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- UMNG - INGENIERIA FORENSE
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```
from google.colab import drive
drive.mount('/content/drive')
from random import random
from scipy import stats
!pip install matplotlib
import matplotlib.pyplot as plt
import os
import pandas as pd
!pip install fitter
!pip install xlrd
from fitter import Fitter, get_distributions, get_common_distributions
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.m
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/p
Requirement already satisfied: matplotlib in /usr/local/lib/python3.7/dist-packages (
Requirement already satisfied: pyparsing!=2.0.4,!=2.1.2,!=2.1.6,>=2.0.1 in /usr/local
Requirement already satisfied: cycler>=0.10 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: numpy>=1.11 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: python-dateutil>=2.1 in /usr/local/lib/python3.7/dist-
Requirement already satisfied: kiwisolver>=1.0.1 in /usr/local/lib/python3.7/dist-pac
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Requirement already satisfied: kiwisolver>=1.0.1 in /usr/local/lib/python3.7/dist-pac
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Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.7/dist-packages (fr
Requirement already satisfied: pytz>=2017.3 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: ptyprocess>=0.5 in /usr/local/lib/python3.7/dist-packa
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/p
Requirement already satisfied: xlrd in /usr/local/lib/python3.7/dist-packages (1.1.0)
```
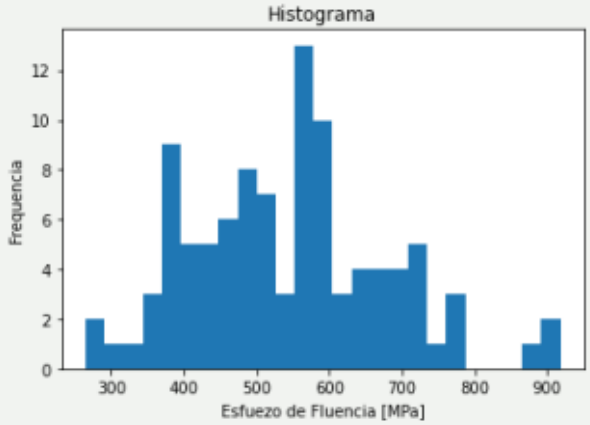

Caso 1: Propiedades de un material

Usted realiza 100 ensayos de tensión para determinar el esfuerzo de fluencia de una acero 4140. La medida de esta propiedad tiene le comportamiento que se muestra en la figura. Para un diseño de una pieza se establece el esfuerzo de fluencia mínimo en 400 MPa, determine la probabilidad de que el material de la pieza no cumpla con la resistencia deseada.

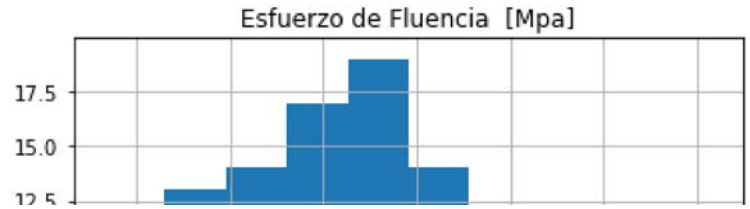



```
archivo = '/content/drive/MyDrive/Datos.xlsx'
df = pd.read_excel(archivo, sheet_name='Caso1')
df.describe()
```

	Esfuerzo de Fluencia [Mpa]
count	100.000000
mean	544.642391
std	135.052183
min	265.005088
25%	443.460679
50%	551.909467
75%	622.837458
max	917.492766

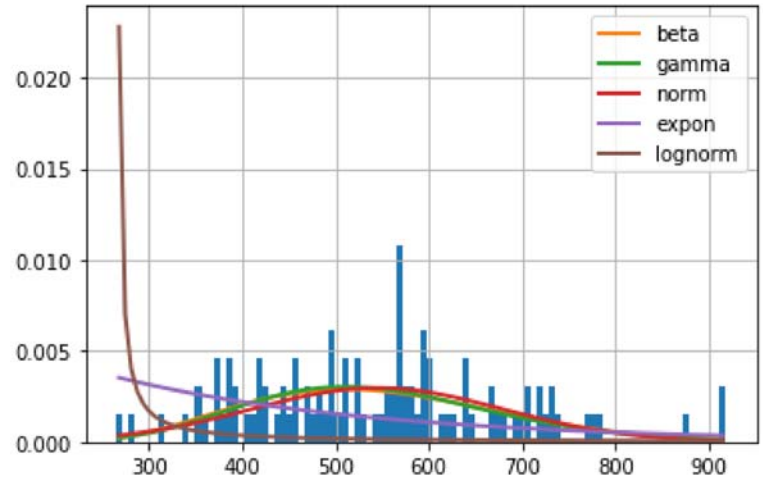
```
df.hist()
```

