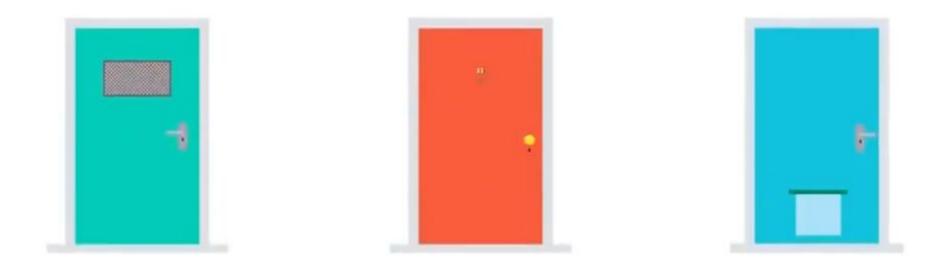
### Cross Entropy Formula

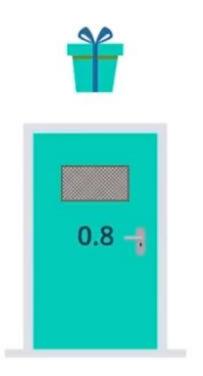










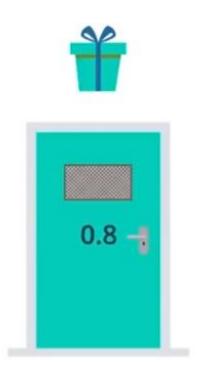






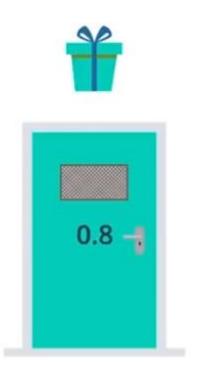




















P(gift)	0.8	0.7	0.1	
P(no gift)	0.2	0.3	0.9	

	*		
P(gift)	0.8	0.7	0.1
P(no gift)	0.2	0.3	0.9

	*	- 44	*
P(gift)	0.8	0.7	0.1
P(no gift)	0.2	0.3	0.9

	*		×
P(gift)	0.8	0.7	0.1
P(no gift)	0.2	0.3	0.9

	*		
P(gift)	0.8	0.7	0.1
P(no gift)	0.2	0.3	0.9

	*		×
P(gift)	0.8	0.7	0.1
P(no gift)	0.2	0.3	0.9

Probability= 0.504

<b>*</b> 0	.8 🔒	0.7	<b>0.1</b>
<b>*</b> 0	.8 🔒	0.7	× 0.9
₩ 0	.8 🗙	0.3	<b>*</b> 0.1
<b>×</b> 0	.2 🔒	0.7	<b>*</b> 0.1
<b>*</b> 0	.8 🗙	0.3	× 0.9
× 0	.2	0.7	× 0.9
× 0	).2 >	0.3	<b>*</b> 0.1
<b>X</b> 0	.2 >	0.3	× 0.9

			Probability	
₩ 0.8	<b>6</b> 0.7	<b>0.1</b>	0.056	
8.0	<b>₩</b> 0.7	× 0.9	0.504	
8.0	<b>×</b> 0.3	<b>0.1</b>	0.024	
<b>X</b> 0.2	<b>#</b> 0.7	<b>6</b> 0.1	0.014	
8.0	<b>X</b> 0.3	× 0.9	0.216	
<b>×</b> 0.2	<b>1</b> 0.7	× 0.9	0.126	
<b>×</b> 0.2	<b>X</b> 0.3	<b>*</b> 0.1	0.006	
<b>X</b> 0.2	× 0.3	× 0.9	0.054	

			Probability	-In(Probability)
₩ 0.8	<b>6</b> 0.7	<b>*</b> 0.1	0.056	2.88
₩ 0.8	<b>₩</b> 0.7	× 0.9	0.504	0.69
₩ 0.8	<b>×</b> 0.3	<b>*</b> 0.1	0.024	3.73
<b>×</b> 0.2	<b>₩</b> 0.7	<b>*</b> 0.1	0.014	4.27
₩ 0.8	<b>X</b> 0.3	× 0.9	0.216	1.53
<b>×</b> 0.2	<b>6</b> 0.7	<b>X</b> 0.9	0.126	2.07
<b>×</b> 0.2	<b>X</b> 0.3	₩ 0.1	0.006	5.12
<b>X</b> 0.2	× 0.3	× 0.9	0.054	2.92

			Probability	-In(Probability)
₩ 0.8	<b>6</b> 0.7	<b>6</b> 0.1	0.056	2.88
₩ 0.8	<b>₩</b> 0.7	× 0.9	0.504	0.69
₩ 0.8	<b>×</b> 0.3	<b>*</b> 0.1	0.024	3.73
<b>×</b> 0.2	<b>₩</b> 0.7	<b>6</b> 0.1	0.014	4.27
₩ 0.8	<b>X</b> 0.3	× 0.9	0.216	1.53
× 0.2	<b>₩</b> 0.7	<b>X</b> 0.9	0.126	2.07
<b>×</b> 0.2	<b>X</b> 0.3	<b>*</b> 0.1	0.006	5.12
<b>X</b> 0.2	× 0.3	× 0.9	0.054	2.92











