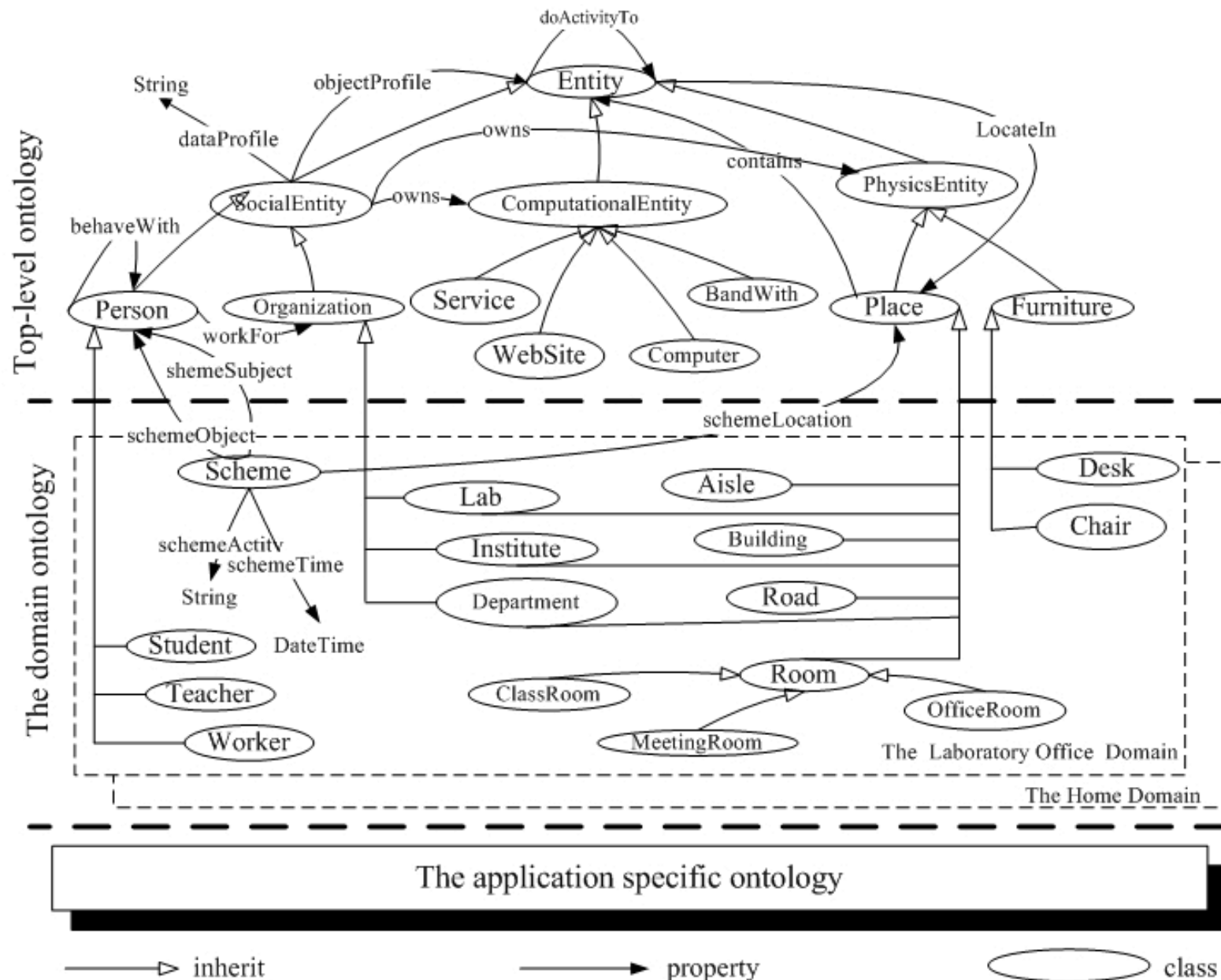


Context Inconsistency Management in Pervasive Computing

Samuel Esposito & Alexander Jurjens



Ontology-based Context Model



Constraint Checking

Constraint Checking

- Non-Incremental Checking

Constraint Checking

- Non-Incremental Checking
- Incremental Checking

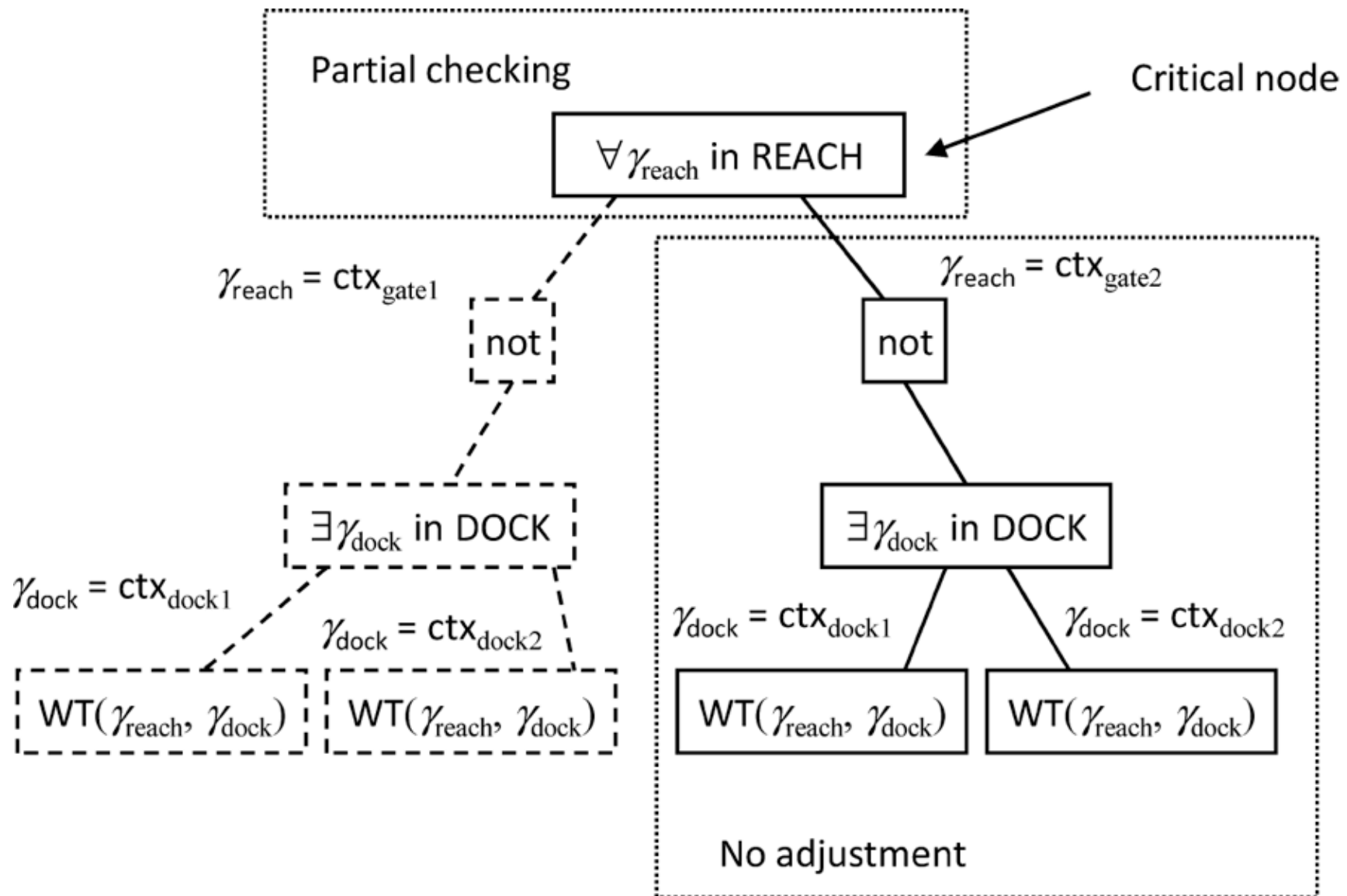
Constraint Checking

- Non-Incremental Checking
- Incremental Checking
 - Entire Constraint Checking

Constraint Checking

- Non-Incremental Checking
- Incremental Checking
 - Entire Constraint Checking
 - Partial Constraint Checking

Consistency Computation Tree



Context Inconsistency Resolution

Context Inconsistency Resolution

- Extend Ontology-based Context Model with status and temporal properties about a context

Context Inconsistency Resolution

- Extend Ontology-based Context Model with status and temporal properties about a context
- Use *relative* frequency

Context Inconsistency Resolution

- Extend Ontology-based Context Model with status and temporal properties about a context
- Use *relative* frequency
- Runs in polynomial time (worst case)

Fuzzy Ontologies

Fuzzy Ontologies

- Hidden Markov Models

```
states = ('Rainy', 'Sunny')
```

```
observations = ('walk', 'shop', 'clean')
```

```
emission_probability = {  
    'Rainy' : {'walk': 0.1, 'shop': 0.4, 'clean': 0.5},  
    'Sunny' : {'walk': 0.6, 'shop': 0.3, 'clean': 0.1},  
}
```

