



FAKULTÄT FÜR  
INFORMATIK

**GEORG ECKERT  
INSTITUTE**

for International Textbook Research

## Finding Implicit Links Between Norms Using HONto

Sabine Wehnert and Ernesto William De Luca

[sabine.wehnert@gei.de](mailto:sabine.wehnert@gei.de)

- Legal AI often relies on information extraction, common tasks:
  - Named Entity Extraction
  - Citation Extraction
  - Relationship Extraction

- Legal AI often relies on information extraction, common tasks:
  - Named Entity Extraction
  - Citation Extraction
  - Relationship Extraction
- **Relationships between legal documents:**
  - explicit: citations in original text of legal documents

- Legal AI often relies on information extraction, common tasks:
  - Named Entity Extraction
  - Citation Extraction
  - Relationship Extraction
- **Relationships between legal documents:**
  - explicit: citations in original text of legal documents
  - implicit: not directly encoded in the document
    - contextual

- Legal AI often relies on information extraction, common tasks:
  - Named Entity Extraction
  - Citation Extraction
  - Relationship Extraction
- **Relationships between legal documents:**
  - explicit: citations in original text of legal documents
  - implicit: not directly encoded in the document
    - situational

**How can implicit relationships be extracted and modeled?**

- **HONto: Book to Knowledge**
  - lightweight bottom-up knowledge base
  - composed of concept hierarchies from legal literature
  - using section titles + citations for the concept hierarchy

- **HONto: Book to Knowledge**

- lightweight bottom-up knowledge base

- composed of concept hierarchies from legal literature

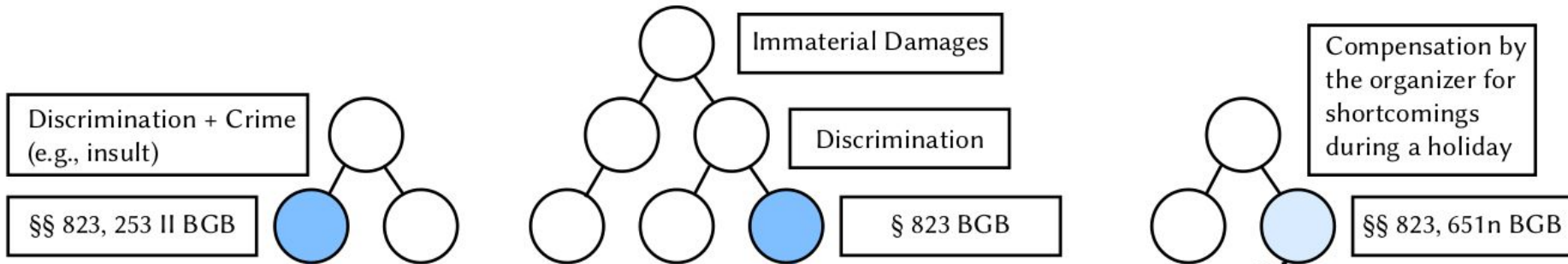
- using section titles + citations for the concept hierarchy

