Large Scale Cross-Document Coreference Resolution

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02/06/2014
LCN - KTH

Overview

Problem

Cross-Document Coreference Resolution

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Cross-Document Coreference Resolution

Current Solution

Vector Space Modeling

Limitations

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Cross-Document Coreference Resolution

Current Solution

Vector Space Modeling

Limitations

Contribution

Graph Based Modeling

Diffusion Based Clustering

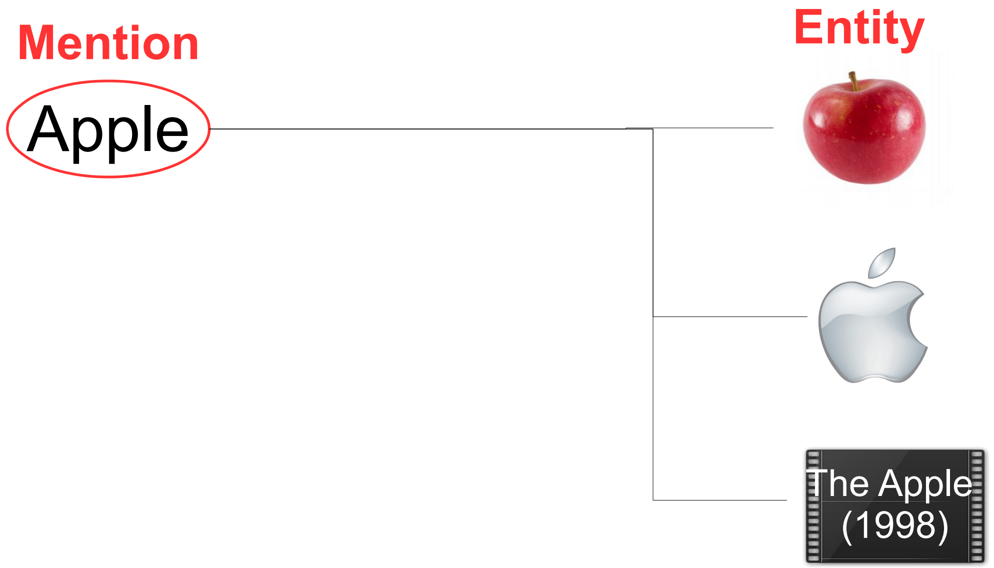
Definition

Entity

Entity

Distinctive and independent thing in the real world.

Definition



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Mention

Linguistic phenomenon (word or phrase) refers to an entity.

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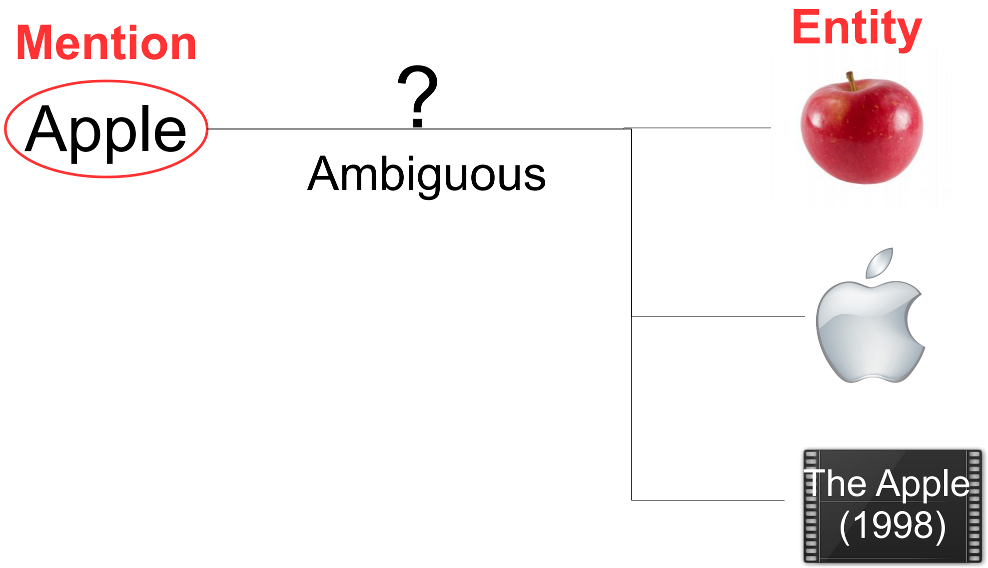

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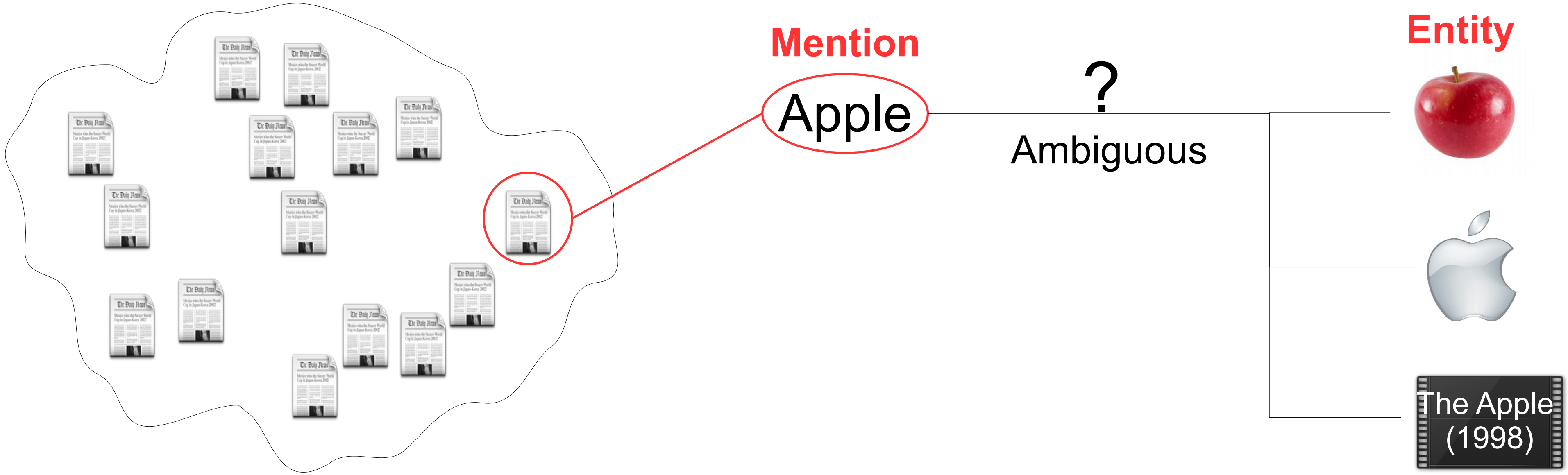

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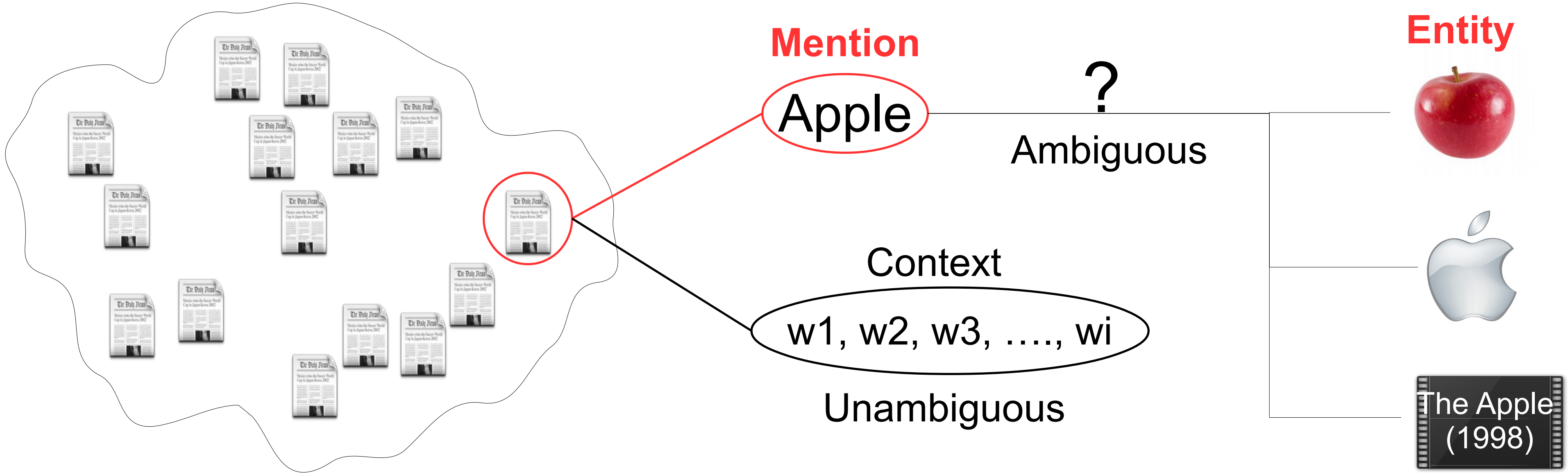
Mention
Apple
?
Ambiguous
Context
w1, w2, w3, …., wi
Unambiguous
Entity
The Apple
(1998)

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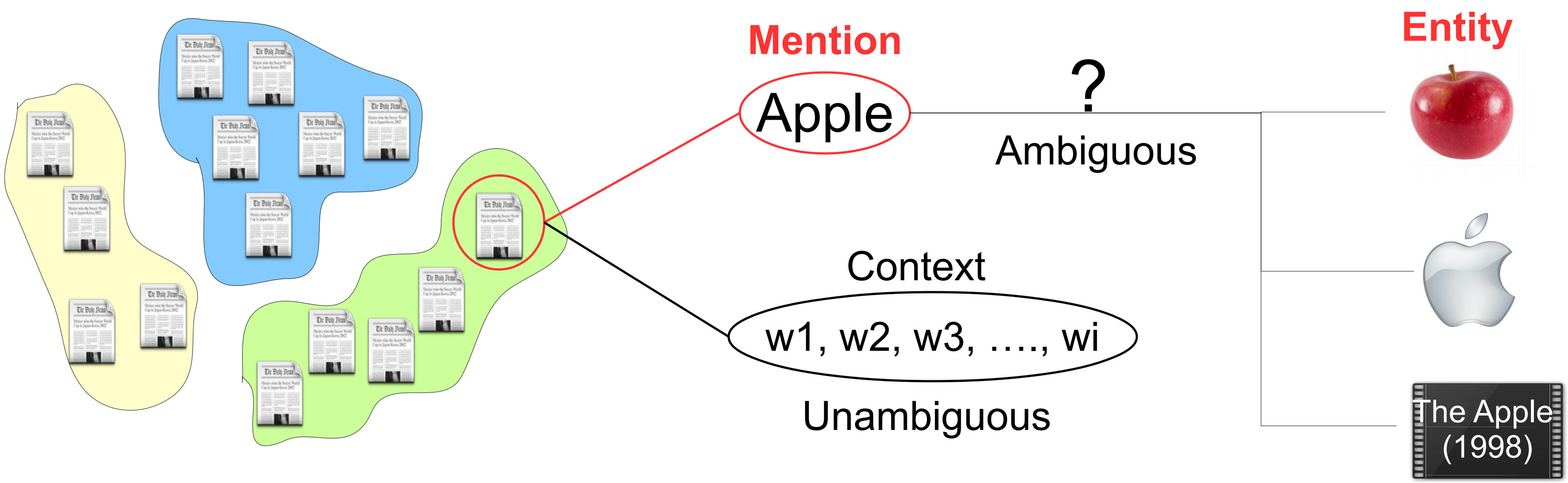
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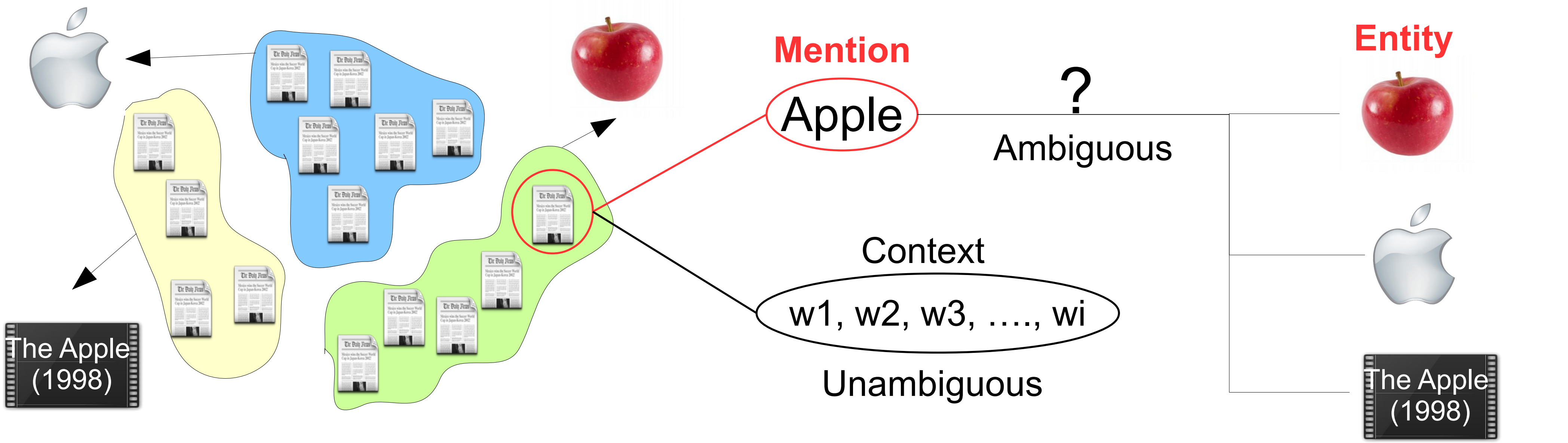
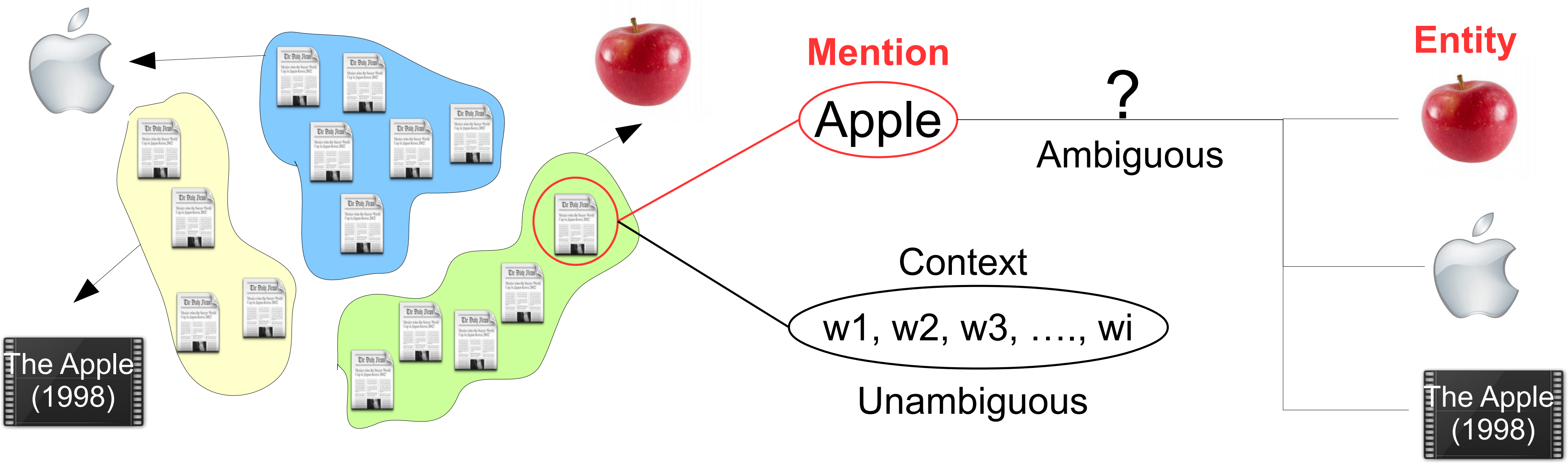


