# FUZZY RELATION

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## ABSTRACT

A fuzzy system consist of input, fuzzy inference and output. In this case, fuzzy relation is used as fuzzy inference. Fuzzy relation is a cartesian product of sets on input with sets on output. If given its input U and output V, then a fuzzy relation in this fuzzy system defined by: $Q = \{((x,y), \mu_Q(x,y)) \mid x \in U, y \in V\}$.

The equation $B = A \circ Q$, where B is a fuzyy set in the output V, A is a fuzzy set in the input U and Q is a fuzzy relation in $U \times V$, if given A and B, can be determined Q, and if given B and Q, can be determined A. Let $\circ$ is called sup-star compotition. Member function on B is defined in t-norm:
$\mu_B(y) = \sup_{x \in U}(\mu_A(x) * \mu_Q(x,y))$. Let $*$ denote the t-norm. Then, used an operator $\varphi$ to compute the value of a fuzzy relation that defined by:

$$a \varphi b = \sup(c \in [0,1] \mid a * c \leq b) = \begin{cases} 1 \text{ jika } a \leq b \\ b \text{ jika } a > b \end{cases}$$

The equation $B = A \circ Q$, the solving for *fuzzy identification problem* (given A and B) is a fuzzy relation $\hat{Q} = A \varphi B$ such that $\hat{Q}$ can be intepreted as Q on $B = A \circ Q$. And, the solving for *fuzzy deconvolution problem* (given B and Q) is a fuzzy set $\hat{A} = Q \varphi B$, such that $\hat{A}$ can be intepreted as A on $B = A \circ Q$.

Key words: fuzzy relation, t-norm.