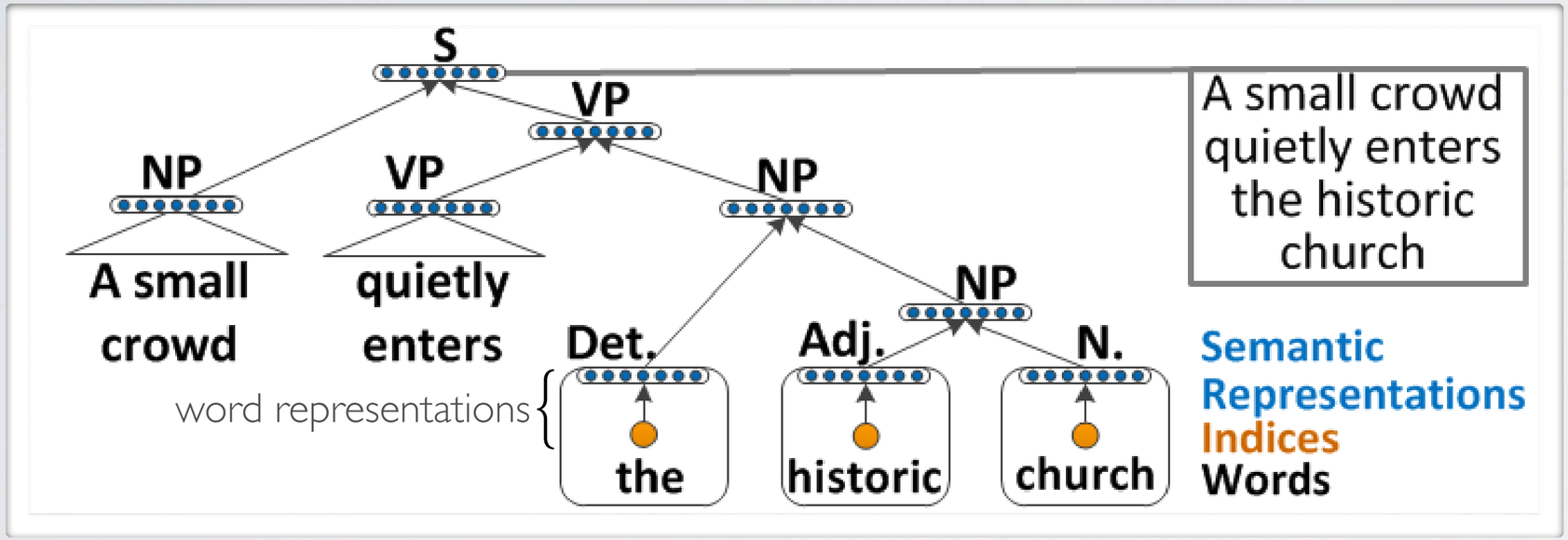
Neural networks

Natural language processing - tree inference

RECURSIVE NEURAL NETWORK

Topics: recursive neural network (RNN)

- Idea: recursively merge pairs of word/phrase representations



- We need 2 things
  - a model that merges pairs of representations
  - a model that determines the tree structure

Socher, Lin, Ng and Manning, 2011

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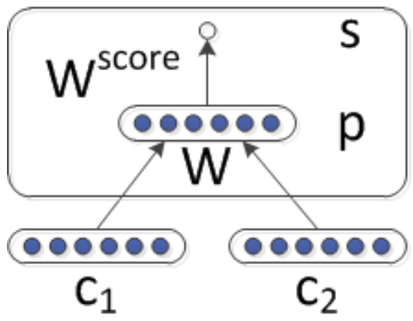
- Given two input representations c_1 and c_2, the recursive network computes the merged representation p as follows:



$$s = W^{score} p$$
$$p = f(W[c_1; c_2] + b)$$

Socher, Lin, Ng and Manning, 2011

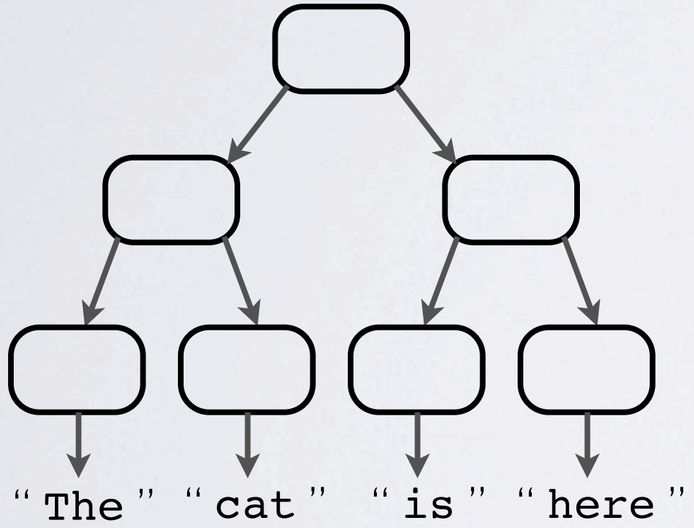
- The network also computes a score s
  - it estimates the quality of the merge
  - it will be used to decide which pairs of representations to merge first

