| 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 lukas.witthaus@udo.edu |

**Exercise 1** *Binning* **0 p.**

 **(a)** Read in the distributions for height and weight from the file `height_weight.txt`. You can find this file in the Moodle. Histogram both distributions in a matplotlib histogram with respectively 5, 10, 15, 20, 30, 50 bins in a figure, split into $3 \times 2$ subplots. What differences do you notice? Which binning seems reasonable to you? Why?

 **(b)** What happens if you use data from much more than 250 people? To what extent might it make sense to use different numbers of bins for the two data sets? Specify a reasonable minimum bin width, as well as the position of the bin centers.

 **(c)** Draw $10^5$ equally distributed integers from the interval 1-100. Logarithmize the drawn numbers and then fill them into a histogram. Again, select different binnings (analogous to **(a)**). Which effects are noticeable depending on the binning?

**Exercise 2** *Monty Hall Problem* **0 p.**

In a game show, the prize is determined according to the following method: The contestants see three numbered doors in front of them. Behind one of these doors is a car, behind each of the others a goat. The candidate does not know where the car is, but must choose one of the doors. After he has done so, the game master opens one of the other two doors, shows the candidate that there is a goat behind it and asks him if he wants to stay with his decision or change it.

 **(a)** What should the candidate do?

 **(b)** What is the probability to win the car?

Please give reasons for all answers and sketch the corresponding probability tree.

**Exercise 3** *Birthdays* **0 p.**

 **(a)** Estimate how many people are needed so that the probability for two birthdays to fall on the same date is greater than 0.5?

 **(b)** Now calculate: in a group of $n$, what is the probability that at least two have their birthdays on the same day[1]? For which $n$ does the probability become 0.5 or greater? Neglect leap years.

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[1]We assume that someone born on February 29 celebrates March 1 in years without that date