**Structure and use of conditional/propositional logic statement**

**Logical statement/proposition**

A logical statement is a sentence describing a state  
Sometimes called a proposition  
Must resolve to TRUE or FALSE but not both

**Logical equivalence**

Two logical statements are logically equivalent if they always produce the same truth value.

**compound proposition**

Several logical statements

Comprised of propositions and one or more of the following connectives:

Text

Description automatically generated with medium confidence

Each proposition is represented by a propositional variable (p, q, r, s )

**Exclusive disjunction**: one or the other o

**Inclusive disjunction**: either is fine aswell

**Types of compound propositions**

**Conditional/implication**

p->q

if p then q

When the hypothesis(p) is true, the conclusion(q) must be true for the conditional statement to be true.

When the hypothesis(p) is false, our conditional statement is always true

* **Converse proposition**

Flipping the condition q->p

* **Inverse proposition**

Negates the conditional statement

~p->~q

Has same truth value as Converse (q->p) (logically equivalent)

* **Contrapositive proposition**

Flips the already negated statement

~q->~p

Has same truth value as conditional (p->q) (logically equivalent)

**Biconditional**

If and only if <-->

Both propositions must share the same truth value

**Conjunction todo**

**Disjunction todo**

**Tautologies**

A statement that is true even when individual elements might be false:

“We are going to the cinema tomorrow or we are not going to the cinema tomorrow”

Same as p OR ~p. – always true

**Contradictions**

A statement is false even though some part of it might be true:

“we are going to the cinema tomorrow and we are not going to the cinema tomorrow”

Same as p AND ~p. – always false

**Truth table**

Left side contains all combinations/propositions

Right side connectives

Amount of rows = 2^amount of propositions