RECURSIVE NEURAL NETWORK

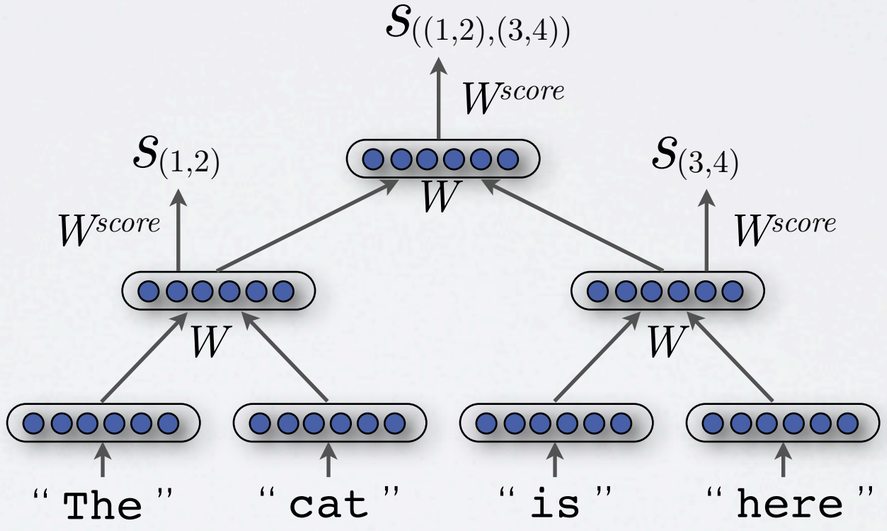
Topics: recursive neural network (RNN)

- The score of the full tree is the sum of all merging scores

Parse tree



Recursive network



Score: $s_{(1,2)} + s_{(3,4)} + s_{((1,2),(3,4))}$

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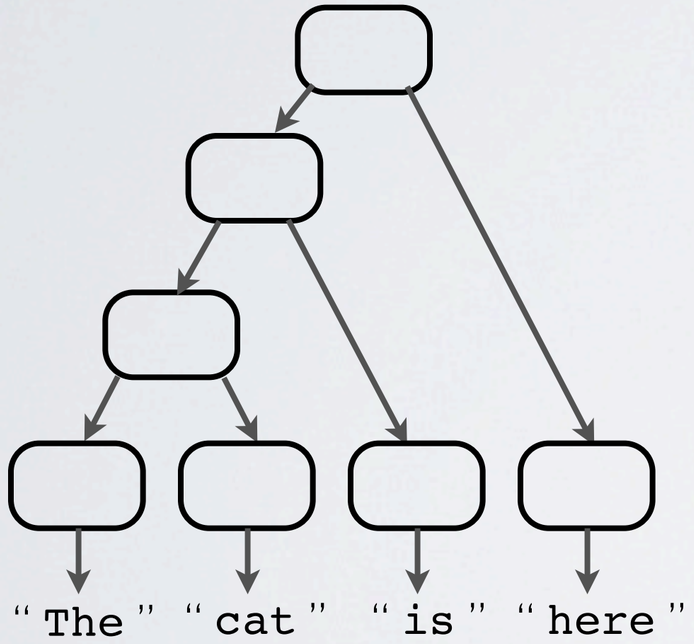
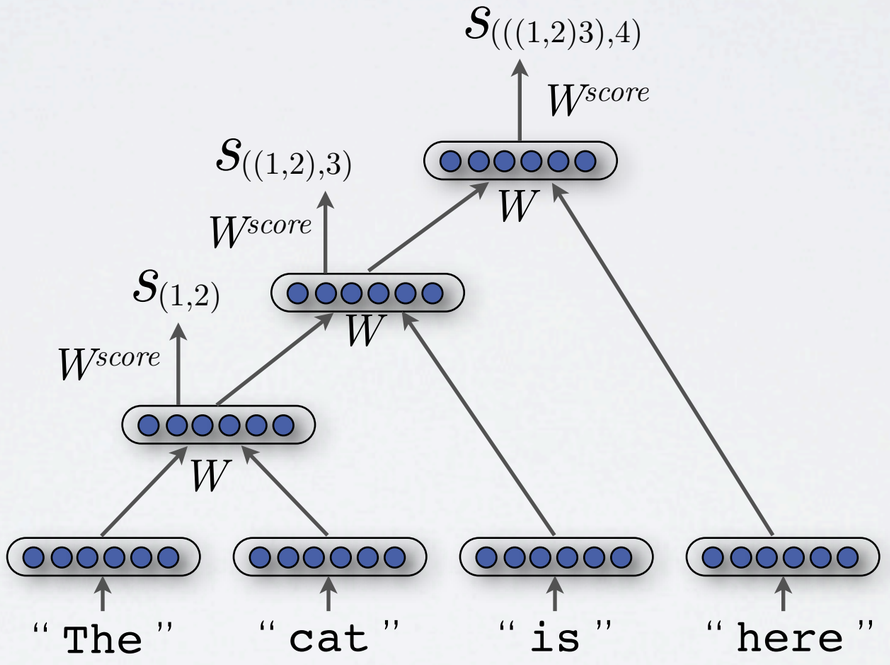


