Untitled

March 22, 2022

[1]:
```
#Uniformverteilung
```

[2]:
```
!pip install scipy
```

```
Requirement already satisfied: scipy in
/Users/h4/opt/anaconda3/lib/python3.8/site-packages (1.7.3)
Requirement already satisfied: numpy<1.23.0,>=1.16.5 in
/Users/h4/opt/anaconda3/lib/python3.8/site-packages (from scipy) (1.19.5)
```

[3]:
```
from scipy.stats import uniform
```

[5]:
```
# daten generieren

n = 50000
start = 10
width = 20

data_uniform = uniform.rvs(size=n, loc= start, scale=width)
```

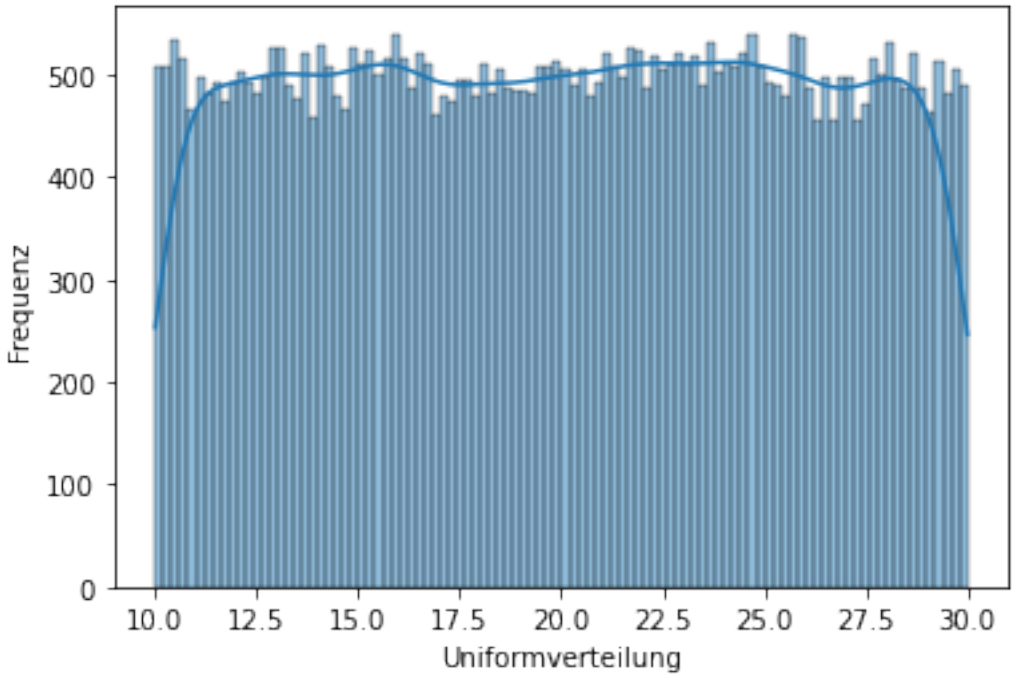
[6]:
```
!pip install seaborn
```

```
Collecting seaborn
  Downloading seaborn-0.11.2-py3-none-any.whl (292 kB)
     |                | 292 kB 342 kB/s eta 0:00:01
Requirement already satisfied: numpy>=1.15 in
/Users/h4/opt/anaconda3/lib/python3.8/site-packages (from seaborn) (1.19.5)
Requirement already satisfied: scipy>=1.0 in
/Users/h4/opt/anaconda3/lib/python3.8/site-packages (from seaborn) (1.7.3)
Requirement already satisfied: pandas>=0.23 in
/Users/h4/opt/anaconda3/lib/python3.8/site-packages (from seaborn) (1.2.0)
Requirement already satisfied: matplotlib>=2.2 in
/Users/h4/opt/anaconda3/lib/python3.8/site-packages (from seaborn) (3.3.3)
Requirement already satisfied: python-dateutil>=2.1 in
/Users/h4/opt/anaconda3/lib/python3.8/site-packages (from
matplotlib>=2.2->seaborn) (2.8.2)
Requirement already satisfied: cycler>=0.10 in
/Users/h4/opt/anaconda3/lib/python3.8/site-packages (from
matplotlib>=2.2->seaborn) (0.11.0)
```

```
Requirement already satisfied: pyparsing!=2.0.4,!=2.1.2,!=2.1.6,>=2.0.3 in
/Users/h4/opt/anaconda3/lib/python3.8/site-packages (from
matplotlib>=2.2->seaborn) (3.0.4)
Requirement already satisfied: kiwisolver>=1.0.1 in
/Users/h4/opt/anaconda3/lib/python3.8/site-packages (from
matplotlib>=2.2->seaborn) (1.3.2)
Requirement already satisfied: pillow>=6.2.0 in
/Users/h4/opt/anaconda3/lib/python3.8/site-packages (from
matplotlib>=2.2->seaborn) (8.4.0)
Requirement already satisfied: pytz>=2017.3 in
/Users/h4/opt/anaconda3/lib/python3.8/site-packages (from pandas>=0.23->seaborn)
(2021.3)
Requirement already satisfied: six>=1.5 in
/Users/h4/opt/anaconda3/lib/python3.8/site-packages (from python-
dateutil>=2.1->matplotlib>=2.2->seaborn) (1.15.0)
Installing collected packages: seaborn
ERROR: pip's dependency resolver does not currently take into account all

the packages that are installed. This behaviour is the source of the following

dependency conflicts.

bioinfokit 2.0.8 requires statsmodels, which is not installed.
Successfully installed seaborn-0.11.2
```

