Blatt 01

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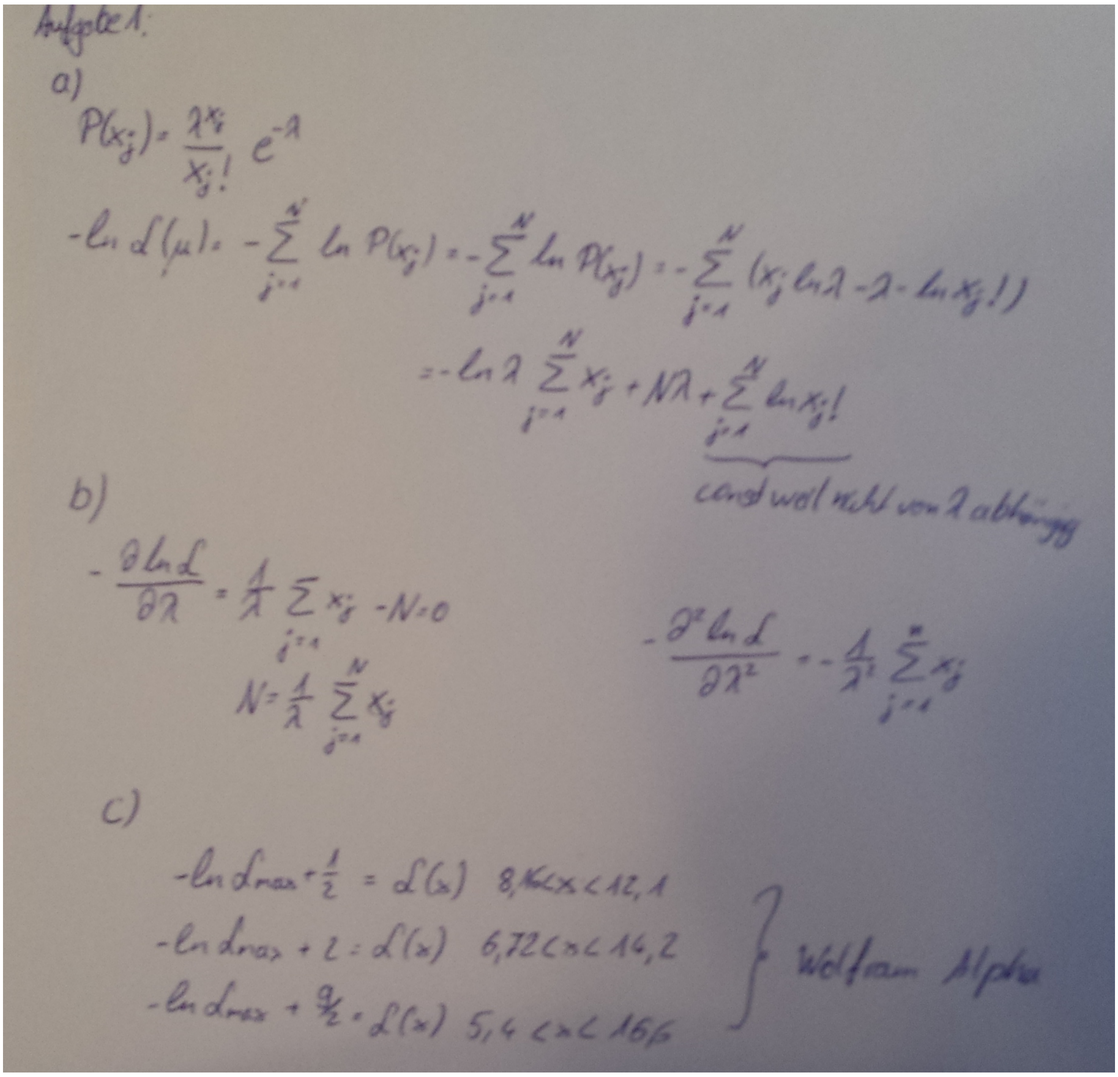
Aufgabe1

a-c)