Questions:

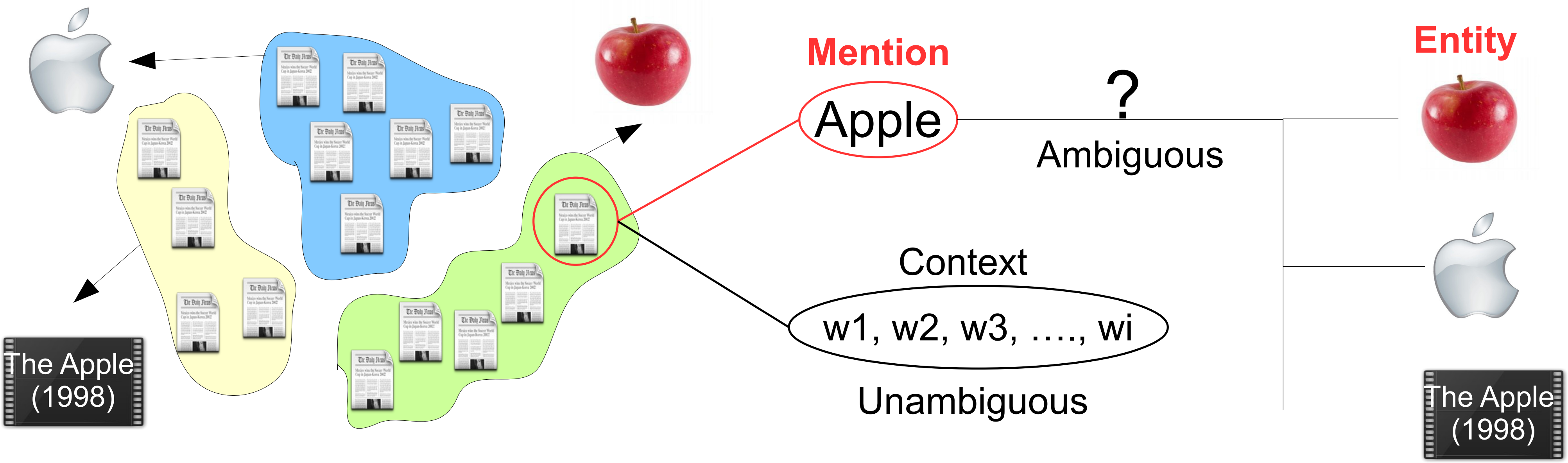
How to group these documents such that all the Mentions in each group refer to the same Entity in the real word?

Problem



Clustering

Problem

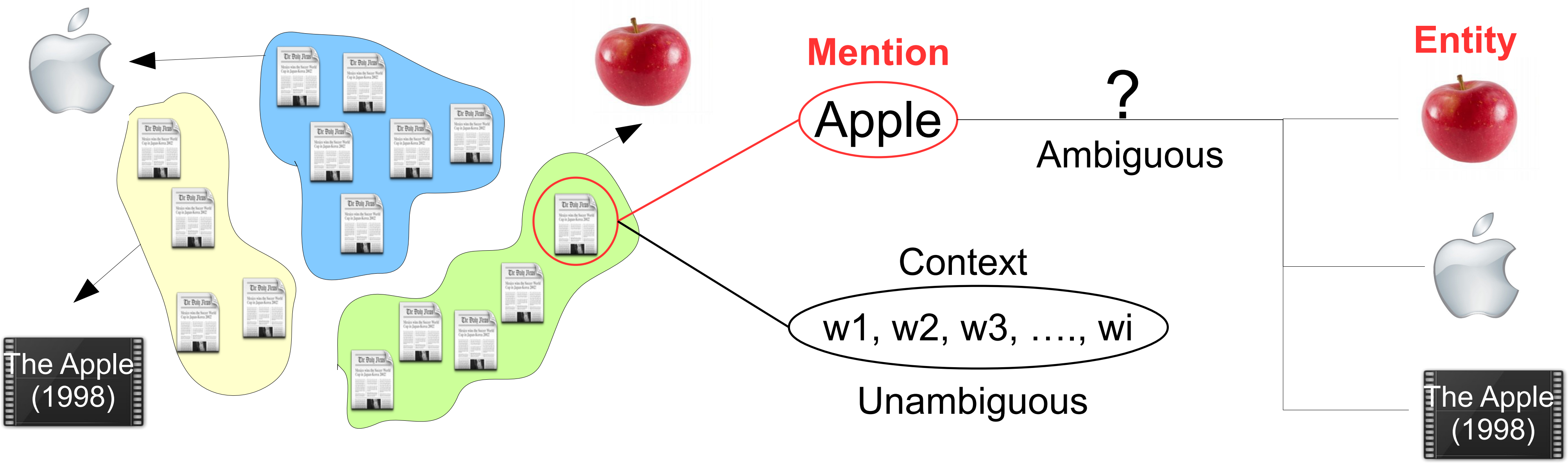


Clustering

Group documents based on their similarity

Similarity(D1,D2) $\propto$ Count(common context words)

Problem



Clustering

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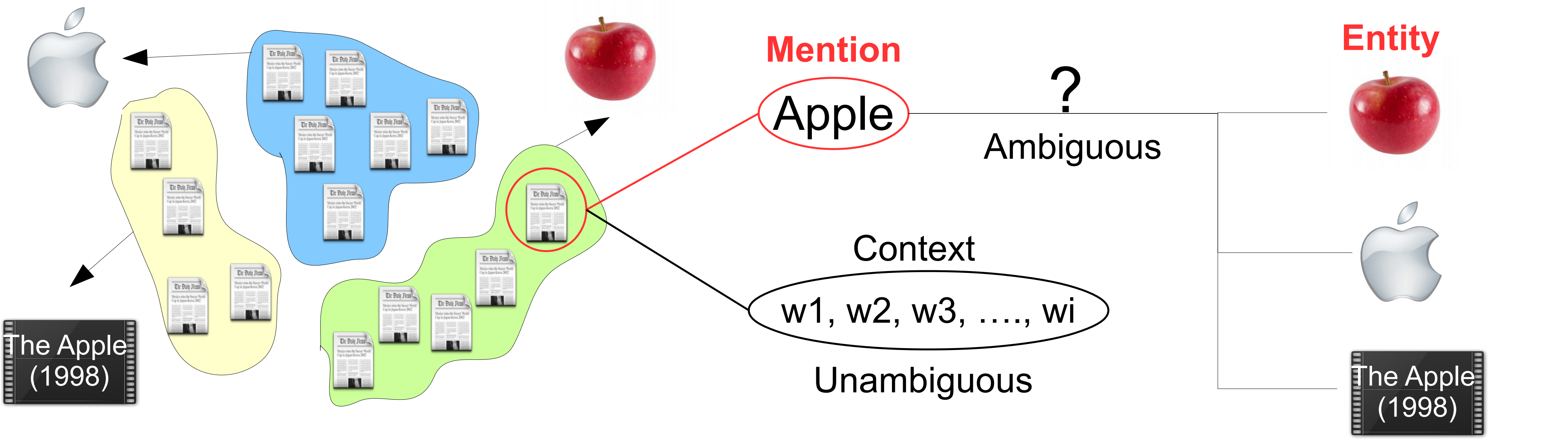
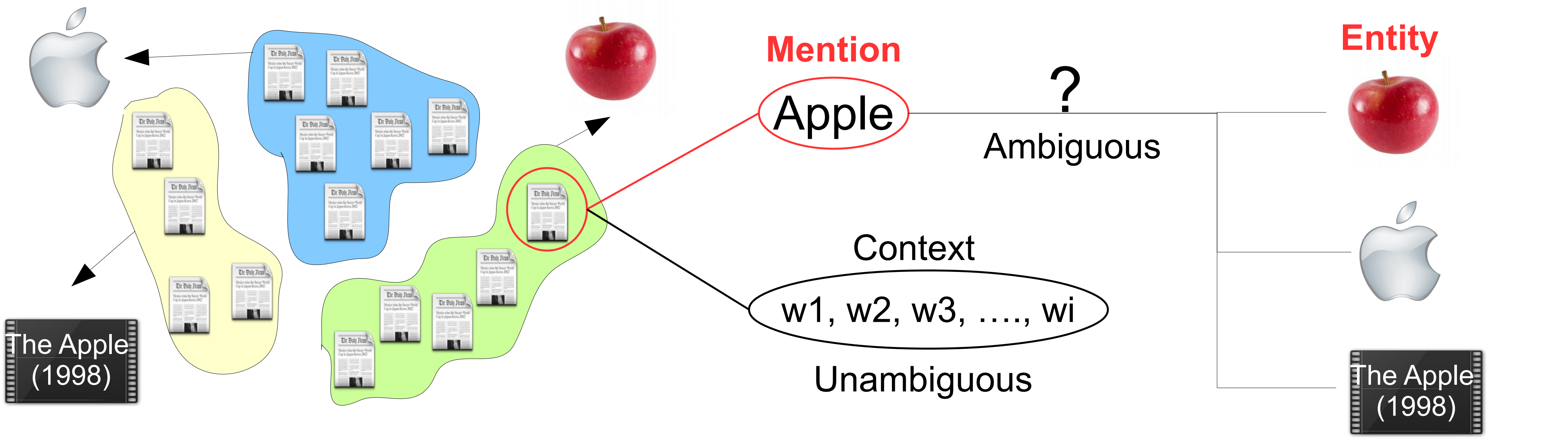
Mathematical model of the documents

Solution – VSM



Vector Space Model (VSM)

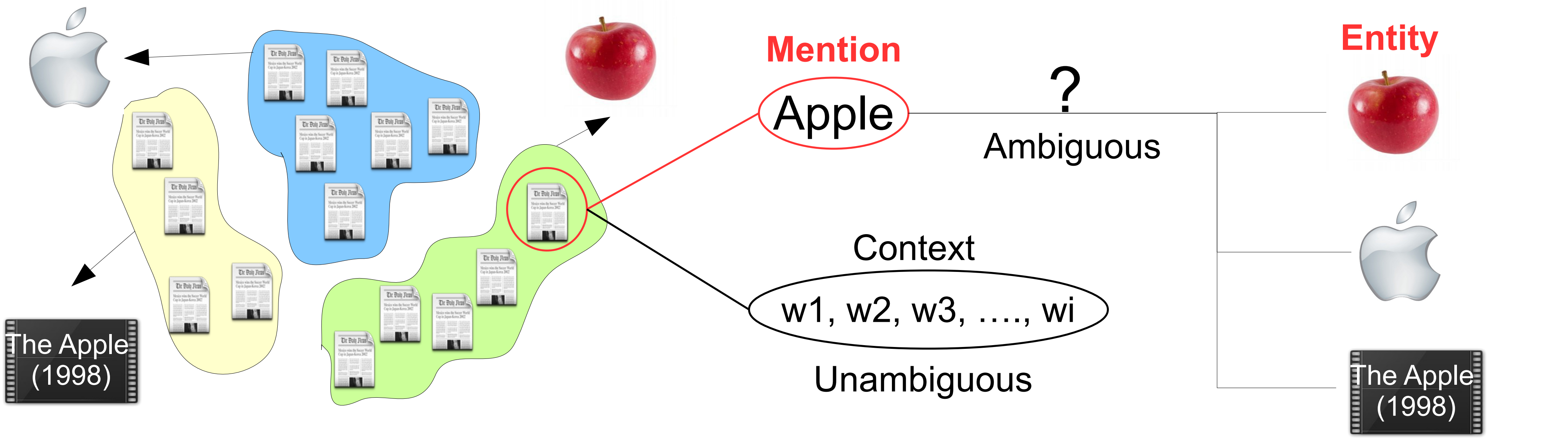
Solution – VSM



Unique Context Words

$$\{ w_1, w_2, w_3, \ldots, w_m \}$$

Solution – VSM



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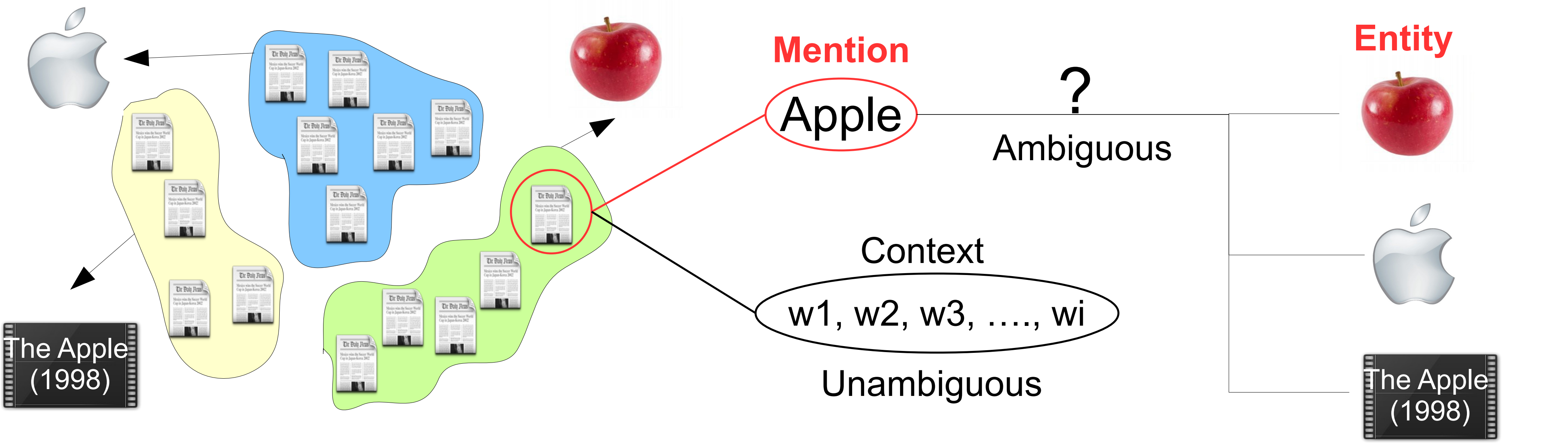
$$D_1 \longrightarrow \vec{V}_1 = \left\{ 1, 0, 1, \ldots, 0 \right\}$$

Solution – VSM



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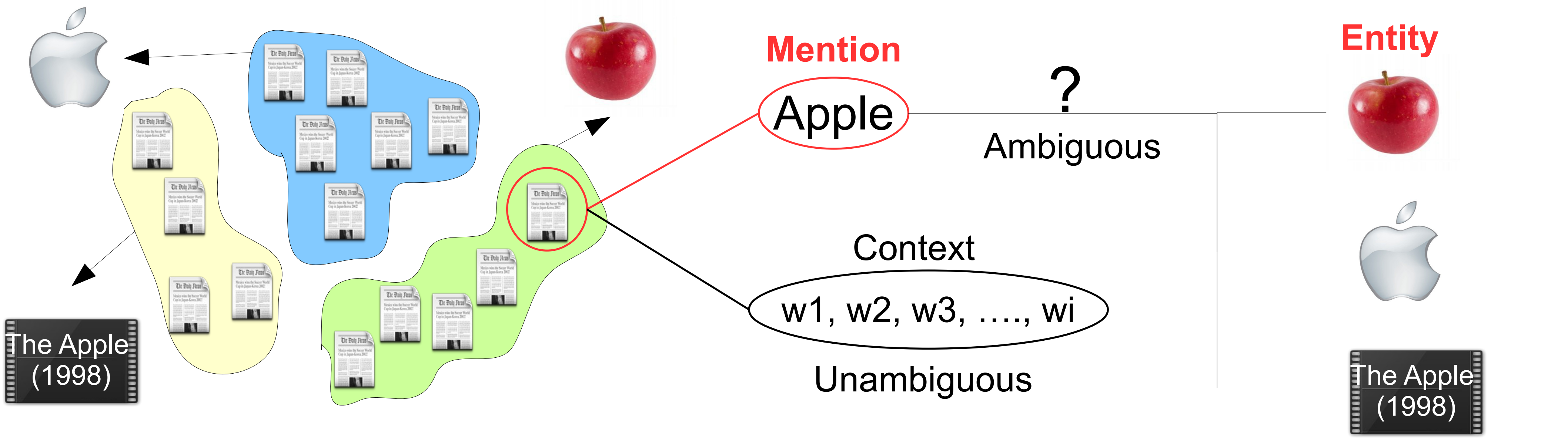

