

Computational Intelligence WS1718

Quiz 4.2

4.1 Use the increasing generator $g(x) = \sqrt{x}$ to derive a fuzzy implication. Does the resulting implication fulfil the axiom of contraposition?

The axiom of contraposition predicates:

$$\text{Imp}(a, b) = \text{Imp}(c(b), c(a))$$

Hence

$$\forall a \in [0, 1] : c(a) = g^{-1}(g(1) - g(a)) \\ \Rightarrow c(a) = g^{-1}(1 - \sqrt{a}) = \sqrt{1 - \sqrt{a} - 1} = a^{\frac{1}{4}}$$

with :

$$g^{-1} = \sqrt{x - 1}$$

the resulting implication of $g(x) = \sqrt{x}$ is:

???

4.2 Check for all fuzzy implications below if they fulfil the axiom of contraposition

The axiom of contraposition predicates:

$$\text{Imp}(a, b) = \text{Imp}(c(b), c(a))$$

4.2.1 Reichenbach $\text{Imp}(a, b) = 1 - a + ab$

4.2.2 Lukaciewicz $\text{Imp}(a, b) = \min\{1, 1 - a + ab\}$

4.2.3 Gödel $\text{Imp}(a, b) = \begin{cases} 1 & , a \leq b \\ b & , \text{otherwise} \end{cases}$