Main use case: **IR and regulatory change recommendation**

- differs from related work [1] by use of legal textbook resources

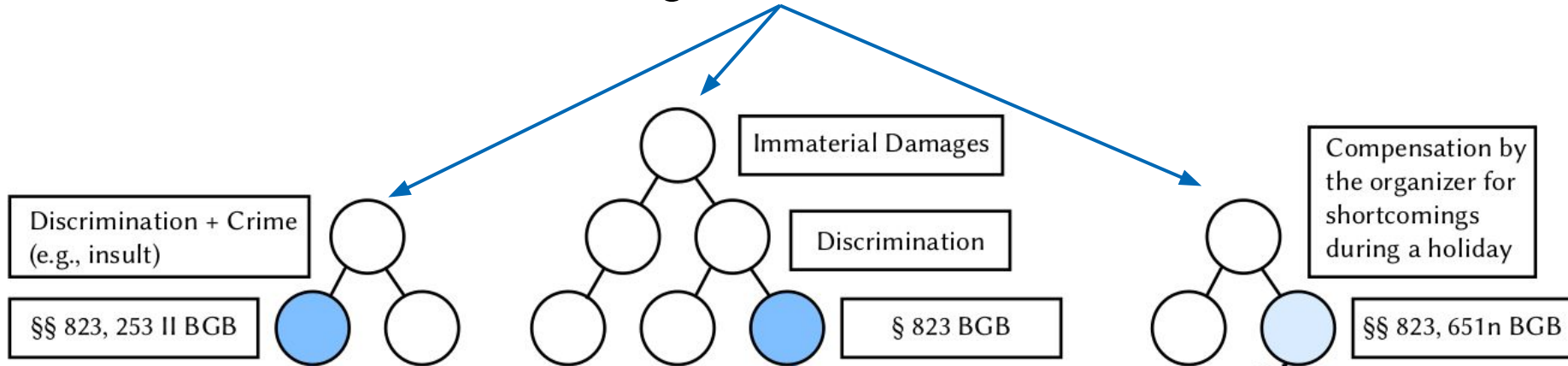
- not intended for reasoning, such as other models [2-4]

