



Auditing the Hierarchical Relations of Partially Antonymous Concept Pairs in SNOMED CT

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Flight Surgeon

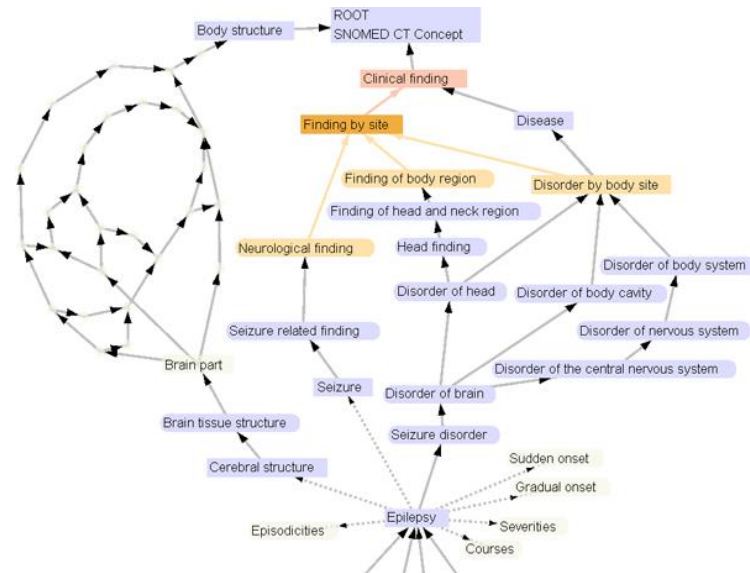
Republic of Korea Air Force





SNOMED CT

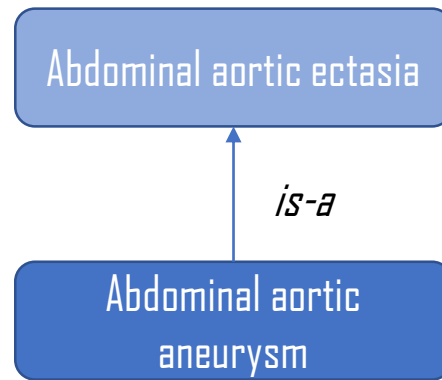
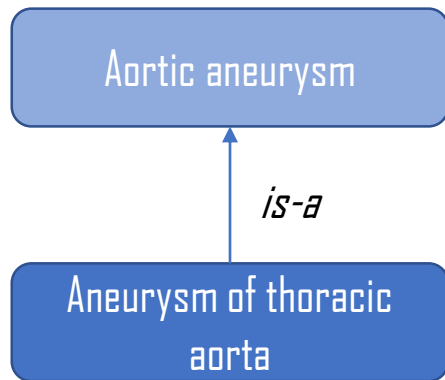
- Comprehensive controlled biomedical vocabulary and ontology
- Extensive coverage of clinical findings, diseases, procedures, and therapies





Complexity of SNOMED CT Modeling

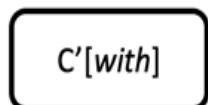
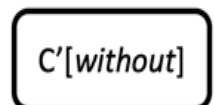
- Often leads to inconsistent allocation of symmetric concepts
 - *Ex) aneurysm of thoracic aorta vs aneurysm of abdominal aorta*





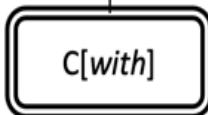
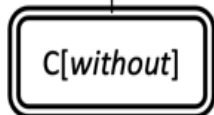
Auditing “Partially Antonymous” Concepts

- Specific case of symmetric concepts
 - Ex) *MRI with contrast* vs *MRI without contrast*
- Inconsistent modeling of partially antonymous concept pairs can lead to destabilized computational linguistic models
 - Knowledge graph embedding, semantic similarity, etc.