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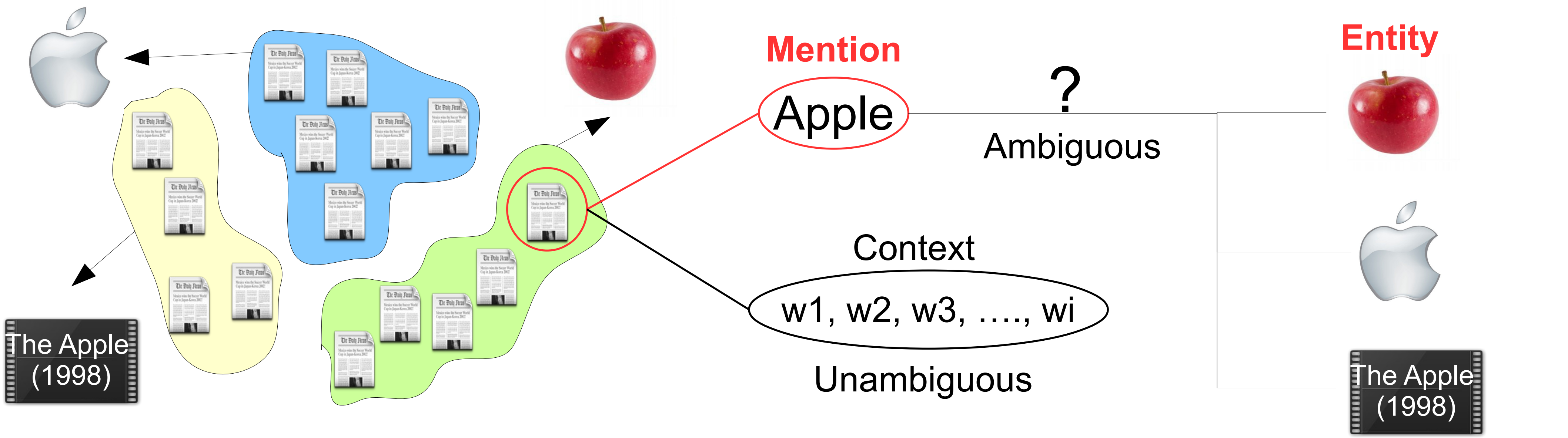

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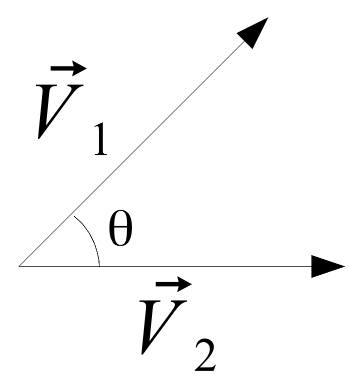
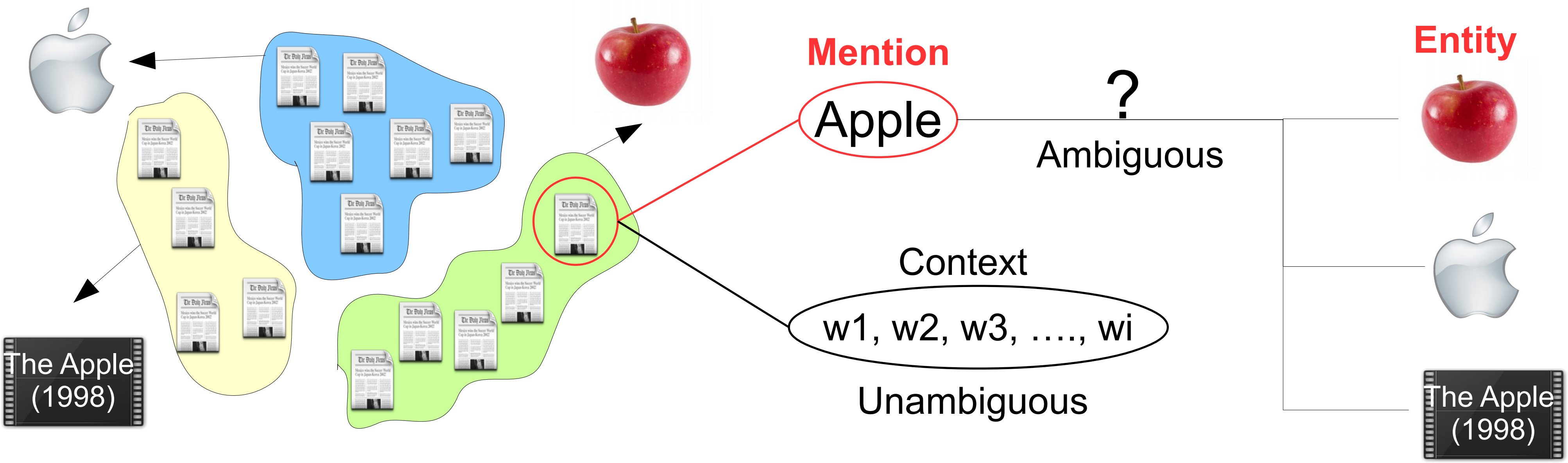


$$Similarity(D_1, D_2) \propto \cos(\theta)$$

Solution – VSM



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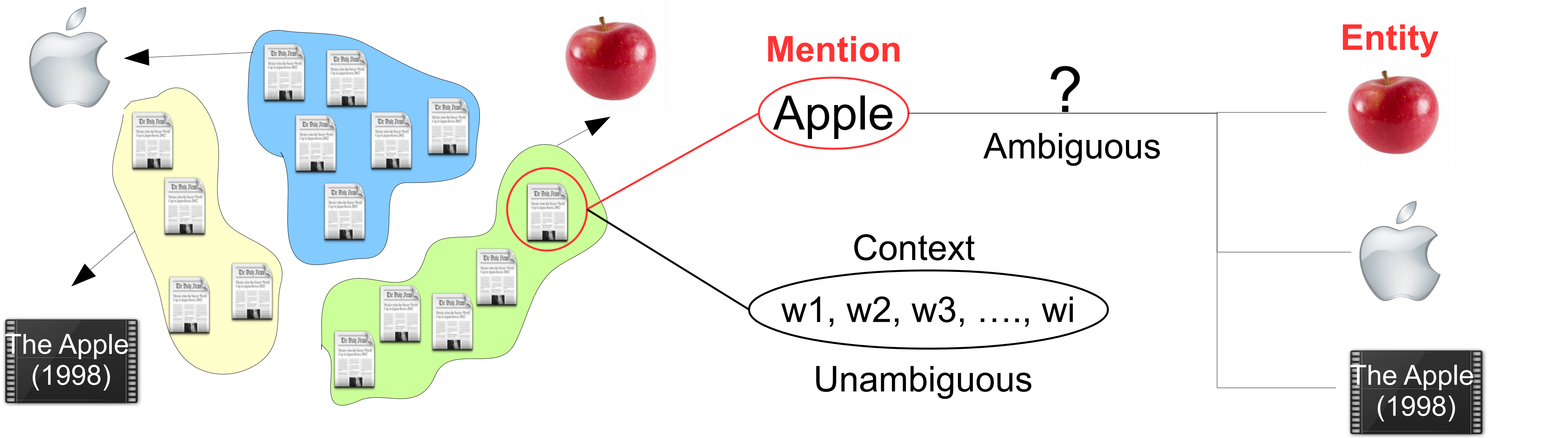
Limitations

Solution – VSM



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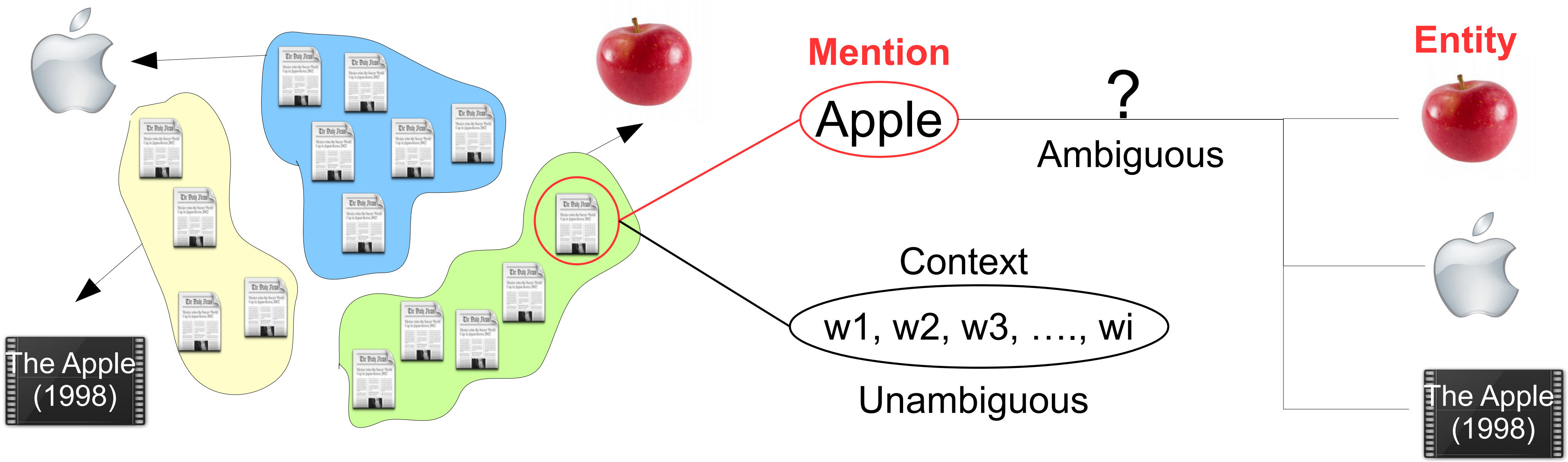
Limitations

Number of Comparisons

Not every two documents need to be compared

Solution – VSM



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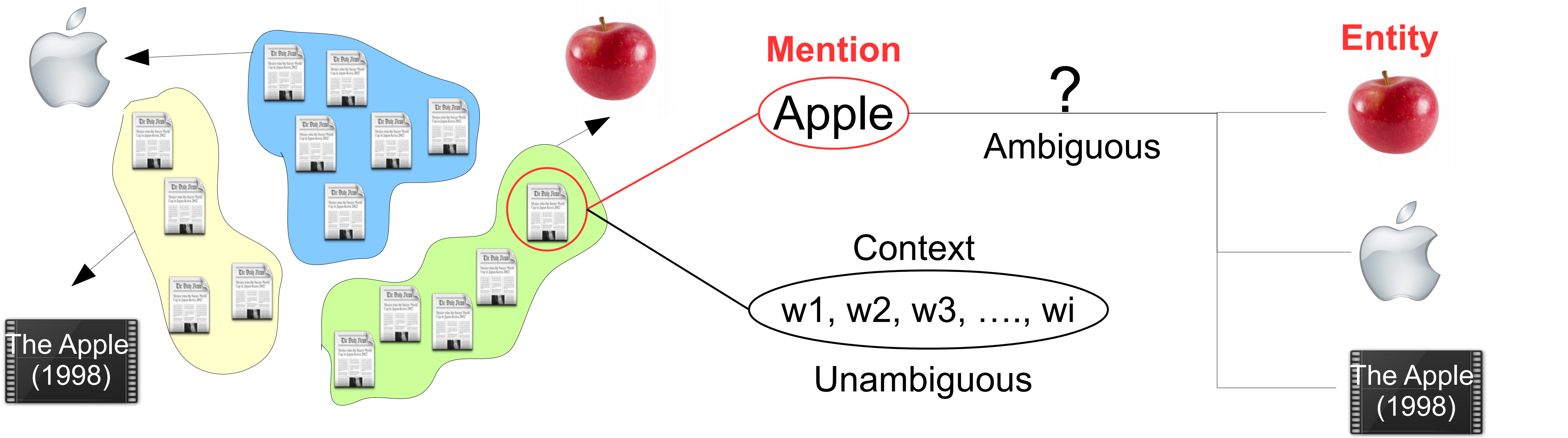
Limitations

Number of Comparisons
Not every two documents need to be compared

Size of each Comparison
Total number of unique context words (n)

Graph Based Modeling



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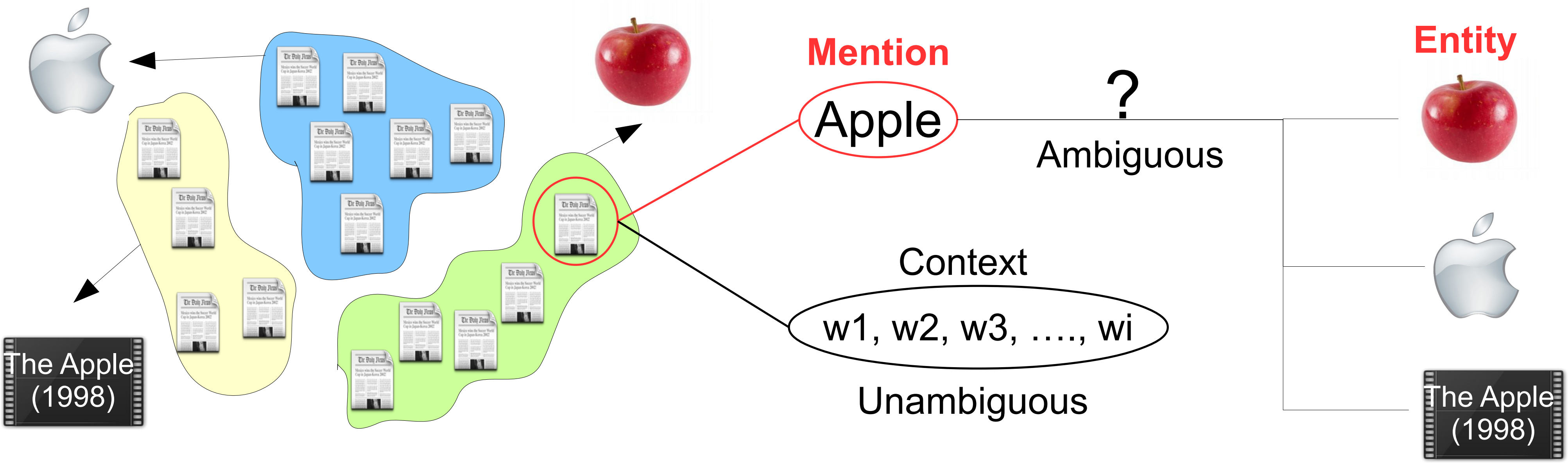

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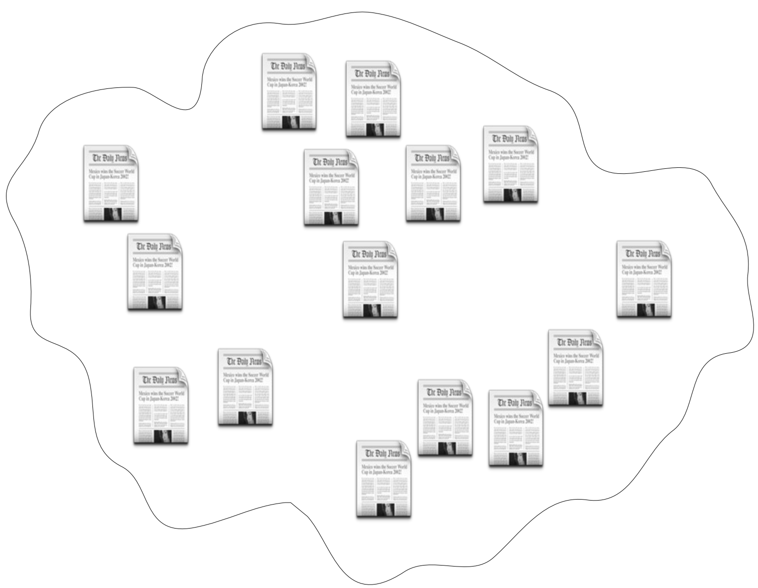

