Event extraction using iterative optimization

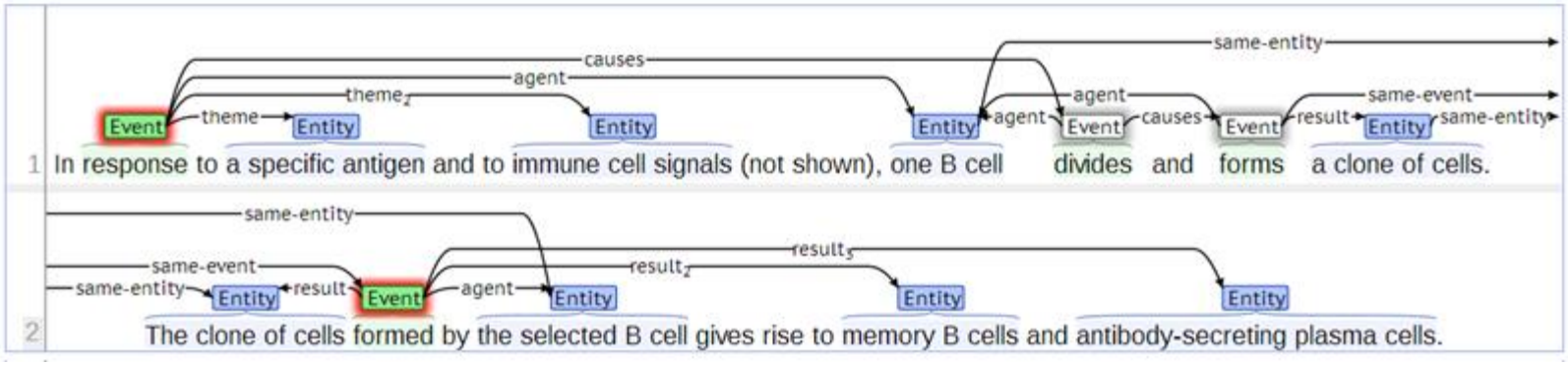
Aju Thalappillil Scaria
Rishita Anubhai
Rose Marie Philip

Guided by – Jonathan Berant, Post Doc in NLP Group

Project goal

In response to a specific antigen and to immune cell signals (not shown), one B cell divides and forms a clone of cells. The remaining B cells, which have antigen receptors specific for other antigens, do not respond. The clone of cells formed by the selected B cell gives rise to memory B cells and antibody-secreting plasma cells.

Model



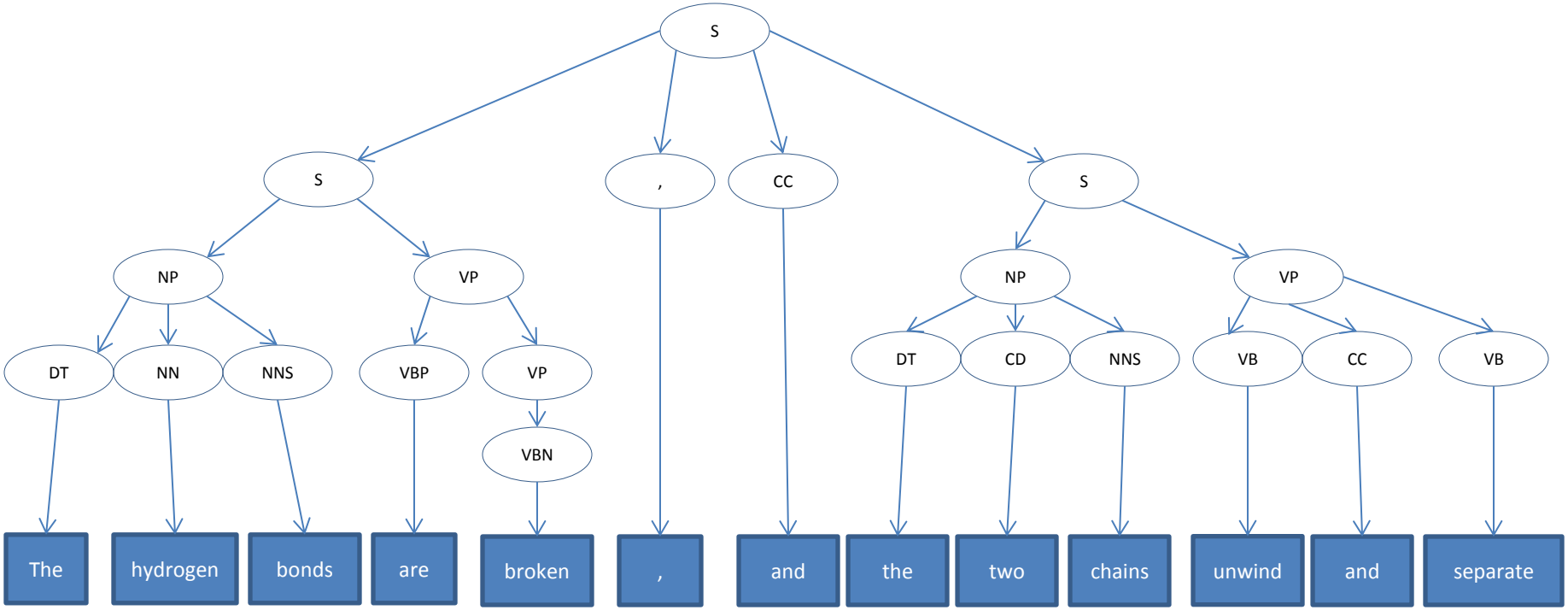
Stages

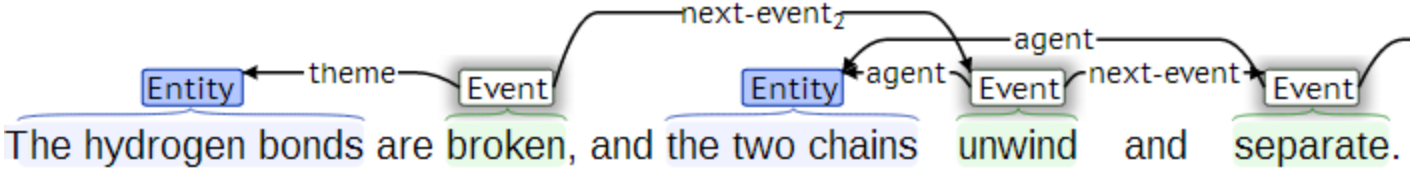
- Three high level stages
  - Event/trigger prediction
  - Entity/argument identification for triggers
  - Semantic role labeling the entities identified
- MaxEnt based classifier for prediction
- Features
  - Lexical
  - Dependency tree based
  - Parse tree based