- **HONto: Book to Knowledge**



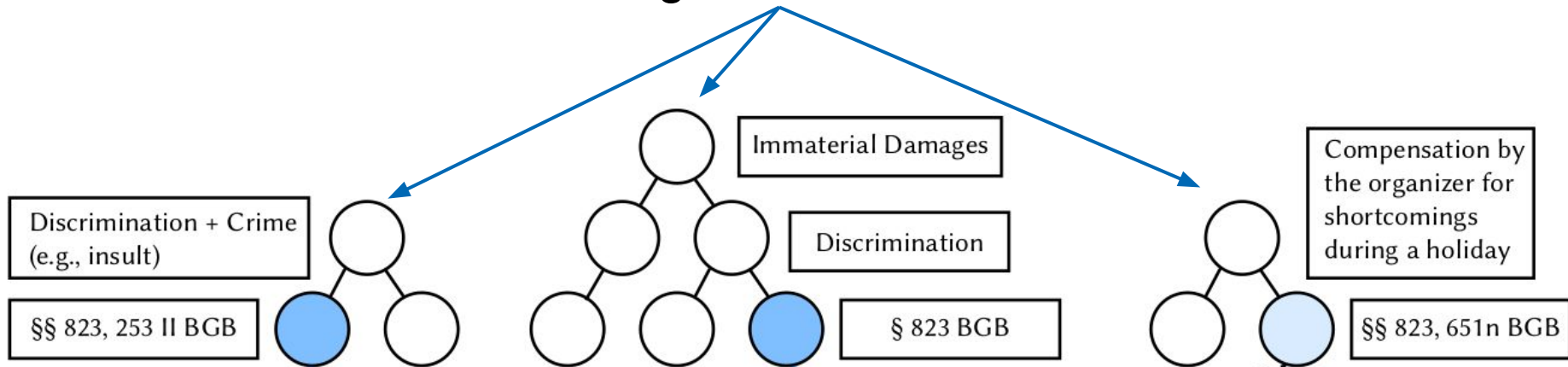


## ■ HONto: Book to Knowledge **Concept Hierarchies from Textbooks**



## ■ HONto: Book to Knowledge

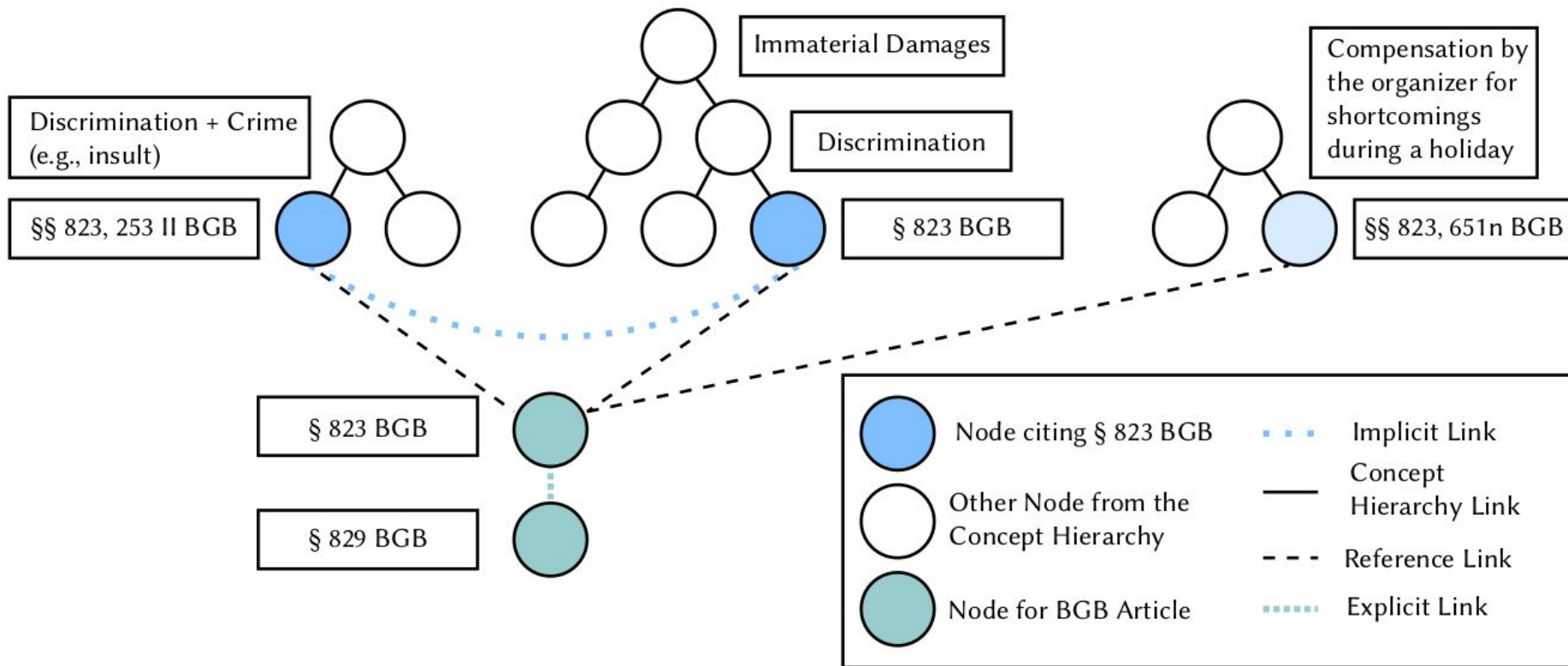
### Concept Hierarchies from Textbooks



## ■ Bottom-up concept hierarchy extraction:

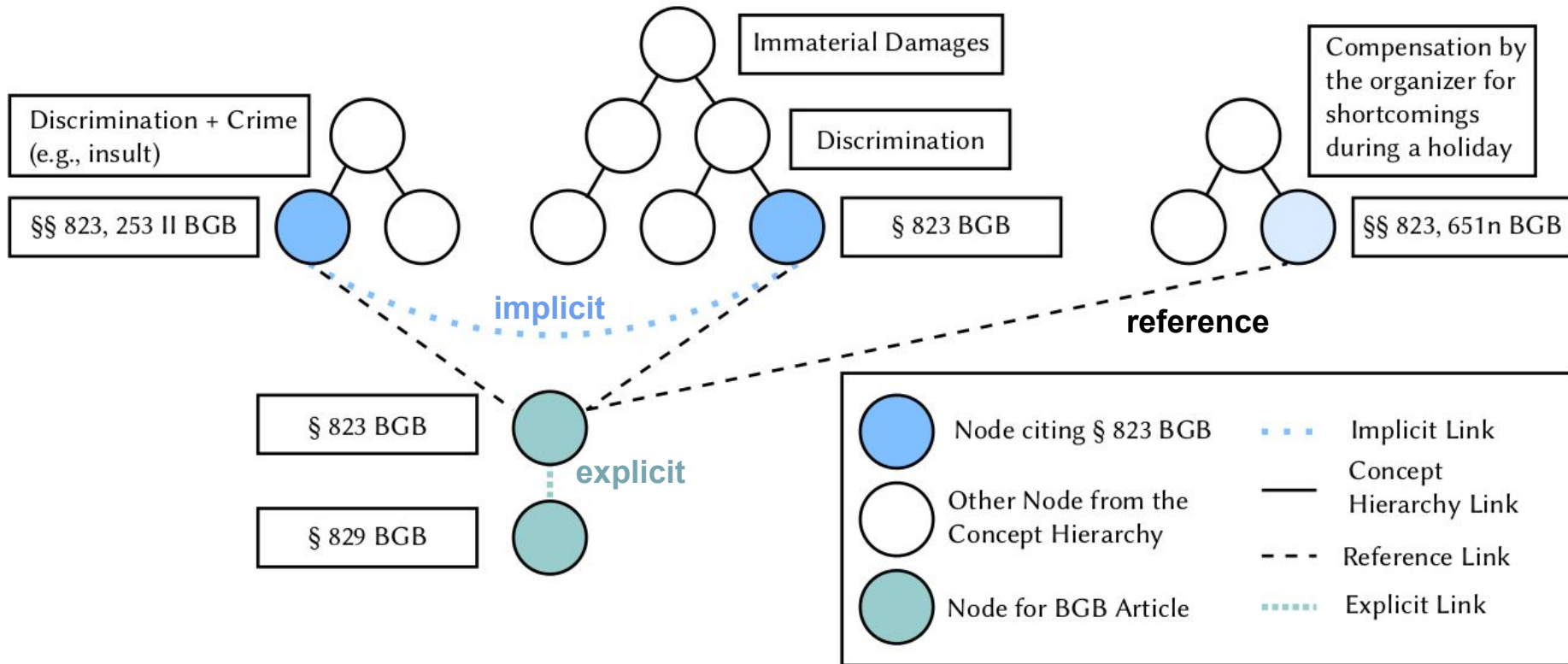
- References to legal documents in the leaves
- Keyword(s) from the sentence citing the legal document
- Concept nodes above that from section titles

## ■ HONto: Linking the references and legal document entities



**Figure 1:** Linking explicitly and implicitly related norms.

## ■ HONto: Linking the references and legal document entities



**Figure 1:** Linking explicitly and implicitly related norms.

- **HONto:** Linking the references and legal document entities
  - Always link explicit citations between legal documents
  - Resolve references to legal document entities [1]
  - Implicit link candidates: references to the same article(s)
  - Determine **topical relevance** for implicit links