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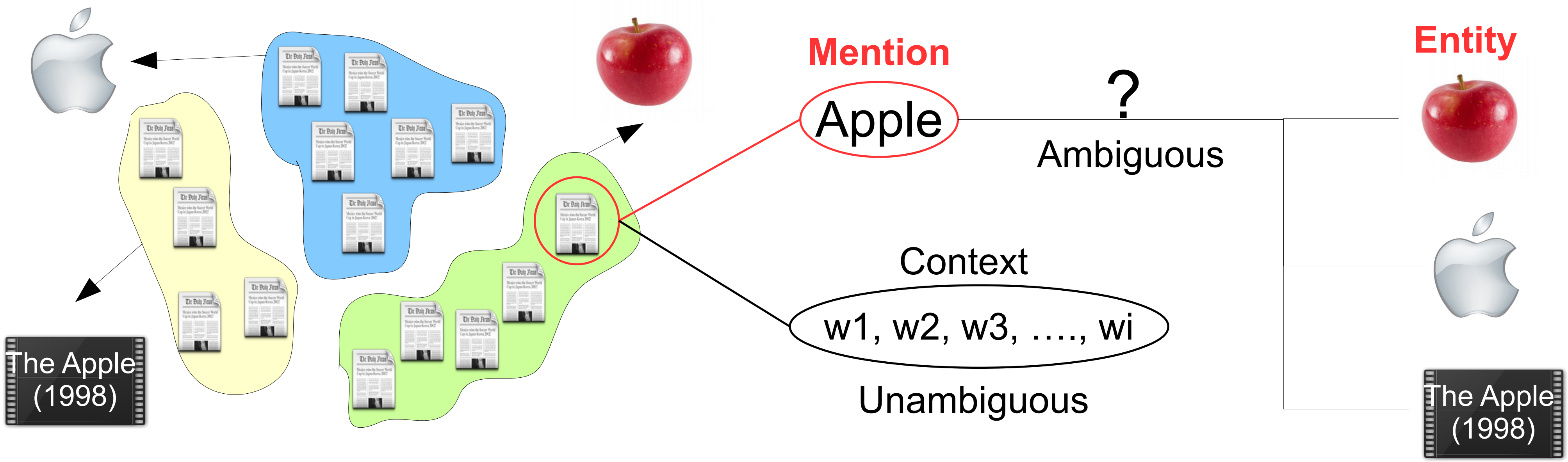
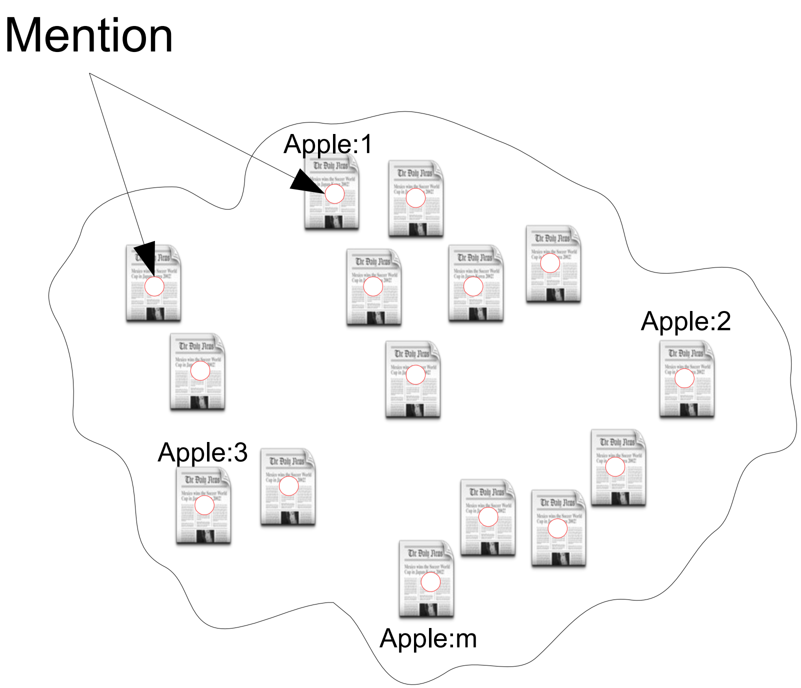
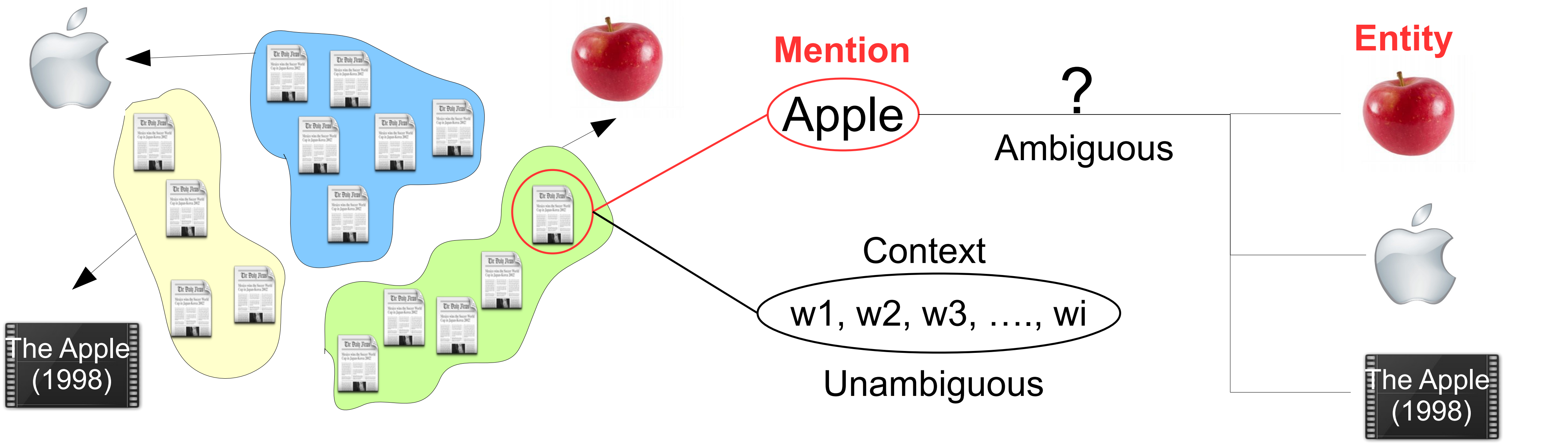


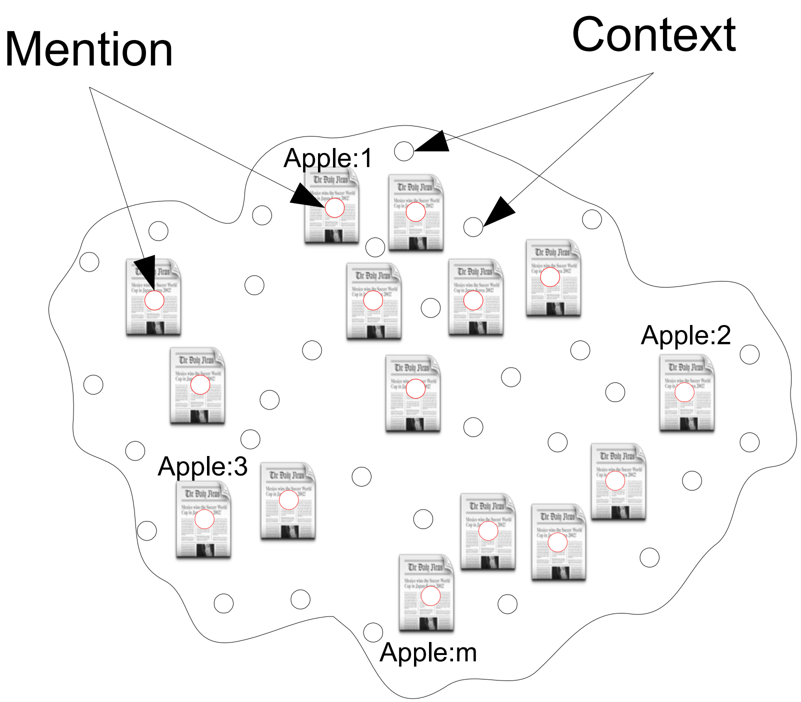


Graph based modeling

- Assign a unique vertex to each Mention

Graph Based Modeling





Graph based modeling

- Assign a unique vertex to each Mention
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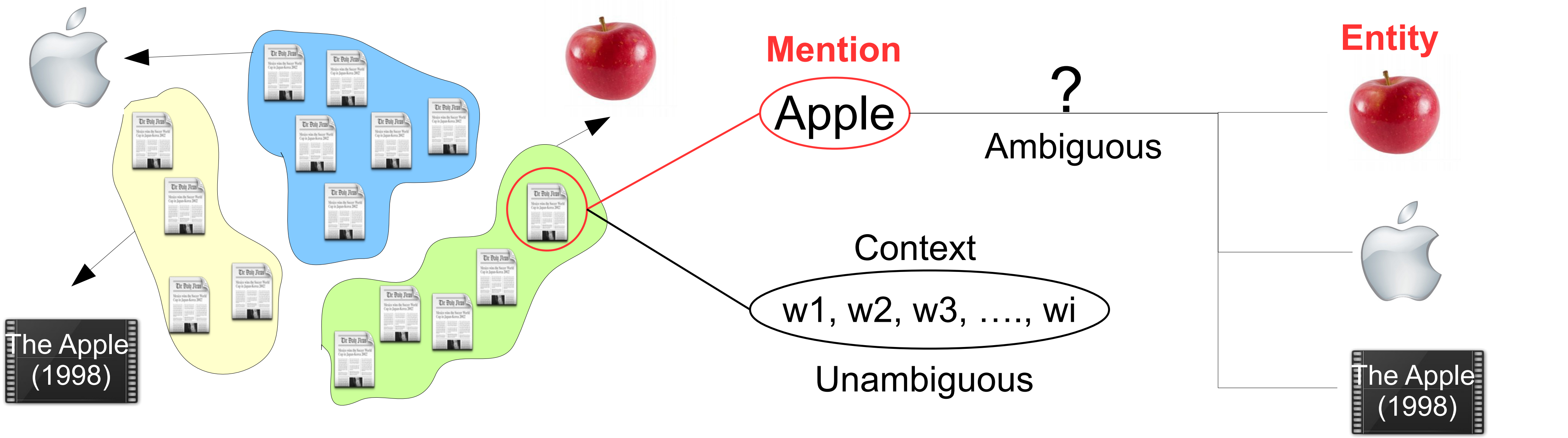
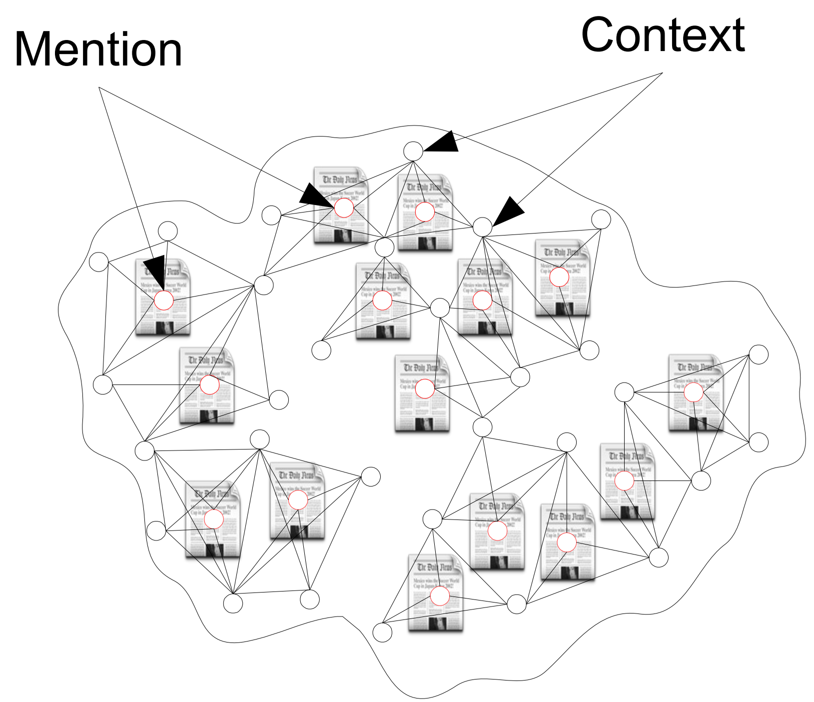
Graph Based Modeling

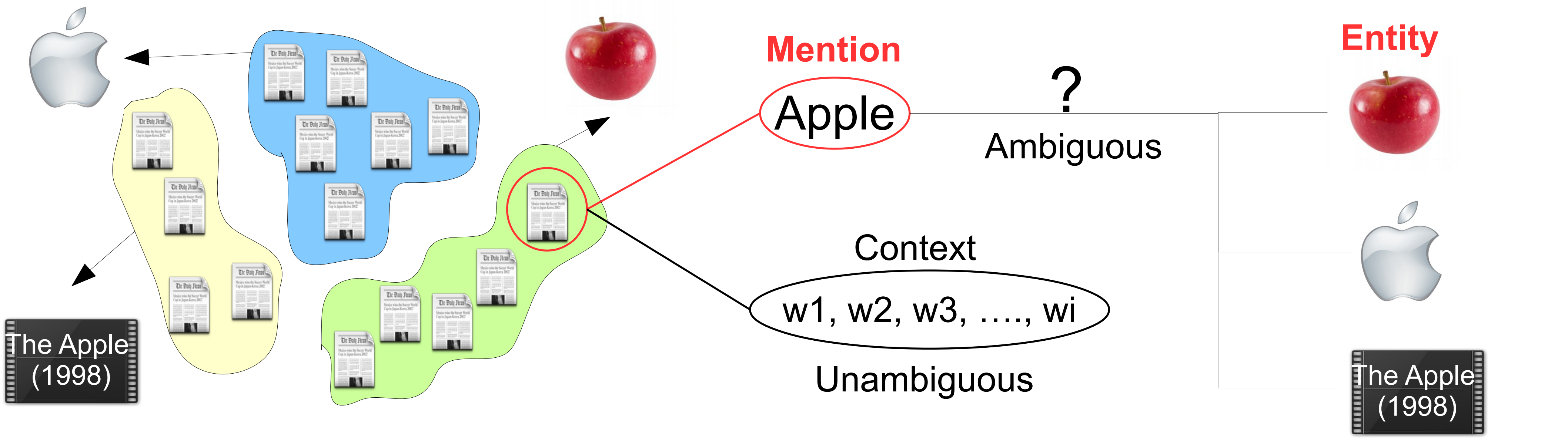


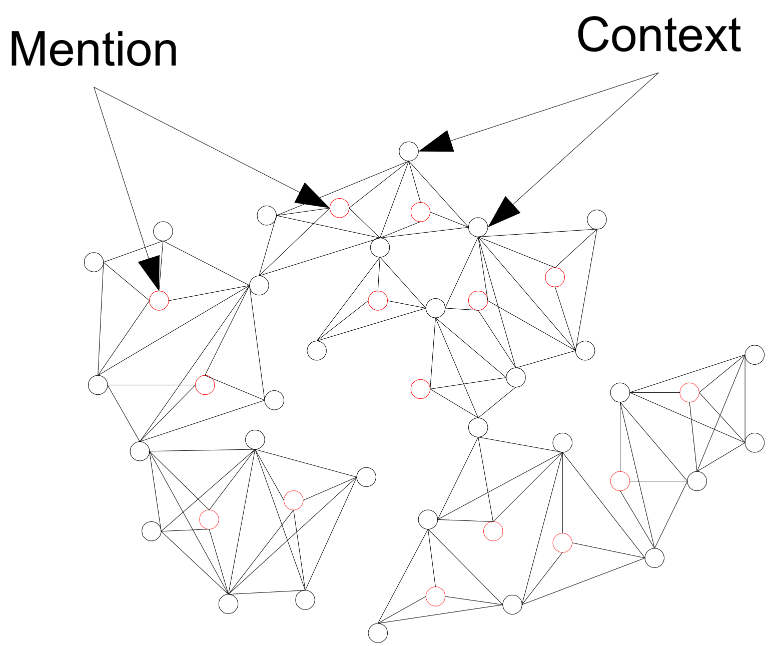


Graph based modeling

- Assign a unique vertex to each Mention
- Assign a unique vertex to each context word
- Connect vertices from same document

