

Concept behind Naive Bayes

$$P(C_{k} | X) = \frac{P(X | C_{k}) * P(C_{k})}{C_{k}) * P(C_{k})}$$

$$P(C_{1} | X_{1} \& X_{2} \& X_{3} \& X_{4}) = \frac{P(X_{1} \cap R_{2}(X) X_{3} \cap X_{4} | C_{1}) *}{P(C_{1})}$$

$$P(C_{1} | X_{1} \& X_{2} \& X_{3} \& X_{4}) = \frac{P(X_{1} | X_{2} | X_{3} | X_{4}) * P(X_{2} | C_{1}) * P(X_{3} | C_{1}) * P(X_{4} | C_{1}) * P(C_{1})}{P(X_{1}) * P(X_{2}) * P(X_{3}) * P(X_{4})}$$



$$P(C_{k} | X) = \frac{P(X | C_{k}) *}{P(C_{k})}$$

$$= P(X)$$

Conditional Probability:
$$P(E_1 \mid E_2) = \frac{P(E_1 \cap E_2)}{P(E_2)}$$



$$P(C_{k} | X) = \frac{P(X | C_{k}) *}{P(C_{k})}$$

$$= \frac{P(X | C_{k}) *}{P(C_{k})} * P(C_{k})$$

$$= \frac{P(C_{k})}{P(C_{k})}$$

Conditional Probability:
$$P(E_1 \mid E_2) = \frac{P(E_1 \cap E_2)}{P(E_2)}$$



$$P(C_{k} | X) = P(X | C_{k}) *$$

$$= P(C_{k})$$

$$P(C_{k}) * P(C_{k})$$

$$= P(C_{k})$$

$$= P(X)$$



$$P(C_{k} | X) = P(X | C_{k}) *$$

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$$P(C_{k} | X) = P(X | C_{k}) *$$

$$= P(X | P(C_{k})) * P(C_{k})$$

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$$= P(X | P(C_{k})) * P(C_{k})$$

$$= P(X | P(X)) * P(X)$$



 $P(C_1 | X_1 \& X_2 \& X_3 \&$

 $X_4) =$

 $P(X_1 \cap X_2 \cap X_3 \cap X_4 \cap$

$$P(C_{k} | X) = P(X | C_{k}) *$$

$$= P(C_{k})$$

$$P(C_{k}) * P(C_{k})$$

$$= P(X | C_{k}) * P(C_{k})$$

$$P(C_{k}) = P(X)$$

$$P(X_{k}) = P(X_{k}) * P(C_{k})$$

$$P(X_{k}) = P(X_{k}) * P(X_{k})$$

$$P(X_{k}) = P(X_{k$$



 $P(X \cap C_k)$

P(X)

$$P(C_{1} | X_{1}\& X_{2}\& X_{3}\& \frac{P(X_{1}\cap X_{2}\cap X_{3}\cap X_{4}\cap X_{4}\cap X_{4})}{C_{1}}$$

$$X_{4}) = \frac{P(X_{1}\& X_{2}\& X_{3}\& X_{4})}{X_{4}}$$



$$P(C_{1} | X_{1}\& X_{2}\& X_{3}\& \frac{P(X_{1}\cap X_{2}\cap X_{3}\cap X_{4}\cap X_{2})}{C_{1}}$$

$$X_{4}) = \frac{P(X_{1}\& X_{2}\& X_{3}\& X_{3}\& X_{4})}{P(X_{1}\& X_{2}\& X_{3}\& X_{4})}$$

$$P(E_{1}\cap E_{2}) = P(E_{1} | E_{2})*P$$

$$(E_{2})$$



$$P(C_{1} | X_{1}\& X_{2}\& X_{3}\& \frac{P(X_{1}\cap X_{2}\cap X_{3}\cap X_{4}\cap X_{2}\cap X_{3})}{C_{1}})$$

$$P(X_{1}\& X_{2}\& X_{3}\& \frac{P(X_{1}\cap X_{2}\cap X_{3}\cap X_{4}\cap X_{4}\cap X_{2}\cap X_{3}\cap X_{4}\cap X_{4}\cap X_{2}\cap X_{3}\cap X_{4}\cap X_{4$$

$$P(X_1 \cap X_2 \cap X_3 \cap X_4 \cap C_1) \cap E_1 = E_2$$



$$P(C_{1} | X_{1} \& X_{2} \& X_{3} \& \frac{P(X_{1} \cap X_{2} \cap X_{3} \cap X_{4} \cap C_{1})}{C_{1}}$$

