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)

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:

<table>
<thead>
<tr>
<th>Classifier</th>
<th>Label/Value</th>
<th>Before</th>
<th>During</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P  R  F</td>
<td>P  R  F</td>
<td>P  R  F</td>
<td>P  R  F</td>
</tr>
<tr>
<td>SVM</td>
<td>Yes</td>
<td>0.47</td>
<td>0.26</td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>0.86</td>
<td>0.94</td>
<td>0.90</td>
</tr>
<tr>
<td>LSTM Ensemble</td>
<td>Yes</td>
<td>0.41</td>
<td>0.38</td>
<td>0.40</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>0.87</td>
<td>0.89</td>
<td>0.88</td>
</tr>
</tbody>
</table>

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