Graph Based Modeling





Graph based modeling

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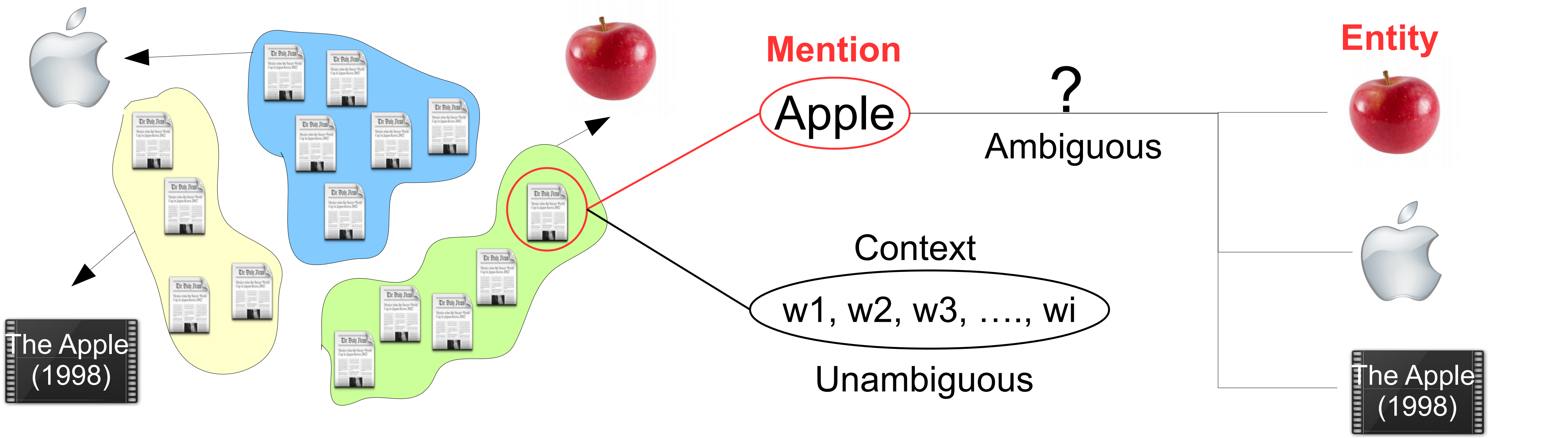
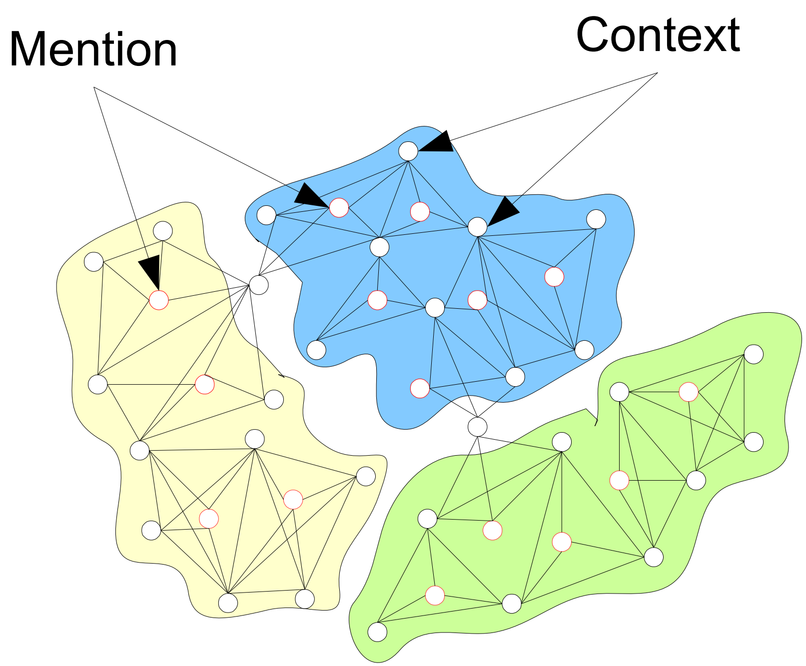
- Assign a unique vertex to each context word
- Connect vertices from same document
- Graph Representation

Graph Based Modeling





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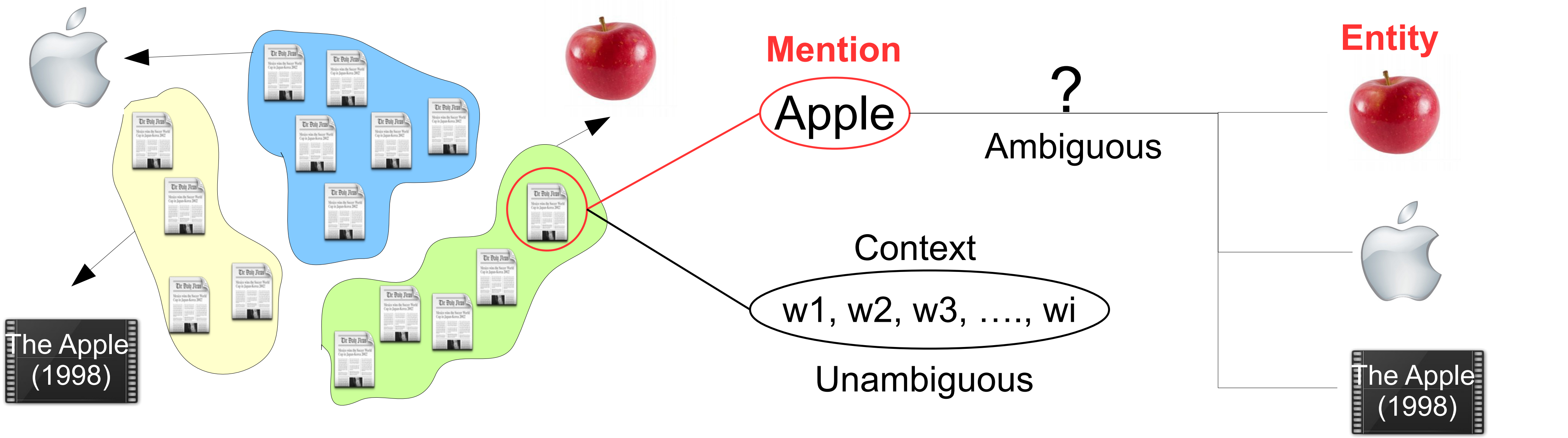
Diffusion based Clustering



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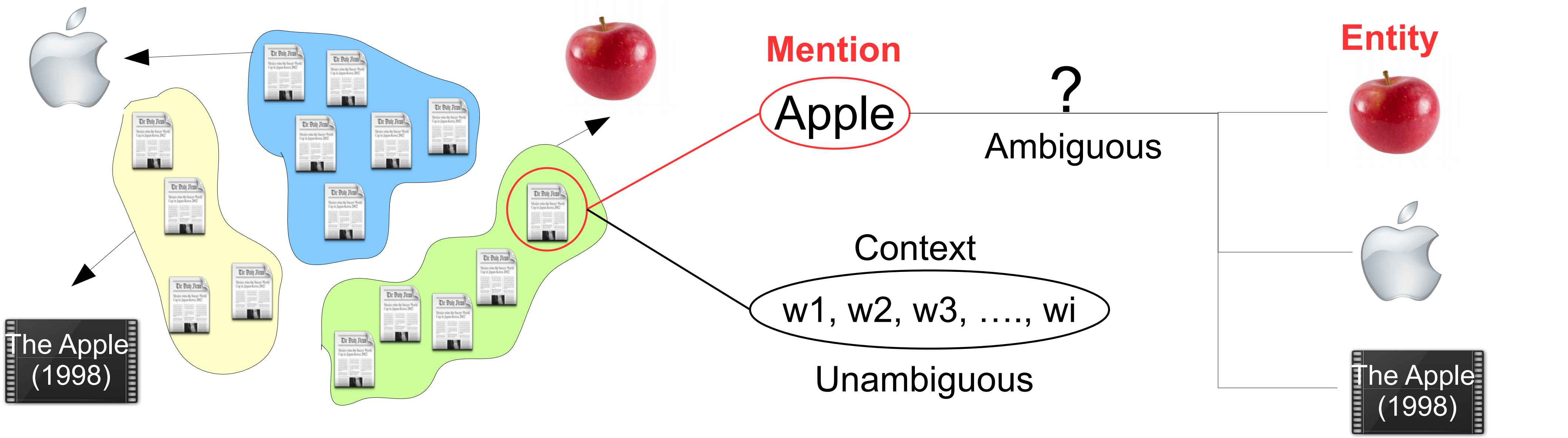
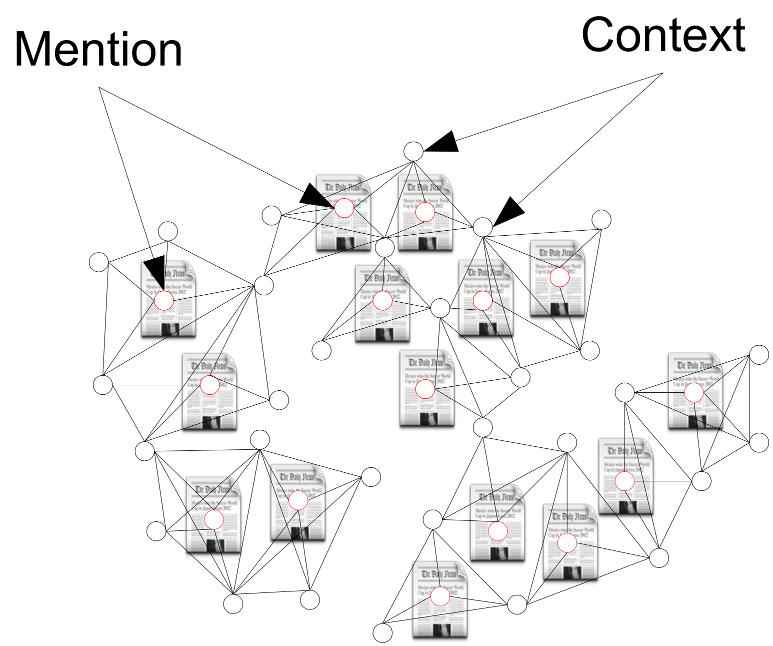
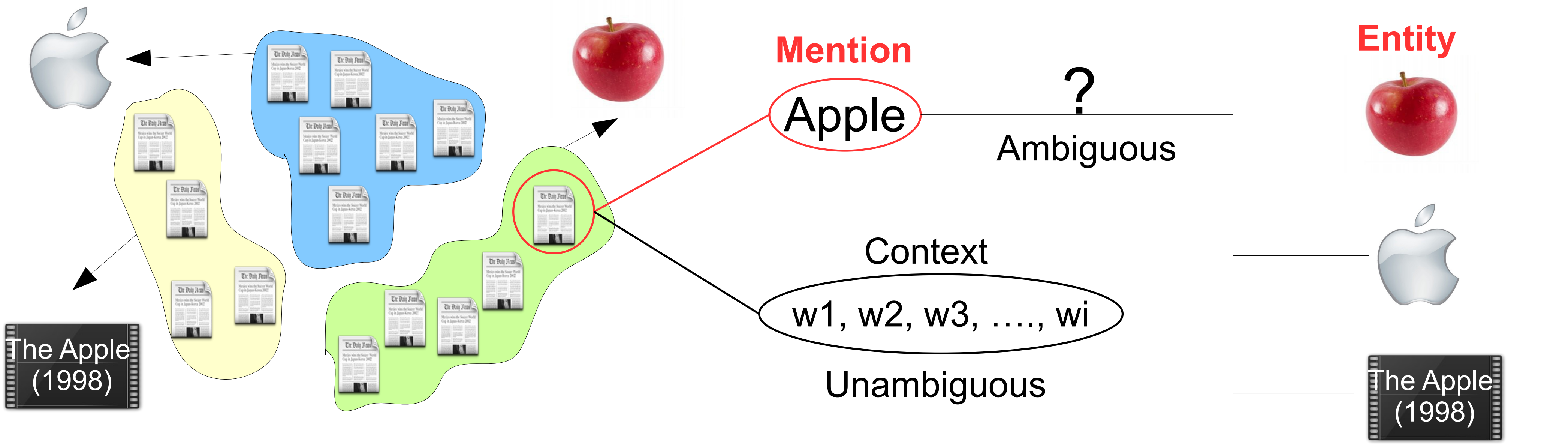


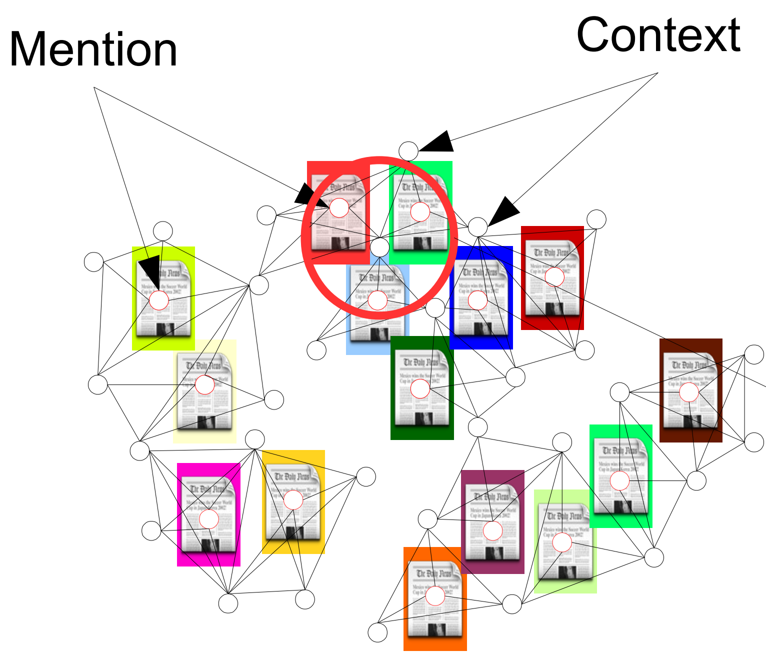


Diffusion Clustering

- Initialization
- Diffusion

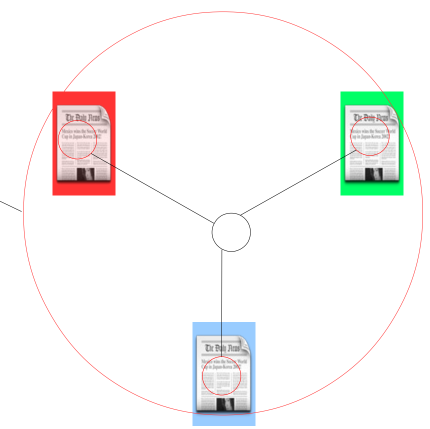
Diffusion based Clustering





Diffusion Clustering

- Initialization
  - Color assignment
- Diffusion



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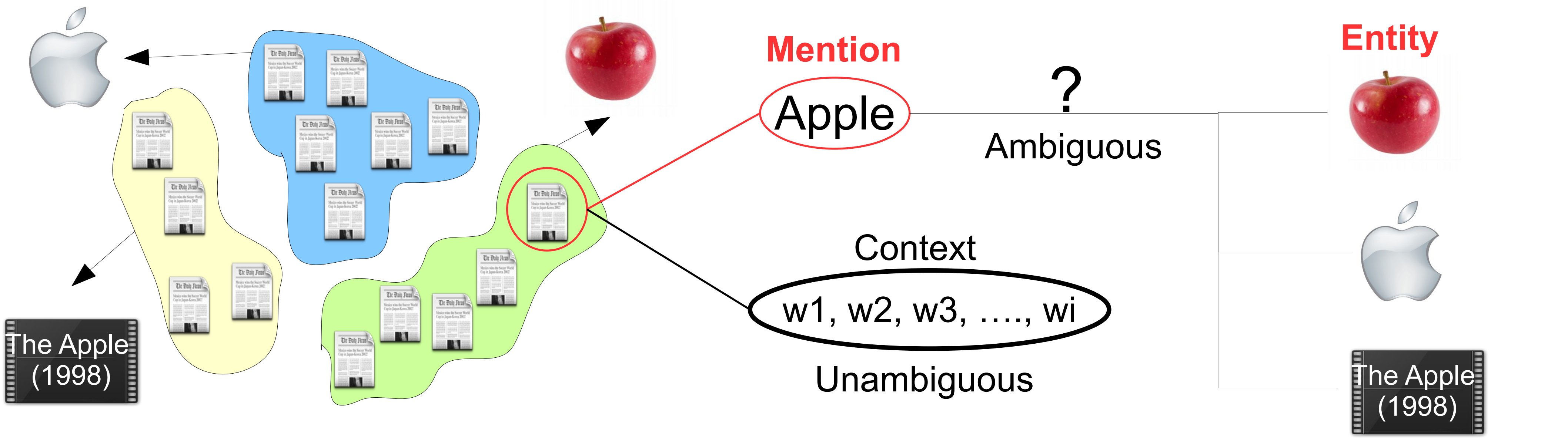