Recursive network

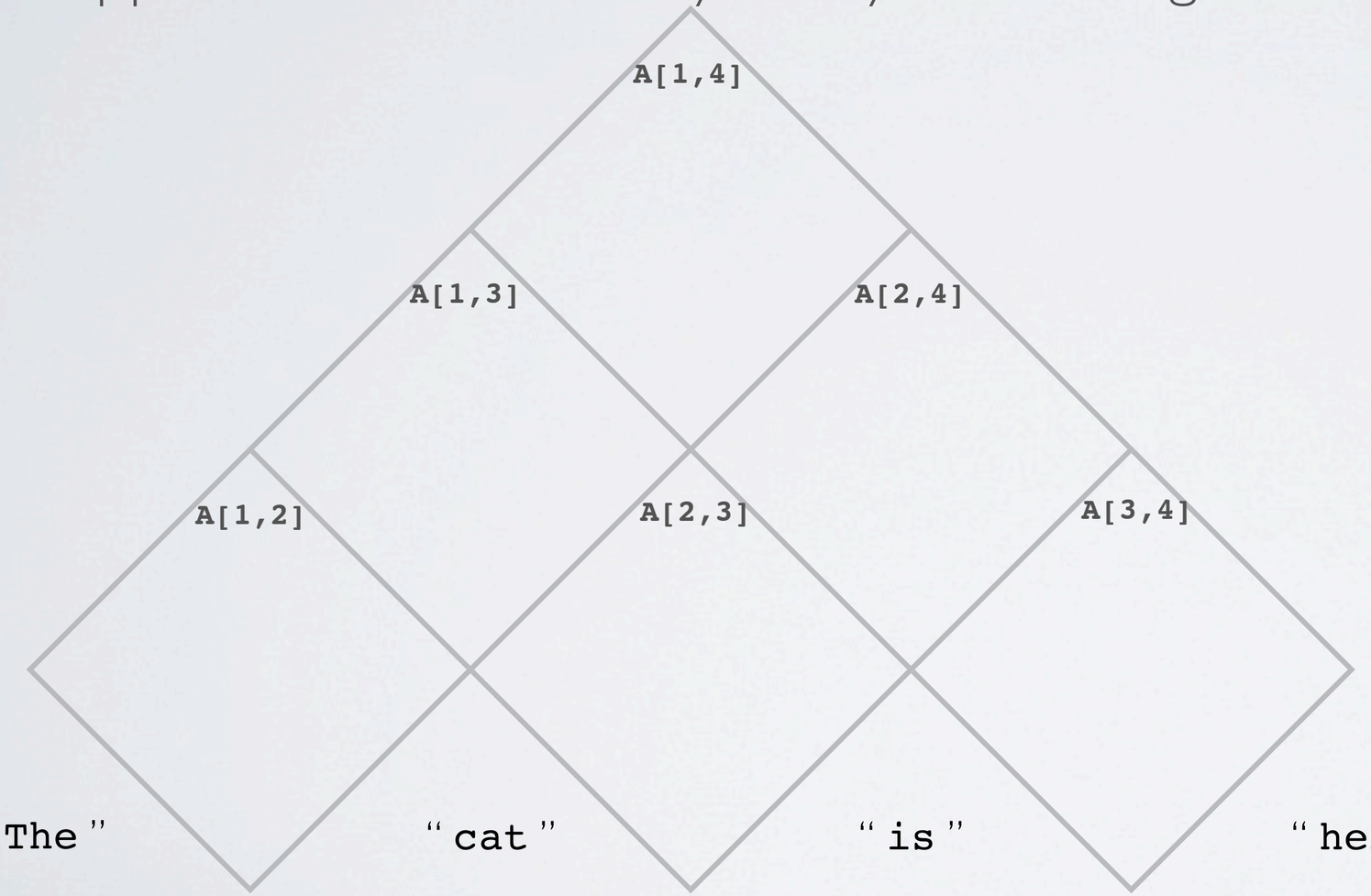


Score: $s_{(1,2)} + s_{((1,2),3)} + s_{(((1,2),3),4)}$

RECURSIVE NEURAL NETWORK

Topics: recursive neural network (RNN)

