

Probabilistic
Graphical
Models



Inference

MAP

Finding a MAP Assignment

Decoding a MAP Assignment

- Easy if MAP assignment is unique
 - Single maximizing assignment at each clique
 - Whose value is the θ value of the MAP assignment
 - Due to calibration, choices at all cliques must agree

a^1	b^1	c^1	7
a^1	b^1	c^2	4.5
a^1	b^2	c^1	0.2
a^1	b^2	c^2	2
a^2	b^1	c^1	3
a^2	b^1	c^2	0.5
a^2	b^2	c^1	1.2
a^2	b^2	c^2	3

↙

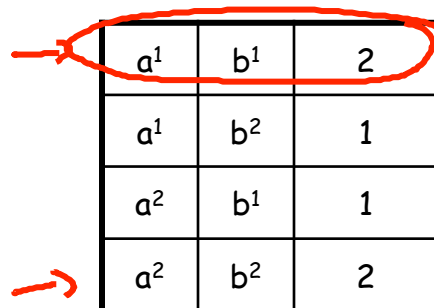
a^1	b^1	$3+4=7$
a^1	b^2	$0+2=2$
a^2	b^1	$-1+4=3$
a^2	b^2	$1+2=3$

↘

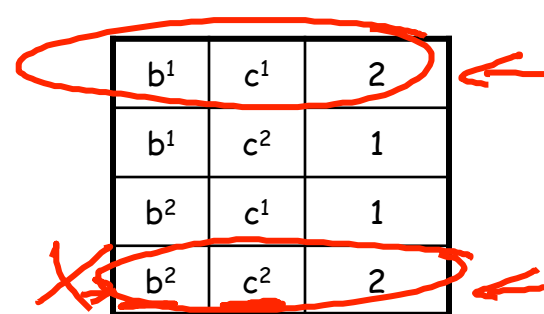
b^1	c^1	$4+3=7$
b^1	c^2	$1.5+3=4.5$
b^2	c^1	$0.2+1=1.2$
b^2	c^2	$2+1=3$

Decoding a MAP assignment

- If MAP assignment is not unique, we may have multiple choices at some cliques
- Arbitrary tie-breaking may not produce a MAP assignment



a^1	b^1	2
a^1	b^2	1
a^2	b^1	1
a^2	b^2	2



b^1	c^1	2
b^1	c^2	1
b^2	c^1	1
b^2	c^2	2

Decoding a MAP assignment

- If MAP assignment is not unique, we may have multiple choices at some cliques
- Arbitrary tie-breaking may not produce a MAP assignment
- Two options:
 - Slightly perturb parameters to make MAP unique
 - Use traceback procedure that incrementally builds a MAP assignment, one variable at a time