```
array([[<matplotlib.axes._subplots.AxesSubplot object at 0x7fafbb37e8d0>]],
      dtype=object)
```




```
f = Fitter(df, distributions=['gamma','lognorm','beta','expon','norm'])
f.fit()
f.summary()
```

	sumsquare_error	aic	bic	kl_div
beta	0.000250	1368.595460	-1271.469685	inf
gamma	0.000251	1371.396014	-1275.784370	inf
norm	0.000251	1376.407981	-1280.119568	inf
expon	0.000396	1364.032245	-1234.801837	inf
lognorm	0.001040	1736.097382	-1133.567899	inf




```
f.get_best(method='sumsquare_error')
```

```
{'beta': {'a': 4.903736596010129,
  'b': 11.61718725546137,
  'loc': 178.75133994774788,
  'scale': 1232.666495391395}}
```

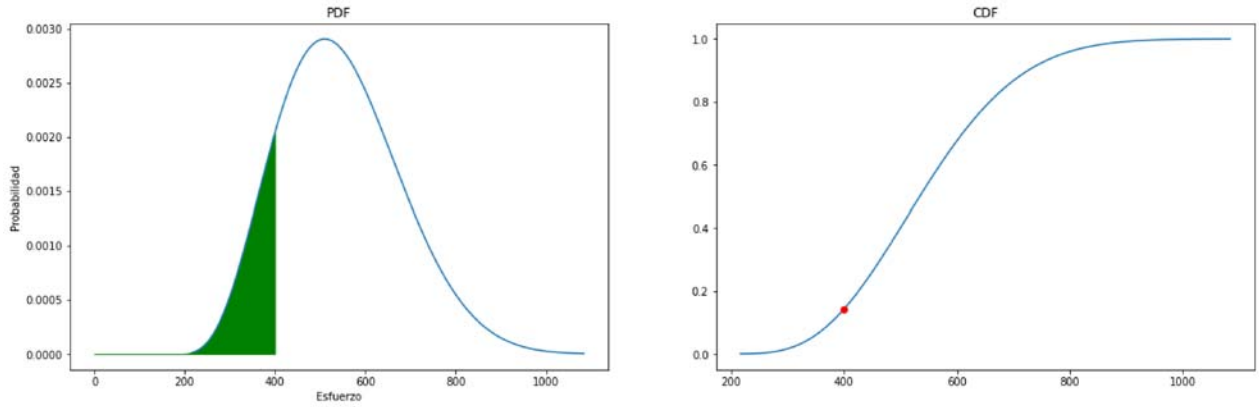
```
f.fitted_param["beta"]
```

```
(4.903736596010129, 11.61718725546137, 178.75133994774788, 1232.666495391395)
```