- Approximate best tree by locally maximizing each subtree



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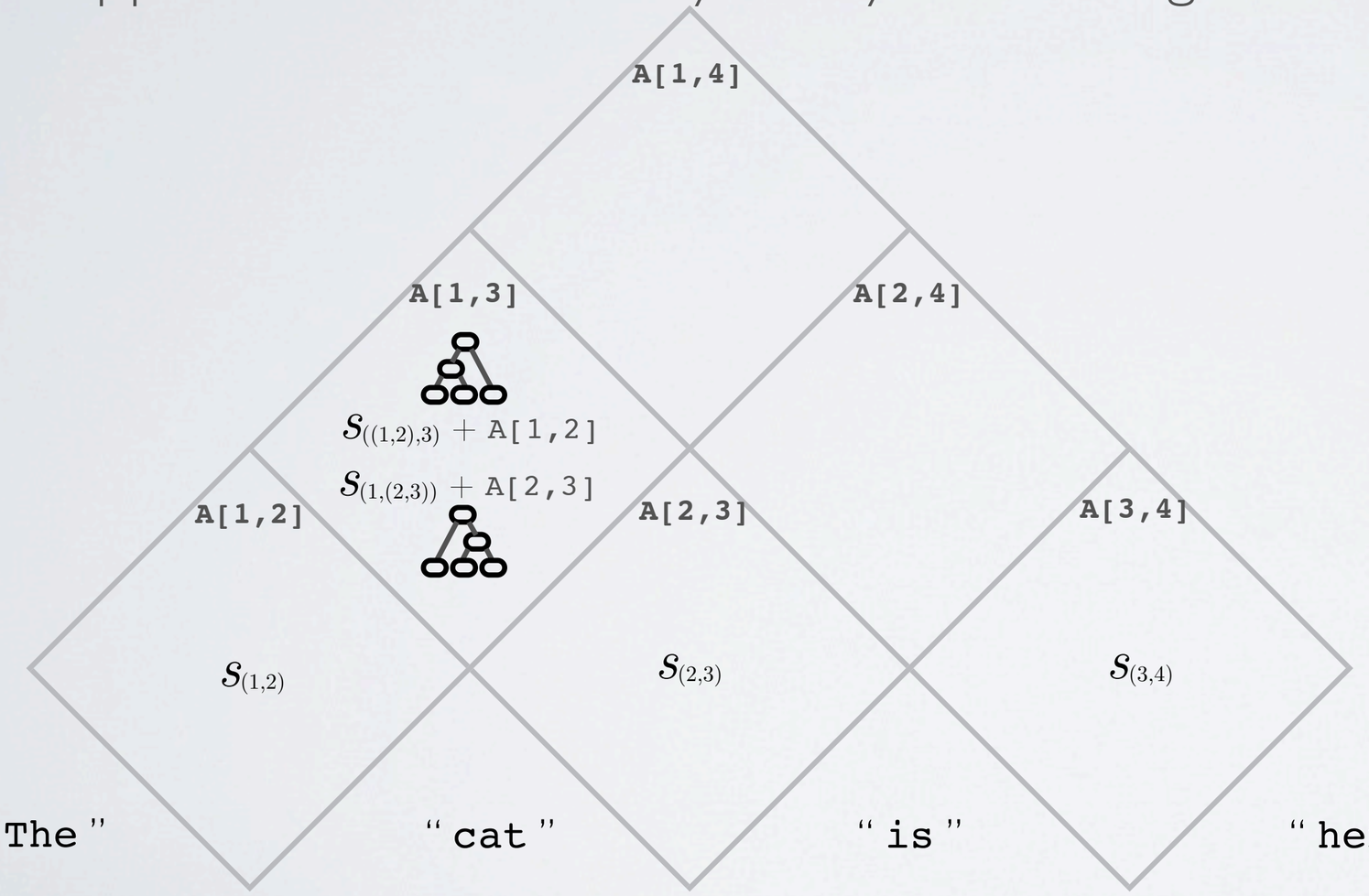

