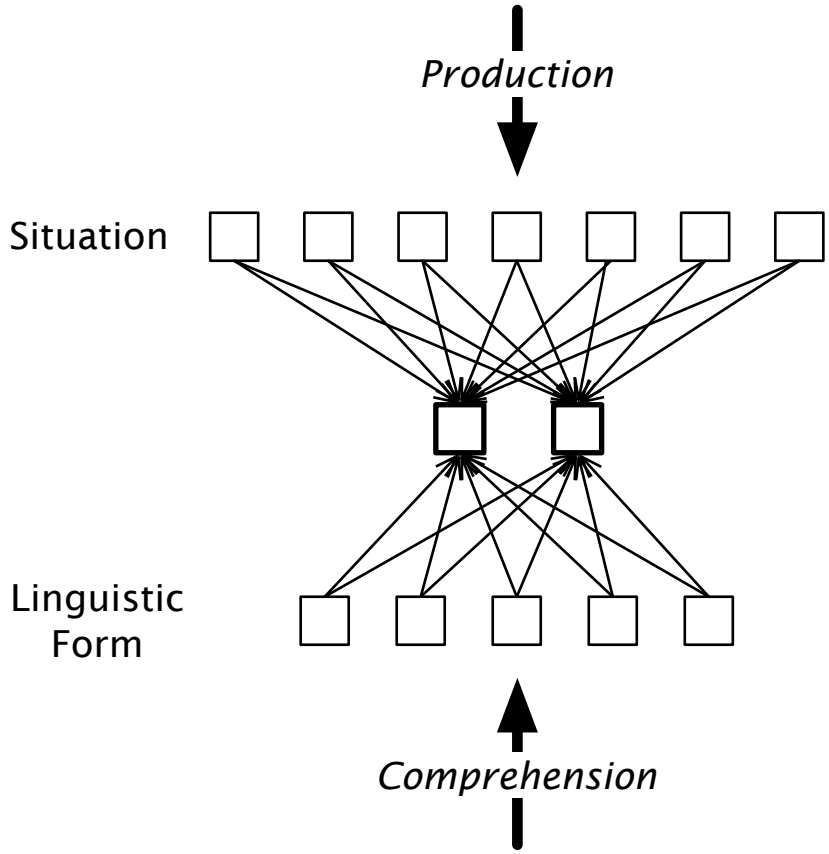
Statistical Learning Mechanisms

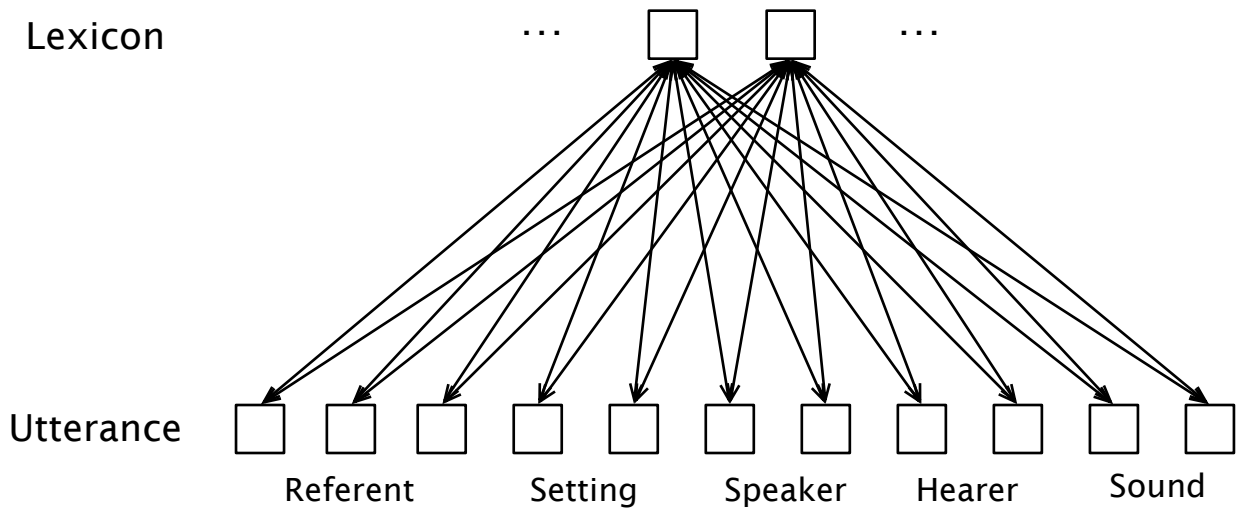