[7]:
```
import seaborn as sns

ax = sns.histplot(data_uniform, bins=100, kde=True)

ax.set(xlabel='Uniformverteilung', ylabel='Frequenz')
```

[7]:
```
[Text(0.5, 0, 'Uniformverteilung'), Text(0, 0.5, 'Frequenz')]
```



[8]:
```
# normalverteilung
```

[9]:
```
from numpy import random
```

[10]:
```
# daten generieren

x = random.normal(size=(2,3))

print(x)
```

```
[[ 0.53529664 -0.16965234  0.23150503]
 [-0.6081015  -0.91057025  0.91732466]]
```

[13]:
```
# daten generieren welche Normalverteilt sind,
# mit Grösse 2x3 und Std Deviation 2

x = random.normal(loc=1, scale=2, size=(2,3))

print(x)
```

```
[[0.6229606  0.87931586 3.89182546]
 [0.98490864 2.14269657 1.70642436]]
```

[16]:
```
# Generation einer Normalverteilung mit Grösse nxm.
# Mittelwert mu und StdDev sigma
```

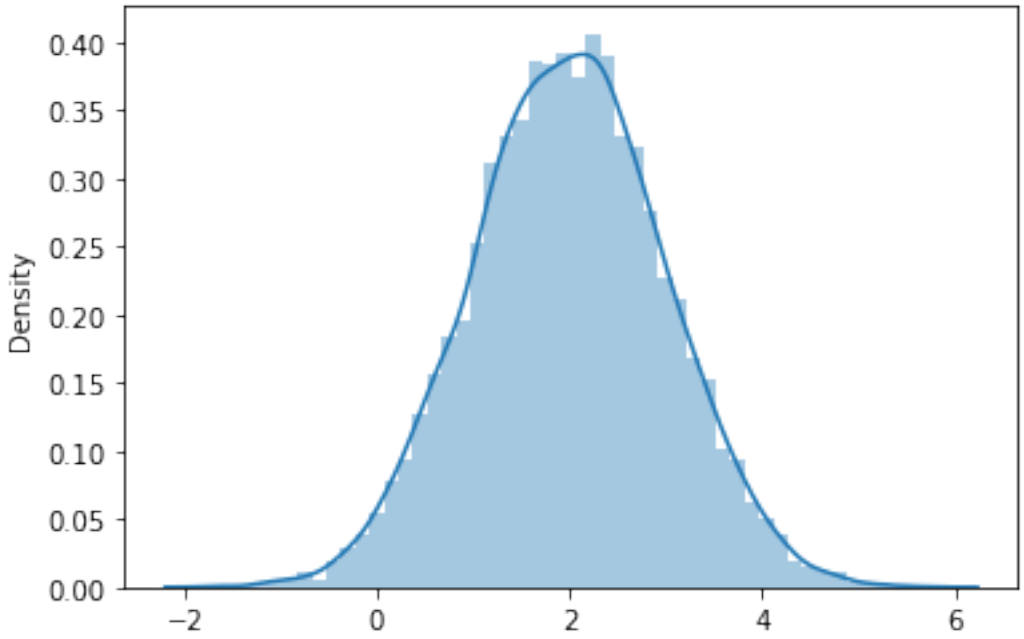
```
# VOM NUTZER DEFINIERT WIRD

n = int(input('Enter first dimension: '))
m = int(input('Enter second dimesnion: '))
mu = int(input('Enter the mean: '))
sigma = int(input('Enter the Standard Deviation: '))

def normal_distribution(n,m,mu,sigma):
    x = random.normal(loc=mu, scale=sigma, size=(n,m))
    return(x)

normal_distribution(n,m,mu,sigma)
```

```
Enter first dimension: 5
Enter second dimesnion: 10
Enter the mean: 2
Enter the Standard Deviation: 7
```