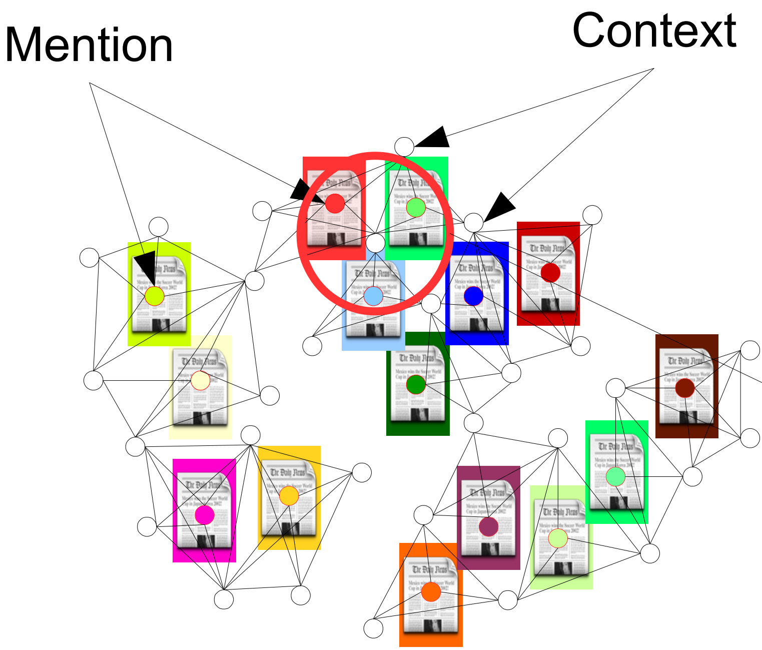

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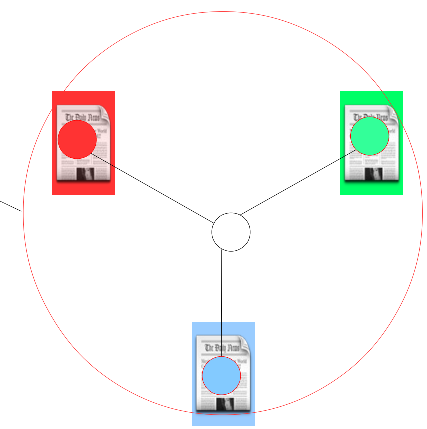

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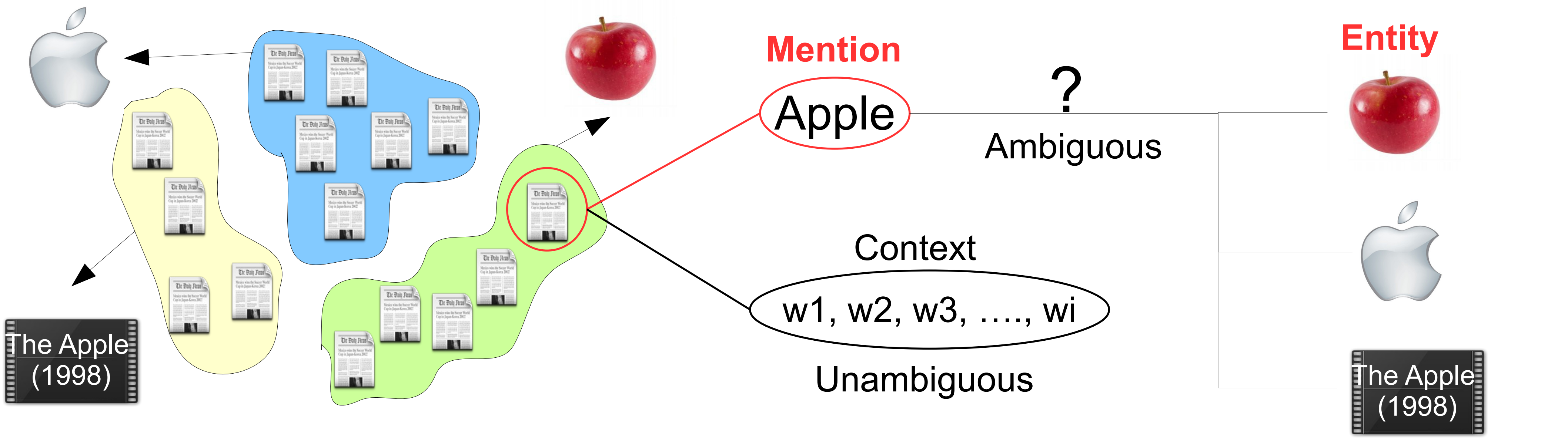

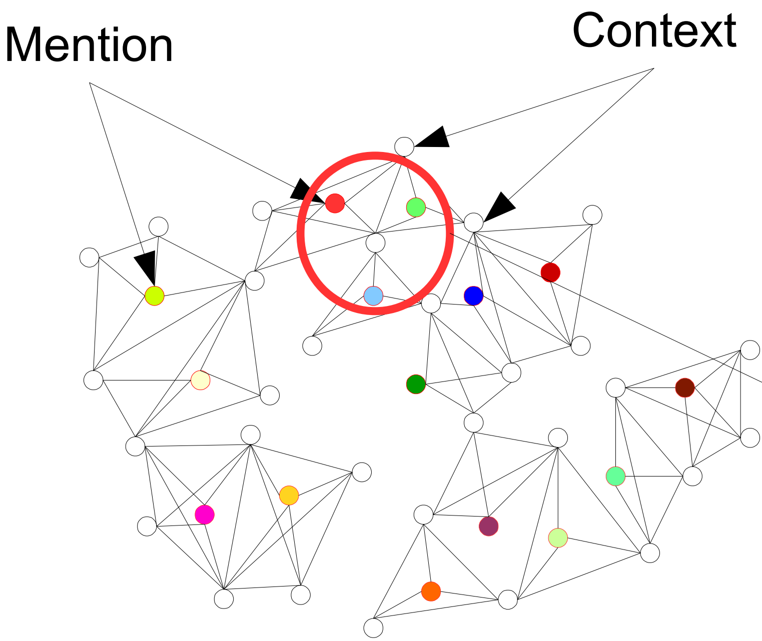

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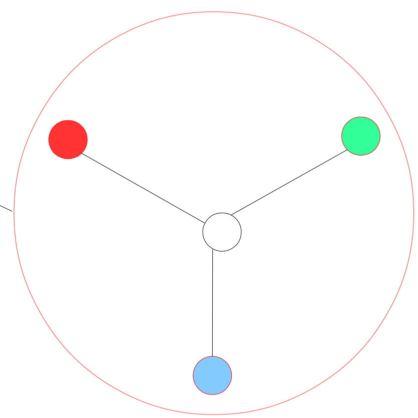

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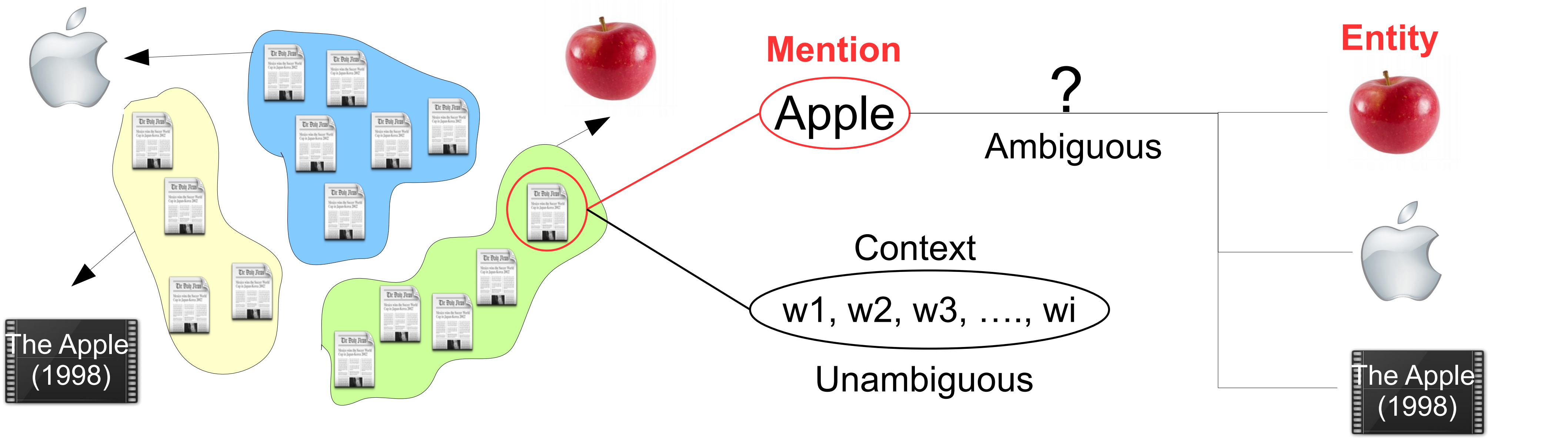

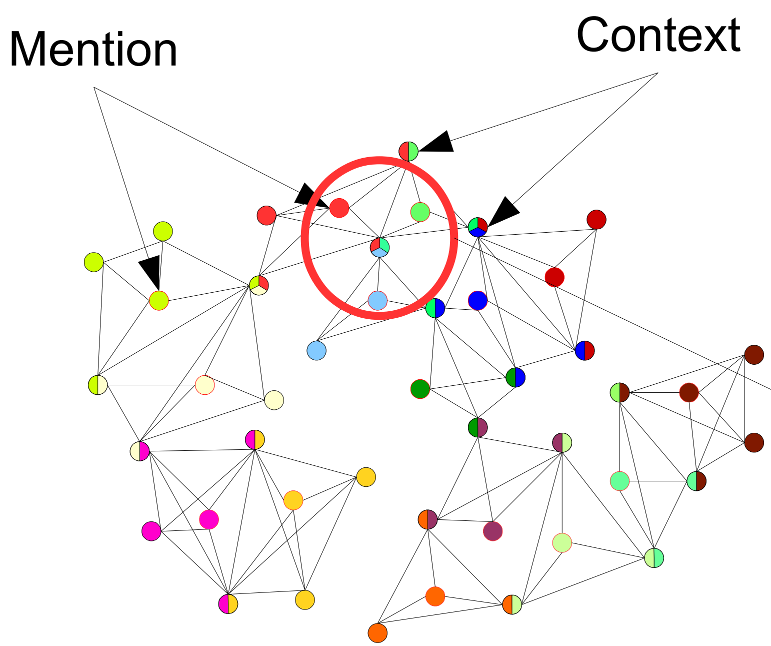

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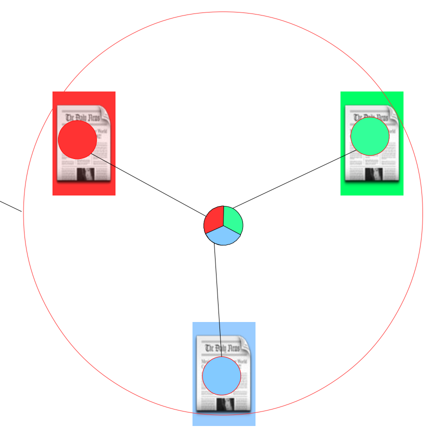

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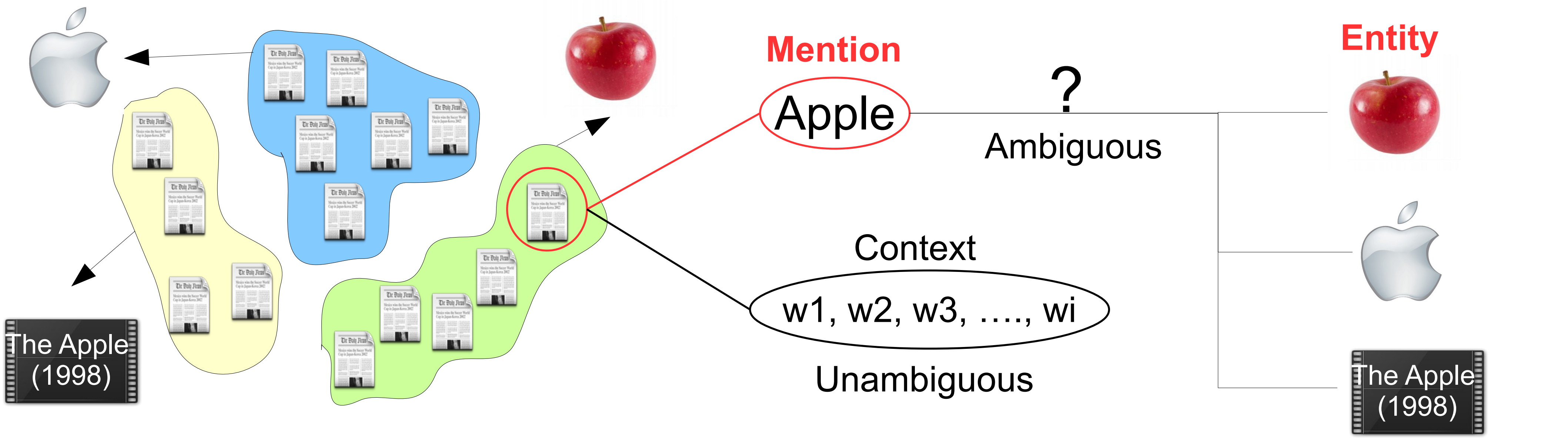
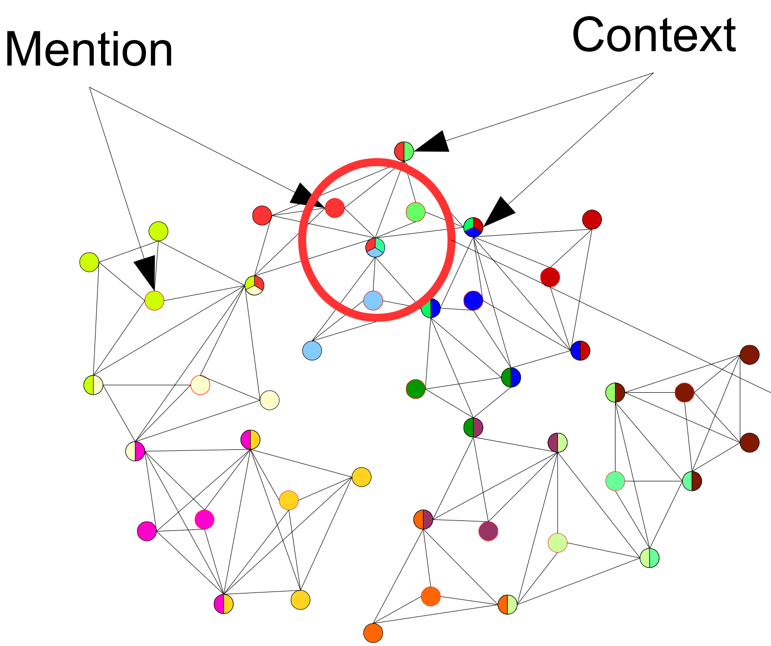
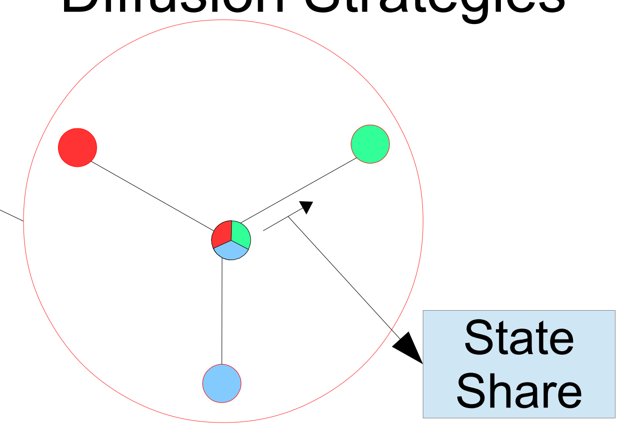