Week 4

Q450/B490
Spring 2012

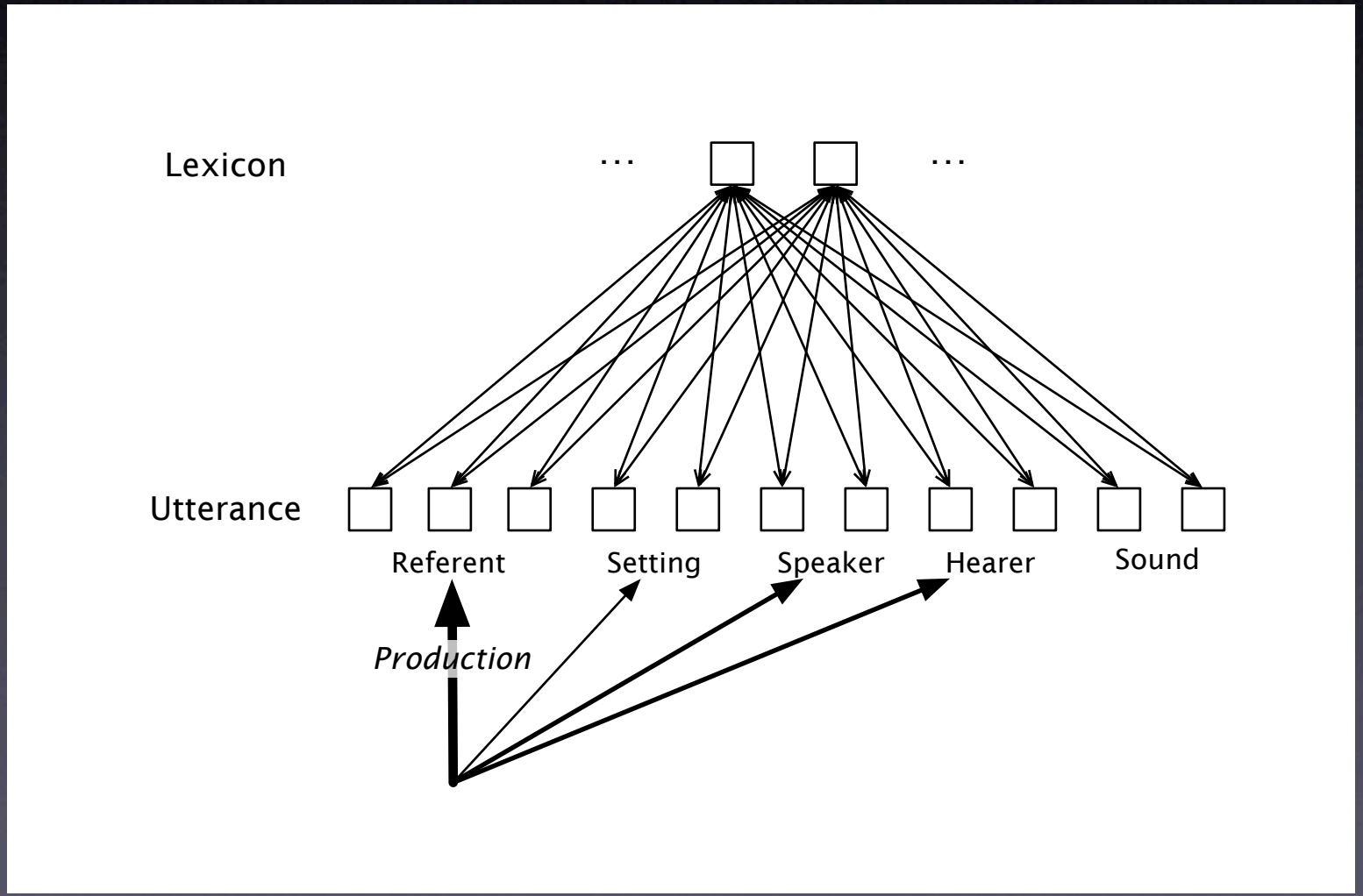
A connectionist lexicon (I)



