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a) ① Because when item B is actually an item with high $Pr(B)$, which means it is justed purchased frequently, it will turns out that many different item "A", will have high confidence $Pr(B|A)$. This actually shows nothing about association.

② $lift(A\to B) = \frac{conf(A\to B)}{s(B)}$ does not suffer from this drawback because if $Pr(B)$, which equals to $s(B)$ is high, $\frac{conf(A\to B)}{s(B)}$ can still show ~~that how much~~ the frequency that A and B appear together despite B appears how often.

③ Similarly, $conv(A\to B) = \frac{1-s(B)}{1-conf(A\to B)}$ actually shows the opposite side version of $lift(A\to B)$, so it does not ~~suffer~~ from the high $Pr(B)$, either.

b) ① $conf(A\to B)$ is not symmetrical.

$conf(A\to B) = Pr(B|A) = \frac{Pr(AB)}{Pr(A)}$, $conf(B\to A) = Pr(A|B) = \frac{Pr(AB)}{Pr(B)}$. So when $Pr(A) \neq Pr(B)$, it is not symmetrical

② $lift(A\to B)$ is symmetrical.

$lift(A\to B) = \frac{conf(A\to B)}{s(B)} = \frac{Pr(AB)}{Pr(A)\cdot Pr(B)}$, $lift(B\to A) = \frac{conf(B\to A)}{s(A)} = \frac{Pr(AB)}{Pr(B)\cdot Pr(A)}$,

so it is symmetrical

③ $conv(A\to B)$ is not symmetrical.

$conv(A\to B) = \frac{1-s(B)}{1-conf(A\to B)} = \frac{1-Pr(B)}{1-\frac{Pr(AB)}{Pr(A)}} = \frac{Pr(A)-Pr(A)\cdot Pr(B)}{Pr(A)-Pr(AB)}$.

$conv(B\to A) = \frac{1-s(A)}{1-conf(B\to A)} = \frac{1-Pr(A)}{1-\frac{Pr(AB)}{\dots}} = \frac{Pr(B)-Pr(A)\cdot Pr(B)}{Pr(B)-Pr(AB)}$

so it is not symmetrical (e.g. $Pr(A)=\frac{1}{2}, Pr(B)=\frac{1}{3}, Pr(AB)=$

): ① conf(A→B) has the property, because when the associated probability is 1, conf(A→B) = 1, reaches its maximum achievable value. (Normalization of Probability).

② lift(A→B) hasn't the property, because $lift(A \to B) = \frac{Pr(AB)}{Pr(A) \cdot Pr(B)}$ when the associated probability is 1, $lift(A \to B) = \frac{1}{Pr(B)}$ but lift(A→B) does not ~~have~~ reaches its maximum achievable value (it can be ~~greater than 1~~) changed by different Pr(B)).

③ conv(A→B) hasn't the property ✗, because $conv(A \to B) = \frac{\cancel{Pr(B)} - 1 - S(B)}{1 - conf(A \to B)}$ when the associated probability is 1, conf(A→B) = 1, ~~con~~ $\lim\limits_{\to} conv(A \to B) = \infty$ n't reaches its maximum achievable value.

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Maximum is infinity.
And maximum is reached,
when P(B|A)=1