[16]:
```
array([[ -6.44951793, -20.14374018,  -7.59739026,   8.16757423,
         -4.52911442, -14.39158331,   4.81594525,  -4.22968433,
          9.09822875,   8.14347527],
        [ 10.54770791,   2.94886394,  -6.20598796,   2.93868261,
         -6.92137943,  12.23824971,  -6.27909792,  -7.46653119,
          9.19419435,  -1.31127721],
        [  8.36526395,  -6.69155491,   3.9455504 ,   5.27207228,
          0.25209503,   8.59979634,   8.70750876,   1.31751543,
          6.08809031,   2.55992632],
        [  2.45257311,   7.77072436,  -1.51555901,   4.92470079,
        -13.43455384,  14.79207148,  -7.84543488,  -2.57664897,
          4.42674174,   5.45997453],
        [  0.5051574 ,   2.42467736,   3.96474682,  10.11313204,
          5.45391393,   3.70334489,  -3.34585955,  -0.32627337,
          0.11449651,   2.82087425]])
```

[19]:
```
import matplotlib.pyplot as plt
sns.distplot(random.normal(loc=2, scale=1, size=10000))
plt.show()
```

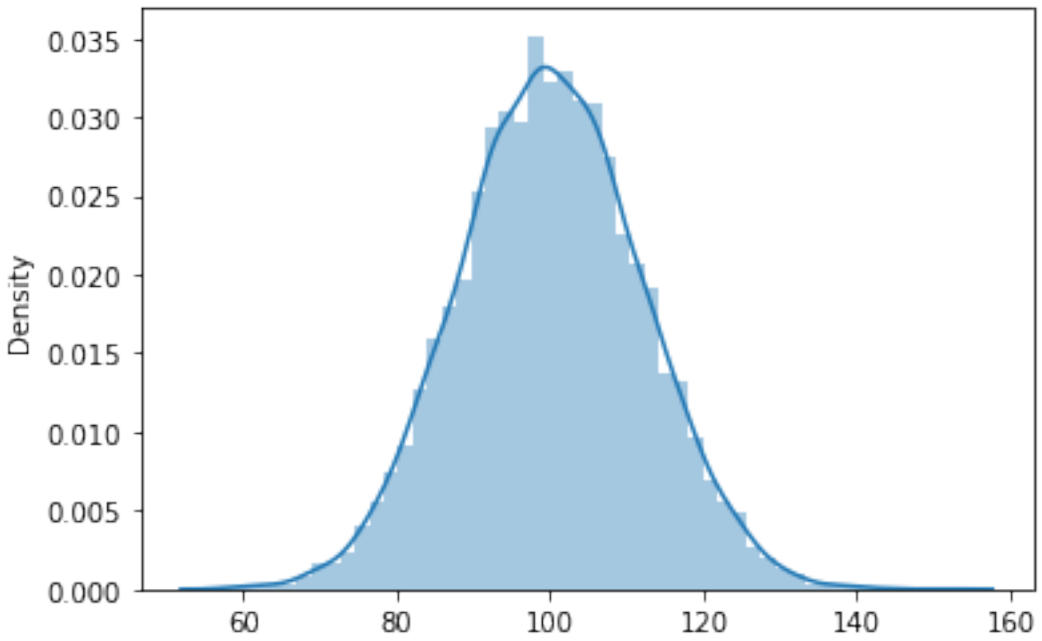
```
/Users/h4/opt/anaconda3/lib/python3.8/site-
packages/seaborn/distributions.py:2619: FutureWarning: `distplot` is a
deprecated function and will be removed in a future version. Please adapt your
code to use either `displot` (a figure-level function with similar flexibility)
or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```



[20]:
```
# wahrscheinlichkeiten in der normalverteilung kalkulieren
```

[21]:
```
import scipy.stats

scipy.stats.norm(loc=100, scale=12)
sns.distplot(random.normal(loc=100, scale=12, size=10000))
plt.show()
```

```
/Users/h4/opt/anaconda3/lib/python3.8/site-
packages/seaborn/distributions.py:2619: FutureWarning: `distplot` is a
deprecated function and will be removed in a future version. Please adapt your
code to use either `displot` (a figure-level function with similar flexibility)
or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```