A connectionist lexicon (2)



A connectionist lexicon (2)



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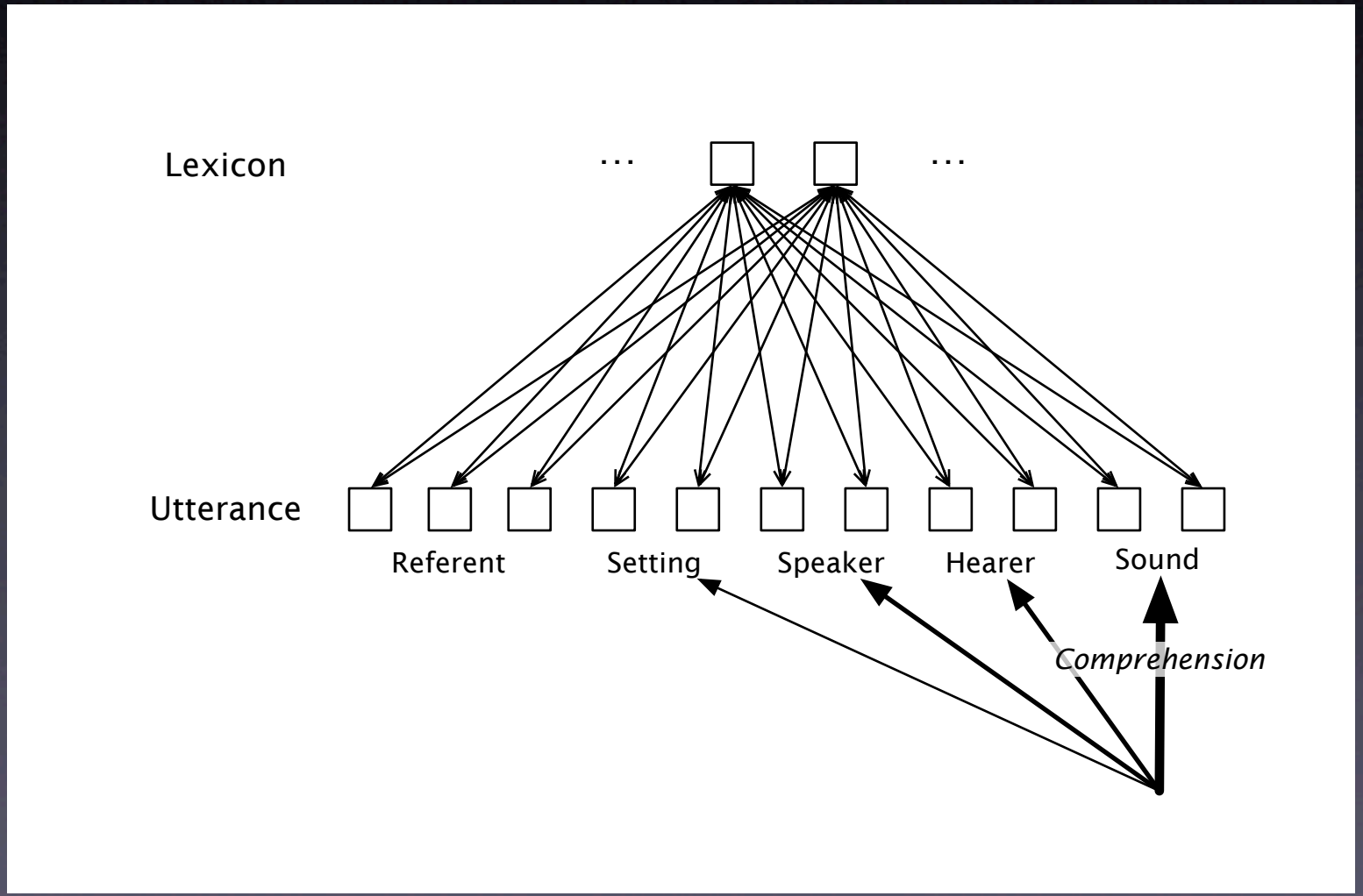