**Aim: relationships among similar contexts in concept hierarchies**

## ■ HONto: Topical Relevance

→ form implicit links if references share the same context

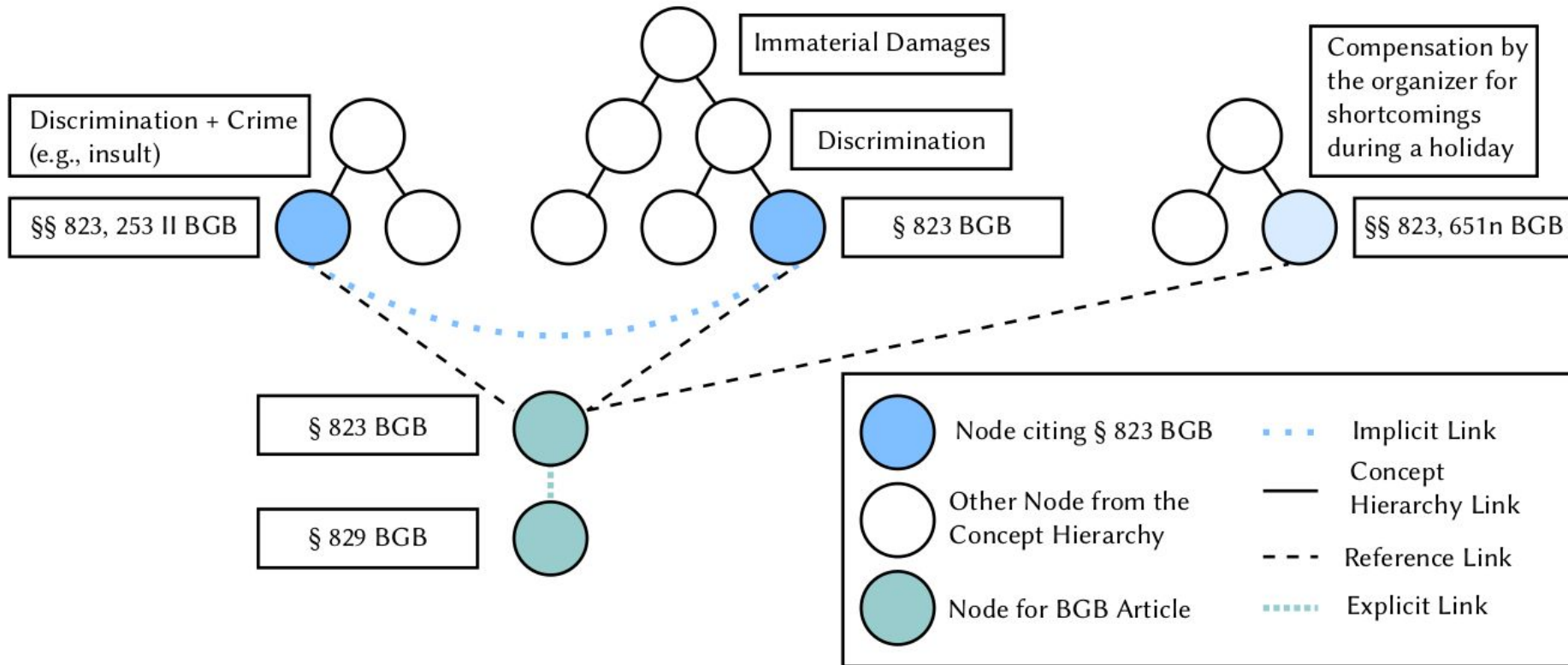


Figure 1: Linking explicitly and implicitly related norms.

- **Dataset:** Wehnert et al. [1]
  - 193 German textbooks covering different areas of law
  - 83,661 norm references extracted with UIMA Ruta\*
  - thereof 122 norm combinations (e.g. §§ 823, 651n BGB)
  - thereof 39 referring to the German Civil Code (BGB)

**Take norm combinations as ground truth of laws to be linked explicitly or implicitly!**

\* <https://uima.apache.org/ruta.html>

Find explicit and potential implicit links:

Search Space	Search Direction	References	Explicit Links	Implicit Link Candidate
BGB-only	Bidirectional	13	4	9
External	Outbound	26	9	17
External	Inbound	26	7	19
External	Bidirectional	26	11	15
<b>Total</b>	<b>Bidirectional</b>	<b>39</b>	<b>15</b>	<b>24</b>



Find explicit and potential implicit links:

Search Space	Search Direction	References	Explicit Links	Implicit Link Candidate
BGB-only	Bidirectional	13	4	9
External	Outbound	26	9	17
External	Inbound	26	7	19
External	Bidirectional	26	11	15
<b>Total</b>	<b>Bidirectional</b>	<b>39</b>	<b>15</b>	<b>24</b>

Why implicit link “**candidate**”? → assess topical relevance first!

