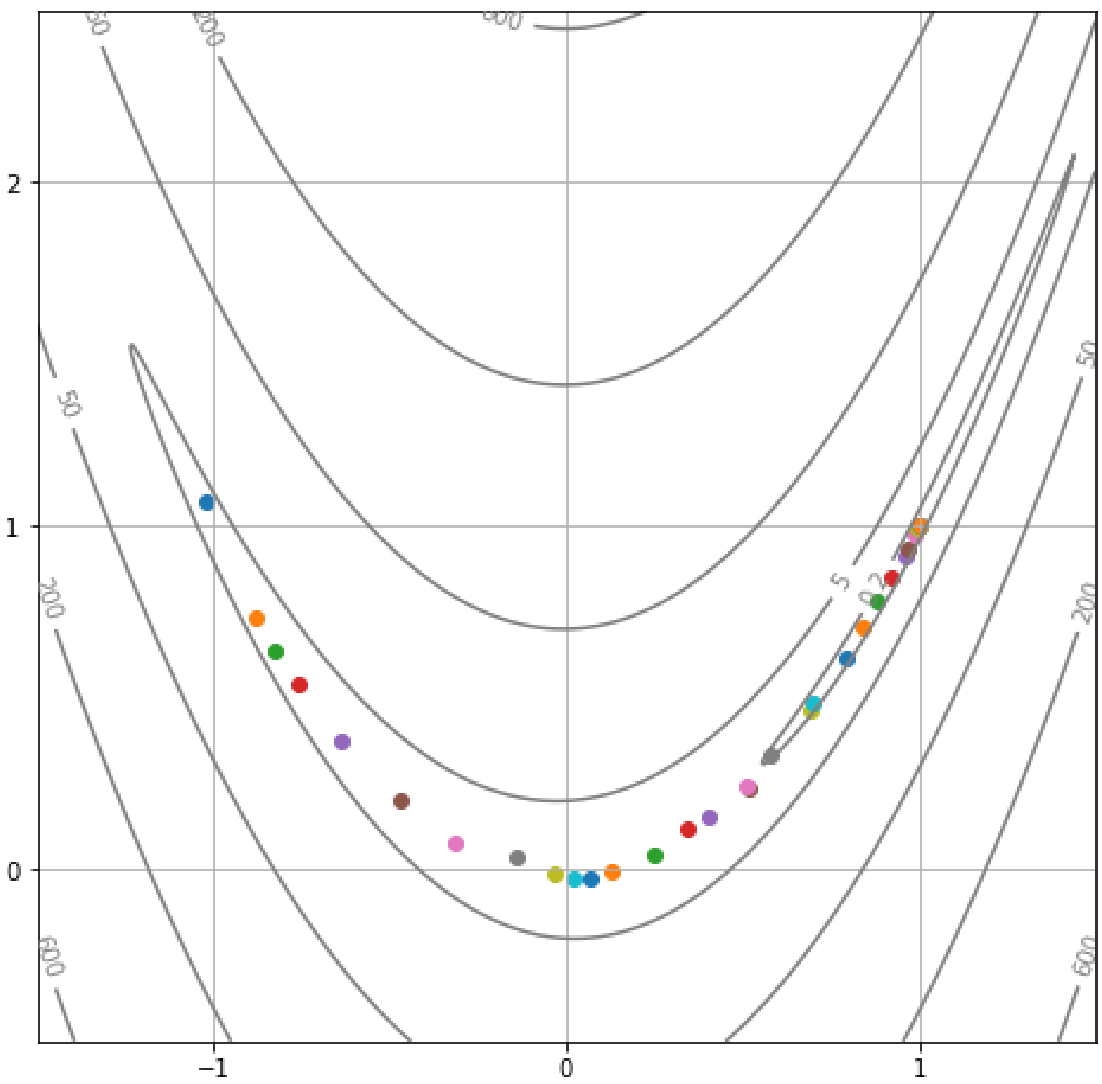
```
     jac: array([ 4.10630637e-06, -2.21341048e-06])
 message: 'Optimization terminated successfully.'
    nfev: 117
     nit: 32
    njev: 39
  status: 0
 success: True
       x: array([0.99999536, 0.99999071])
```

til að lesa úr svarinu er hentugt að vita að $rosen((1,1))$ skilar núlli. xmin er sá vigur sem er næstur $(1,1)$ án þess að skila núlli. svarið inniheldur samt meira en bara xmin, inniheldur líka hes mikið af öðrum upplýsingum

1.1.3 3

[ ]:

```
plt.figure(figsize=(8,8))
x = np.linspace(-1.5,1.5,400)
y = np.linspace(-0.5,2.5,400)
[X,Y] = np.meshgrid(x,y)
Z = rosen([X,Y])
levels = [0.2, 5, 50] + list(range(200,2300,400))
c = plt.contour(X, Y, Z, levels = levels, colors = 'gray')
levstr = {l:str(l) for l in levels}
plt.clabel(c, fmt=levstr)
plt.xticks(range(-2,3))
plt.yticks(range(-1,4))
plt.grid("True")
def cb(x): plt.scatter(x[0],x[1])
opt.minimize(rosen,(-1.2,1),callback=cb)
plt.show()
```