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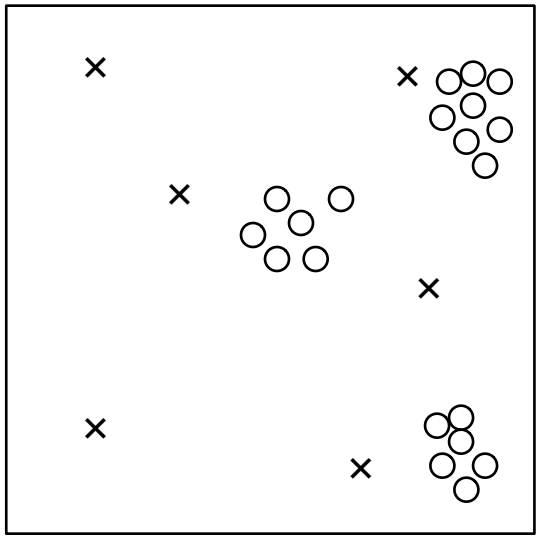
  - Update the weights into the winner by moving them toward the input by some small distance (η_{winner}).
  - Variation: update the weights into the losers by moving them toward the input by an even smaller distance (η_{loser}).

Competitive learning in 2D



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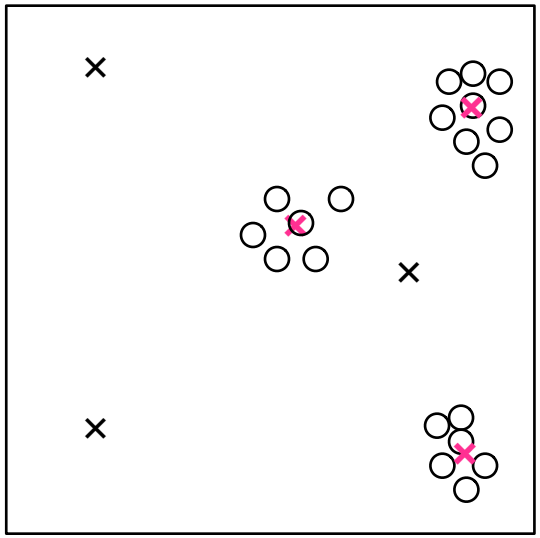
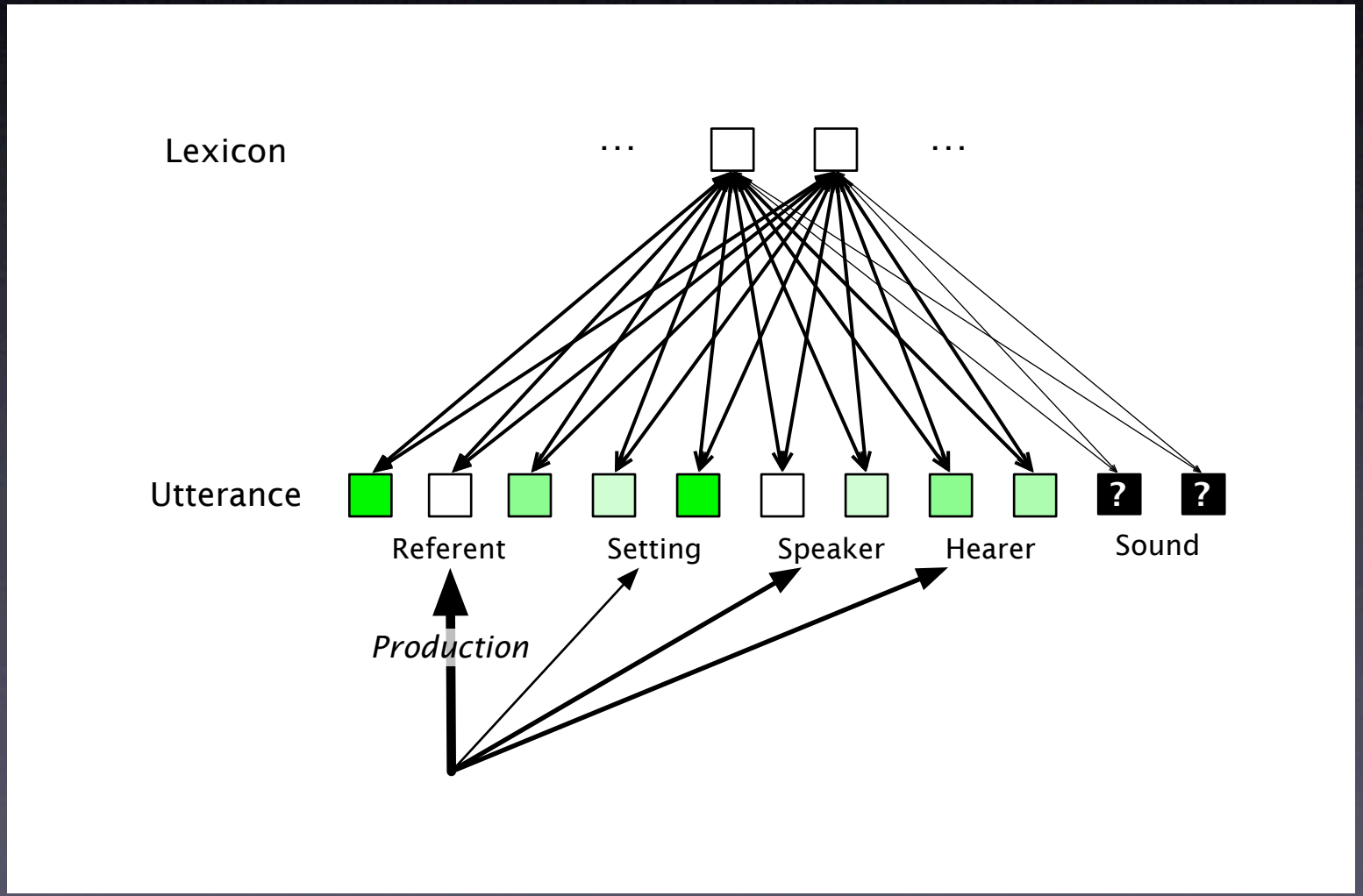
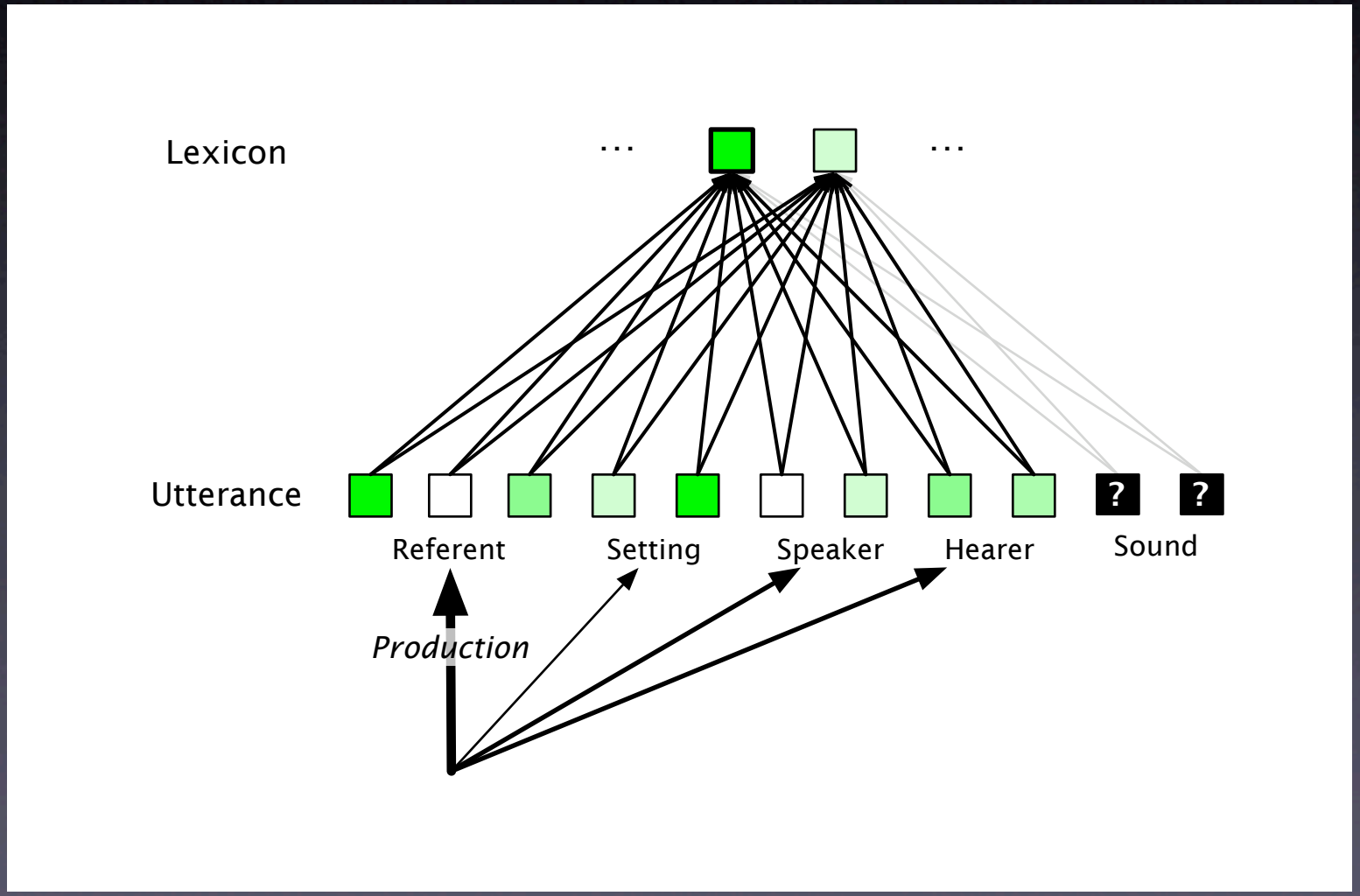


