exercicio_5

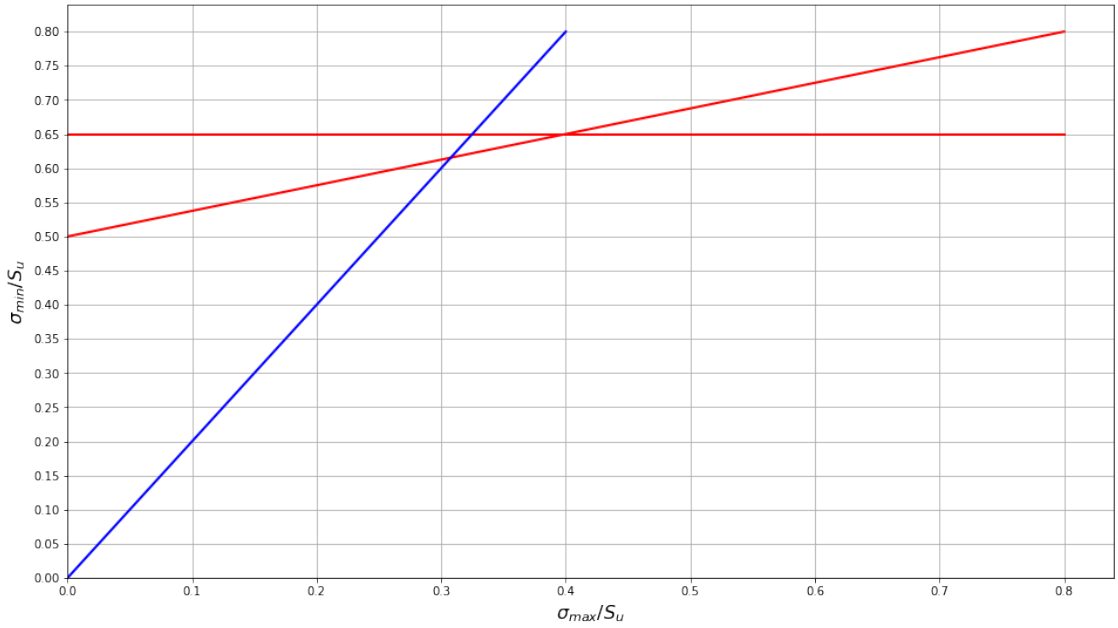
May 16, 2022

[ ]:
```
import numpy as np
import matplotlib.pyplot as plt
from scipy.interpolate import interp1d
import pandas as pd
import utils
```

[ ]:
```
# definindo constantes

theta = utils.deg_to_rad(27.5*2)
D = 25e-3
c = 3
Fs = 0.1
Su = 1900e6
G = 79e6
E = 207e9
Sy = 0.9
tensao_vida_inf = 0.5
a = 80e-3
l_linha = 35e-3
```

[ ]:
```
gm = utils.Goodman(tensao_vida_inf,0.65,1,2,tipo="modificado")
gm.show()
```

Diagrama de Goodman modificado



[ ]:
```
tensao_max = 0.05/4+0.6 * Su
print("{:4e} MPa".format(tensao_max *1e-6))
```

```
1.140000e+03 MPa
```

[ ]:
```
tensao_max_s = tensao_max/(1+Fs)
print("{:4e} MPa".format(tensao_max_s *1e-6))
```

```
1.036364e+03 MPa
```

[ ]:
```
L = np.pi*D*c + 2*l_linha
print("{:4e} mm".format(L*1e3))
```

```
3.056194e+02 mm
```

[ ]:
```
ki = tensao_max_s * L/(theta*E*c)
print("{:4e} N/mm".format(ki*1e3))
```

```
5.313265e-01 N/mm
```

[ ]:
```
# iterando diâmetros para achar a melhor solução

d_mm_list = np.linspace(2,5,num=7,dtype=float)

C_list = []
```

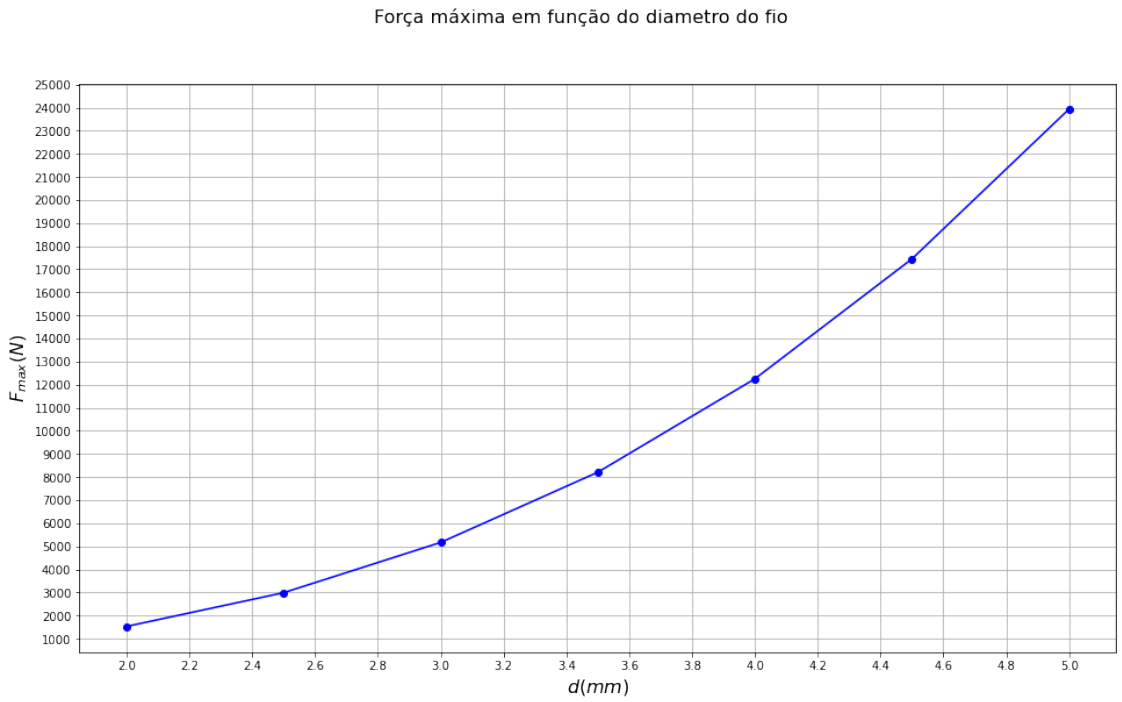
```
d_list = []
Fmax_list = []

for i,d_mm in enumerate(d_mm_list):

    d = d_mm*1e-3

    Fmax = np.pi*d**3*tensao_max_s/(32*ki)

    C = D/d

    d_list.append(d)
    C_list.append(C)
    Fmax_list.append(Fmax)

df = pd.DataFrame(np.vstack((
        d_list,
        C_list,
        Fmax_list,
    )).T,columns=[
            'd',
            'C',
            'Fmax'
        ])

df
```

