

## Naive Bayes HW

$Size(B, S)$	Color (R, G, B)	Output (P, N)	
B	R	P	
S	B	P	$SB = P \quad SBP$
S	B	N	$SD = W$
B	R	N	
B	B	P	
B	G	N	
S	B	P	

1)

Size	P	N
B	.5	.67
S	.5	.33

Output	P	N	Total
	4	3	7
	.57	.43	1.00

Color	P	N
R	.25	.33
G	0	.33
B	.75	.33

2) (Small, Blue) - Predicted class is P since  $.214 > .047$

$$P(P|Small, Blue) = P(P|Small) \times P(P|Blue) \times P(P)$$

$$.5 \times .75 \times .57 = .214 = 21.4\%$$

$$P(N|Small, Blue) = P(N|Small) \times P(N|Blue) \times P(N)$$

$$.33 \times .33 \times .43 = .047 = 4.7\%$$

3) 3 Small, Blue examples (P, N)

Bayes values = .214, .047

$$P(S, P) = .214 + .047 = .261$$

$$\text{Normalized outputs: } \frac{.214}{.261} = .8199 = 82\%$$

$$\frac{.047}{.261} = .1800 = 18\%$$