Aufgabe 1:

a)

$$P(x_j) = \frac{\lambda^{x_j}}{x_j!} e^{-\lambda}$$

$$-\ln \mathcal{L}(\mu) = -\sum_{j=1}^{N} \ln P(x_j) = -\sum_{j=1}^{N} \ln P(x_j) = -\sum_{j=1}^{N} (x_j \ln\lambda - \lambda - \ln x_j!)$$

$$= -\ln\lambda \sum_{j=1}^{N} x_j + N\lambda + \underbrace{\sum_{j=1}^{N} \ln x_j!}_{\text{const weil nicht von } \lambda \text{ abhängig}}$$

b)

$$-\frac{\partial \ln \mathcal{L}}{\partial \lambda} = \frac{1}{\lambda} \sum_{j=1} x_j - N = 0$$

$$N = \frac{1}{\lambda} \sum_{j=1}^{N} x_j$$

$$-\frac{\partial^2 \ln \mathcal{L}}{\partial \lambda^2} = -\frac{1}{\lambda^2} \sum_{j=1}^{N} x_j$$

c)

$$\left.\begin{array}{ll} -\ln \mathcal{L}_{max} + \frac{1}{2} = \mathcal{L}(x) & 8{,}16 < x < 12{,}1 \\ -\ln \mathcal{L}_{max} + 2 = \mathcal{L}(x) & 6{,}72 < x < 14{,}2 \\ -\ln \mathcal{L}_{max} + \frac{9}{2} = \mathcal{L}(x) & 5{,}4 < x < 16{,}6 \end{array}\right\} \text{Wolfram Alpha}$$

d

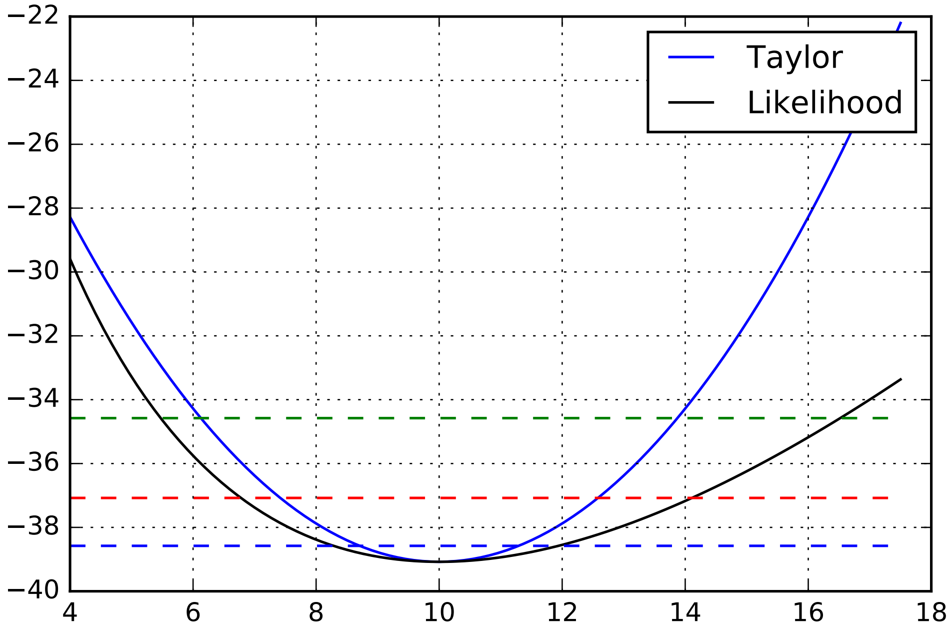


Abbildung 1: Likelihood und Taylorentwicklung

Aufgabe 3

a)

Die mittels kleinste Quadrate ermittelten Parameter sind:
3.63230696e-05
-9.86645792e-04
1.02008069e-02
-4.74531133e-02
8.25540287e-02
2.90985385e-05
1.09489710e-01