$$X_{4}) = \frac{P(X_{1} \cap X_{2} \cap X_{3} \cap X_{4} \cap C_{1})}{P(X_{1} \& X_{2} \& X_{3} \& X_{4})}$$

$$P(E_{1} \cap E_{2}) = P(E_{1} | E_{2}) * P(E_{1} | E_{2})$$

$$P(X_1 \cap X_2 \cap X_3 \cap X_4 \cap C_1) - C_1$$

$$E_1 \qquad E_2$$

$$P(C_1 | X_1 \& X_2 \& X_3 \& X_4) = P(C_1 | X_1 \& X_2 \& X_3 \& X_4)$$

$$\frac{P(\mathbf{X_1}| \ X_2 \cap X_3 \cap X_4 \cap C_1) * P(X_2 \cap X_3 \cap X_4 \cap C_1)}{C_1)}$$

P(
$$X_1 \& X_2 \& X_3 \& X_4$$
)



$$P(C_{1} | X_{1}\& X_{2}\& X_{3}\& \frac{P(X_{1}\cap X_{2}\cap X_{3}\cap X_{4}\cap X_{4}\cap X_{4})}{C_{1}}$$

$$X_{4}) = P(X_{1}\& X_{2}\& X_{3}\& X_{3}\& X_{4})$$

$$P(E_{1}\cap E_{2}) = P(E_{1}|E_{2})*P$$

$$(E_{2})$$

$$P(X_1 \cap X_2 \cap X_3 \cap X_4 \cap C_1) \cap E_1 \qquad E_2$$

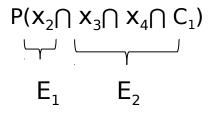
$$P(C_1 | X_1 \& X_2 \& X_3 \& C_1) = \frac{P(\mathbf{X_1} | X_2 \cap X_3 \cap X_4 \cap C_1) * P(X_2 \cap X_3 \cap X_4 \cap C_1)}{C_1}$$

P(X₁& X₂& X₃& X₄)



$$P(C_{1} | X_{1} \& X_{2} \& X_{3} \& \frac{P(X_{1} | X_{2} \cap X_{3} \cap X_{4} \cap C_{1}) * P(X_{2} \cap X_{3} \cap X_{4} \cap C_{1})}{C_{1}}$$

$$X_{4}) = \frac{P(X_{1} | X_{2} \cap X_{3} \cap X_{4} \cap C_{1}) * P(X_{2} \cap X_{3} \cap X_{4} \cap C_{1})}{P(X_{1} \& X_{2} \& X_{3} \& X_{4})}$$





$$P(C_{1} | X_{1} \& X_{2} \& X_{3} \& P(X_{1} | X_{2} \cap X_{3} \cap X_{4} \cap C_{1}) * P(X_{2} \cap X_{3} \cap X_{4} \cap C_{1})$$

$$X_{4}) = P(X_{1} \& X_{2} \& X_{3} \& X_{4})$$

$$P(C_{1} | X_{1} \& X_{2} \& X_{3} \& P(X_{1} | X_{2} \cap X_{3} \cap X_{4} \cap C_{1}) * P(X_{2} | X_{3} \cap X_{4} \cap C_{1}) * P(X_{3} \cap X_{4} \cap C_{1})$$

$$P(C_{1} | X_{1} \& X_{2} \& X_{3} \& P(X_{1} | X_{2} \cap X_{3} \cap X_{4} \cap C_{1}) * P(X_{2} | X_{3} \cap X_{4} \cap C_{1}) * P(X_{3} \cap X_{4} \cap C_{1})$$

$$X_{4}) = P(X_{1} \& X_{2} \& X_{3} \& X_{4})$$



$$P(C_{1} | X_{1} \& X_{2} \& X_{3} \& \frac{P(X_{1} | X_{2} \cap X_{3} \cap X_{4} \cap C_{1}) * P(X_{2} \cap X_{3} \cap X_{4} \cap C_{1})}{C_{1}}$$

