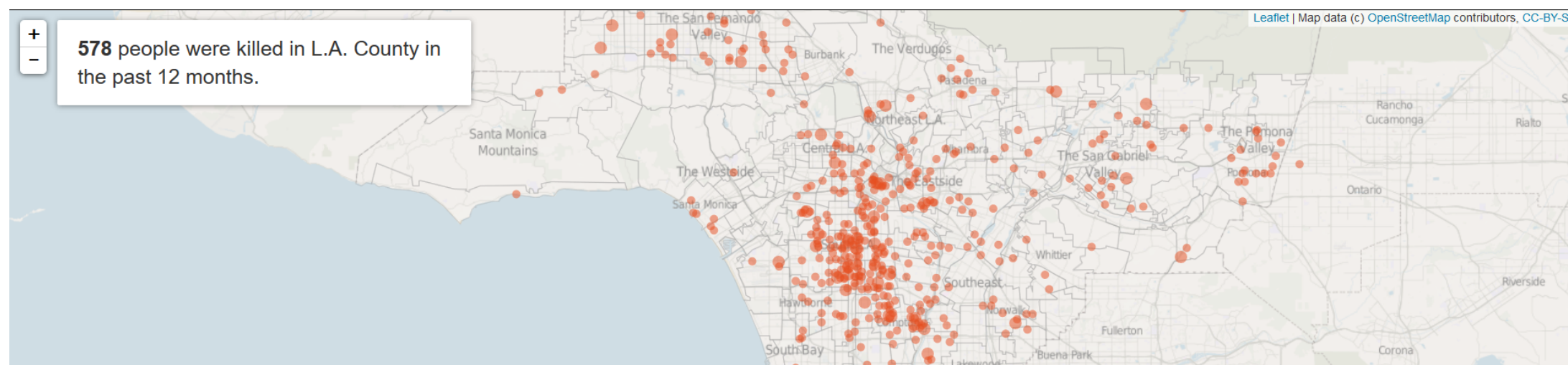


Motivation

Motivation

- A city reports the number of homicides, robberies or burglaries that occur each year. Such categorization potentially masks significant variability within individual crime types.
- Mapping the situational and motivational variability in crime may be important for developing approaches to preventing and solving crime.



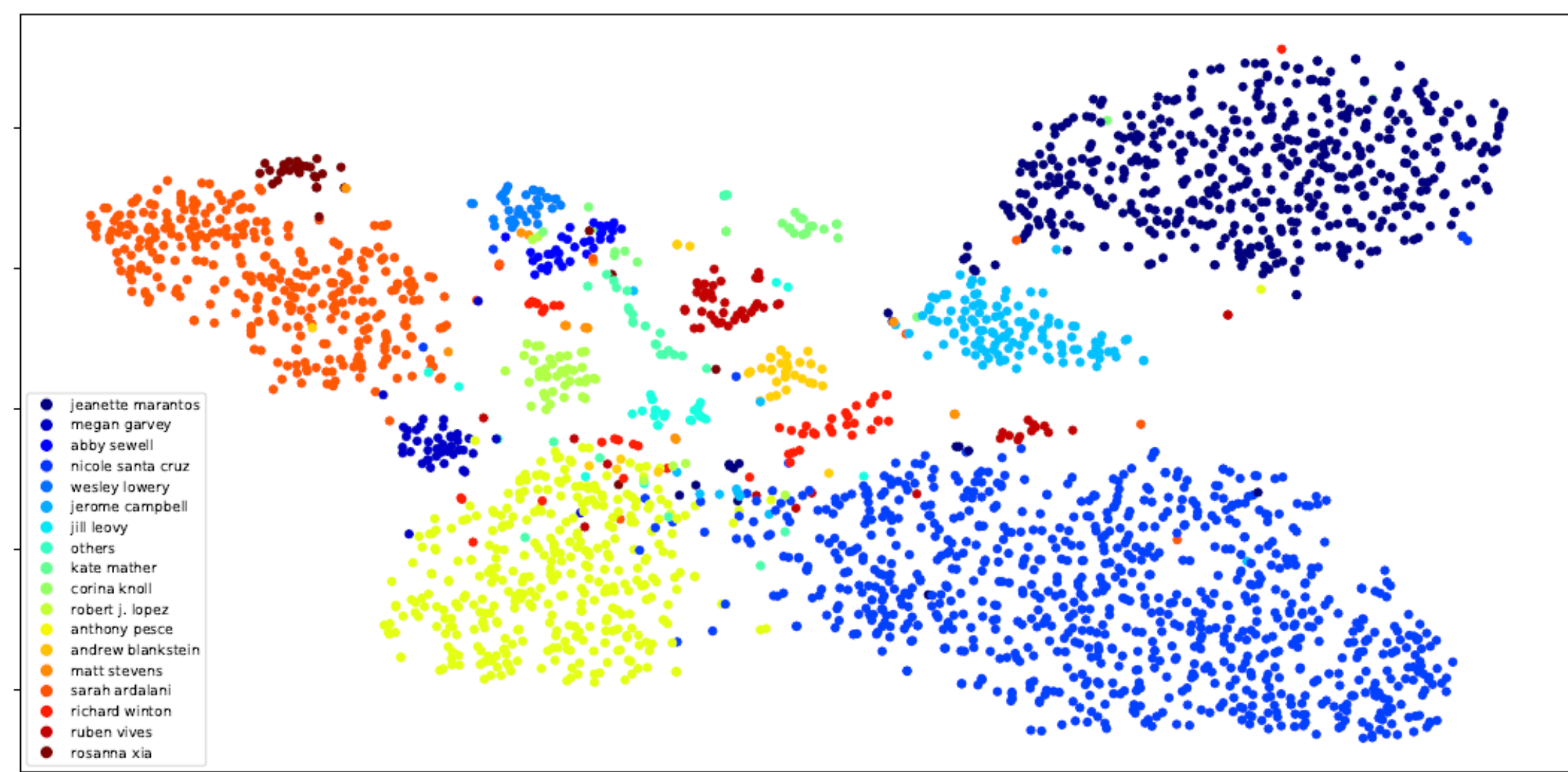
Locations of the homicides in Los Angeles reported to LA Times for last 12 months