Diffusion Clustering

- Initialization
  - Color assignment
- Diffusion
  - Diffusion Strategies



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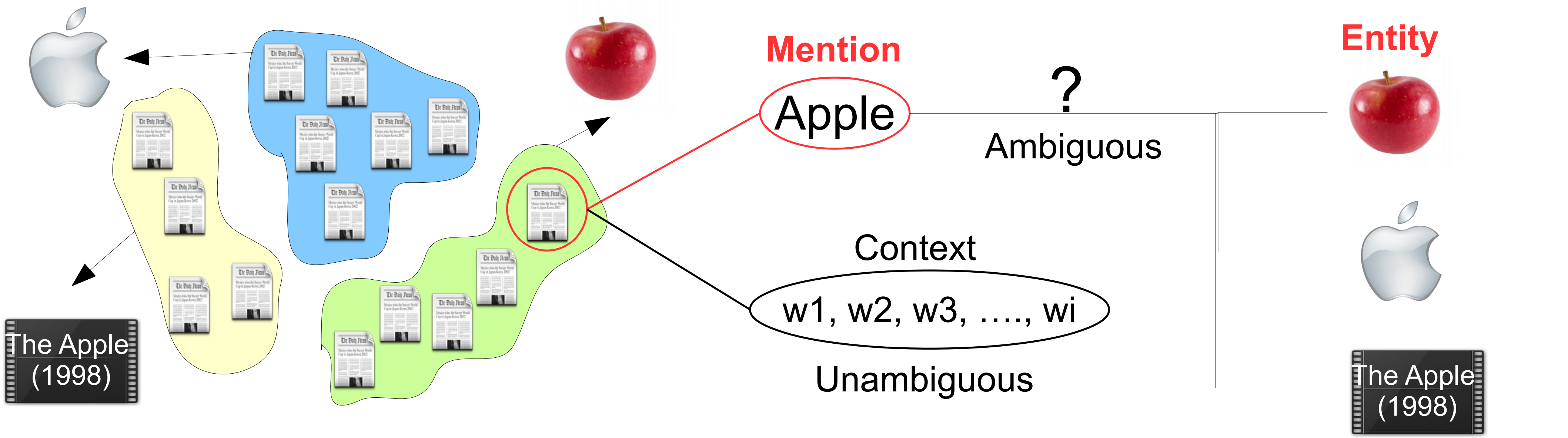

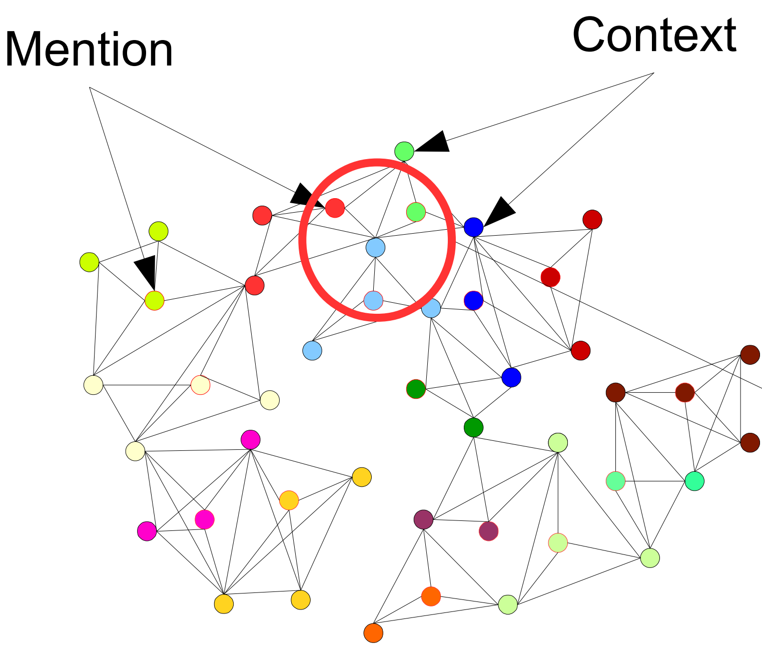

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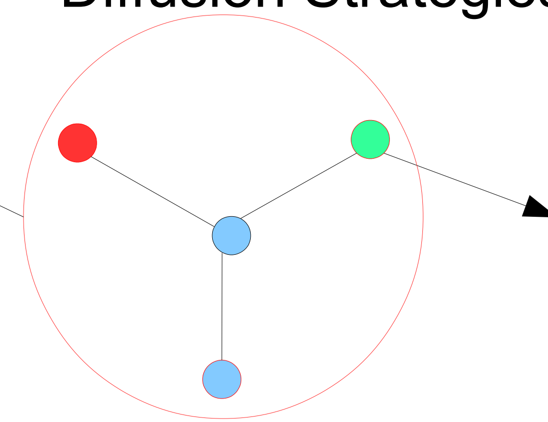
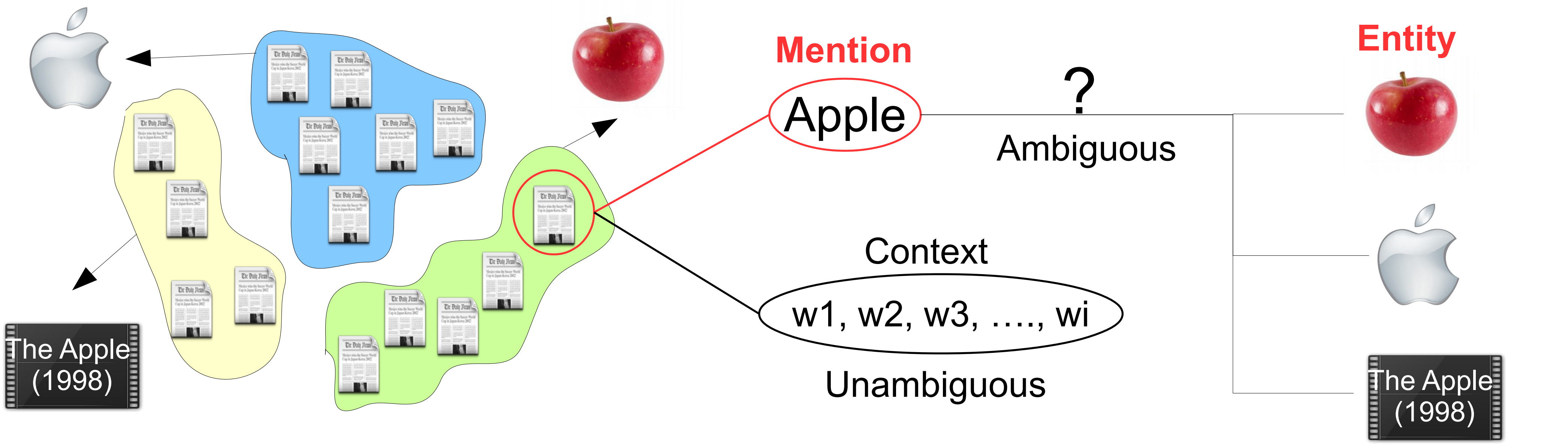
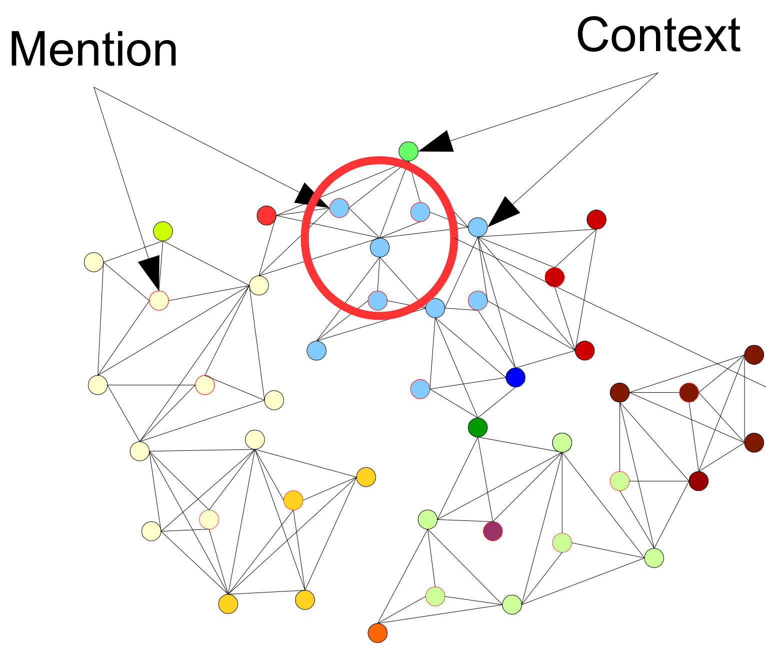


Information:

Own state
Neighbor state
Incoming colors

Diffusion based Clustering





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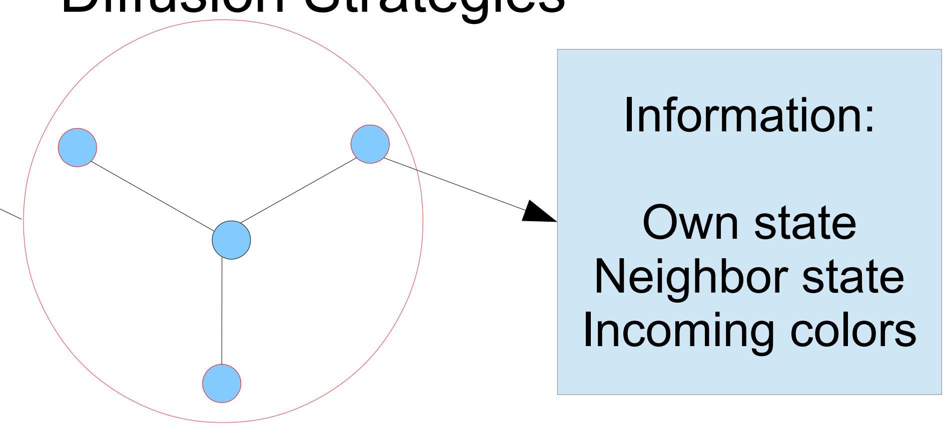

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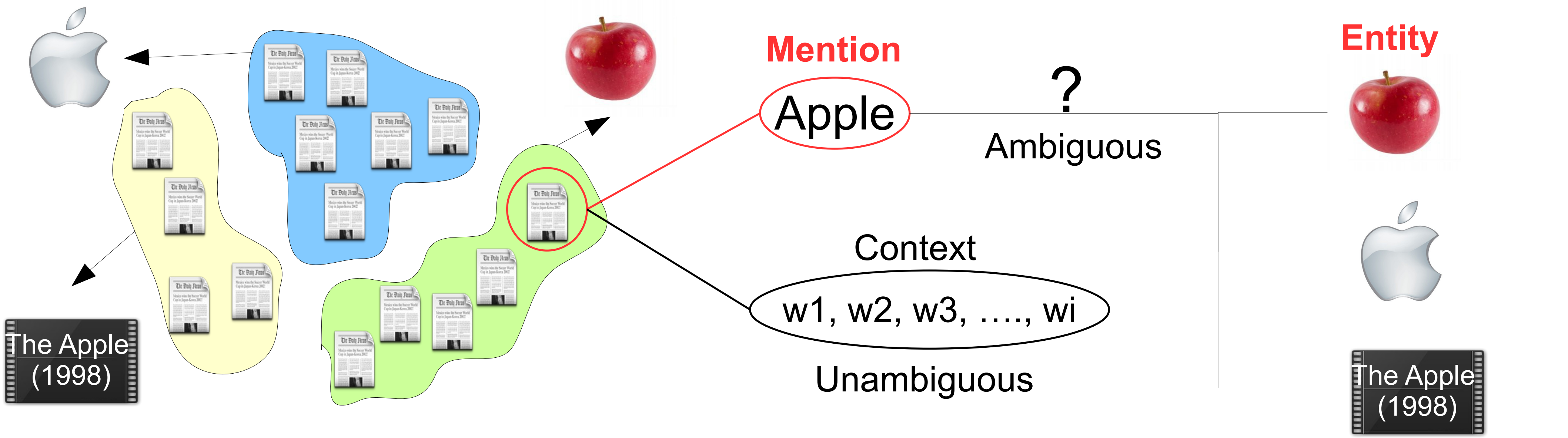