We use Stanford CoreNLP Toolkit

Representation

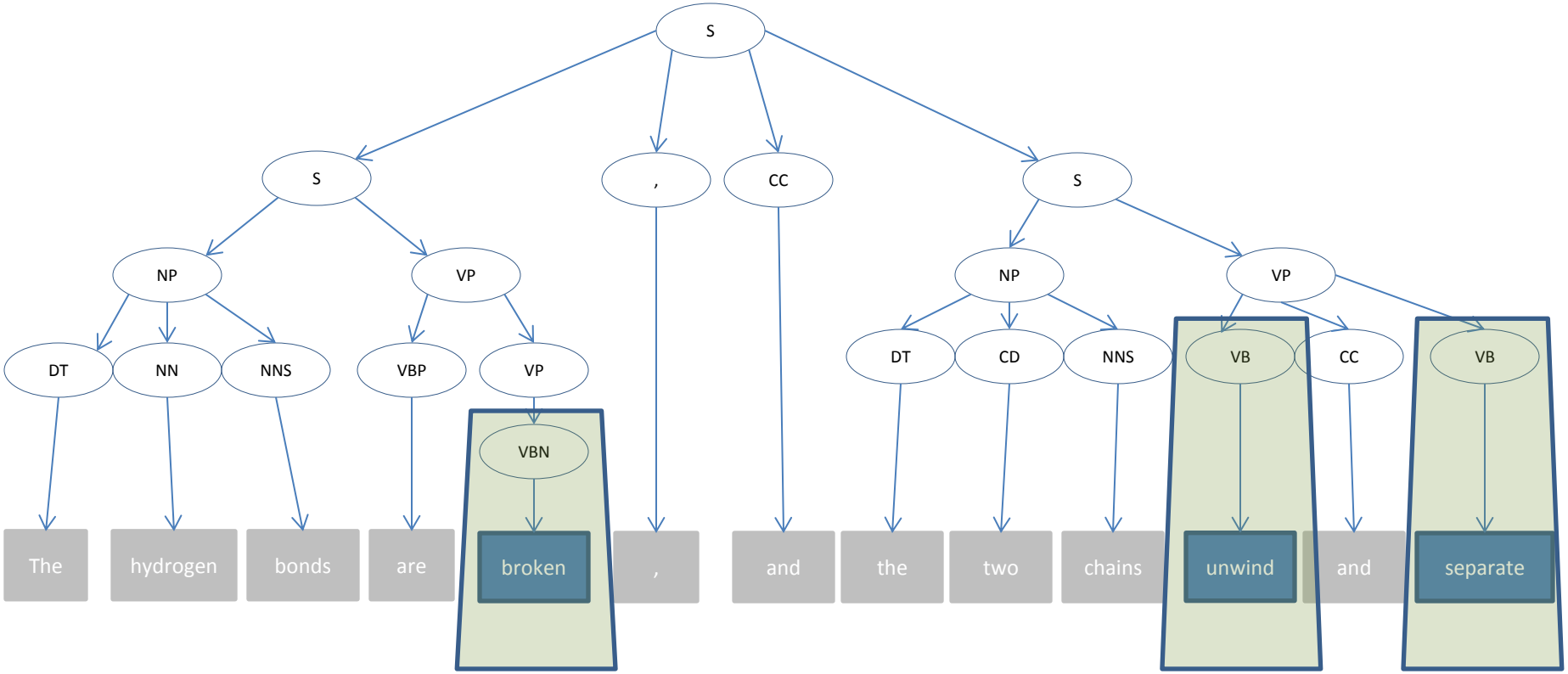
The hydrogen bonds are broken, and the two chains unwind and separate.

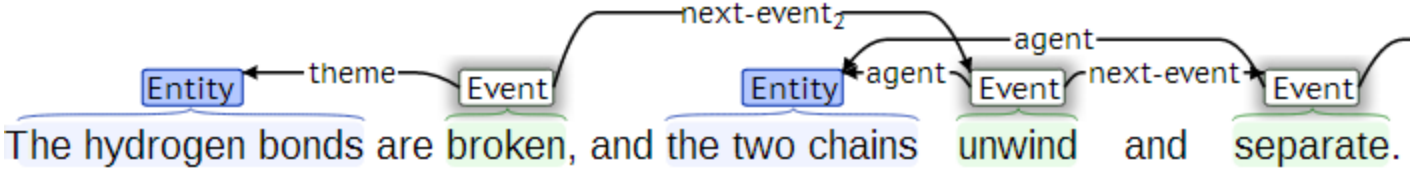




Representation – Event triggers

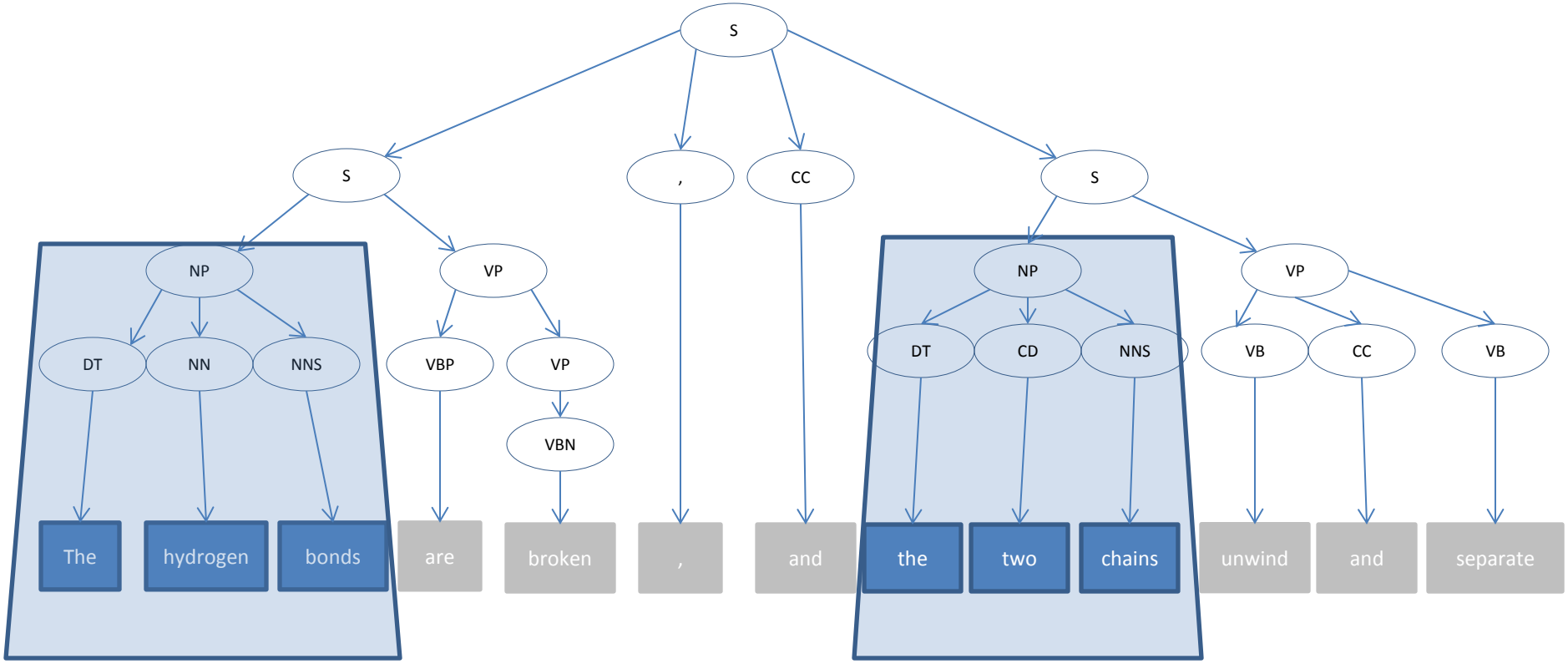
The hydrogen bonds are broken, and the two chains unwind and separate.

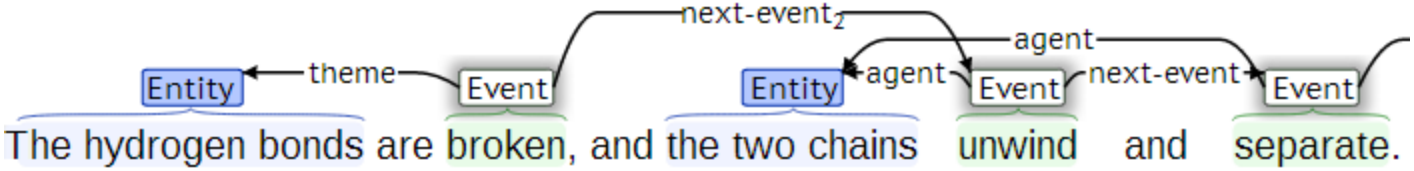




Representation - Entities

The hydrogen bonds are broken, and the two chains unwind and separate.

