

# Elements of Probability Theory [nlm43]

Transcription from set theory:

- set  $\rightarrow$  sample space
- subset  $\rightarrow$  event
- element  $\rightarrow$  elementary event

Sample space  $S$ : set of all possible outcomes in an experiment.

Event  $A \subset S$ : possible outcome of experiment.

Probability axioms [Kolmogorov 1933]:

- $P(A) \geq 0$  for all  $A \subset S$ ,
- $P(S) = 1$ ,
- $P(A + B) = P(A) + P(B)$  if  $AB = \emptyset$ .

Some immediate consequences [nex94]

- $P(\emptyset) = 0$ ,
- $P(\bar{A}) = 1 - P(A)$ ,
- $P(A + B) = P(A) + P(B) - P(AB)$ .

Under idealized circumstances the sample space is divisible into elementary, mutually exclusive, events to which equal probabilities can be assigned for reasons of symmetry:

$$S = A_1 + \cdots + A_N \text{ with } A_i A_j = \emptyset \text{ for } i \neq j \text{ and } P(A_i) = \frac{1}{N}.$$