$$I(p;q) = H(p) - H(p|q) = \sum_{x,y} r(x,y) \log_2 \frac{r(x,y)}{p(x)q(y)} \tag{5}$$

where

- $r(x,y)$ is the joint distribution of finding x, y.
- $p(x)$ and $q(y)$ are the probabilities of x and y in their respective distributions.
- Exceptions to metric rules includes that

$$p(x) = q(y) \rightarrow I(x;y) = 0 \tag{6}$$

  is not guaranteed.