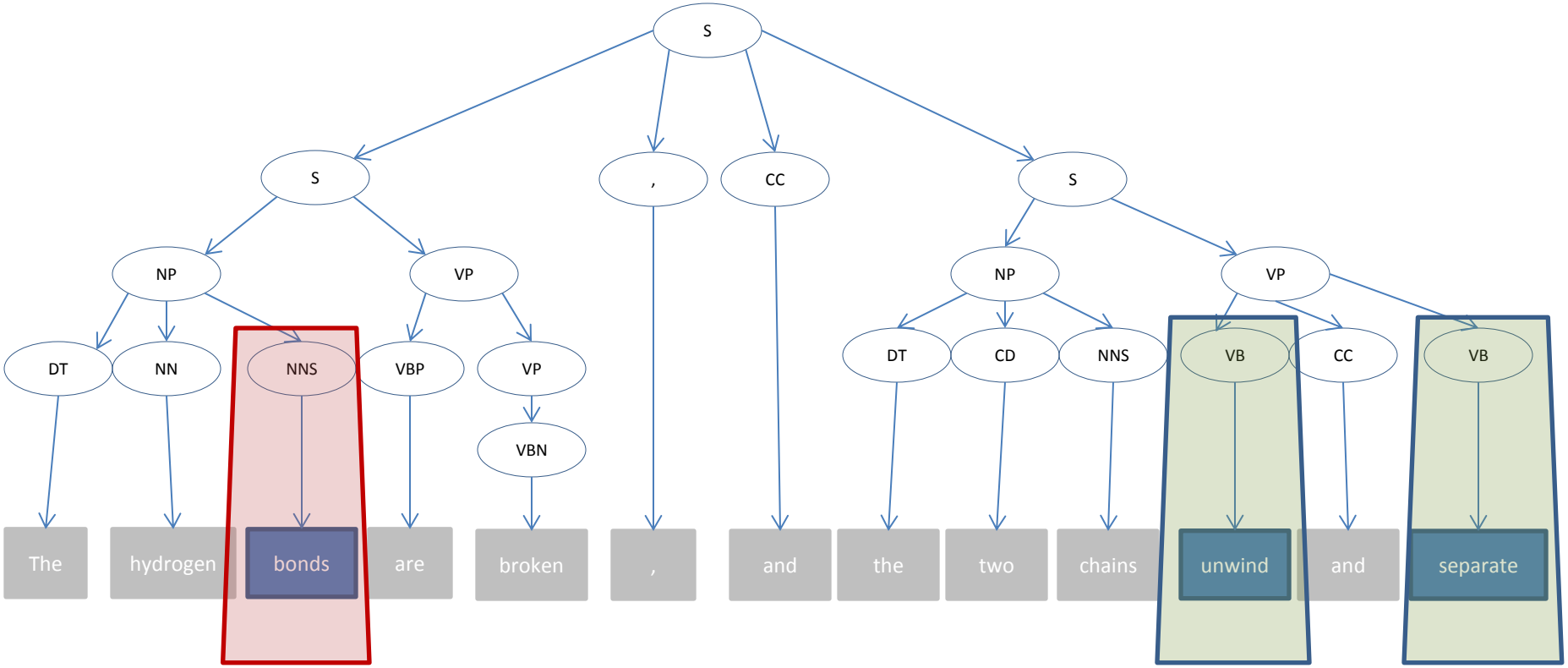


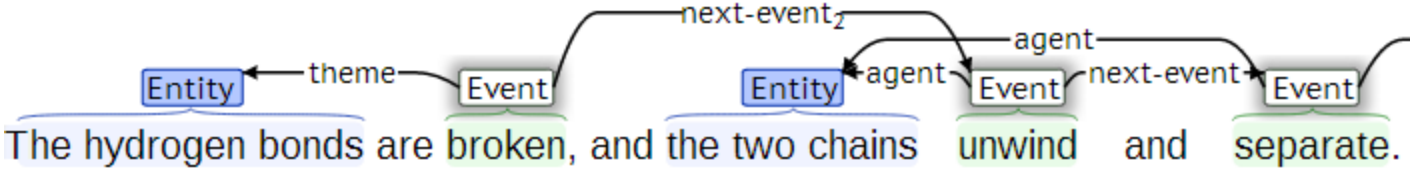


MODELS

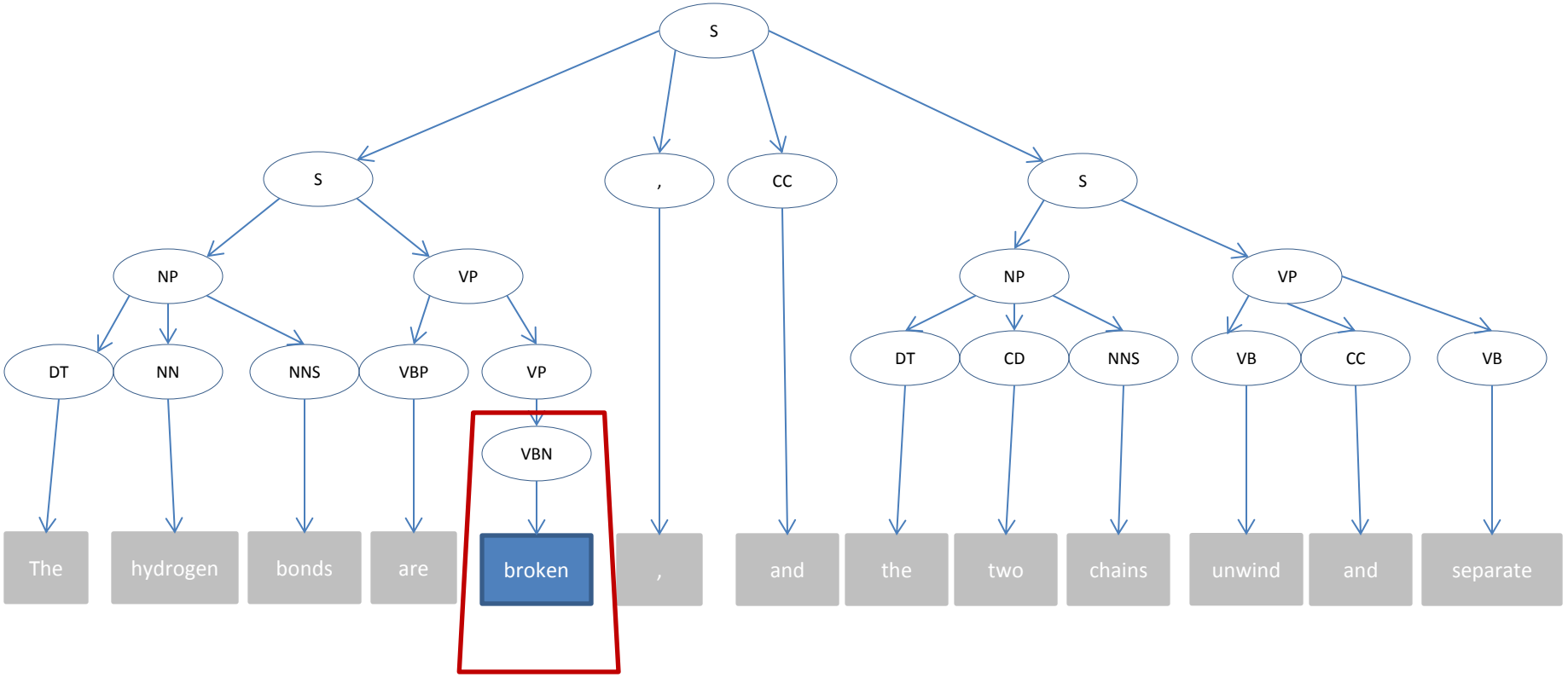
Event trigger prediction

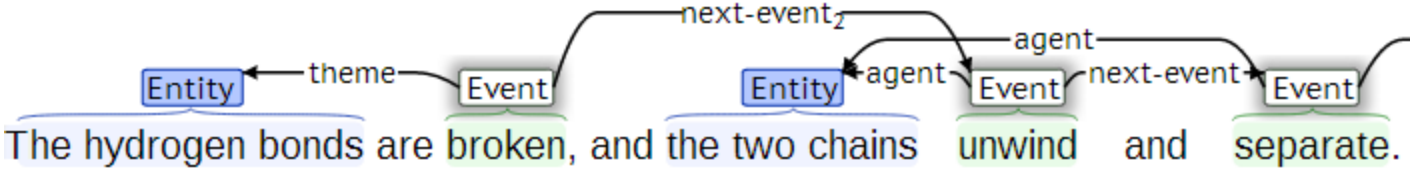
$$P(word \in \{TRIGGER\} \mid sentence)$$