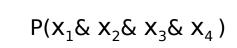
$$X_{4}) = \frac{P(X_{1} \& X_{2} \& X_{3} \& X_{4})}{P(X_{1} \& X_{2} \& X_{3} \& X_{4})}$$

$$P(C_1 | X_1 \& X_2 \& X_3 \& X_4) =$$

$$\frac{P(X_{1}| X_{2} \cap X_{3} \cap X_{4} \cap C_{1}) * P(\mathbf{X_{2}}| X_{3} \cap X_{4} \cap C_{1}) * P(X_{3} \cap X_{4} \cap C_{1})}{P(X_{1} \& X_{2} \& X_{3} \& X_{4})}$$

$$P(C_1 | X_1 \& X_2 \& X_3 \& X_4) =$$

$$P(X_1| X_2 \cap X_3 \cap X_4 \cap C_1) * P(X_2| X_3 \cap X_4 \cap C_1) * \dots P(X_4| C_1) * P(C_1)$$





For two events A and B, if A and B are independent

$$P(A \mid B) = P(A)$$



For two events A and B, if A and B are independent

$$P(A \mid B) = P(A)$$

For three events A, B and C, is A and B are conditional

independent

$$P(A \mid B, C) = P(A|C)$$



$$P(C_{1} | X_{1} \& X_{2} \& X_{3} \& P(X_{1} | X_{2} \cap X_{3} \cap X_{4} \cap C_{1}) * P(X_{2} | X_{3} \cap X_{4} \cap C_{1}) * \dots P(X_{4} | C_{1}) * P(C_{1})$$

$$P(C_{1}) * P(C_{1}) * P(C_{$$



$$P(C_{1} | X_{1} \& X_{2} \& X_{3} \& P(X_{1} | X_{2} \cap X_{3} \cap X_{4} \cap C_{1}) * P(X_{2} | X_{3} \cap X_{4} \cap C_{1}) * \dots P(X_{4} | C_{1}) * P(C_{1})$$

$$P(C_{1} | X_{1} \& X_{2} \& X_{3} \& X_{4})$$

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$$P(C_{1} | X_{1} \& X_{2} \& X_{3} \& X_{4}) = P(X_{1} | X_{2} \cap X_{3} \cap X_{4} \cap C_{1}) * P(X_{2} | X_{3} \cap X_{4} \cap C_{1}) * \dots P(X_{4} | C_{1}) * P(C_{1}) * \dots P(C_{4} | C_{1}) * P(C_{1}) * P(C_{1$$

 $P(X_1 \& X_2 \& X_3 \& X_4)$

$$P(C_{1} | X_{1}\& X_{2}\& X_{3}\& P(X_{1}| X_{2}\cap X_{3}\cap X_{4}\cap C_{1}) * P(X_{2}| X_{3}\cap X_{4}\cap C_{1}) * P(X_{4}| C_{1}) * P(C_{1})$$

$$P(C_{1} | X_{1}\& X_{2}\& X_{3}\& P(X_{1}| C_{1}) * P(X_{2}| C_{1}) * P(X_{4}| C_{1}) * P(C_{1})$$

$$P(C_{1} | X_{1}\& X_{2}\& X_{3}\& P(X_{1}| C_{1}) * P(X_{2}| C_{1}) * P(X_{4}| C_{1}) * P(C_{1})$$

$$P(C_{1} | X_{1}\& X_{2}\& X_{3}\& P(X_{1}| C_{1}) * P(X_{2}| C_{1}) * P(X_{4}| C_{1}) * P(X_{4}| C_{1}) * P(C_{1})$$

$$P(C_{1} | X_{1}\& X_{2}\& X_{3}\& P(C_{1}| C_{1}) * P(X_{2}| C_{1}) * P(X_{4}| C_{1}) * P(X_{4}| C_{1}) * P(C_{1})$$



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$$P(C_{1} | X_{1}\& X_{2}\& X_{3}\& \frac{P(X_{1} | C_{1}) * P(X_{2} | C_{1}) * P(X_{4} | C_{1}) *}{P(C_{1})}$$

$$X_{4}) = P(X_{1}\& X_{2}\& X_{3}\& X_{4})$$

$$P(A \cap B) = P(A)*P(B), \text{ when A, B are independent}$$

$$P(C_{1} | X_{1}\& X_{2}\& X_{3}\& X_{4}) = \frac{P(X_{1} | C_{1}) * P(X_{2} | C_{1}) * P(X_{3} | C_{1}) * P(X_{4} | C_{1}) * P(C_{1})}{P(X_{1}) * P(X_{2}) * P(X_{3}) * P(X_{4})}$$

