Computation of Mutual Information

Presence & absence of w1: $p(X_{W1}=1) + p(X_{W1}=0) = 1$

Presence & absence of w2: $p(X_{W2}=1) + p(X_{W2}=0) = 1$

Co-occurrences of w1 and w2:

$$p(X_{W1}=1, X_{W2}=1) + p(X_{W1}=1, X_{W2}=0) + p(X_{W1}=0, X_{W2}=1) + p(X_{W1}=0, X_{W2}=0) = 1$$

$$p(X_{W1}=1, X_{W2}=1) + p(X_{W1}=1, X_{W2}=0) = p(X_{W1}=1)$$

$$p(X_{W1}=0, X_{W2}=1) + p(X_{W1}=0, X_{W2}=0) = p(X_{W1}=0)$$

$$p(X_{W1}=1, X_{W2}=1) + p(X_{W1}=0, X_{W2}=1) = p(X_{W2}=1)$$

$$p(X_{W1}=1, X_{W2}=0) + p(X_{W1}=0, X_{W2}=0) = p(X_{W2}=0)$$

We only need to know $p(X_{W1}=1)$, $p(X_{W2}=1)$, and $p(X_{W1}=1, X_{W2}=1)$.