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Reasoning and Decision Making under Uncertainty
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Work Sheet 1

Uni-Modal Distributions

Note:
Do not use the ready-made routines that certainly exist in your programming language for the following tasks. Implement the tasks yourself from scratch.

Exercise 1

Multinomial distributed random numbers

a) Create a multinomial distribution from the example file `anthrokids.csv`: Use the column *age* and round the floating point values to obtain integers. Count the frequencies of the integers and use them as basis of the distribution.

b) Sample from the multinomial distribution.

c) How can you check if your samples really follow the distribution from 1 a)?

Exercise 2

Uniformly distributed random numbers

a) Implement a way to generate uniformly distributed one-dimensional random numbers. Make sure that your implementation can be parametrized.

b) Use the random number generator from 2 a) to create a sample set of random numbers. Estimate the parameters of the underlying uniform distribution from this sample set. What do you observe? How accurate is your parameter estimate? What happens if the size of the sample set changes?

c) How can you check if your random numbers really follow the distribution from 2 a)?

Exercise 3

Normally distributed random numbers

a) Implement a way to generate normally distributed one-dimensional random numbers with mean 0 and standard deviation of 1.0.

b) Use the random number generator from 3 a) to create a sample set of random numbers. Estimate the parameters of the underlying normal distribution from this sample set. What do you observe? How accurate is your parameter estimate? What happens if the size of the sample set changes?

c) How can you check if your random numbers really follow the distribution from 3 a)?

Exercise 4

Eponentially distributed random numbers

a) Implement a way to generate exponentially distributed one-dimensional random numbers. Make sure that your implementation can be parametrized.

b) Use the random number generator from 4 a) to create a sample set of random numbers. Estimate the parameters of the underlying exponential distribution from this sample set. What do you observe? How accurate is your parameter estimate? What happens if the size of the sample set changes?

c) How can you check if your random numbers really follow the distribution from 4 a)?