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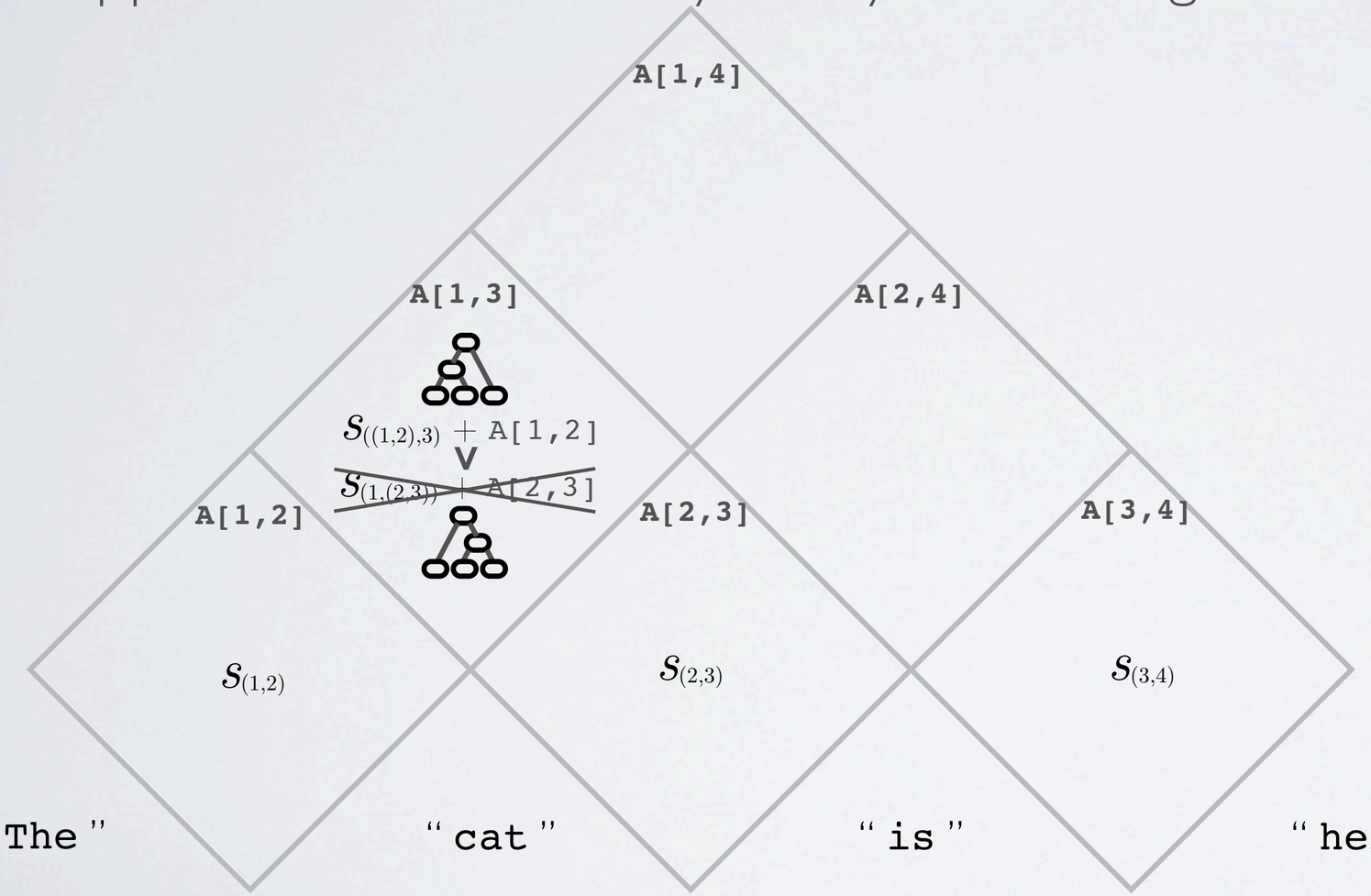