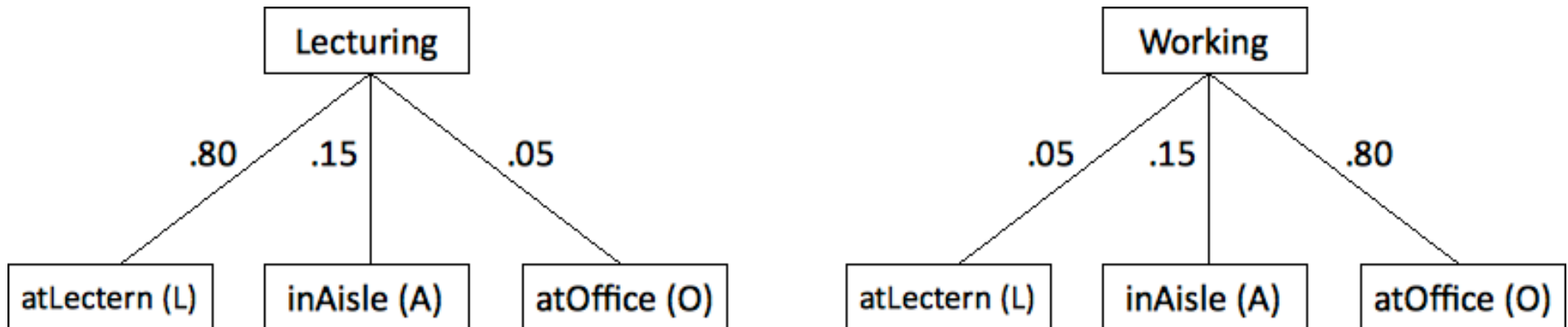
```
start_probability = {'Rainy': 0.6, 'Sunny': 0.4}
```

```
transition_probability = {  
    'Rainy' : {'Rainy': 0.7, 'Sunny': 0.3},  
    'Sunny' : {'Rainy': 0.4, 'Sunny': 0.6},  
}
```

See http://en.wikipedia.org/wiki/Viterbi_algorithm#Example

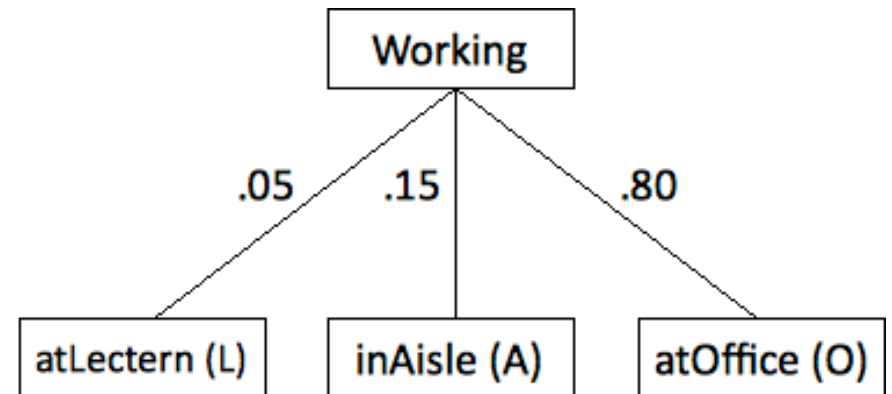
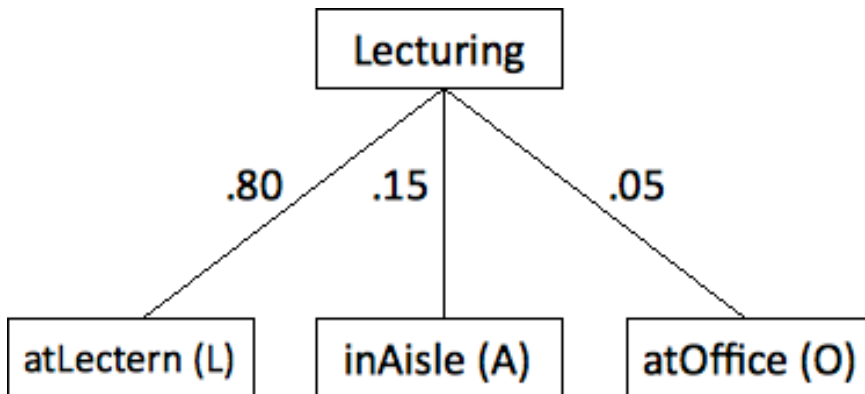
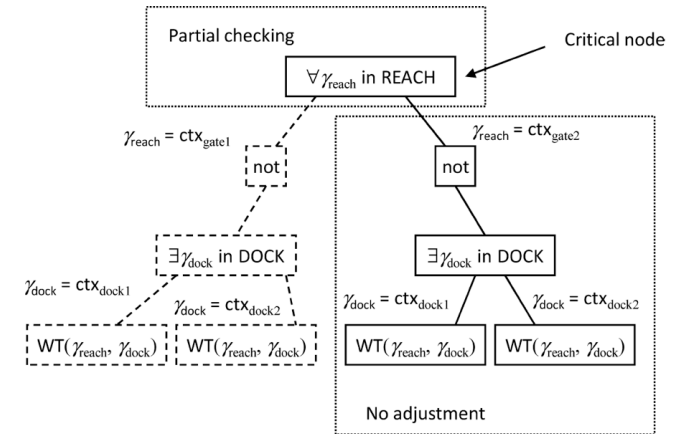
Fuzzy Ontologies