```
a = f.fitted_param["beta"][0]
b = f.fitted_param["beta"][1]
loc = f.fitted_param["beta"][2]
scale = f.fitted_param["beta"][3]
import numpy as np
x = np.linspace(stats.beta(a,b,loc,scale).ppf(0.0001),
```

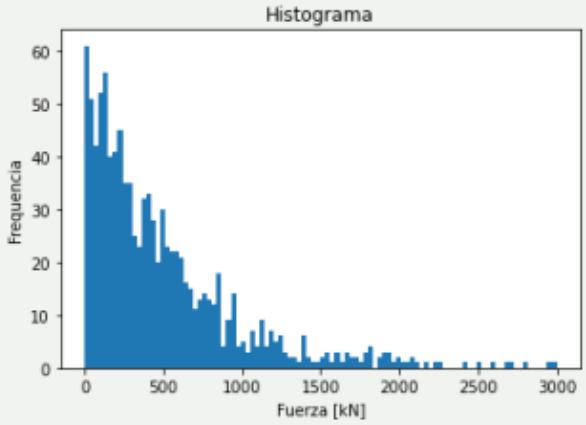
```
                stats.beta(a,b,loc,scale).ppf(0.9999),
                1000)
dist = stats.beta(a,b,loc,scale)
valor = 400
fig,(ax1,ax2) = plt.subplots(1,2,figsize=(20,6))
ax1.plot(x, dist.pdf(x))
px = np.arange(0, valor, 0.001)
ax1.fill_between(px, dist.pdf(px), color = 'g')
ax1.set_title("PDF")
ax1.set_xlabel('Esfuerzo')
ax1.set_ylabel('Densidad')

fda_beta = dist.cdf(x)

ax2.plot(x, fda_beta)
ax2.plot(valor,dist.cdf(valor),"ro")
ax2.set_title("CDF")
ax1.set_xlabel('Esfuerzo')
ax1.set_ylabel('Probabilidad')

prob1 = dist.cdf(valor)
print(f'La probabilidad de sacar menos de {valor}', f'es: {prob1}')
```

```
La probabilidad de sacar menos de 400 es: 0.14252938006727864
```



Caso 2: Fuerza de una Prensa

Una prensa mecánica presenta fallas de forma constante, por lo que se realiza un estudio con respecto a la fuerza que aplica en cada proceso. Se realizan 1000 pruebas registrando la fuerza que genera la prensa. De acuerdo con el fabricante, la prensa soporta fuerzas hasta de 1300 kN. Con base en los datos, determine la probabilidad de que la prensa exceda la fuerza permitida.




```
archivo = '/content/drive/MyDrive/Datos.xlsx'
df = pd.read_excel(archivo, sheet_name='Caso 2')
df.describe()
```

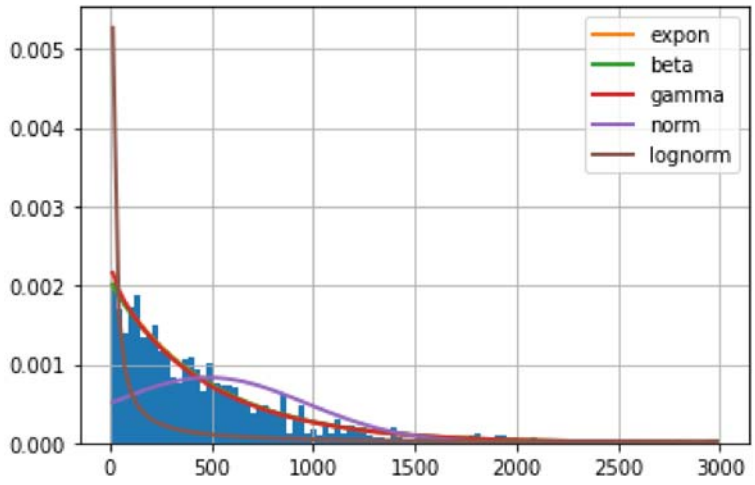
	Fueza [kN]
count	1000.000000
mean	485.928757
std	481.054123
min	0.490356
25%	144.741650
50%	347.637513
75%	652.556676
max	2997.212340

```
df.hist()
```

```
array([[<matplotlib.axes._subplots.AxesSubplot object at 0x7fafbb274cd0>]],
      dtype=object)
```


```
f = Fitter(df, distributions=['gamma','lognorm','beta','expon','norm'])
f.fit()
f.summary()
```

	sumsquare_error	aic	bic	kl_div
expon	9.297130e-07	1858.333291	-20782.329664	inf
beta	9.322977e-07	1856.695012	-20765.737886	inf
gamma	1.015085e-06	1852.661219	-20687.570441	inf
norm	1.067366e-05	2190.374970	-18341.670866	inf
lognorm	2.701613e-05	2031.982822	-17406.108576	inf