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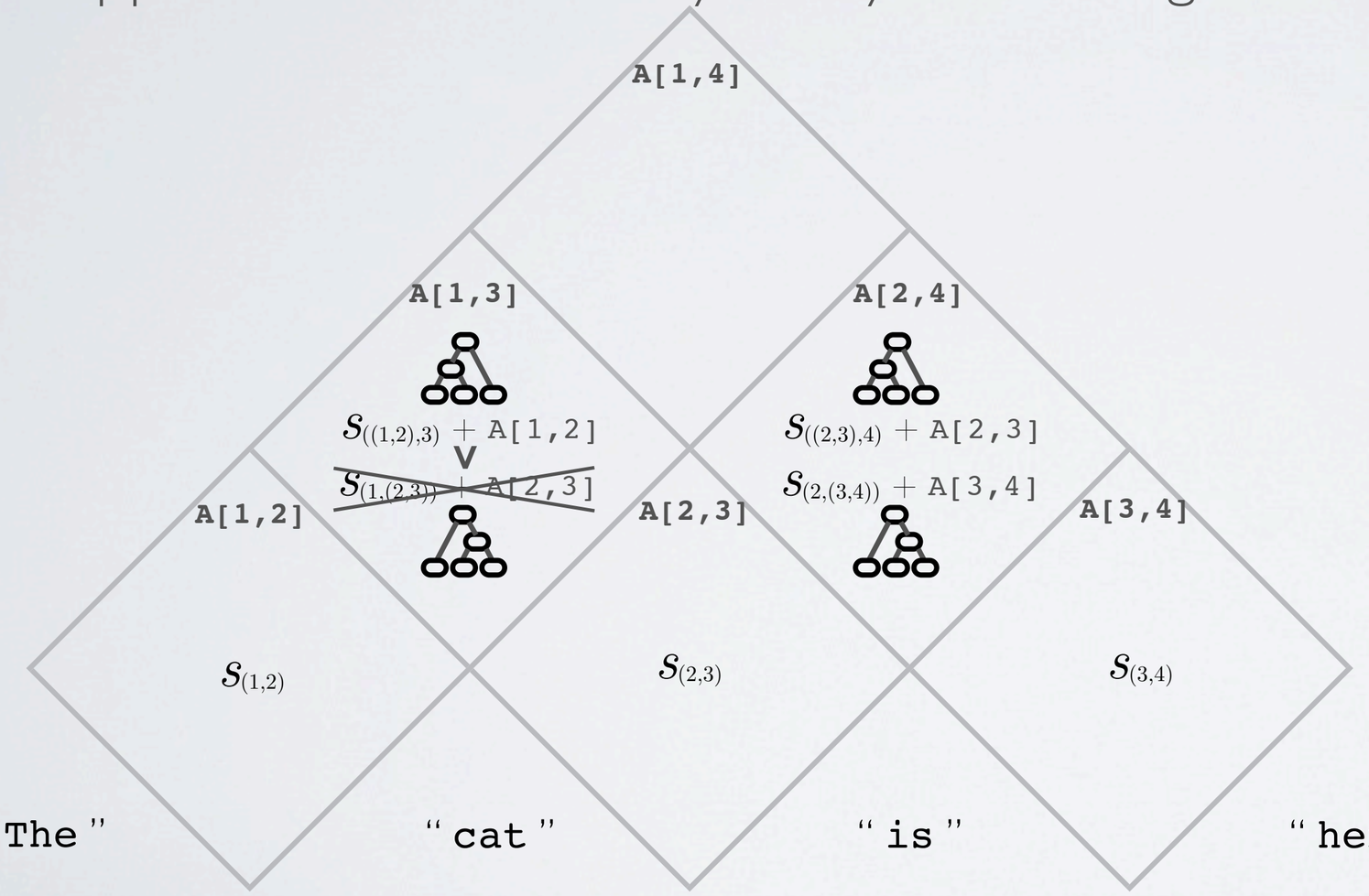

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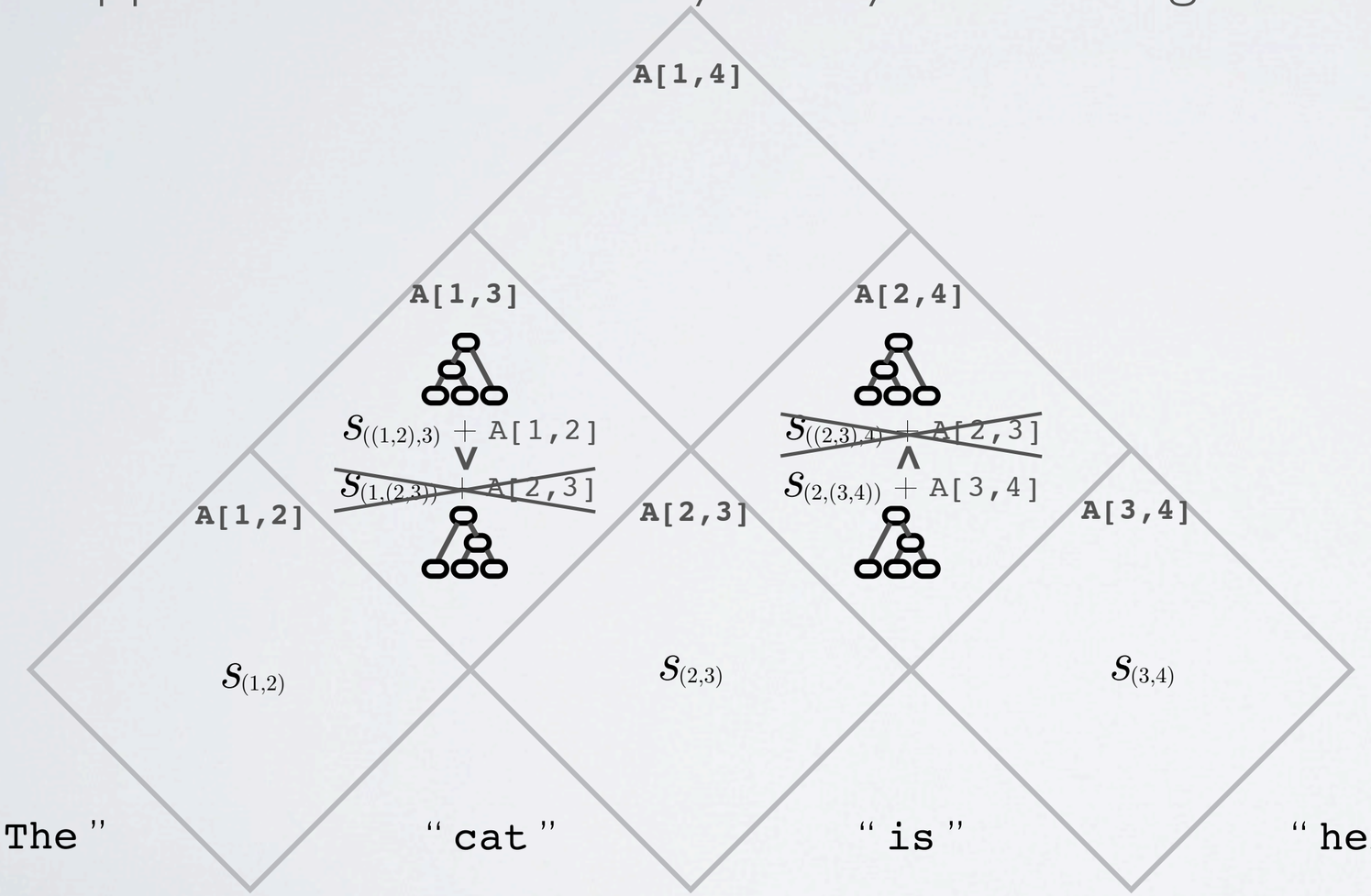