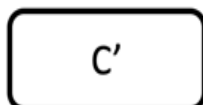


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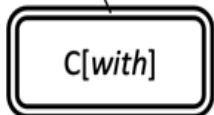
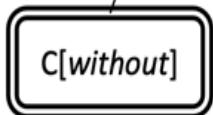


Type I (desirable)

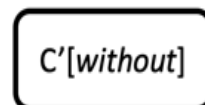


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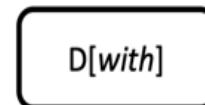
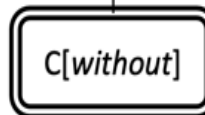
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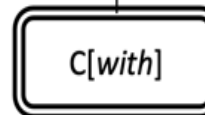
Type III (desirable)



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Type VI (undesirable)



Methods

- Audited partially antonymous pairs under *Procedure* and *Disease* hierarchies of SNOMED CT

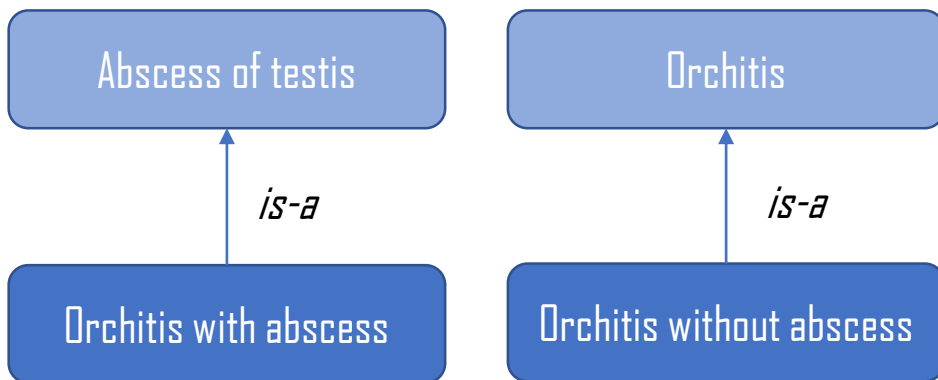


Results

	Procedure	Disease
Total number of descendants	59,489	83,036
Total number of partial antonym pairs (A)	132	477
Type I concept pairs	56	233
Type III concept pairs	103	339
Type VI concept pairs (undesirable) (B) (B/A)	10 (7.6%)	35 (7.3%)

