RELAN - Relation Analysis

Logical Relations

Logical relations are (true) sentences in which logical variables (positive or negative statements, e.g., A, B, C) are connected by logical relations (e.g., NO, AND, OR, IF-THEN).

Example: In an office four employees are regularly late to work: If employee A is late, employee B will also be late, but not employee C. However, employee A, C and D are either all late, or A, B and D are all on time in the office. The question arises whether these incidents are based on a general regularity.

The individual observations can be formulated propositionally as follows:

$(A \wedge B \wedge -C) \vee (-A \wedge -C \wedge -D) \vee (A \wedge B \wedge D)$

which can be transformed (e.g., by the Quine-McCluskey-Algorithm) into the following logical function:

$(C \rightarrow D) \wedge (D \rightarrow A) \wedge (A \rightarrow B)$.

That is, if C is late, D is also late, if D is late, A is also late, and if A is late, B is also late. While hardly any causal conclusions can be derived from the first formulations, this is very much the case with the functional transformation.

REFERENCE

Maderthaner, R. (2022). RELATIONSANALYSE (RELAN) - Aussagenlogische, statistische und kausale Analyse von Daten. Springer Spektrum, Heidelberg.