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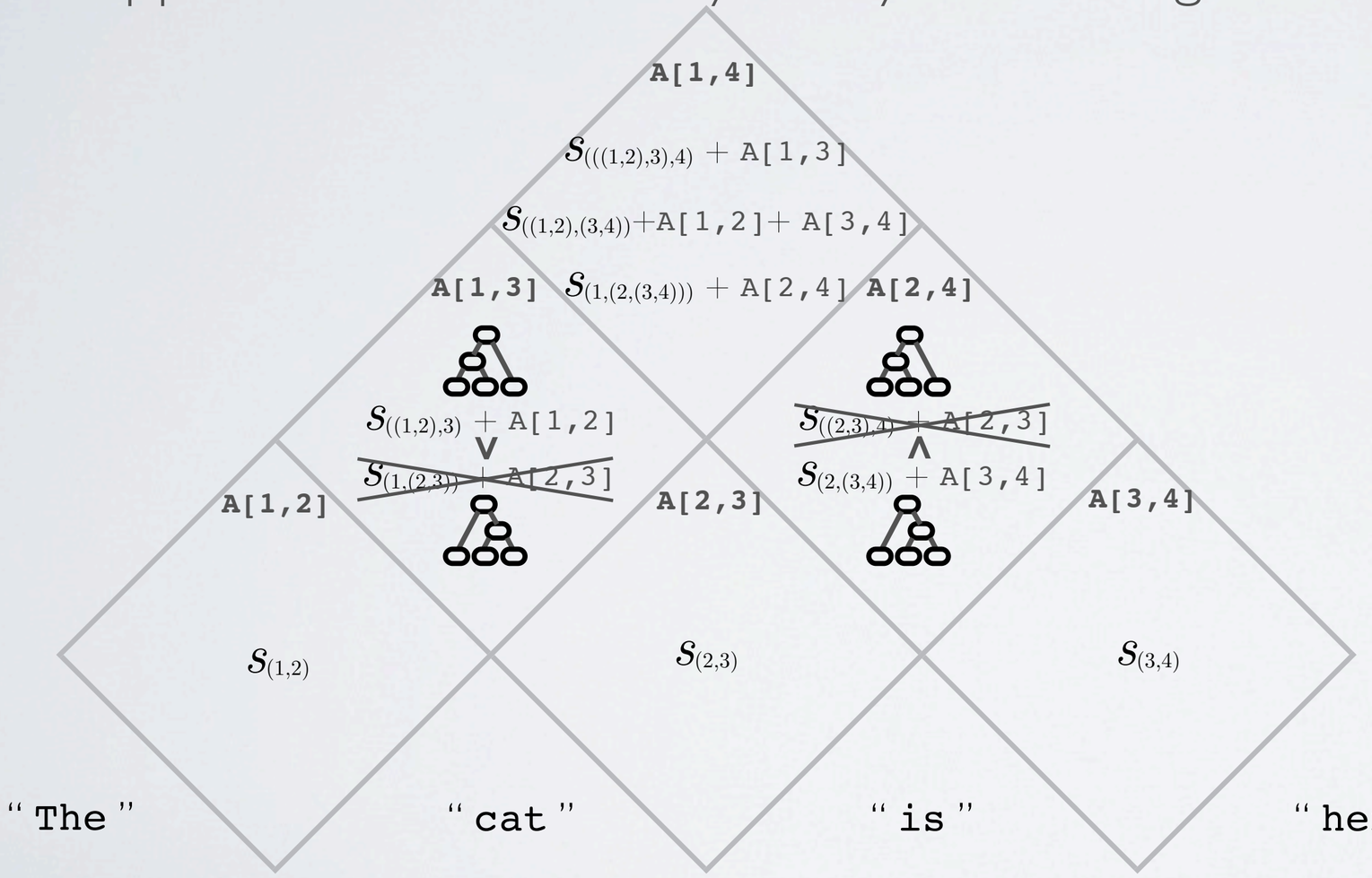

