

ISCC Fall 2026

Exercises on Lecture 1

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1. An urn contains 90 balls, of which 30 are white, and 60 are either black or yellow. A ball is going to be drawn from the urn. Represent the uncertainty about the outcome of this experiment using a random set and the corresponding mass function on a suitable frame of discernment. Compute the corresponding belief, plausibility and commonality functions.
2. Let $\Theta = \{a, b, c\}$ and f the following function from $\mathcal{P}(\Theta)$ to $[0, 1]$:

A	$\emptyset$	$\{a\}$	$\{b\}$	$\{a, b\}$	$\{c\}$	$\{a, c\}$	$\{b, c\}$	$\{a, b, c\}$
$f(A)$	0	0.5	0.2	0.8	0	0.5	0.5	1

Is f a belief function?

3. An expert has given the following contour function on $\Theta = \{a, b, c, d, e, f\}$:

θ	a	b	c	d	e	f
$\text{pl}(\theta)$	0.1	0.3	0.5	1	0.7	0.3

Compute the corresponding mass function, assuming that it is consonant.

4. Let m_1 and m_2 be two mass functions on $\Theta = \{a, b, c\}$ defined as follows:

$$m_1(\{a\}) = 0.4 \quad m_1(\{a, c\}) = 0.1 \quad m_1(\{b, c\}) = 0.5,$$

$$m_2(\{c\}) = 0.2 \quad m_2(\{b, c\}) = 0.3 \quad m_2(\Theta) = 0.5.$$

Compute the combined mass function $m_{12} = m_1 \oplus m_2$. (Present the calculations in a two-way table). What is the degree of conflict between m_1 and m_2 ?

5. We consider four variables X, Y, Z, T and five mass functions $m^X, m^{XY}, m^{YZ}, m^{ZT}$ and m^T .
 - (a) Draw the corresponding evidential network.
 - (b) We want to combine the five mass functions and compute the marginal on Z . For this, we delete the variables using the Fusion algorithm in the following order: X, Y, T . Represent graphically the different steps of the algorithm and write the literal expression of the final mass function.