[22]:
```
# Wahrscheinlichkeit dafür, dass ein Wert < gleich ist als 113

# "cdf" Funktion steht für cumulative density function.
# P(x<113)

scipy.stats.norm.cdf(113,100,12)
```

[22]: 0.8606697525503779

[24]:
```
# exponentielle Verteilung

x = random.exponential(scale=2, size=(2,3))
print(x)
```

```
[[3.56769015 2.45783772 0.27169324]
 [0.83573465 2.53620478 1.12697951]]
```

[25]:
```
# Angenommen, ein Angestellter hilft Personen in einer Schlange,
# eine nach dem anderen.
# Sei X die Anzahl Minuten,
# die benötigt werden,
# um jeder PErson zu helfen.
# Nehmen Sie an, dass X eine Exponentialverteilung hat,
# mit einer mittleren Beratungszeit von 4 Minuten.
```

```
# Ermitteln Sie die W dafür, dass der Sachbearbeiter 3 bis 5 Minuten mit einer␣
 ↪bestimmten Person verbringt.

import scipy
import scipy.stats
scipy.stats.expon.cdf(5,scale=4)-scipy.stats.expon.cdf(3,scale=4)
```

[25]:
```
0.18586175588082454
```

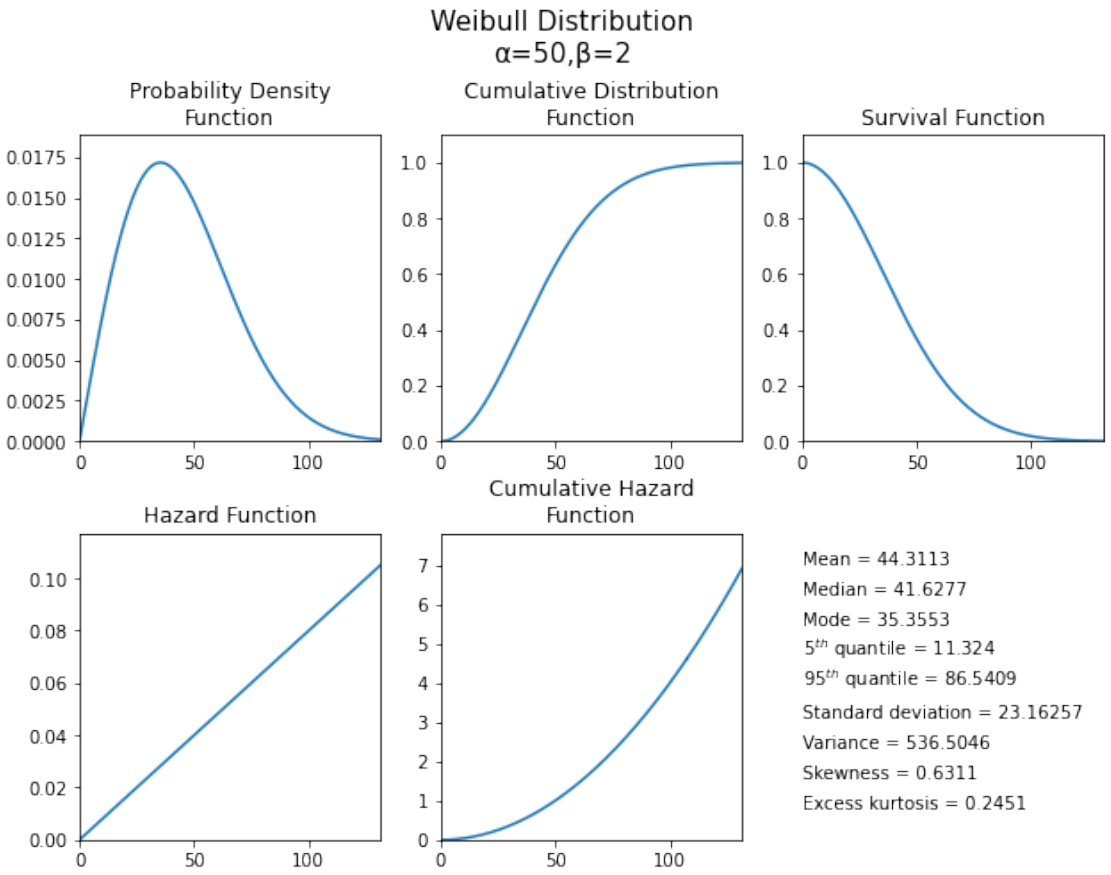
[26]:
```
# weibull verteilung
```

[27]:
```
!pip install reliability
```

```
Collecting reliability
  Downloading reliability-0.8.1-py3-none-any.whl (246 kB)
     |                  | 246 kB 215 kB/s eta 0:00:01
Collecting autograd-gamma>=0.5.0
  Using cached autograd_gamma-0.5.0-py3-none-any.whl
Collecting matplotlib>=3.5.0
  Downloading matplotlib-3.5.1-cp38-cp38-macosx_10_9_x86_64.whl (7.3 MB)
     |                  | 7.3 MB 6.7 MB/s eta 0:00:01
Requirement already satisfied: docutils<0.18 in
/Users/h4/opt/anaconda3/lib/python3.8/site-packages (from reliability) (0.17.1)
Requirement already satisfied: autograd>=1.3 in
/Users/h4/opt/anaconda3/lib/python3.8/site-packages (from reliability) (1.3)
Collecting mplcursors>=0.3
  Downloading mplcursors-0.5.1.tar.gz (88 kB)
     |                  | 88 kB 2.0 MB/s eta 0:00:011
Requirement already satisfied: numpy>=1.19.2 in
/Users/h4/opt/anaconda3/lib/python3.8/site-packages (from reliability) (1.19.5)
Requirement already satisfied: scipy>=1.7.0 in
/Users/h4/opt/anaconda3/lib/python3.8/site-packages (from reliability) (1.7.3)
Requirement already satisfied: pandas>=1.1.2 in
/Users/h4/opt/anaconda3/lib/python3.8/site-packages (from reliability) (1.2.0)
Requirement already satisfied: future>=0.15.2 in
/Users/h4/opt/anaconda3/lib/python3.8/site-packages (from
autograd>=1.3->reliability) (0.18.2)
Requirement already satisfied: pyparsing>=2.2.1 in
