

Exercises from conversions from horizontal to vertical representation of fuzzy sets and fuzzy negations.

Exercise 3.1 (“satisfaction with the grades”; old scale) *Fuzzy set A is given by its collection of cuts:*

$$\mathcal{R}_A(\alpha) = \begin{cases} \{1, 2, 3, 4\}, & \alpha = 0, \\ \{1, 2\}, & \alpha \in (0, 0.5], \\ \{1, 2, 3\}, & \alpha \in (0.5, 0.8], \\ \{1\}, & \alpha \in (0.8, 1]. \end{cases}$$

Find its vertical representation.

Exercise 3.2 *Verify that $\neg$ is a fuzzy negation and i_1, i_2 are its different generators:*

$$\begin{aligned} \neg \alpha &= \frac{1 - \alpha}{1 + \alpha}, \\ i_1(\alpha) &= \log_2(1 + \alpha), \\ i_2(\alpha) &= \frac{3\alpha + \alpha^2}{2(1 + \alpha)}. \end{aligned}$$