→ test different similarity scoring methods in future work

- Properties of the implicit link candidates (mutually not exclusive):
  - default link
  - situational relationship
  - implicit mention

- Properties of the implicit link candidates (mutually not exclusive):
  - default link
  - situational relationship
  - implicit mention

- Properties of the implicit link candidates (mutually not exclusive):  
→ **default link:**
  - § 195 BGB (duration of a limitation period)
  - § 199 I BGB (its default beginning at the end of the year)

- Properties of the implicit link candidates (mutually not exclusive):
  - **situational relationship:**
    - § 611a BGB (employment contract)
    - § 613 BGB (non-transferable duties of service)
    - § 242 BGB (performance in good faith)
    - entitlement to continued employment as a claim of an employee who is in dispute with his employer
    - almost no word overlap between situation and norms

- Properties of the implicit link candidates (mutually not exclusive):
  - **implicit mention:**
    - § 242 BGB (performance in good faith)
    - keyphrase often used without norm citation

- Properties of the implicit link candidates (mutually not exclusive):

→ **implicit mention:**

§ 242 BGB (performance in good faith)

→ keyphrase often used without norm citation

§ 75c I 2 HGB (instead of citing § 343 I 1 BGB explicitly):

*“Where the commercial employee has promised to be subject to a penalty in the event of [...] in accordance with the provisions of section 340 of the Civil Code. The provisions of the Civil Code concerning reduction of a disproportionately high contractual penalty shall remain unaffected.”*

→ mention of another norm with approximate reference

## Takeaways:

- We can find valuable knowledge about implicit links in textbooks
- Criterion of topical relevance for linking implicit references
- Implicit link categorization into default links, situational relationships and implicit mentions

## Future work:

- Determine topical relevance with similarity scoring methods
- Enhance textbook corpus with web knowledge from wikipedia, open source commentary and ontologies



- [1] R. Schönhof, A. Tenschert, A. Cheptsov, Practical aspects of ontology-based analysis and reasoning for law information represented in textual form, *International Journal On Advances in Intelligent Systems* 8 (2015) 45–55.
- [2] T. Humberg, C. Wessel, D. Poggenpohl, S. Wenzel, T. Ruhroth, J. Jürjens, Using ontologies to analyze compliance requirements of cloud-based processes, in: M. Helfert, F. Desprez, D. Ferguson, F. Leymann (Eds.), *Cloud Computing and Services Science - Third International Conference, CLOSER 2013, Aachen, Germany, May 8-10, 2013, Revised Selected Papers*, volume 453 of *Communications in Computer and Information Science*, Springer, 2013, pp. 36–51.
- [3] M. Araszkievicz, I. A. Amantea, S. Chakravarty, R. van Doesburg, M. Dymitruk, M. Garin, L. Gilpin, D. Odekerken, S. S. Salehi, ICAIL doctoral consortium, montreal 2019, *Artif. Intell. Law* 28 (2020) 267–280.

- [4] M. Palmirani, G. Governatori, Modelling legal knowledge for GDPR compliance checking, in: M. Palmirani (Ed.), Legal Knowledge and Information Systems - JURIX 2018: The Thirtyfirst Annual Conference, Groningen, The Netherlands, 12-14 December 2018, volume 313 of Frontiers in Artificial Intelligence and Applications, IOS Press, 2018, pp. 101–110.
- [5] S. Wehnert, G. C. Durand, G. Saake, ERST: leveraging topic features for context-aware legal reference linking, in: M. Araszkievicz, V. Rodríguez-Doncel (Eds.), Legal Knowledge and Information Systems - JURIX 2019: The Thirty-second Annual Conference, Madrid, Spain, December 11-13, 2019, volume 322 of Frontiers in Artificial Intelligence and Applications, IOS Press, 2019, pp. 113–122. URL: <https://doi.org/10.3233/FAIA190312>.




FAKULTÄT FÜR  
INFORMATIK

**GEORG ECKERT  
INSTITUTE**

for International Textbook Research

## Finding Implicit Links Between Norms Using HONto

 @sabine\_wehnert

 anybass/HONto

Sabine Wehnert and Ernesto William De Luca

sabine.wehnert@gei.de