Testing the lexicon: production



Testing the lexicon: production



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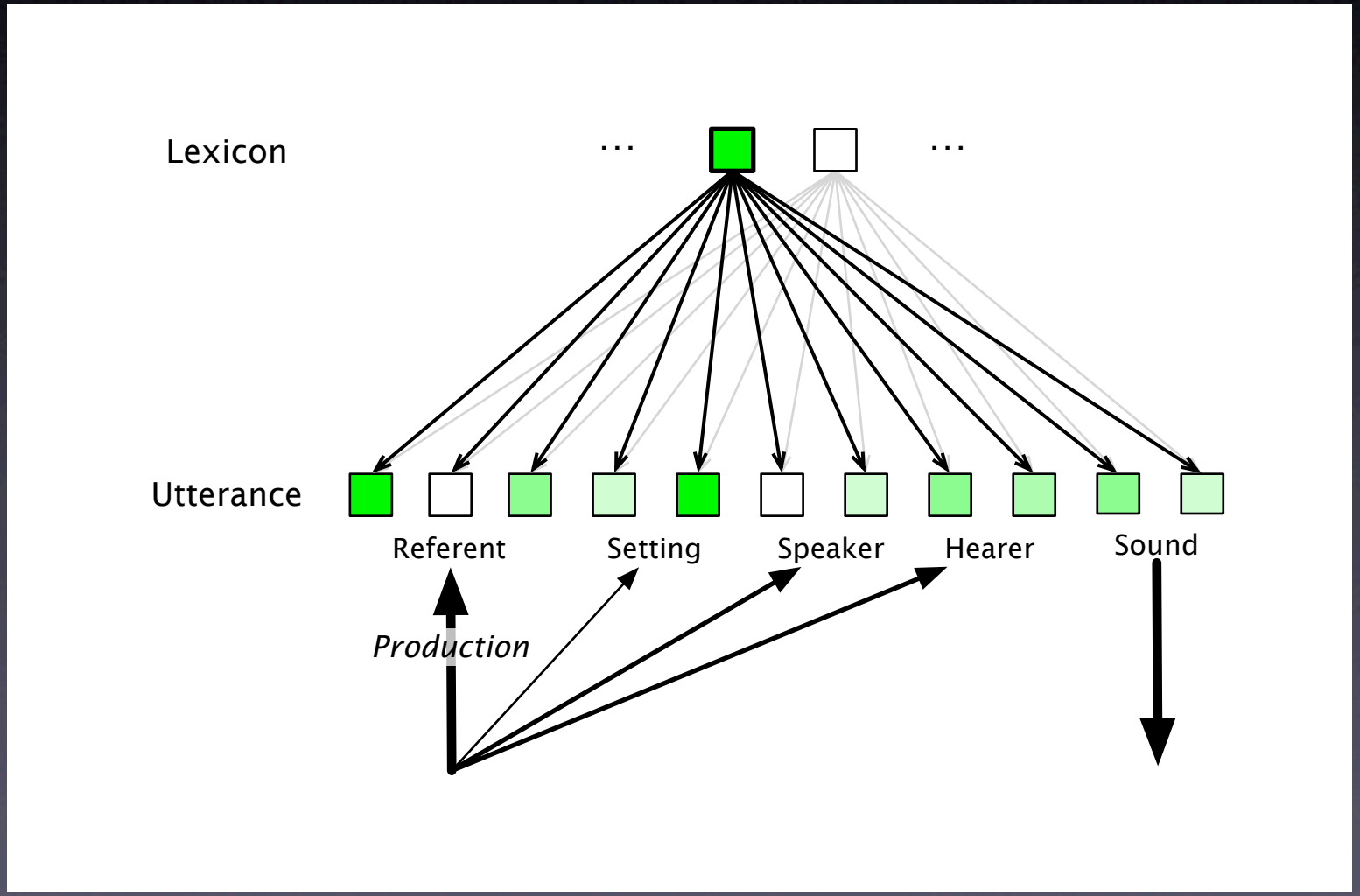

Semantic space models (statistical semantics)

- Goals
  - Discover some aspects of the meanings of words automatically
  - (Sometimes) a model of human (cognitive) semantics
  - (Occasionally) a model of human word learning
- The basic idea
  - Given lots of texts, count the co-occurrences of each word with other words (HAL) or with contexts (paragraphs, articles, etc.; LSA).
  - The "meaning" of each word is its (sometimes compressed) co-occurrence vector.
  - Semantic distance is the distance between vectors.

Semantic space models: HAL, etc.

	peach	strawberry	fruit	eat	pick	sweet	sour	dessert	jam
peach	—								
strawberry		—							
fruit			—						
eat				—					
pick					—				
sweet						—			
sour							—		
dessert								—	
jam									—

Semantic space models: LSA, etc.

	context1	context2	context3	context4	context5	context6	context7
peach							
strawberry							
fruit							
eat							
pick							
sweet							
sour							
dessert							
jam							

Applications of semantic space approaches

- Word similarity and priming
- Document similarity
- Information retrieval
- Essay grading
- Lexical development (late)
- Semantic development (early; Riordan)