```
f.get_best(method='sumsquare_error')
```

```
{'expon': {'loc': 0.4903556588589409, 'scale': 485.43840138541145}}
```

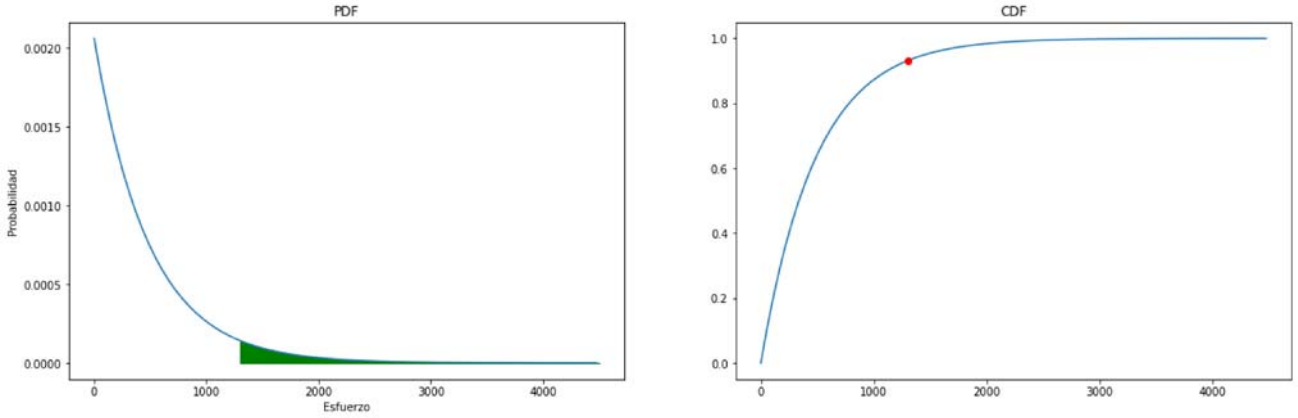
```
f.fitted_param["expon"]
```

```
(0.4903556588589409, 485.43840138541145)
```

```
loc = f.fitted_param["expon"][0]
scale = f.fitted_param["expon"][1]

import numpy as np
x2 = np.linspace(stats.expon(loc, scale).ppf(0.0001),
                 stats.expon(loc, scale).ppf(0.9999),
                 1000)

dist2 = stats.expon(loc, scale)
```

```
valor = 1300
fig,(ax1,ax2) = plt.subplots(1,2,figsize=(20,6))
ax1.plot(x2, dist2.pdf(x2))
px2 = np.arange(valor,4500, 0.001)
ax1.fill_between(px2, dist2.pdf(px2), color = 'g')
ax1.set_title("PDF")
ax1.set_xlabel('Esfuerzo')
ax1.set_ylabel('Densidad')

fda_expon = dist2.cdf(x2)

ax2.plot(x2, fda_expon)
ax2.plot(valor,dist2.cdf(valor),"ro")
ax2.set_title("CDF")
ax1.set_xlabel('Esfuerzo')
ax1.set_ylabel('Probabilidad')

prob1 = dist2.cdf(valor)
print(f'La probabilidad de sacar mas de {valor}kN', f'es: {1-prob1}')
```

```
La probabilidad de sacar mas de 1300kN es: 0.06877042123805688
```




```
!wget -nc https://raw.githubusercontent.com/brpy/colab-pdf/master/colab_pdf.py
from colab_pdf import colab_pdf
colab_pdf("ForenseMiNIp.ipynb")
```

VlyxbaMCaEEEIICSvQKCZ+Z9GixfLnn9vkzp27cuL4Cfn++xmMKSaEEEJImIJGMfE7adOmlRw5c0iOH
NklZqyYcvbsGXn8iKtPEEIIISTsQKOY+J1s2d7RE+0KFyksdfUaxbHk0eNHxreEEEIIIa8eGsXE7/z+
+++yZPES/flh3nx58OCBRIoYyfiWEEIIIeTVQ6OY+J2nT5/pJdiePXXsmCRMllBYtmku8+PGMbwkhhBB
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