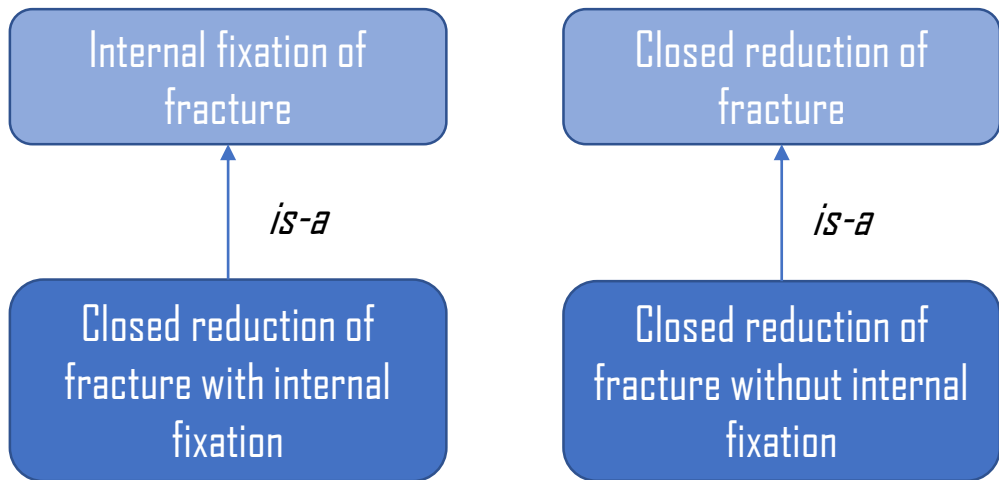


Examples of Type IV (Undesirable) Pairs



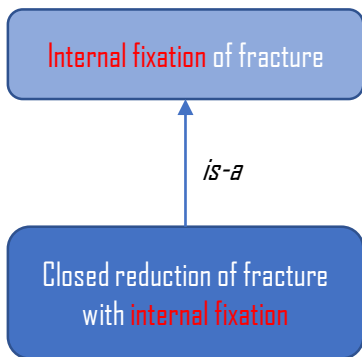


Examples of Type IV (Undesirable) Pairs

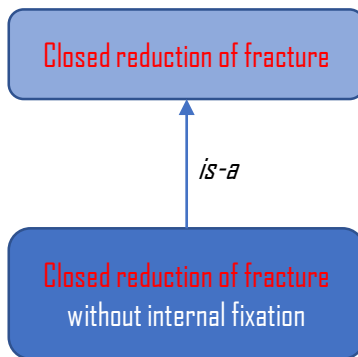




Inconsistent Modeling of Context



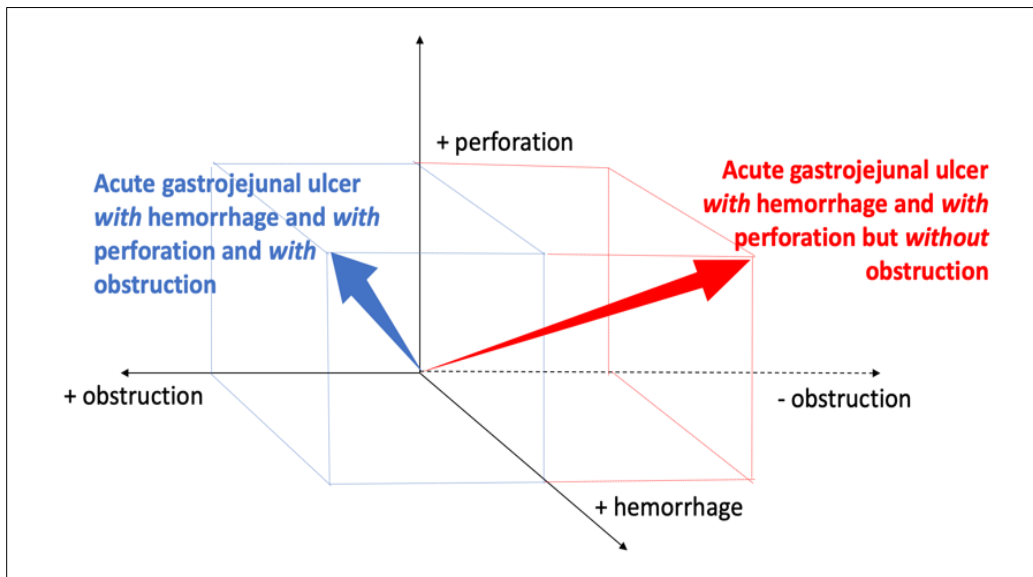
Context:
Internal fixation



Context:
Closed reduction of fracture



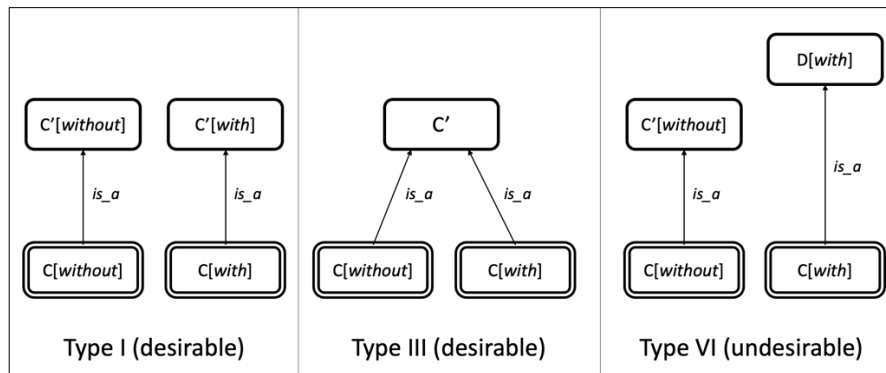
Orthogonality on Semantic Dimension





Lexical Retrieval

- Query: "Acute gastrojejunal ulcer *with* hemorrhage and *with* perforation"
- Retrieves "acute gastrojejunal ulcer *with* hemorrhage and *with* perforation *without* obstruction," in Type III
- Cannot be done in Type I
- Type III >> Type I





Conclusion

- About 7% of partially antonymous pairs are undesirably located under the *Disease* and *Procedure* hierarchies in SNOMED CT
- Inconsistent modeling of context can lead to linguistic computational flaws
- Type III is more desirable than Type I for lexical querying
- Other contexts need to be examined