Event trigger prediction





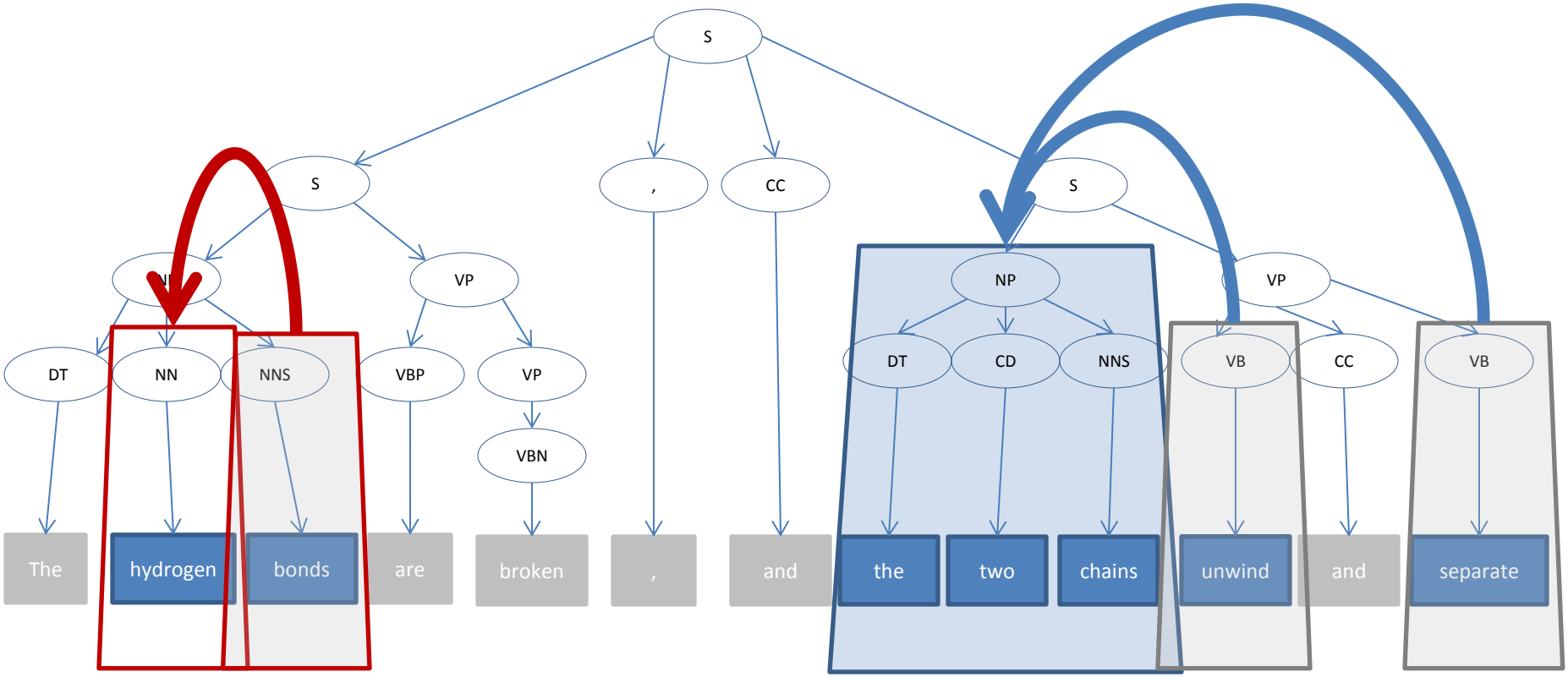
Event argument (entity) prediction

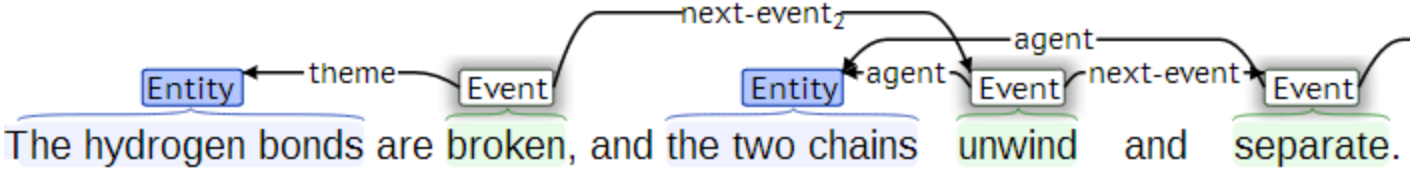
- For each trigger

$$P(phrase = argument \mid trigger, sentence)$$

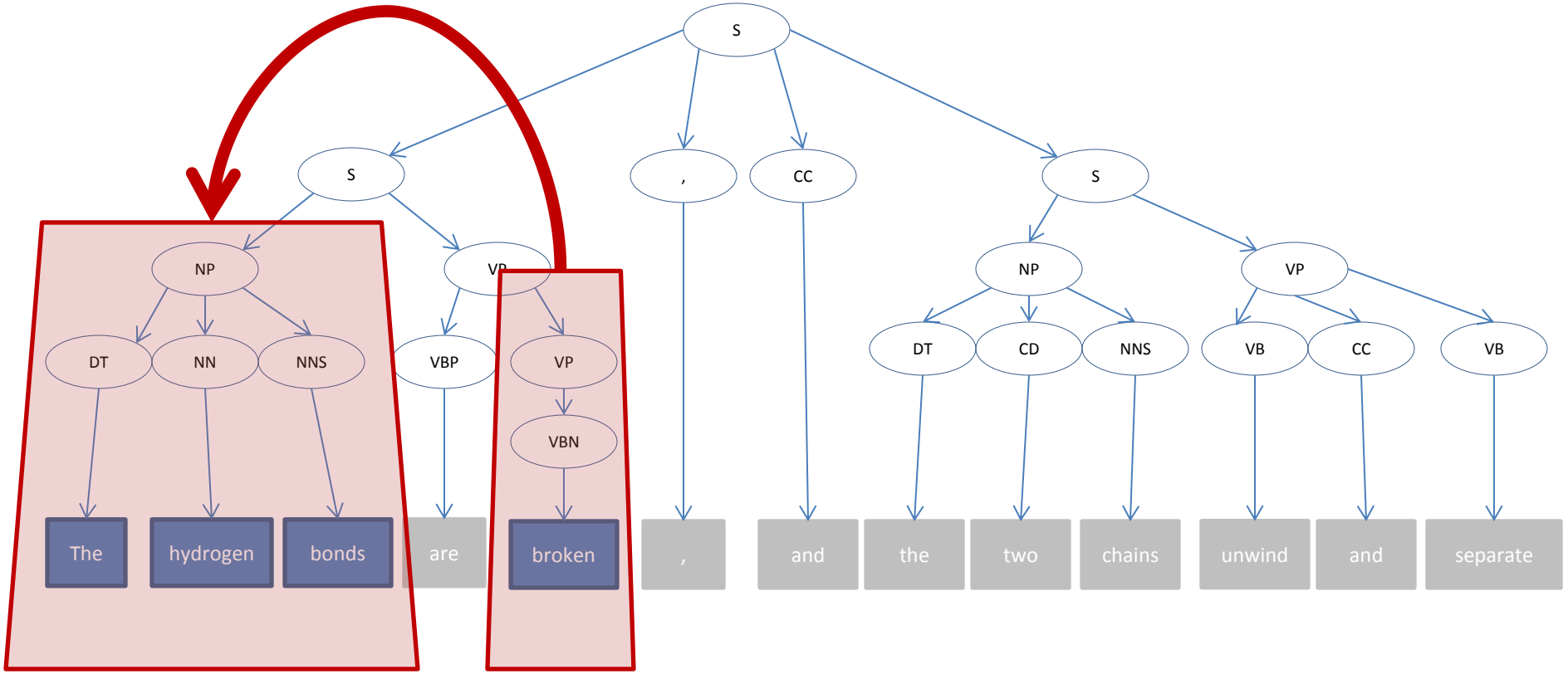
- Non overlapping constraint
  - Dynamic program