1.1.4 4

[ ]:

```
x = (-1.2, 1)
results = []
results.append(opt.minimize(rosen, x))
results.append(opt.minimize(rosen, x, method="L-BFGS-B"))
results.append(opt.minimize(rosen, x, method="CG"))
results.append(opt.minimize(rosen, x, method="Powell"))

print(f'nit | nfev | xmin')
for i in results:
    print(f'{i.nit}  | {i.nfev}  | {i.x}')
```

```
nit | nfev | xmin
```

```
32  | 117  | [0.99999536 0.99999071]
36  | 132  | [0.99999616 0.99999242]
37  | 280  | [0.99999678 0.99999355]
23  | 665  | [1. 1.]
```

Það er greinilegt að powell aðferðin skilar nákvæmustu niðurstöðunum, þar sem xmin er $(1,1)$ það kallar samt líka á rosen næstum 6 sinnum oftar en BFGS

1.1.5 5

[ ]:

```
def rosg(x,y):
    hlutX = -2*(1-x)-400*x*(y-x**2)
    hlutY = 200*(y-x**2)
    return np.array([hlutX,hlutY])

print(rosg(-1.2,1))
print(rosg(1,1))
```

```
[-215.6  -88. ]
[0 0]
```

1.2 VV8. jarðskjálftar og eldgos á reykjanesskaga 2021

[ ]:

```
import pandas as pd

df = pd.read_csv('https://cs.hi.is/python/skjalftar.
 ↪txt',delim_whitespace=True,engine='python')

# time = pd.to_datetime(df.tími)
# dagur1 = pd.to_datetime('24.02.2021')
# dagur = (time - dagur1).dt.total_seconds()/(60*60*24)

print(df)
```

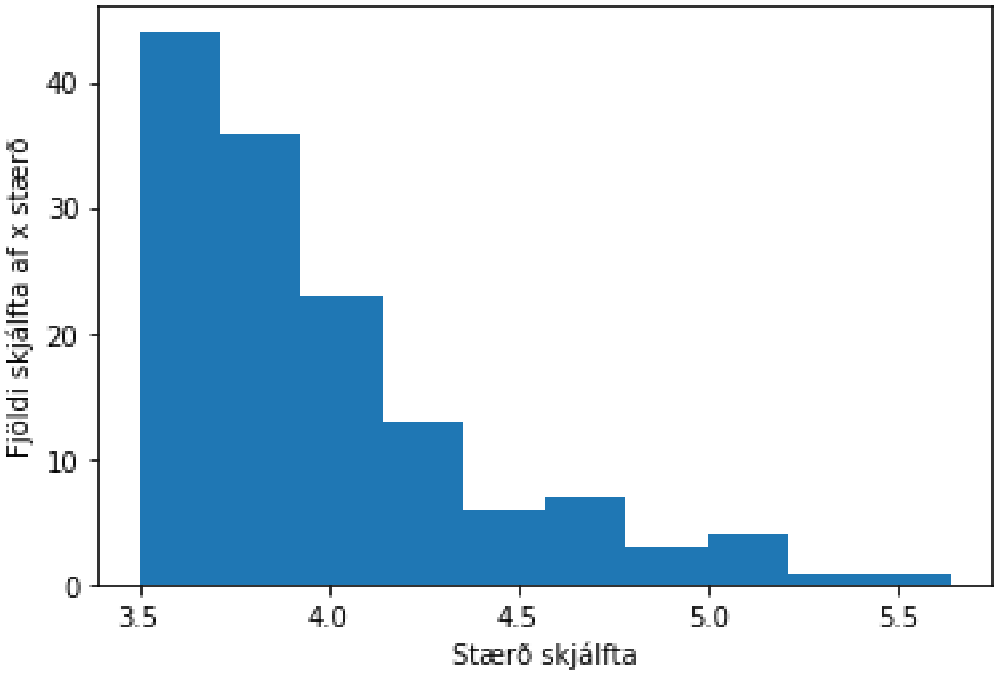
```
                    tími  breidd   lengd     M
0    2021-02-24T08:05:57  63.919 -22.201  5.64
1    2021-02-24T08:42:36  63.931 -21.981  4.42
2    2021-02-24T08:49:00  63.889 -22.394  4.75
3    2021-02-24T08:58:14  63.895 -22.275  3.61
4    2021-02-24T09:20:23  63.923 -22.050  3.78
..                   …       …       …     …
133  2021-03-14T19:18:12  63.870 -22.301  3.70
134  2021-03-15T20:31:54  63.904 -22.250  4.11
135  2021-03-19T03:27:49  63.819 -22.787  3.90
136  2021-03-19T03:41:44  63.819 -22.788  3.57
137  2021-03-19T03:53:03  63.815 -22.737  3.66

[138 rows x 4 columns]
```

1.3 2

```
[ ]: plt.hist(df.M)
     plt.ylabel('Fjöldi skjálfta af x stærð')
     plt.xlabel('stærð skjálfta')
```

```
[ ]: Text(0.5, 0, 'Stærð skjálfta')
```


Fjöldi skjálfta af x stærð
Stærð skjálfta