Learning Fine-Grained Semantics for Multi-Relational Data

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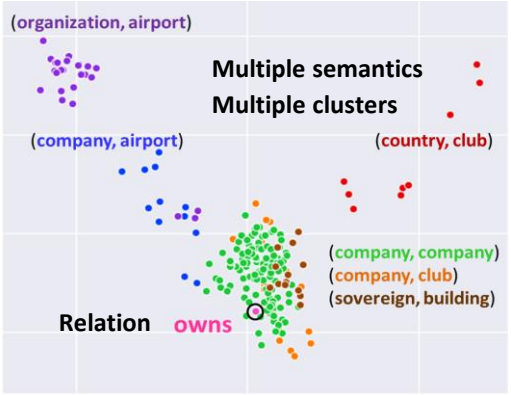
Motivation

- Polysemous relations between different types of entities in knowledge graphs
- Relations with multiple semantics - exhibit distinct meanings in different contexts

Yago relations with different meanings

created class types	**owns** class types
(artist, medium)	(country, club)
(artist, movie)	(company, club)
(player, movie)	(company, company)
(officeholder, movie)	(sovereign, building)
(writer, movie)	(company, airport)
(writer, television)	(organization, airport)
(writer, fictional_character)	
(artist, computer_game)	
(company, computer_game)	



Method

- **SemSplit** - Define fine-grained relation semantics, data-driven, scalable method
- Leverage knowledge graph embeddings for semantic vectors
- Find optimal sub-relation clusters with well defined meanings

Evaluation

- Clustering algorithms - Spectral (SP), Optics (OP) and Hierarchical Agglomerative (HA)
- C_{opt} clusters by **SemSplit** perform better than baselines, promising results

Relation (algorithm)	*SemSplit* optimal clusters $\mathcal{C}_{opt}$	Homegeneity Score (# clusters) $\mathcal{C}_{orig}$	$\mathcal{C}_{max}(\mathcal{L})$	$\mathcal{C}_{opt}(\mathcal{N})$
created (OP)	{(artist, computer_game)}, {(artist, medium) (officeholder, movie)}, {(writer, movie) (writer, television) (artist, movie) (player, movie)}, {(company, computer_game)}, {(writer, fictional_character)}	0.14 (1)	0.29 (9)	**0.49** (5)
owns (SP)	{(company, airport) (organization, airport)}, {(sovereign, building)}, {(company, club) (company, company) (country, club)}	0.03 (1)	0.32 (6)	**0.52** (3)
isAffiliatedTo (HA)	{(artist, club)}, {(cricketer, club)}, {(player, club) (hockey_player, club) (hockey_player, university) (hockey_player, team)}, {(officeholder, club)}	0.09 (1)	0.43 (7)	**0.61** (4)

C_{orig} - original relation cluster C_{max} - maximal splitting clusters

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