Time	Group	Submission in Moodle; Mails with subject: [SMD2022]
Th.12:15–13:00	A	lukas.beiske@udo.edu and jean-marco.alameddine@udo.edu
Fr. 8:15–9:00	B	samuel.haefs@udo.edu and stefan.froese@udo.edu
Fr. 10:15–11:00	C	david.venker@udo.edu and lucas.witthaus@udo.edu

Exercise 9 *Confidence Intervals Short Questions* **4 p.**

- Given is a confidence interval $[x_1, x_2]$ of a parameter x at a confidence level α. What is the frequentist, what is the Bayesian interpretation of this interval?
- What role does the prior in Bayesian statistics play?
- What freedom is there in choosing these intervals?
- What happens in the special case of symmetrical PDF?
- What is the difference between intervals and upper/lower limits?

Exercise 10 *Confidence intervals* **6 p.**

Given is the likelihood function for a measured value x at a given parameter a

$$L(X;a) = \frac{1}{\pi}\,\frac{1}{1+(x-a)^2} \quad \text{mit} \quad a > 0\,. \tag{1}$$

(a) Using the Neyman construction, determine the central frequentist 90 % confidence interval for a when a value $x = 10$ was measured.

(b) Assuming a uniform prior distribution in a, determine the central Bayesian credibility interval. (Both sides outside the central confidence interval have the same probability content).

(c) Consider the difference between the two methods for $x \to \infty$.
Hint:

$$\int \frac{1}{1+x^2}\,\mathrm{d}x = \arctan x \tag{2}$$