Three tricks we use

Chapter 13

Bayes' rule:

\[
P(Y|X) = P(X|Y)P(Y) \frac{1}{P(X)} = \alpha P(X|Y)P(Y)
\]

Marginalization:

\[
P(X) = \sum_y P(X,Y=y)
\]

Product rule:

\[
P(X,Y) = P(X)P(Y|X)
\]

All 3 work with extra conditioning:

\[
P(X|Z) = \sum_y P(X,Y=y|Z)
\]

\[
P(Y|X,Z) = \alpha P(X|Y,Z)P(Y|Z)
\]

Bayes' rule: