

Possessors Change Over Time:

A Case Study with Artworks

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Objective: To track change of possessors over time for a fixed possessee

Possession: The state of having or controlling something

Possessor: An entity that possesses a possessee

John's car; Louvre bought the painting; The diamond moved to London

Possessee: An entity that is possessed by a possessor

John's car; Louvre bought the painting; The diamond moved to London

Change of possessors over time:

Fixed possessee: paintings, sculptures, archeological artifacts, etc.

Track possession changes with respect to a temporal anchor

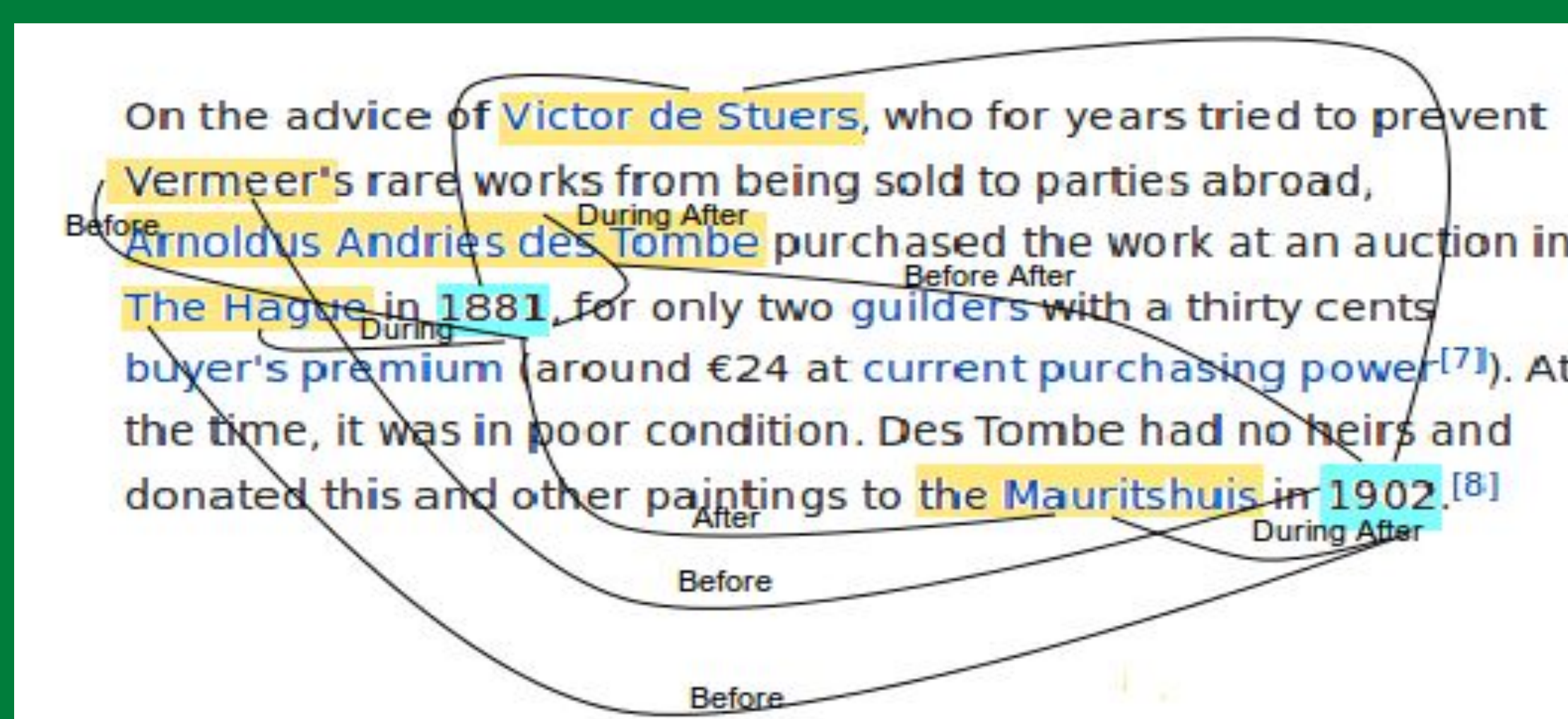
Temporal anchor: specific year (e.g., 1852)



Possessee: Girl with a Pearl Earring

Possessors: Johannes Vermeer, Arnoldus Andries des Tombe, Mauritshuis, etc.

Source: Wikipedia articles on artifacts



Pairing potential possessors and years:

Potential possessor & year pairs are chosen from each section of the Wikipedia article.

- Potential possessors: PER, ORG, LOC, and GPE NEs
- Year: four digits inside a DATE NE
- All duplicate pairs removed

Validating possessors and years:

Did a possession relation exist between the possessee and potential possessor at any point in time **before/during/after** the year?

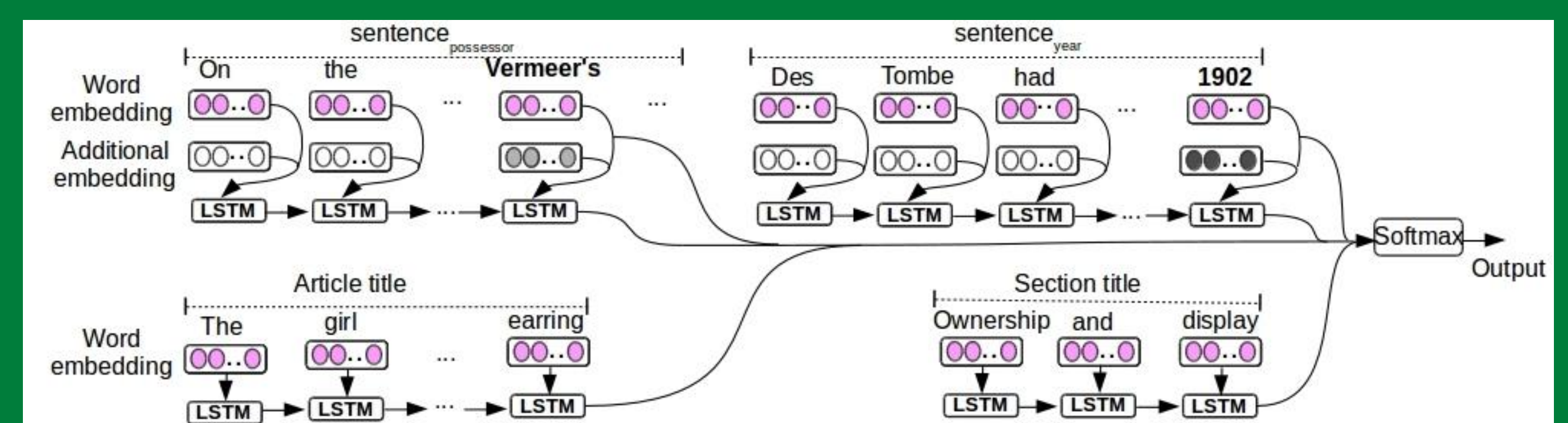
Labels: Before, During, After

Values: Yes, No

Cohen's kappa - 0.70

Automatic Extraction:

- SVM: standard features - relation extraction
- LSTM Ensemble: Potential possessor sentence + Year sentence + Section name + Wikipedia title name (possessee)



Results:

Classifier	Label/Value	Before			During			After		
		P	R	F	P	R	F	P	R	F
SVM	Yes	0.47	0.26	0.33	0.33	0.29	0.31	0.42	0.46	0.44
	No	0.86	0.94	0.90	0.93	0.94	0.93	0.88	0.87	0.87
LSTM Ensemble	Yes	0.41	0.38	0.40	0.22	0.56	0.32	0.44	0.65	0.53
	No	0.87	0.89	0.88	0.95	0.80	0.87	0.92	0.82	0.87

★ Yes is the only useful label

Conclusion:

- New deterministic approach to pairing potential possessors and years, given the wikipedia article about the possessee.
- Annotation strategy for validating change in possessors over time.
- Automatic extraction change in possessions allows creation of possession timelines