[ ]:

	d	C	Fmax
0	0.0020	12.500000	1531.935746
1	0.0025	10.000000	2992.062005
2	0.0030	8.333333	5170.283144
3	0.0035	7.142857	8210.218141
4	0.0040	6.250000	12255.485972
5	0.0045	5.555556	17449.705612
6	0.0050	5.000000	23936.496039

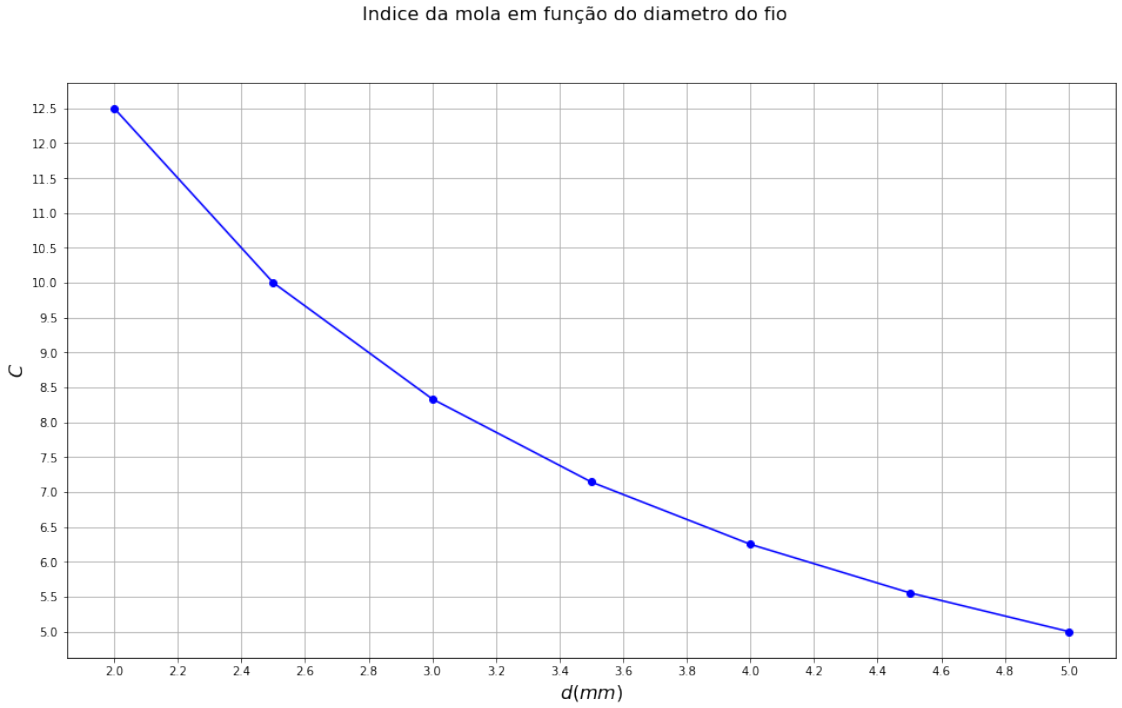
[ ]:
```
# Análise gráfica

# plotagem do peso em funcao do diametro

fig = plt.figure(figsize=[16, 9])
fig.suptitle('Força máxima em função do diametro do fio', fontsize=16)

# Plotando 2D

ax = fig.add_subplot(1, 1, 1)
```

```
ax.plot(d_mm_list,
    df['Fmax'],
    'o',
    d_mm_list,
    df['Fmax'],
    '-',
    color='b',
)

ax.locator_params(axis='y', nbins=30)
ax.locator_params(axis='x', nbins=30)
ax.set_ylabel('$F_{max}(N)$', fontsize=16)
ax.set_xlabel('$d(mm)$', fontsize=16)
ax.grid()

plt.show()
```



[ ]:
```
fig = plt.figure(figsize=[16, 9])
fig.suptitle('Indice da mola em função do diametro do fio', fontsize=16)

ax = fig.add_subplot(1,1,1)

# Plotando 2D
```

```
ax.plot(d_mm_list,
    df['C'],
    'o',
    d_mm_list,
    df['C'],
    '-',
    color='b',
)

ax.locator_params(axis='y', nbins=30)
ax.locator_params(axis='x', nbins=30)
ax.set_ylabel('$C$', fontsize=16)
ax.set_xlabel('$d(mm)$', fontsize=16)
ax.grid()

plt.show()
```



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