Conditional Probabilities

$$P(A \mid B) = \frac{P(A \cap B)}{P(B)}$$

$$\mathbf{P(A \cap B)} = \boldsymbol{P(A|B)P(B)}$$

$$\mathbf{P(A \cap B)} = \boldsymbol{P(B|A)P(A)}$$

Bayes and Naïve Bayes

$$P(S/1^{st}) = \frac{P(1st|S)P(S)}{P(1st)} = \frac{P(1^{st} \& S)}{}$$

$$P(\sim S/1^{st}) = \frac{P(1st|\sim S)P(\sim S)}{P(1st)} = \frac{p(1s \,\&\, \sim s)}{}$$

Bayes and Naïve Bayes

$$\mathbf{P(S/1^{st}\ \&\ Female)} = \frac{P(1st\ \&Female|S)P(S)}{P(1st\ \&Female)}$$

$$\mathbf{P(\sim S/1st\ \&Female)} = \frac{P(1st\ \&\ Female/\sim S)P(\sim S)}{P(1st\ \&\ Female)}$$

Naïve Bayes

P(S/1st&Female)= $P(1st\&Female|S)P(S) =$

Naive

$P(1st/S) * p(Female|S)P(S)$

P(~S/1s&Female)= $P\left(1st\&\frac{Female}{\sim S}\right)P(\sim S) =$

Naive

$P(1st|\sim S) * P(Female/\sim S)P(\sim S)$

Titanic Survival

Survived

Cabin

	1st	2nd	3rd	Crew	Sub Total
Female	141	93	90	20	344
Male	62	25	88	192	367
Sub Total	**203**	**118**	**178**	**212**	**711**

Not Survived

Cabin

	1st	2nd	3rd	Crew	Sub Total
Female	4	13	106	3	126
Male	118	154	422	670	1,364
Sub Total	**122**	**167**	**528**	**673**	**1490**

Bayes and Naïve Bayes

Max of $P(\Theta 1|S)P(\Theta 2|S)P(S)$, **Over all possible S**