/Users/h4/opt/anaconda3/lib/python3.8/site-packages (from
matplotlib>=3.5.0->reliability) (3.0.4)
Requirement already satisfied: python-dateutil>=2.7 in
/Users/h4/opt/anaconda3/lib/python3.8/site-packages (from
matplotlib>=3.5.0->reliability) (2.8.2)
Requirement already satisfied: kiwisolver>=1.0.1 in
/Users/h4/opt/anaconda3/lib/python3.8/site-packages (from
matplotlib>=3.5.0->reliability) (1.3.2)
Requirement already satisfied: pillow>=6.2.0 in
```

```
/Users/h4/opt/anaconda3/lib/python3.8/site-packages (from
matplotlib>=3.5.0->reliability) (8.4.0)
Requirement already satisfied: fonttools>=4.22.0 in
/Users/h4/opt/anaconda3/lib/python3.8/site-packages (from
matplotlib>=3.5.0->reliability) (4.28.2)
Requirement already satisfied: cycler>=0.10 in
/Users/h4/opt/anaconda3/lib/python3.8/site-packages (from
matplotlib>=3.5.0->reliability) (0.11.0)
Requirement already satisfied: packaging>=20.0 in
/Users/h4/opt/anaconda3/lib/python3.8/site-packages (from
matplotlib>=3.5.0->reliability) (21.3)
Requirement already satisfied: pytz>=2017.3 in
/Users/h4/opt/anaconda3/lib/python3.8/site-packages (from
pandas>=1.1.2->reliability) (2021.3)
Requirement already satisfied: six>=1.5 in
/Users/h4/opt/anaconda3/lib/python3.8/site-packages (from python-
dateutil>=2.7->matplotlib>=3.5.0->reliability) (1.15.0)
Building wheels for collected packages: mplcursors
  Building wheel for mplcursors (setup.py) … done
  Created wheel for mplcursors: filename=mplcursors-0.5.1-py3-none-any.whl
size=20810
sha256=10cd90650cdf708ac2eaa079817baa610511ba26f2eb5ab375b249942771f1f4
  Stored in directory: /Users/h4/Library/Caches/pip/wheels/90/5e/db/c20b4c1dd6ac
92b9cc8aa11f7221f648c23883dc2e3a5d2408
Successfully built mplcursors
Installing collected packages: matplotlib, mplcursors, autograd-gamma,
reliability
  Attempting uninstall: matplotlib
    Found existing installation: matplotlib 3.3.3
    Uninstalling matplotlib-3.3.3:
      Successfully uninstalled matplotlib-3.3.3
ERROR: pip's dependency resolver does not currently take into account all
the packages that are installed. This behaviour is the source of the following
dependency conflicts.
bioinfokit 2.0.8 requires statsmodels, which is not installed.
timeseries-generator 0.1.0 requires matplotlib==3.3.3, but you have matplotlib
3.5.1 which is incompatible.
Successfully installed autograd-gamma-0.5.0 matplotlib-3.5.1 mplcursors-0.5.1
reliability-0.8.1
```