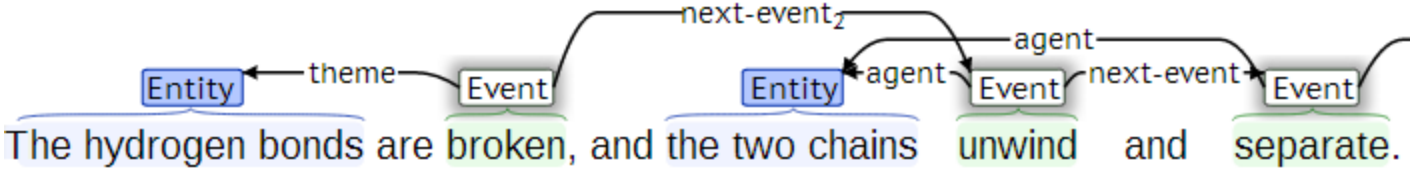
Argument prediction for trigger





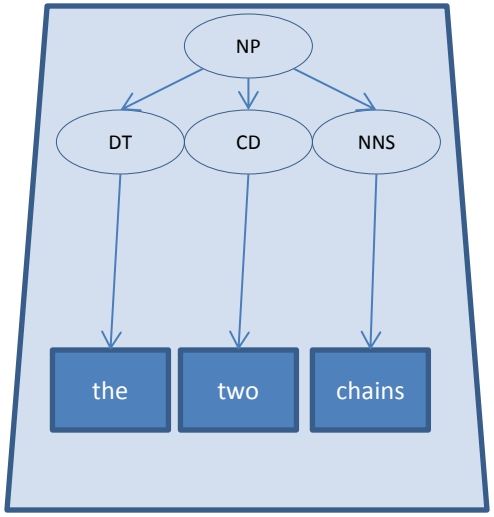
Argument prediction for trigger



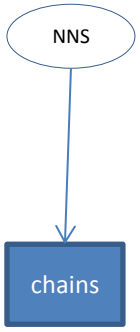


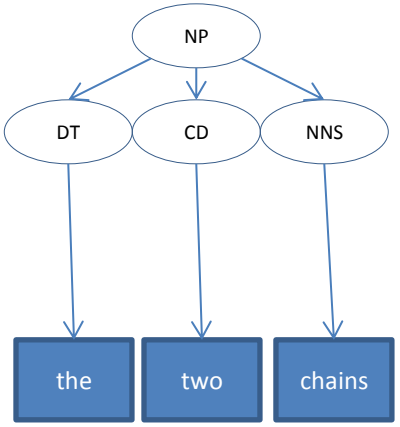
Dynamic program

Actual



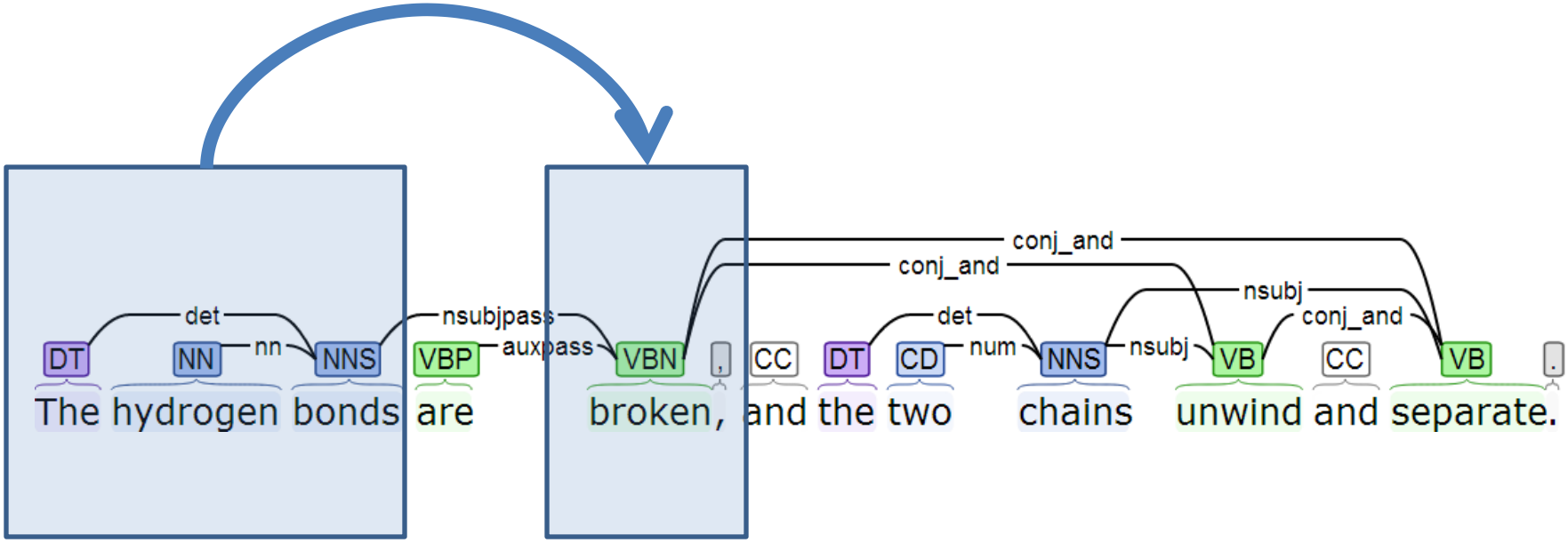
Predicts both



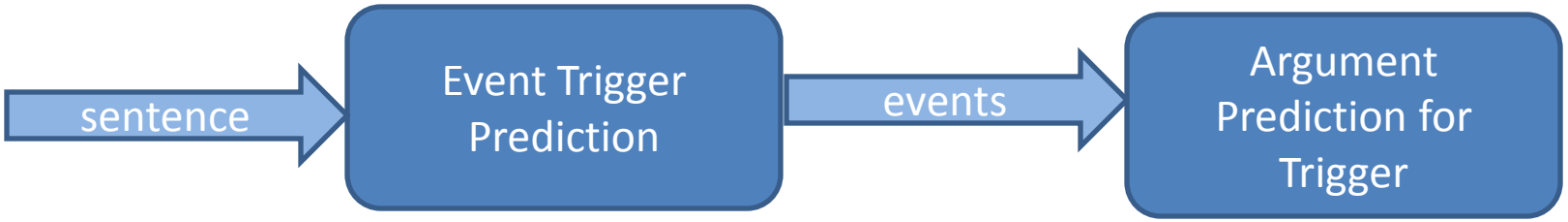


Can we use entities to predict triggers?