**Cross-Entropy** 

 $-\ln(0.8) - \ln(0.7) - \ln(0.9)$ 

 $p_1 = 0.8$ 



**Cross-Entropy** 

 $p_1 = 0.8$ 

 $\frac{1}{100}$  p<sub>2</sub> = 0.7



**Cross-Entropy** 

 $p_1 = 0.8$ 

 $\frac{1}{100}$  p<sub>2</sub> = 0.7

 $p_3 = 0.1$ 



**Cross-Entropy** 

```
p_1 = 0.8
```

$$\frac{1}{100}$$
 p<sub>2</sub> = 0.7

$$p_3 = 0.1$$



**Cross-Entropy** 

```
p_1 = 0.8
```

$$\frac{1}{12}$$
 p<sub>2</sub> = 0.7

$$p_3 = 0.1$$



**Cross-Entropy** 

-In(0.8) - In(0.7) - In(0.9)

 $y_i = 1$  if present on box i

 $\mathbf{\hat{f}} p_1 = 0.8$ 

 $\frac{1}{12}$  p<sub>2</sub> = 0.7

 $p_3 = 0.1$ 

 $y_i = 1$  if present on box i







 $p_1$ 

 $p_2$ 

1 - p<sub>3</sub>

 $y_{2} = 1$  $y_{1} = 1$ 

**Cross-Entropy** 

 $-\ln(0.8) - \ln(0.7) - \ln(0.9)$ 

 $p_1 = 0.8$ 

 $\frac{1}{12}$  p<sub>2</sub> = 0.7

 $p_3 = 0.1$ 

 $y_i = 1$  if present on box i





**\*** 0.8 **\*** 0.7 **×** 0.9



 $p_1$ 

p<sub>2</sub> 1 - p<sub>3</sub>

$$y_1 = 1$$

 $y_{2} = 1$  $y_3 = 0$  **Cross-Entropy** 

 $-\ln(0.8) - \ln(0.7) - \ln(0.9)$ 

$$p_1 = 0.8$$

$$\frac{11}{100}$$
 p<sub>2</sub> = 0.7

$$p_3 = 0.1$$

 $y_i = 1$  if present on box i











$$p_1$$

$$p_2$$

$$p_1 p_2 1 - p_3$$

$$y_1 = 1$$

$$y_1 = 1$$
  $y_2 = 1$   $y_3 = 0$ 

$$y_3 = 0$$

Cross-Entropy = 
$$-\sum_{i=1}^{m} y_i ln(p_i) + (1 - y_i) ln(1 - p_i)$$

$$y_i \ln(p_i) + (1 - y_i) \ln(1 - p_i)$$

$$\frac{1}{1}$$
 p<sub>1</sub> = 0.8

$$\frac{1}{12}$$
 p<sub>2</sub> = 0.7

$$p_3 = 0.1$$

 $y_i = 1$  if present on box i











$$p_1$$

$$p_2$$

$$p_1 p_2 1 - p_3$$

$$y_1 = 1$$

$$y_1 = 1$$
  $y_2 = 1$   $y_3 = 0$ 

$$y_{3} = ($$

Cross-Entropy = 
$$-\sum_{i=1}^{m} y_i \ln(p_i) + (1 - y_i) \ln(1 - p_i)$$

$$y_i ln(p_i) + (1 - y_i) ln(1 - p_i)$$



$$\frac{1}{1}$$
 p<sub>1</sub> = 0.8

$$\frac{11}{100}$$
 p<sub>2</sub> = 0.7

$$p_3 = 0.1$$

 $y_i = 1$  if present on box i













$$p_1$$

$$p_2$$

$$p_1 p_2 1 - p_3$$

$$y_1 = 1$$
  $y_2 = 1$   $y_3 = 0$ 

$$y_{2} = 1$$

$$y_{3} = ($$

Cross-Entropy = 
$$-\sum_{i=1}^{m} y_i \ln(p_i) + (1 - y_i) \ln(1 - p_i)$$

$$y_i \ln(p_i) + (1 - y_i) \ln(1 - p_i)$$





$$p_1 = 0.8$$

$$\frac{1}{2}$$
 p<sub>2</sub> = 0.7

$$p_3 = 0.1$$

 $y_i = 1$  if present on box i











$$p_1$$

$$p_2$$

$$p_1 p_2 1 - p_3$$

$$y_1 = 1$$
  $y_2 = 1$   $y_3 = 0$ 

$$y_2 = 1$$

$$y_{3} = ($$

Cross-Entropy = 
$$-\sum_{i=1}^{m} y_i \ln(p_i) + (1 - y_i) \ln(1 - p_i)$$

$$y_i \ln(p_i) + (1 - y_i) \ln(1 - p_i)$$





$$CE[(1,1,0), (0.8,0.7,0.1)] = 0.69$$

$$p_1 = 0.8$$

$$\frac{1}{100}$$
 p<sub>2</sub> = 0.7

$$p_3 = 0.1$$

 $y_i = 1$  if present on box i









 $p_1 p_2 1 - p_3$ 

$$y_1 = 1$$
  $y_2 = 1$   $y_3 = 0$ 

$$y_2 = '$$

$$y_3 = 0$$

Cross-Entropy = 
$$-\sum_{i=1}^{m} y_i \ln(p_i) + (1 - y_i) \ln(1 - p_i)$$

$$y_i \ln(p_i) + (1 - y_i) \ln(1 - p_i)$$



$$CE[(1,1,0), (0.8,0.7,0.1)] = 0.69$$

$$CE[(0,0,1), (0.8,0.7,0.1)] = 5.12$$