[28]:
```
from reliability.Distributions import Weibull_Distribution

dist = Weibull_Distribution(alpha=50, beta=2)

dist.plot()
```



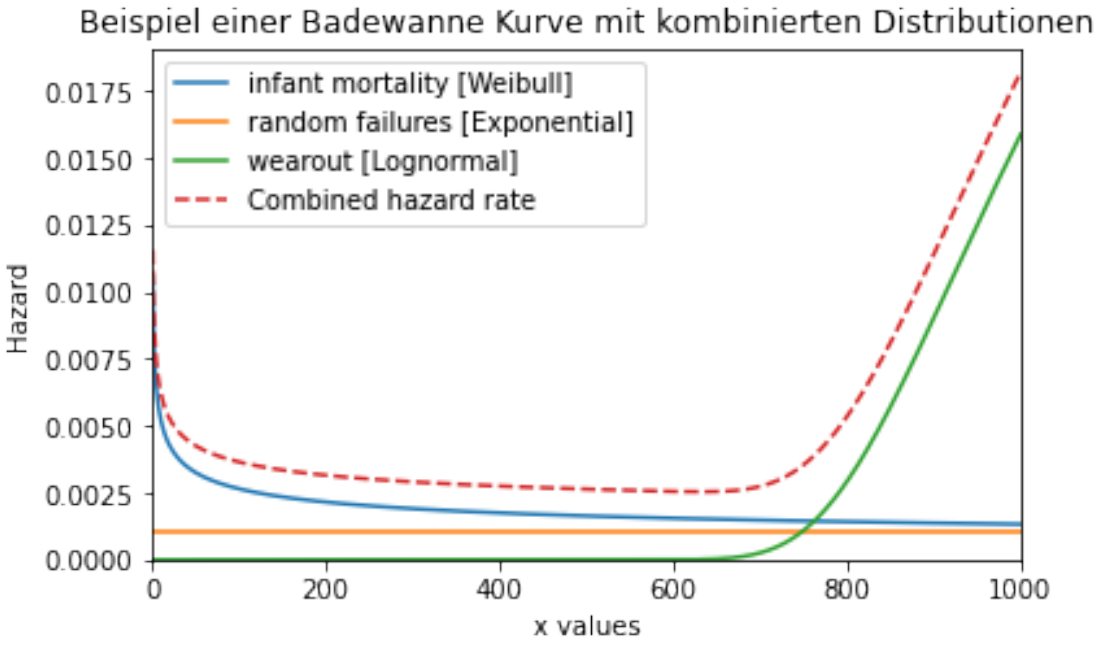
[29]:
```
#Badewannekurve
```

[36]:
```
# Infant mortality (Frühausfallrate)
import numpy as np
xvale= np.linspace(0,1000,1000)

infant_mortality = Weibull_Distribution(alpha=400, beta=0.7)
```

[33]:
```
# Zufallsrate

from reliability.Distributions import Exponential_Distribution

random_failures = Exponential_Distribution(Lambda=0.001)
```

[34]:
```
# Wear out. Älterungsfehler

from reliability.Distributions import Lognormal_Distribution

wear_out = Lognormal_Distribution(mu=6.8, sigma=0.1)
```

[40]:
```
 xvals = np.linspace(0,1000,1000)
infant_mortality = Weibull_Distribution(alpha=400, beta=0.7).
 ↪HF(xvals=xvals,label='infant mortality [Weibull]')
random_failures = Exponential_Distribution(Lambda=0.001).
 ↪HF(xvals=xvals,label='random failures [Exponential]')
wear_out = Lognormal_Distribution(mu=6.8, sigma=0.1).
 ↪HF(xvals=xvals,label='wearout [Lognormal]')
combined = infant_mortality + random_failures + wear_out
plt.plot(xvals, combined, linestyle='--', label='Combined hazard rate')
plt.legend()
plt.title('Beispiel einer Badewanne Kurve mit kombinierten Distributionen')
plt.xlim(0,1000)
plt.ylim(bottom=0)
plt.show()
```



[ ]: