

$$P(\textit{term}_t \mid \textit{doc}) = \sum_{k=1}^K P(\textit{term}_t \mid \textit{topic}_k) P(\textit{topic}_k \mid \textit{doc})$$

The same, written using shorthands :

$$P(t \mid \textit{doc}) = \sum_{k=1}^K P(t \mid k) P(k \mid \textit{doc})$$

So by replacing this, for any doc in the collection,

$$P(\textit{doc}) = \prod_{t=1}^T \left\{ \sum_{k=1}^K P(t \mid k) P(k \mid \textit{doc}) \right\}^{X(t, \textit{doc})}$$