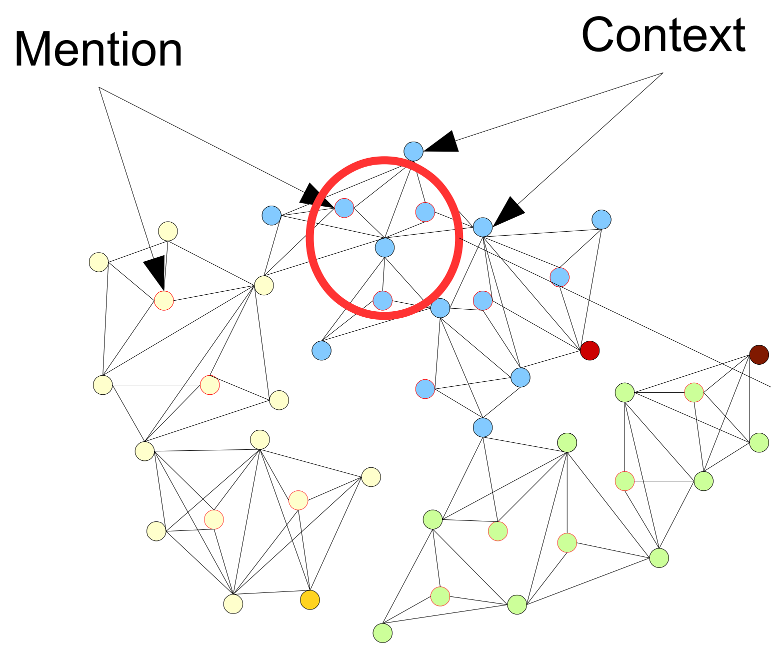

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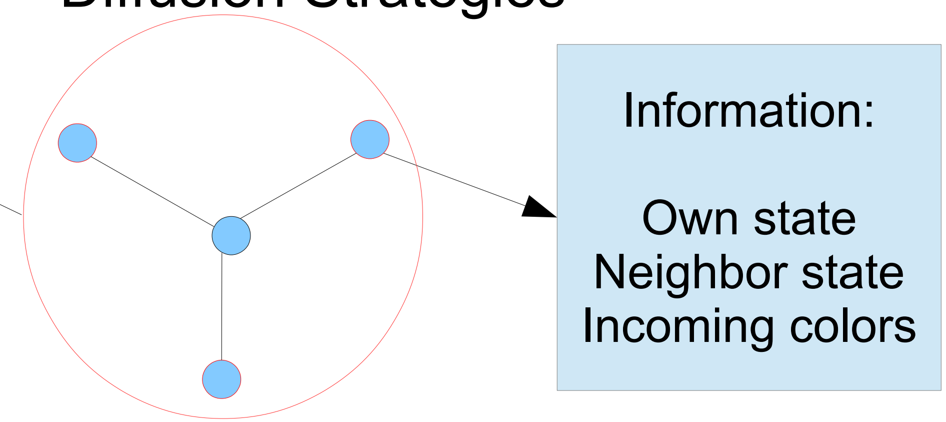
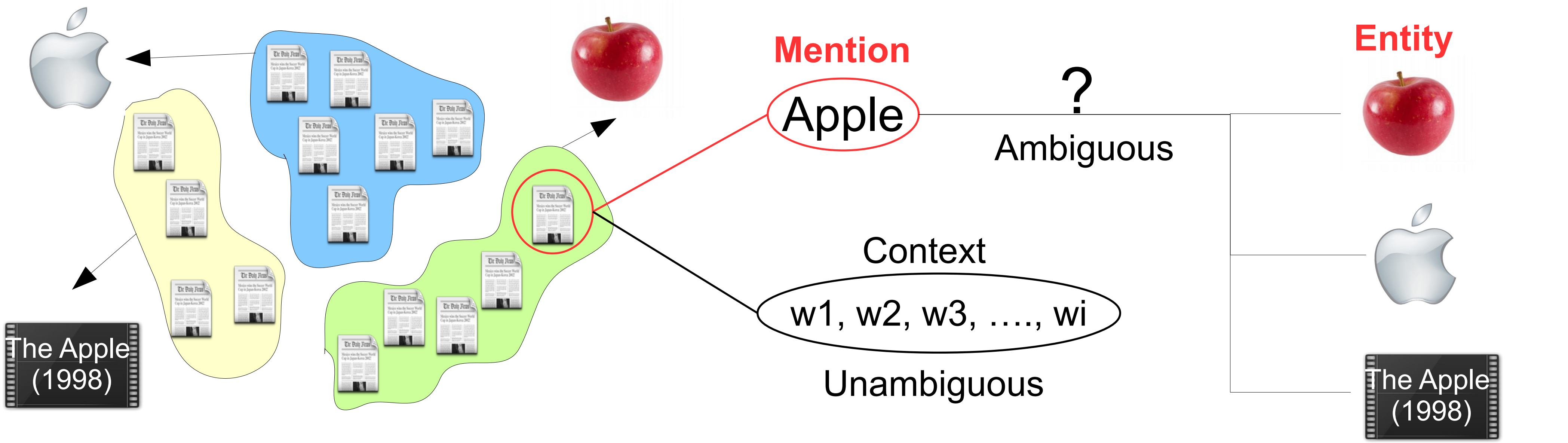
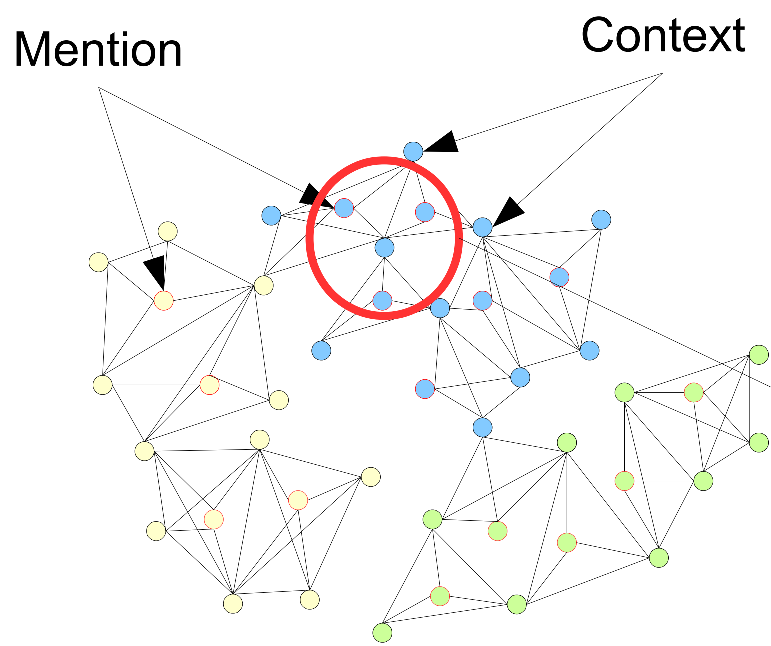


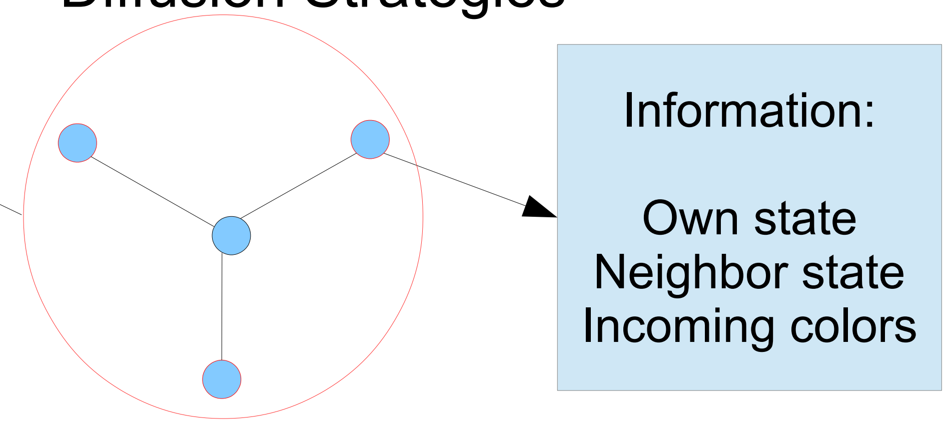
Diffusion based Clustering



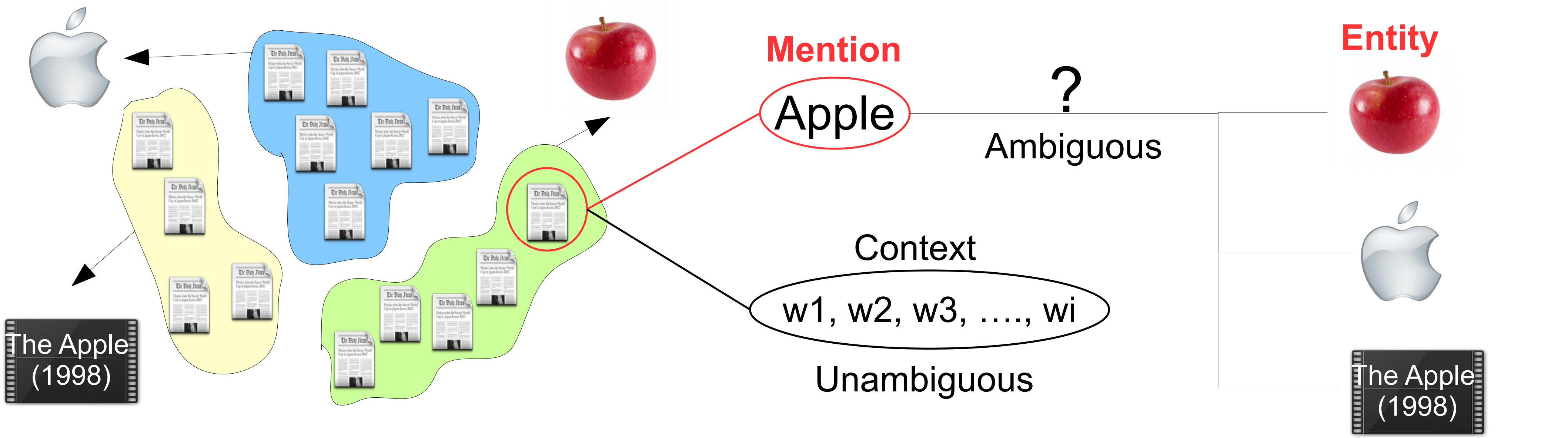


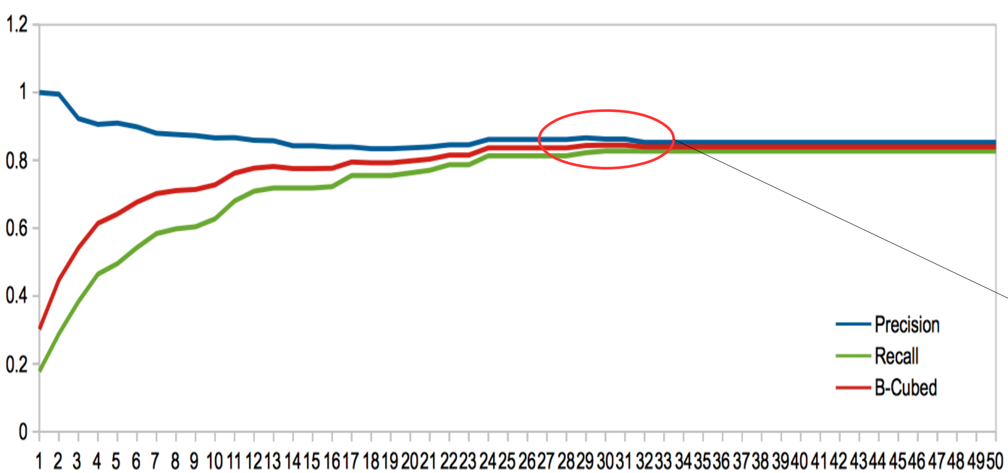
Diffusion Clustering

- Initialization
  - Color assignment
- Diffusion
  - Diffusion Strategies



Results

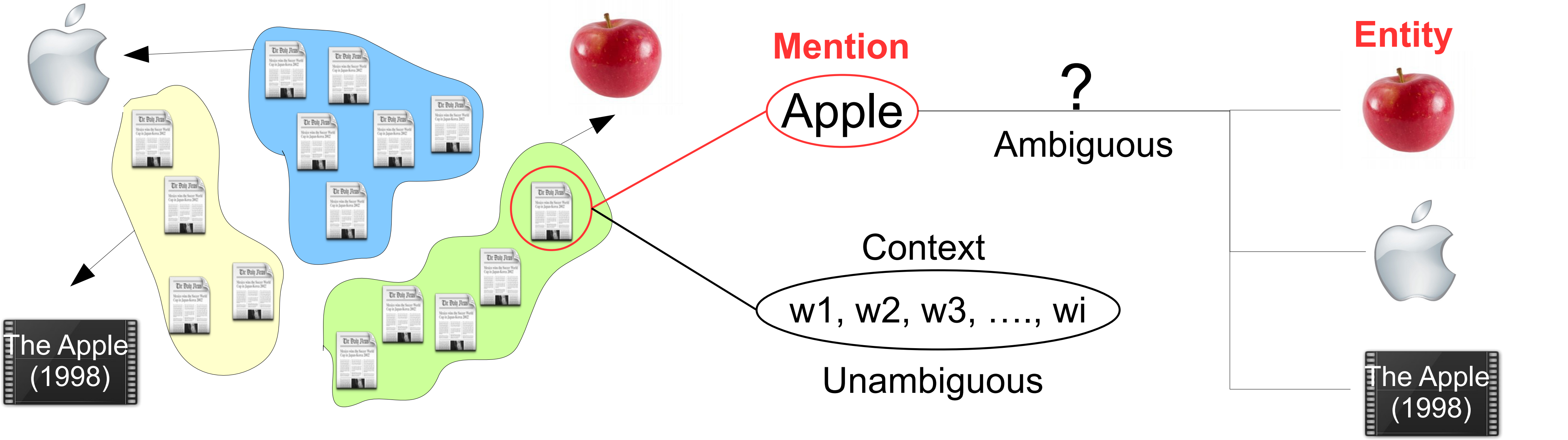


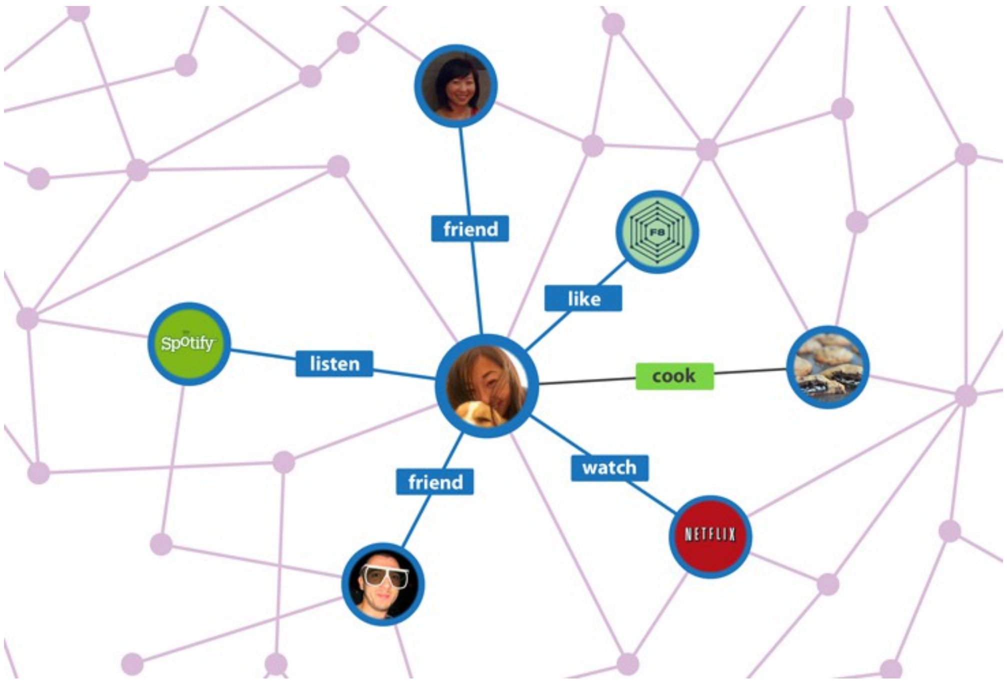


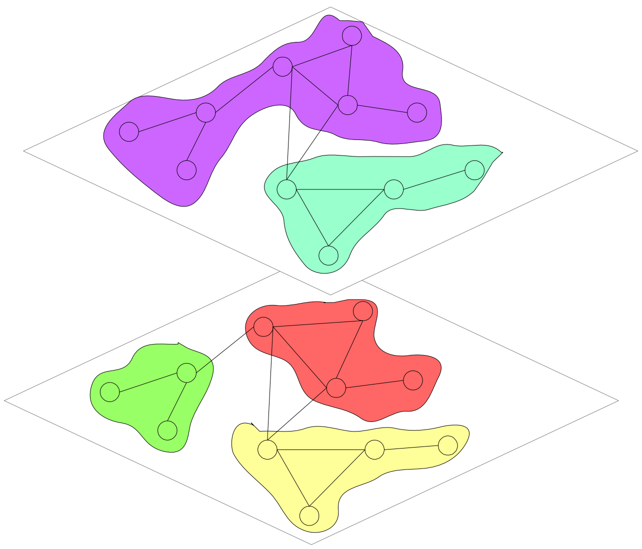
$\alpha = 0, \beta = 0.7, \gamma = 0.96, \delta = 0.05$

Model	Accuracy(F1%)
Bagga & Baldwin	84.6
Google	66.4
Basic	84.5
Extended	**88.9**

What Next?


The Apple
(1998)
Mention
Apple
?
Ambiguous
Context
w1, w2, w3, …., wi
Unambiguous
Entity
The Apple
(1998)


friend
like
listen
cook
friend
watch
Spotify
NETFLIX


Activity
Profile

Thank You!