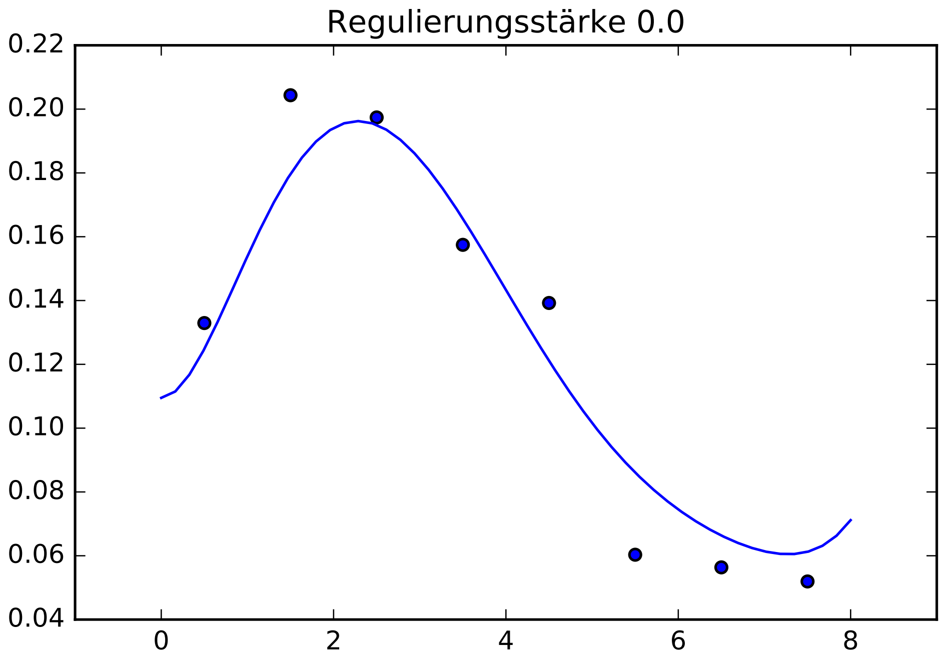


Abbildung 2: kleinste Quadrate Regulierung $\alpha = 0$

b)

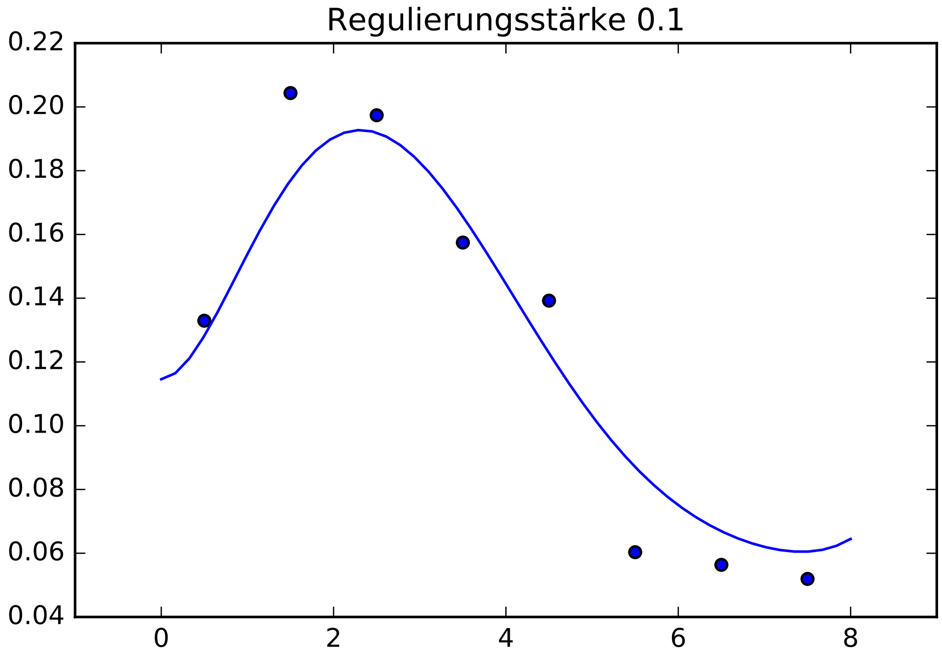


Abbildung 3: kleinste Quadrate Regulierung $\alpha = 0.1$

c)

