Train In Data

Expected frequency and joint probability

Contingency table

$$E = \text{(Row x Column) / Total}$$

Observed

	Cats	Dogs	
Brown	200	60	260
Ginger	100	10	110
	300	70	370

Expected

	Cats	Dogs
Brown	260 x 300 / 370	260 x 70 / 370
Ginger	110 x 300 / 370	110 x 70 / 370

Contingency table

$$E = (\text{Row} \times \text{Column}) / \text{Total}$$

Observed

	Cats	Dogs	
Brown	200	60	260
Ginger	100	10	110
	300	70	370

Expected

	Cats	Dogs
Brown	210.8	49.19
Ginger	89.19	20.81

Probability

Divide by number of observations

$$E = (\text{Row} \times \text{Column}) / \text{Total}$$

Observed

	Cats	Dogs	
Brown	0.541	0.162	0.703
Ginger	0.270	0.027	0.297
	0.811	0.189	**370**

Expected

	Cats	Dogs
Brown	?	?
Ginger	?	?

Marginal Probability

$$E = (\text{Row} \times \text{Column}) / \text{Total}$$

Observed

	Cats	Dogs	
Brown	0.541	0.162	0.703
Ginger	0.270	0.027	0.297
	0.811	0.189	370

Expected

	Cats	Dogs
Brown	?	?
Ginger	?	?

Marginals

- Probability that we take an animal from our population and it is a cat.
- Probability that we take an animal from our population and it is ginger.

Joint Probability

$$E = \text{(Row x Column) / Total}$$

Observed

	Cats	Dogs	
Brown	0.541	0.162	0.703
Ginger	0.270	0.027	0.297
	0.811	0.189	370

Expected

	Cats	Dogs
Brown	?	?
Ginger	?	?

The **joint probability**, is the probability of two events occurring together.

- P(brown, cat)
- P(brown, dog)
- P(ginger, cat)
- P(ginger, dog)

Joint Probability

$$E = (\text{Row} \times \text{Column}) / \text{Total}$$

Observed

	Cats	Dogs	
Brown	0.541	0.162	0.703
Ginger	0.270	0.027	0.297
	0.811	0.189	370

Expected

	Cats	Dogs
Brown	?	?
Ginger	?	?

$$P(A \cap B) = P(A) \times P(B)$$

Joint Probability

$$E = (\text{Row} \times \text{Column}) / \text{Total}$$

Observed

	Cats	Dogs	
Brown	0.541	0.162	0.703
Ginger	0.270	0.027	0.297
	0.811	0.189	370

Expected

	Cats	Dogs
Brown	p(cat) x p(Brown)	p(dog) x p(Brown)
Ginger	p(cat) x p(ginger)	p(dog) x p(ginger)

$$P(A \cap B) = P(A) \times P(B)$$

Joint Probability

$$E = (\text{Row} \times \text{Column}) / \text{Total}$$

Observed

	Cats	Dogs	
Brown	0.541	0.162	0.703
Ginger	0.270	0.027	0.297
	0.811	0.189	370

Expected

	Cats	Dogs
Brown	0.811 x 0.703	0.189 x 0.703
Ginger	0.811 x 0.297	0.189 x 0.297

$$P(A \cap B) = P(A) \times P(B)$$

Joint Probability

$$E = (\text{Row} \times \text{Column}) / \text{Total}$$

Observed

	Cats	Dogs	
Brown	0.541	0.162	0.703
Ginger	0.270	0.027	0.297
	0.811	0.189	370

Expected

	Cats	Dogs
Brown	0.570	0.133
Ginger	0.241	0.056

$$P(A \cap B) = P(A) \times P(B)$$

Joint Probability

$$E = (\text{Row} \times \text{Column}) / \text{Total}$$

Observed

	Cats	Dogs	
Brown	0.541	0.162	0.703
Ginger	0.270	0.027	0.297
	0.811	0.189	370

Expected

	Cats	Dogs
Brown	210.8	49.19
Ginger	89.19	20.81

Multiply by number of observations

$$P(A \cap B) = P(A) \times P(B)$$

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THANK YOU

www.trainindata.com