

Statistical Syllogism

N percent of A's are B's. X is an A. This is all we know about the matter. \hat{A} It's N percent probable that X is a B.

Independent

Prob of (A and B) = prob of A X prob of B.

Mutually Exclusive

Prob of (A XOR B) = prob of A + prob of B.

Not Mutually Exclusive

Prob of (A or B) = Prob of A + prob of B - prob of (A and B).

This holds even if A and B aren't independent:

Prob of (A and B) = Prob of A X (prob of B after A occurs).

Probability and Philosophy

- ▶ Ratio of observed frequencies: We've observed that coins land heads about half of the time.
- ▶ Ratio of abstract possibilities: Heads is one of the two equally likely abstract possibilities.
- ▶ Measure of actual confidence: We have the same confidence in the toss being heads as we have in it not being heads.
- ▶ Measure of rational confidence: It's rational to have the same confidence in the toss being heads as in it not being heads.

Expected Values

PLAYING. There are two possible outcomes: P1 (I win) and P2 (I lose). P1 is $1/36$ likely and gains \$3,536; P1 is worth $(1/36 \times \$3,536)$ or \$98.22. P2 is $35/36$ likely and loses \$100; P2 is worth $(35/36 \times -\$100)$, or -\$97.22. The expected gain of alternative P is $(\$98.22 - 97.22)$, or \$1.

Reasoning from a sample

1. Other things being equal, a larger sample gives a stronger argument.
2. Other things being equal, a more varied sample gives a stronger argument.
3. Other things being equal, we get a stronger argument if we have a more cautious conclusion.

Analogical Reasoning

Most things true of X also are true of Y.

*X is A. This is all we know about the matter. **THUS:**
Probably Y is A.*

Mill's Method: Agreement

A occurred more than once. B is the only additional factor that occurred if and only if A occurred. ∴ Probably B caused A, or A caused B.

Disagreement

*A occurred in some case. B didn't occur in the same case.
THUS A doesn't necessarily cause B.*

Difference

A occurred in the first case but not the second. The cases are otherwise identical, except that B also occurred in the first case but not in the second. THUS Probably B is (or is part of) the cause of A, or A is (or is part of) the cause of B.

Variation

A changes in a certain way if and only if B also changes in a certain way. THUS Probably B's changes caused A's, or A's caused B's, or some C caused both.