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Modeling Psychological and Sociological Dynamics Methods and Applications

Advanced Topic - Cognitive Algebra

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Advanced Topic - Cognitive Algebra (1)

Understand the Effect Needed

$0 \leq X \leq 1$ $0 \leq Y \leq 1$	$0 \leq f(X, Y) \leq 1$	If $X = 0$ (X turned off)	If $X = 1$ (X set to max)	COMMENTS	EXAMPLES
Logical AND	$X * Y$	0	Y	One variable restricts the effect of the other	$f(X, Y) = X * Y =$ productivity $X =$ normal productivity $Y =$ schedule pressure effect on productivity
Arithmetic Average	$\frac{X + Y}{2}$	$\frac{Y}{2}$	$\frac{1 + Y}{2}$	An average	$f(X, Y) = (X + Y) / 2 =$ average worker experience $X =$ experience worker 1 $Y =$ experience worker 2

Advanced Topic - Cognitive Algebra (2)

Understand the Effect Needed

$0 \leq X \leq 1$ $0 \leq Y \leq 1$	$0 \leq f(X, Y) \leq 1$	If $X = 0$ (X turned off)	If $X = 1$ (X set to max)	COMMENTS	EXAMPLE
Logical OR	$X + Y - XY$	Y	1	Only one variable at its maximum is enough for a maximum effect	$f(X, Y) = X + Y - X * Y$ = combined effect of media interest and enthusiasm on riot recruitment X = effect media interest on riot recruitment Y = effect of enthusiasm on riot recruitment Either media interest (which increases sympathy to riot) or enthusiasm (to riot) is sufficient for recruitment

Example from: Hayward, J., et al. (2014). Model Building with Soft Variables: A Case Study on Riots.