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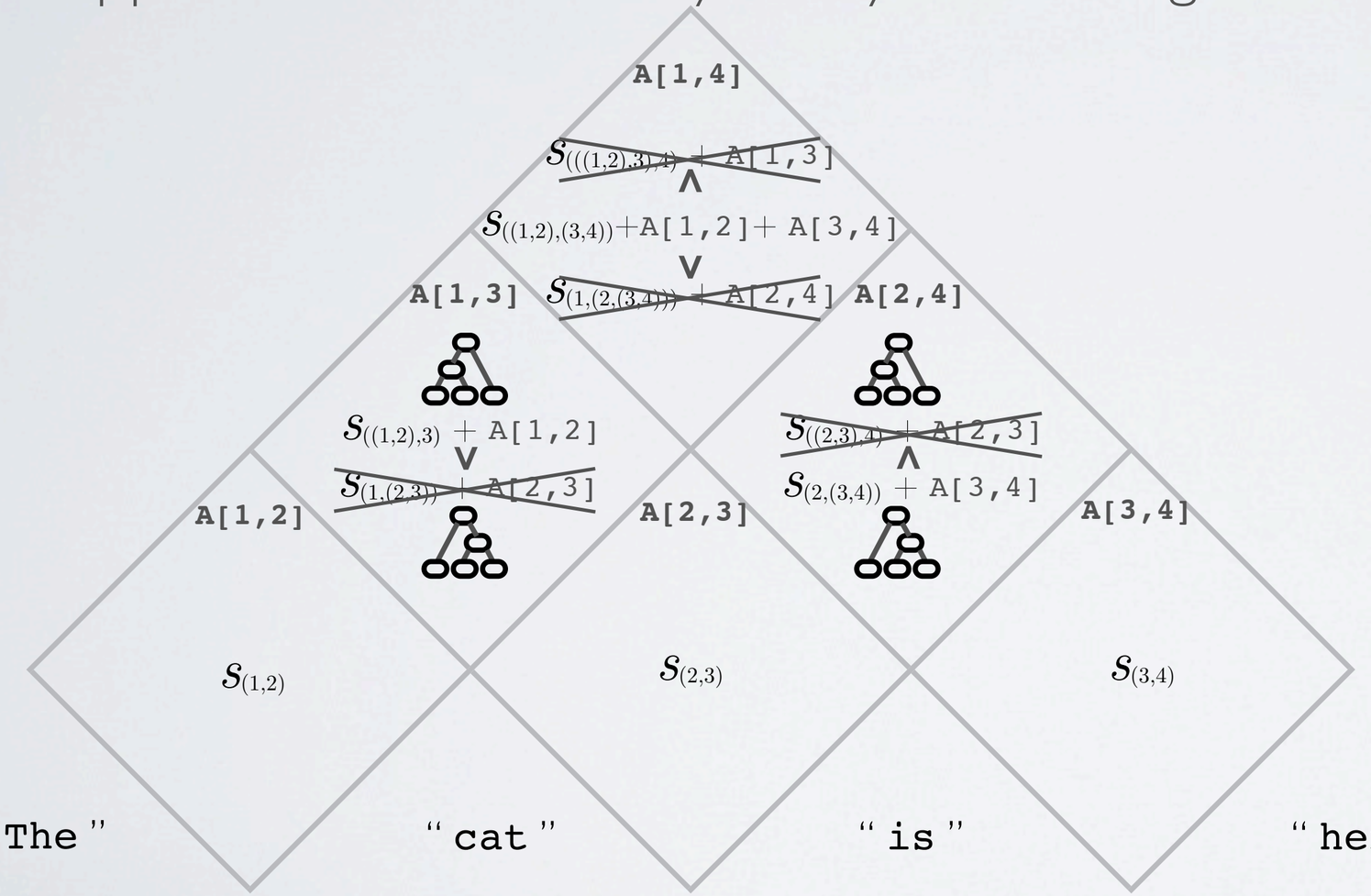

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