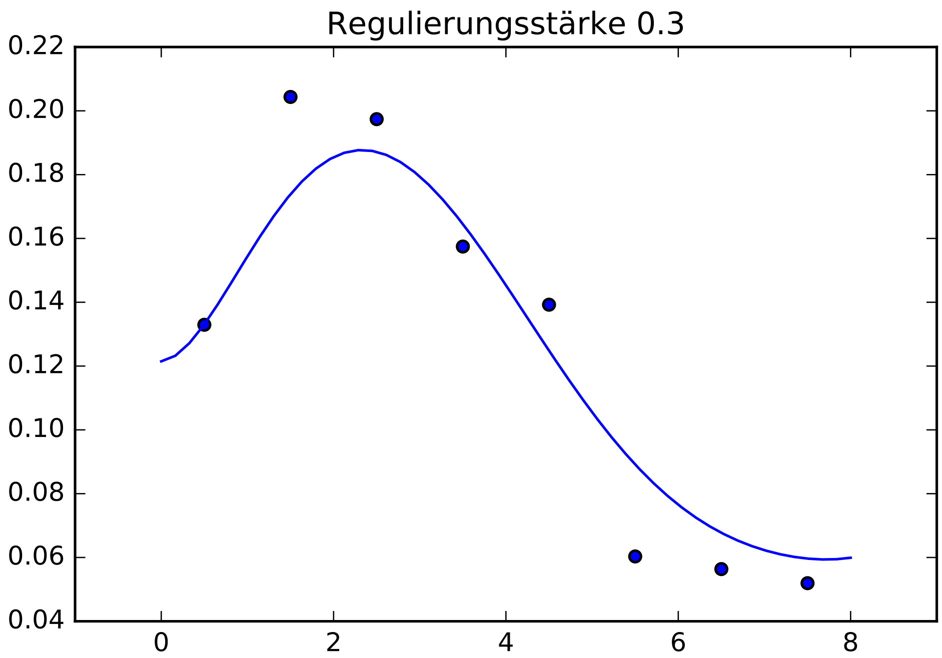


Abbildung 4: kleinste Quadrate Regulierung $\alpha = 0.3$

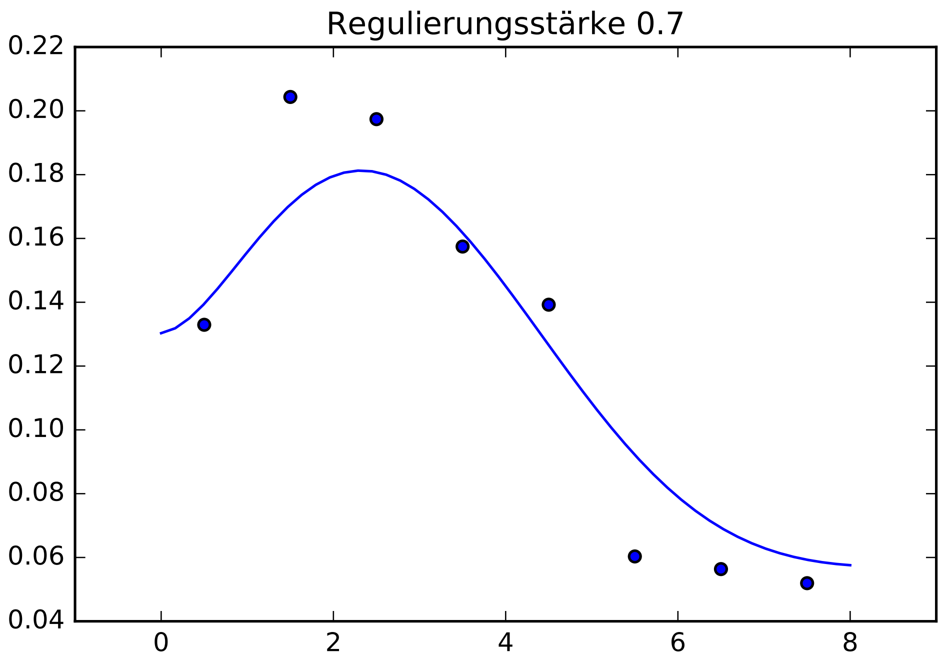


Abbildung 5: kleinste Quadrate Regulierung $\alpha = 0.7$

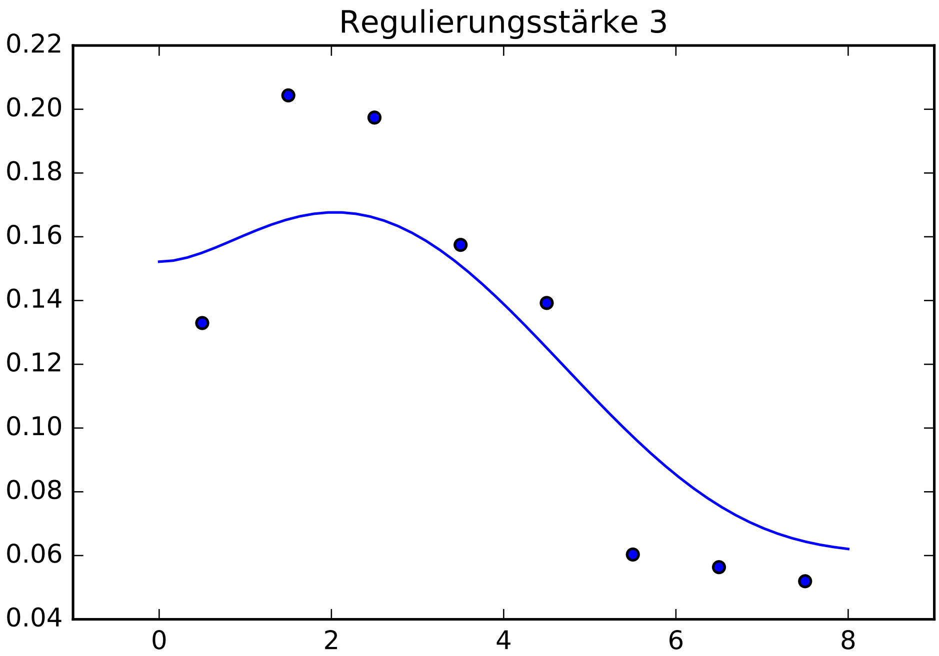