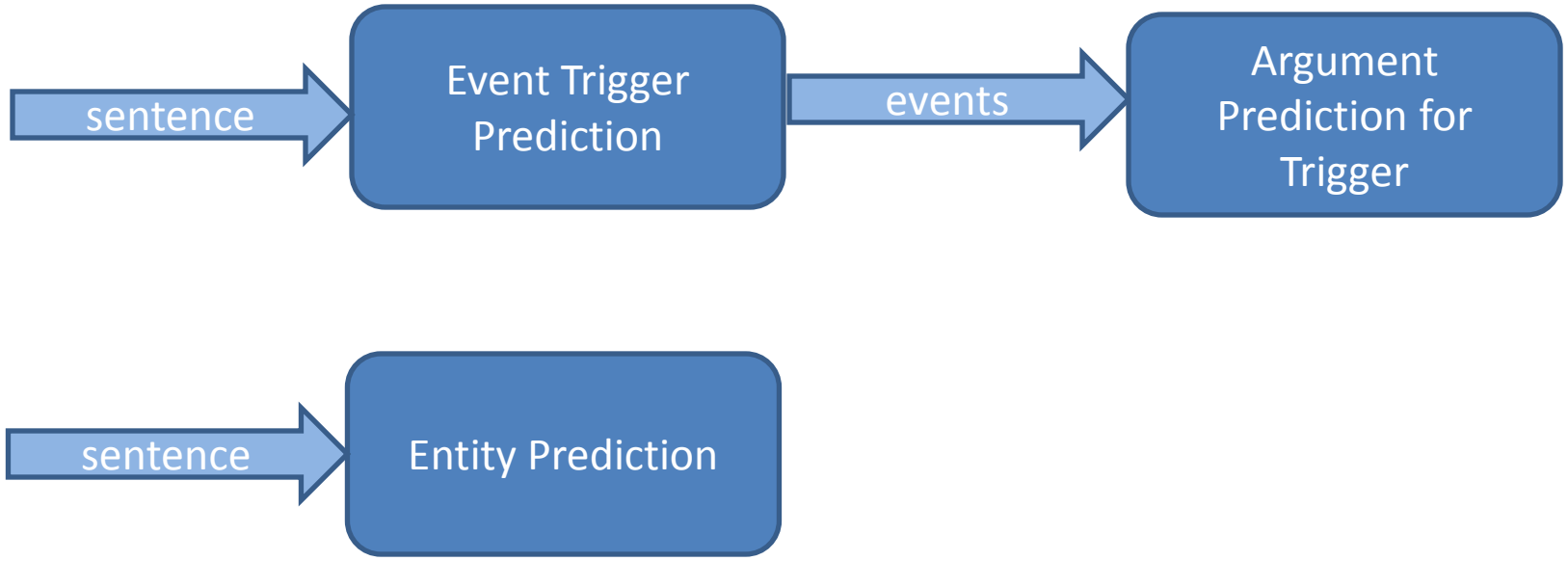
Dependency parse



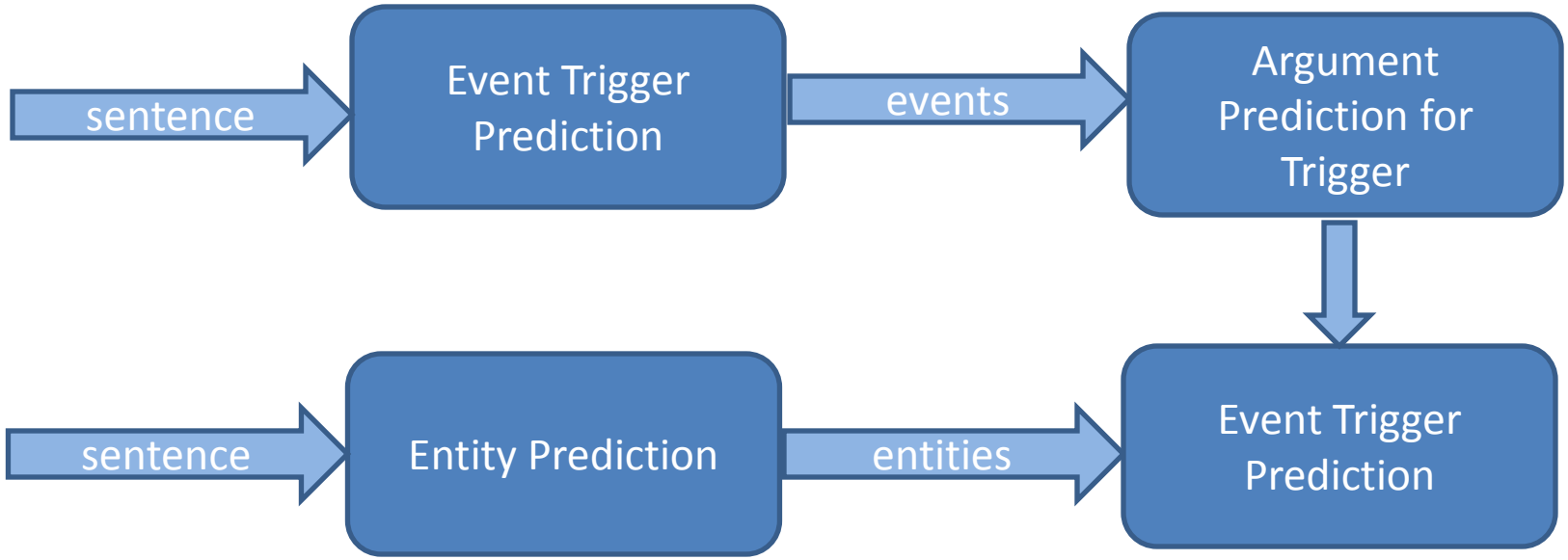
Iterative optimization



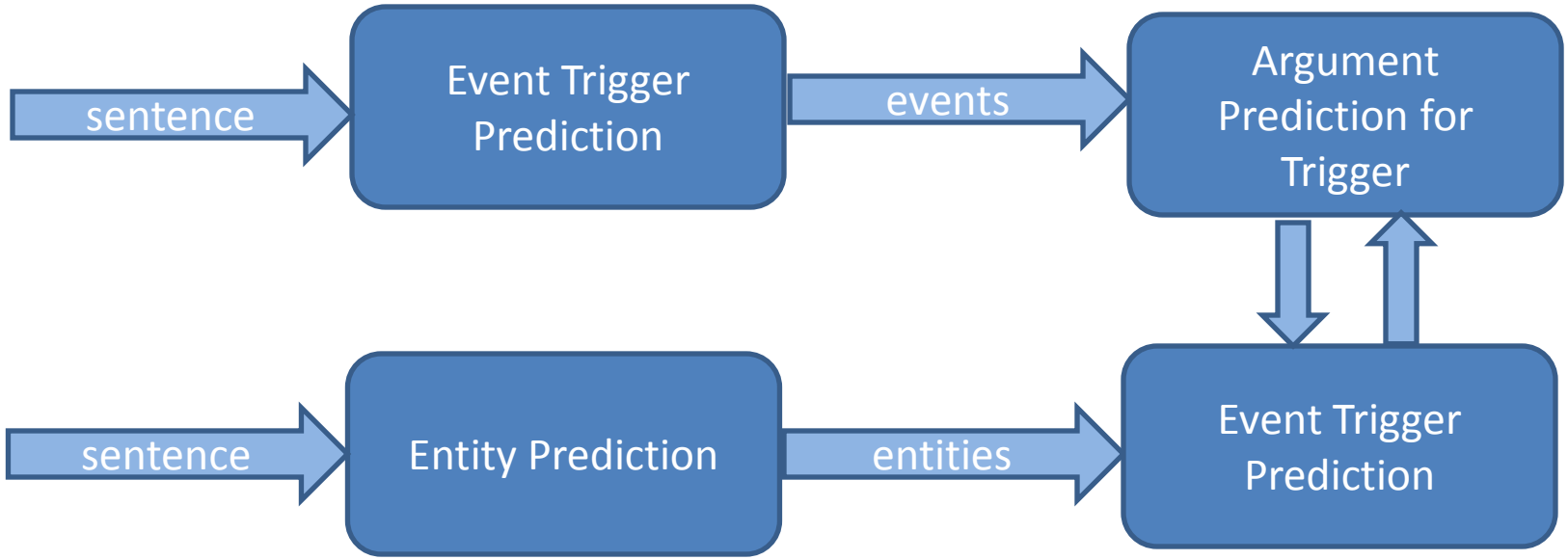
Iterative optimization



Iterative optimization

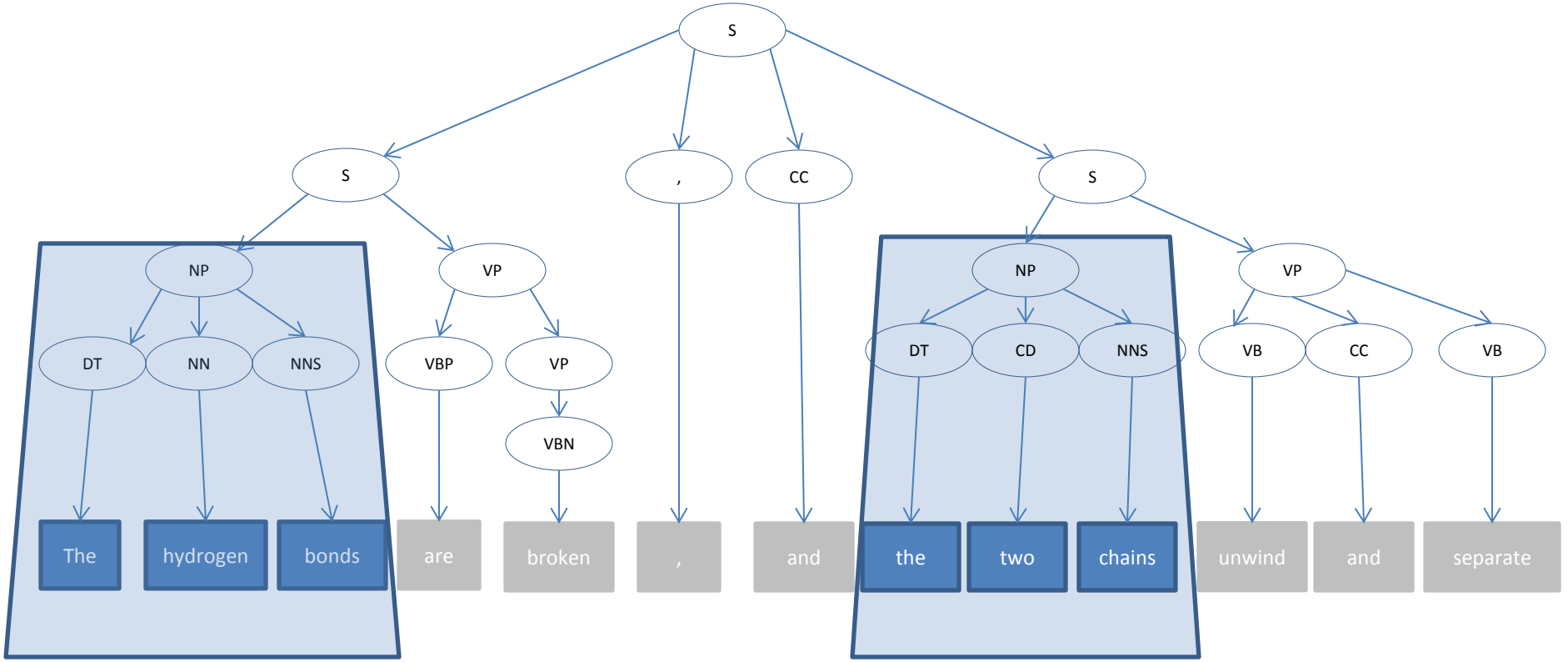


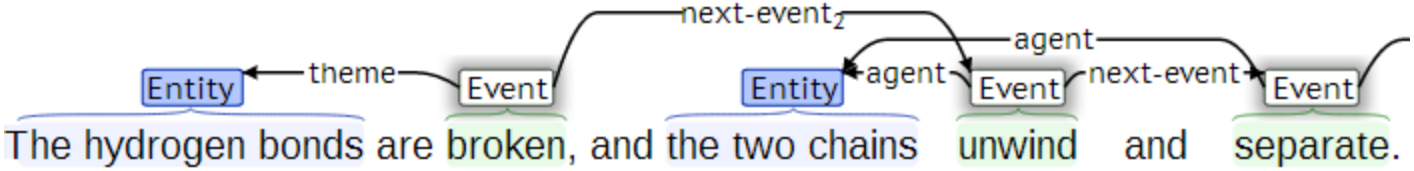
Iterative optimization



Entity Prediction

