

kollimator_ausgleichung.py

```
001 # Ausgleichende Gerade
002 # #####
003
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009
010 # #####
011
012 # Import of Libraries
013 # -----
014
015 import numpy as np
016 import math as ma
017 import matplotlib.pyplot as plt
018
019 # Functions
020 # -----
021
022 def emp_kov(x,y):
023     n = x.shape[0]
024     kov = 0
025     m_x = np.average(x)
026     m_y = np.average(y)
027
028     for i in range(n):
029         kov += ((x[i]-m_x)*(y[i]-m_y))/(n-1)
030     return kov
031
032 def emp_varianz(p):
033     n = p.shape[0]
034     p_q = np.average(p)
035     summe = 0
036
037     for i in range(n):
038         summe += ((p[i]-p_q)**2)
039     v = summe/(n-1)
040     return v
041
042 # Beginning of the Programm
043 # -----
044
045 daten = np.loadtxt("messwerte_v.txt")
046 x_v = daten[:,0]
047 y_v = daten[:,1]
048
049 fig = plt.plot(x_v,y_v,'o')
050 plt.grid()
051 plt.xlabel('x-Werte')
052 plt.ylabel('y-Werte')
053 plt.show(fig)
054
055 m_s = np.average(daten)
056 print("Mittelwert berechnet:",m_s)
057 m_s_x = np.average(x_v)
058 m_s_y = np.average(y_v)
059
060 e_k = emp_kov(x_v,y_v)
061 print("empirische Kovarianz berechnet:",emp_kov(x_v,y_v))
062
063 e_v_x = emp_varianz(x_v)
064 e_v_y = emp_varianz(y_v)
065 print("empirische Varianz x:",e_v_x)
066 print("empirische Varianz y:",e_v_y)
067
068 a = e_k / e_v_x
069 print("Steigung:",a)
070
071 b = (m_s_y) - (a*m_s_x)
072 print("y-Achsenabschnitt:",b)
073
074 y = (a*x_v)+b
075
076 v = y-y_v
077
078 fig = plt.plot(x_v,y_v,"o")
079 plt.plot(x_v,y)
080 plt.xlabel('x-Werte')
```

```
081 plt.ylabel('y-Werte')
082 plt.show(fig)
083
084 kk = (e_k)/((ma.sqrt(emp_varianz(x_v)))*(ma.sqrt((emp_varianz(y_v)))))
085 print("Korrelationskoeffizient:", kk)
```