Abbildung 6: kleinste Quadrate Regulierung $\alpha = 3$

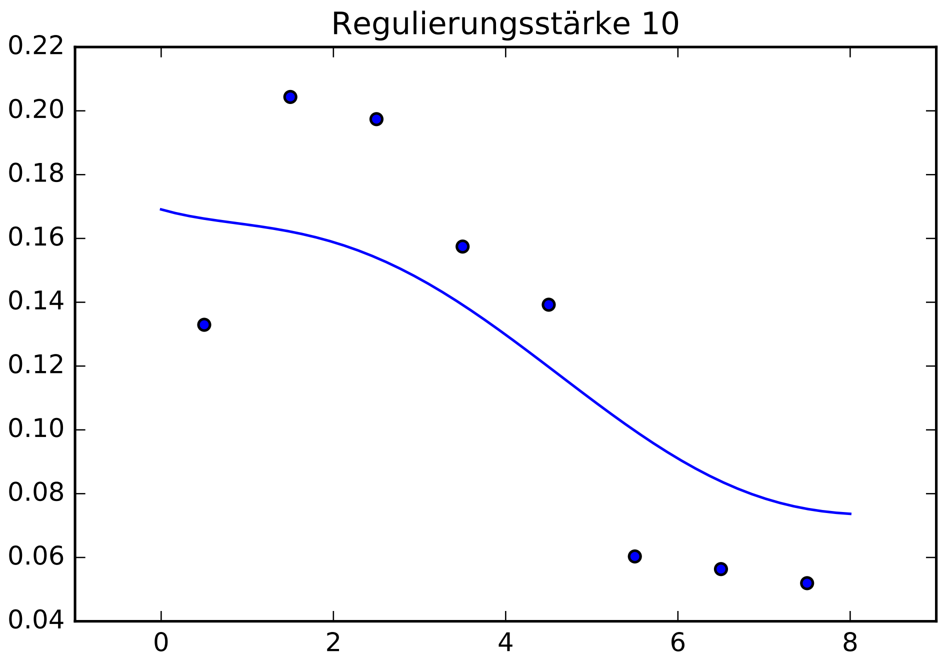


Abbildung 7: kleinste Quadrate Regulierung $\alpha = 10$

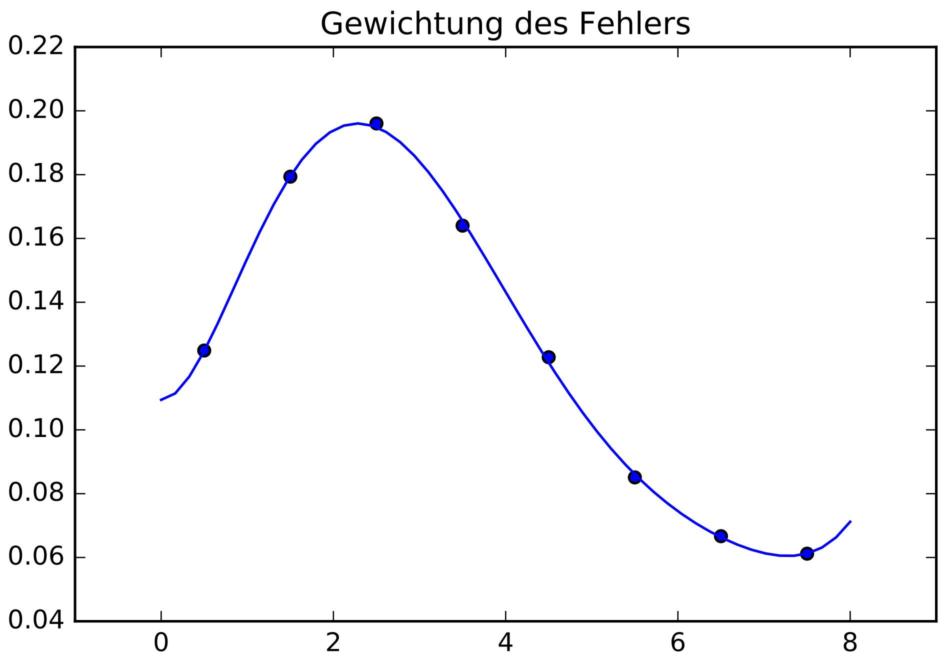


Abbildung 8: Der mittels Fehler des Mittelwerts berechneter Fit