

Exercises in belief functions

1. Suppose you are giving your degrees of belief regarding the outcome of a soccer contest of your favorite team. There are three options: Win (1), Lose (2) Draw (3)

Due to imprecision you only provide imprecise probabilities for this case:

- _ p1 in [0.1, 0.3]
- _ p2 in [0.2, 0.4]
- _ p3 in [0.3, 0.5]

- a) Is there a probability compatible with these intervals (= avoiding sure loss)
- b) Can these bounds be improved without adding information (check coherence)
- c) Compute the lower probabilities of all 8 events
- d) Compute the Moebius transform of the lower probability function.

Conclude whether the lower probability is a belief function or not.

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2. Consider two belief functions on $S = \{a, b, c\}$:
First mass function: $m_1(ab) = 0.5, m_1(bc) = 0.5$;
Second mass function: $m_2(abc) = 0.5, m_2(b) = 0.5$.

- a) is one of the belief function a specialization of the other ?
- b) compare the contour functions of the two belief functions
- c) compare the two plausibility functions (or equivalently the belief functions): which one is the more informative with respect with this ordering ?
- d) compare the two commonality functions (or equivalently the belief functions): which one is the more informative with respect with this ordering ?

Which if the 4 comparisons do you find the most convincing ?