- Hidden Markov Models

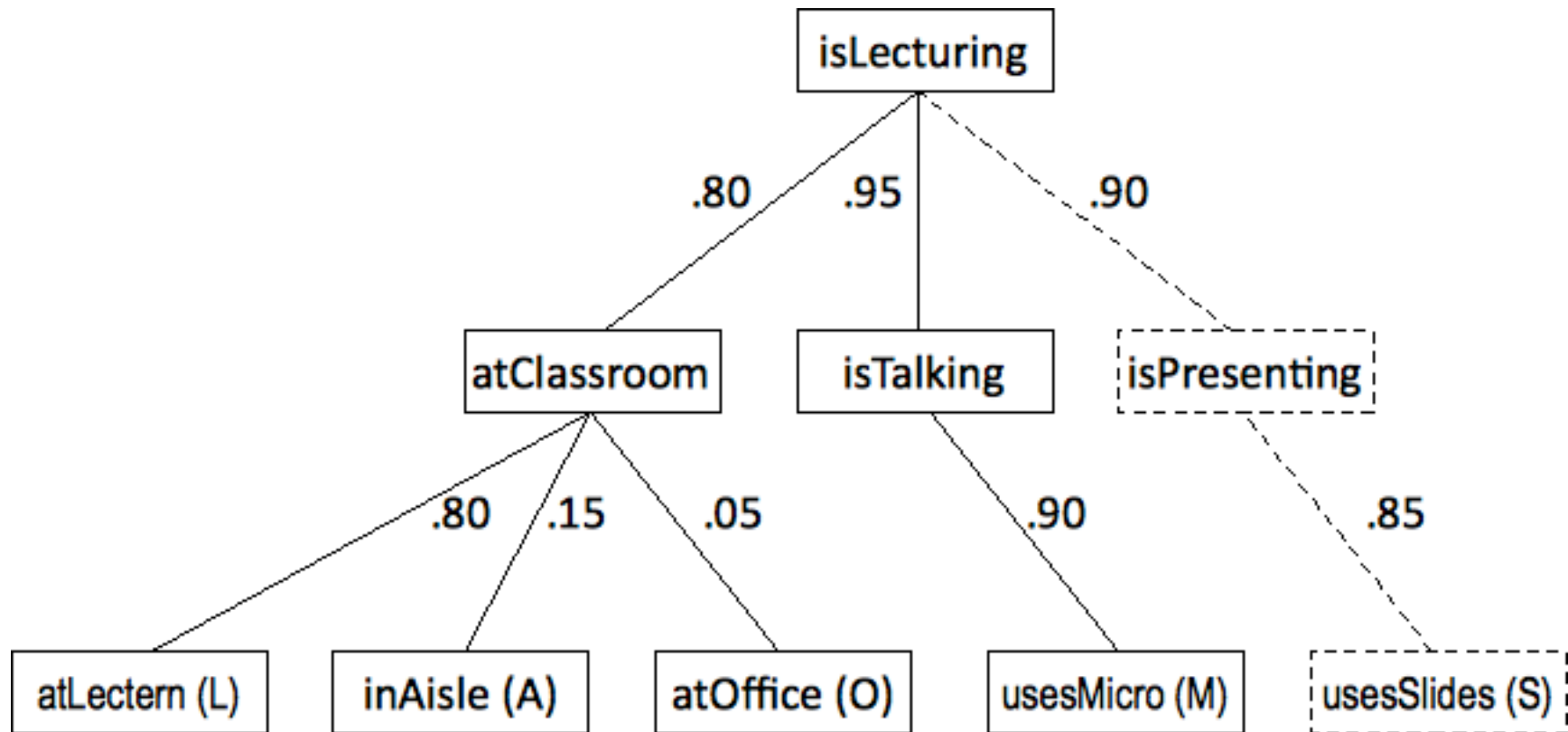


Fuzzy Ontologies

- Hidden Markov Models



Partial Probability Calculation



Results: PPC Advantages and Disadvantages

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- Possible inconsistencies incorporated in the model.

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- Efficiently yields most probable high-level contexts.

Results: PPC Advantages and Disadvantages

- Possible inconsistencies incorporated in the model.
- Efficiently yields most probable high-level contexts.
- Requires training

Discussion

