Conditional Distributions

 Conditional distributions are probability distributions over some variables given fixed values of others

Conditional Distributions

= hot	P	0.8	0.2
J(W T)	W	uns	rain

= cola	d	0.4
T M	W	ans
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L(M|L)

rain

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P(T,W)

T	M	P
hot	uns	0.4
hot	rain	0.1
cold	uns	0.2
cold	rain	0.3

Normalization Trick

$$P(W = s | T = c) = \frac{P(W = s, T = c)}{P(T = c)}$$

$$= \frac{\Gamma(W - s, I - c)}{P(W = s, T = c) + P(W = r, T = c)}$$
$$= \frac{0.2}{0.2 + 0.3} = 0.4$$

P(T, W)

 \nearrow

san

hot

rain

hot

rain

cold

sun

cold

$=r T=c) = \frac{P(W=r,T=c)}{P(T=c)}$	$= \frac{P(W = r, T = c)}{P(W = s, T = c) + P(W = r, T = c)}$	$=\frac{0.3}{0.0\pm0.3}=0.6$
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W	P
uns	0.4
rain	0.6

Normalization Trick

$$P(W = s | T = c) = \frac{P(W = s, T = c)}{P(T = c)}$$

$$= \frac{P(W = s, T = c)}{P(W = s, T = c) + P(W = r, T = c)}$$

$$= \frac{0.2}{0.2 + 0.3} = 0.4$$
NORMALIZE the

P(T,W)

\mathbf{T}	W	P
hot	sun	0.4
hot	rain	0.1
cold	sun	0.2
cold	rain	0.3

SELECT the joint

probabilities matching the



T	W	Ь
cold	sun	0.2
cold	rain	0.3





W	P
sun	0.4
rain	9.0

P(W|T=c)

(make it sum to one)

P(c, W)

selection

Normalization Trick

P(T,W)

Ь	0.4	0.1	0.2	0.3
W	sun	rain	sun	rain
T	hot	hot	cold	cold

SELECT the joint

matching the probabilities

evidence

P(c, W)

(make it sum to one) sun rain cold cold

P(W|T=c)NORMALIZE the

selection

Ь	0.4	0.6
M	sun	rain

• Why does this work? Sum of selection is P(evidence)! (P(T=c), here)

$$P(x_1|x_2) = \frac{P(x_1, x_2)}{P(x_2)} = \frac{P(x_1, x_2)}{\sum_{x_1} P(x_1, x_2)}$$