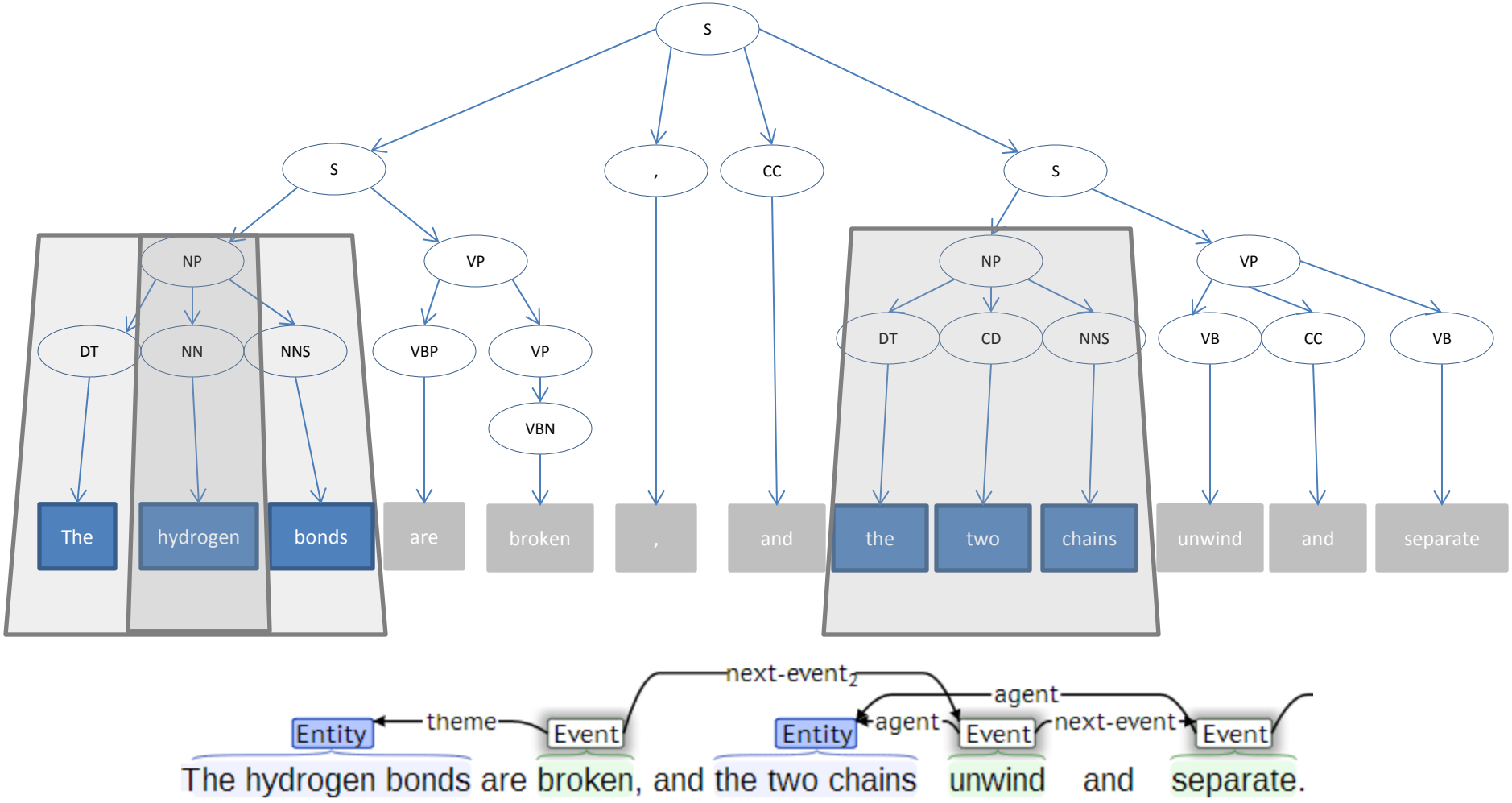
$P(phrase = argument \mid sentence)$



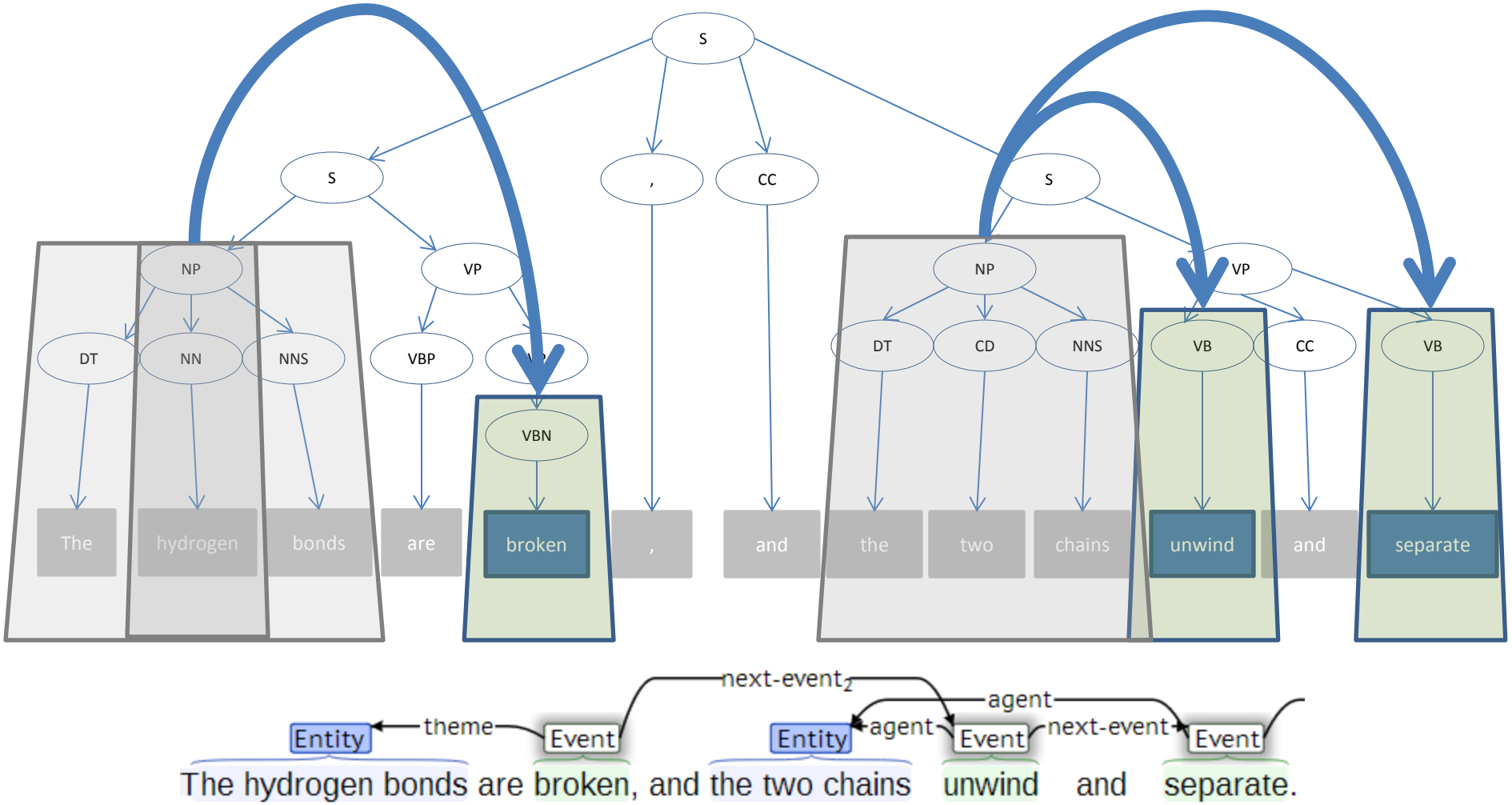


Iterative optimization

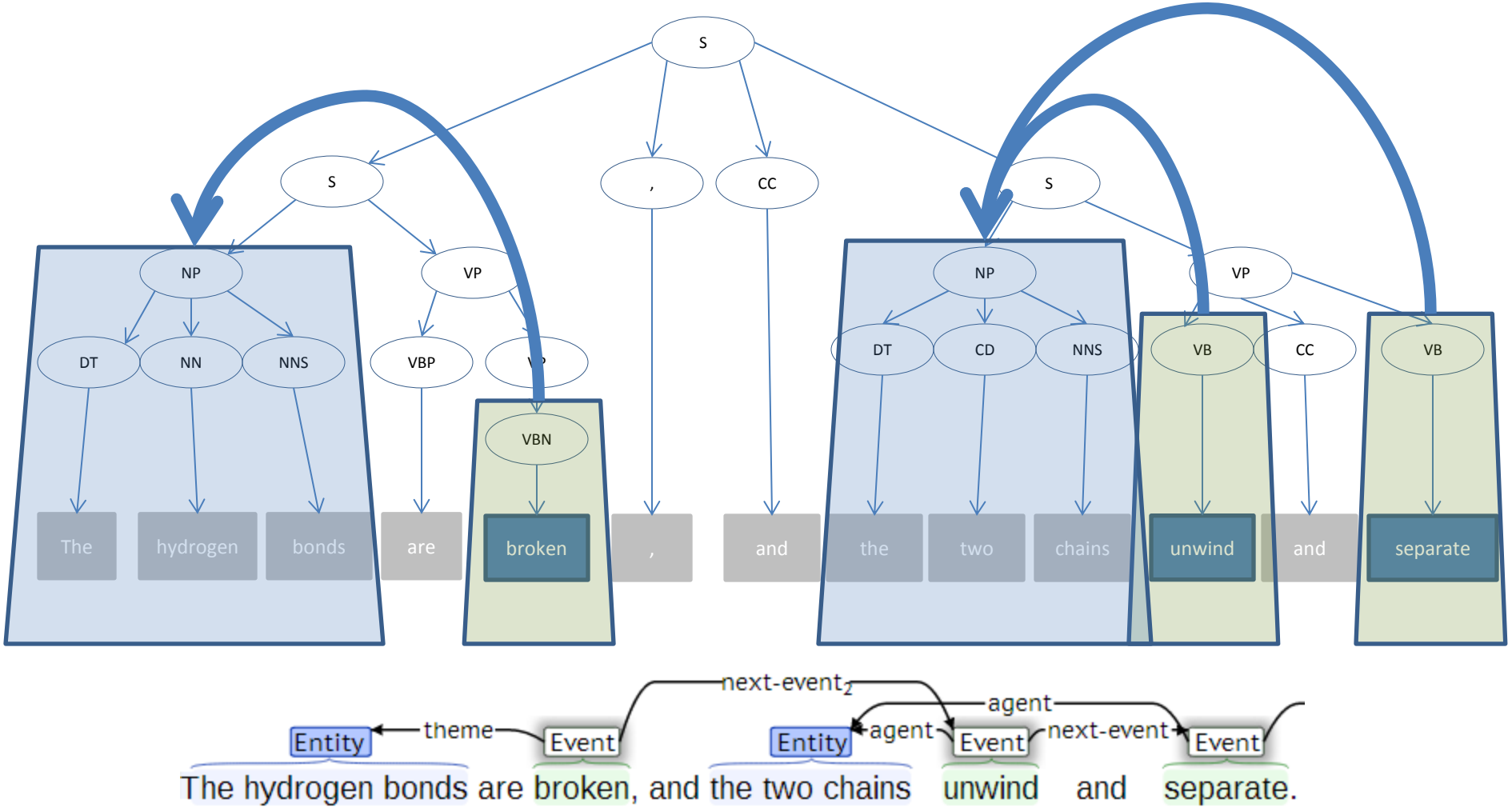
$$P(word \in \{TRIGGER\} \mid \{ENTITIES\}, sentence)$$



Iterative optimization



Iterative optimization



Results

Event trigger prediction

Type	Precision	Recall	F1
Baseline	0.47	0.73	0.57
MaxEnt_Basic	0.69	0.66	0.67
MaxEnt_Iterative	0.72	0.70	0.71

Event argument prediction

Type	Precision	Recall	F1
Baseline	0.44	0.53	0.48
MaxEnt_Basic	0.56	0.45	0.50
MaxEnt_Iterative	0.55	0.50	0.52

Next steps

- Improve performance of classifiers
  - Tune features
- Semantic role labeling
  - Multiclass MaxEnt
  - Re-ranking
- Joint models