LA Times Homicide Report Analysis

- Supervised learning for semantic analysis.
- Topic modeling.
- Text mining and knowledge graph build.

Supervised Learning for Semantic Analysis

We examine if the reports have contextual structures dependent on a certain class labels such as authorship, ethnicity and crime cause. We train different classifiers to distinguish the reports from different authors.



Visualization of the embedding vectors of the homicide reports. Each report reflects the characteristics (writing style) of each writer

Table: Important terms for each writer

First Name	Terms (Top 5 selected)
Jeanette	see, tell, family, away, strike
Nicole	boulevard, attorney, shortly, count, charge
Anthony	place, killing, boulevard, stab, official
Sarah	Relate, detail, tip, update, handle

Table: Authorship classification results

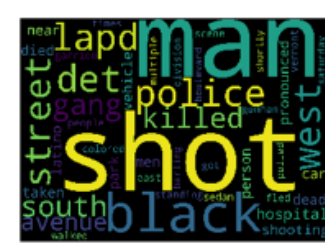
Methods	Accuracy
Random baseline	0.30
Naive Bayes	0.68
Logistic Regression	0.72
MLP	0.75

Topic Modeling

We implement topic modelling methods and trying to extract the different topic patterns hiding under different articles.

NMF result

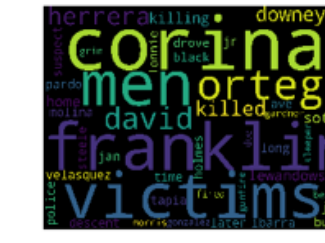
Topic 1: gang, south, west, det, lapd, street, police, black, man, shot
Topic 2: man, responded, officers, det, department, new, release, police, long, beach
Topic 3: victim, homicide, wishing, remain, anonymous, information, crime, stoppers, asked, contact
Topic 4: court, attorney, woman, home, charged, arrested, death, stabbed, court, murder
Topic 5: line, dead, taken, to, hospital, died, office, spokesman, ed, winter
Topic 6: gunshot, deputy, investigators, shot, compton, bureau, department, deputies, jauch, sheriff
Topic 7: scene, shooting, news, responded, gonna, department, release, officer, police, officers
Topic 8: quintero, multiple, quezada, rio, died, south, sanchez, latino, eddie, hernandez
Topic 9: friend, shooting, family, don, garcia, lt, investigation, car, jay, mendosa
Topic 10: person, heights, shot, street, stabbed, samir, martinez, latino, garcia, lopez



(a) NMF

LDA result

Topic 1: killed, hernandez, lapd, department, shooting, shot, man, officer, officers, police
Topic 2: black, information, latino, pronounced, dead, street, shooting, man, police, shot
Topic 3: lewandowski, killed, downey, hernandez, david, steph, men, victims, franklin, corina
Topic 4: northeast, path, megana, mummy, rhonda, wright, mart, luma, carter, shop, jackson
Topic 5: barrera, whitmore, rose, eddie, doubacker, bazajas, villagaz, dolson, ramon, rivera
Topic 6: casillas, multi, porter, has, negro, negro, valencia, glendia, mercado, pinosa
Topic 7: office, department, died, dead, man, long, beach, death, murder, police
Topic 8: invasion, mecoso, vela, well, mela, pyrene, wendy, valencia, whi, bradon
Topic 9: don, deputies, lt, shot, shooting, car, sheriff, family, mendosa, investigators
Topic 10: down, brock, palayo, cole, riley, lamp, swab, lisa, fu, jama



(b) LDA

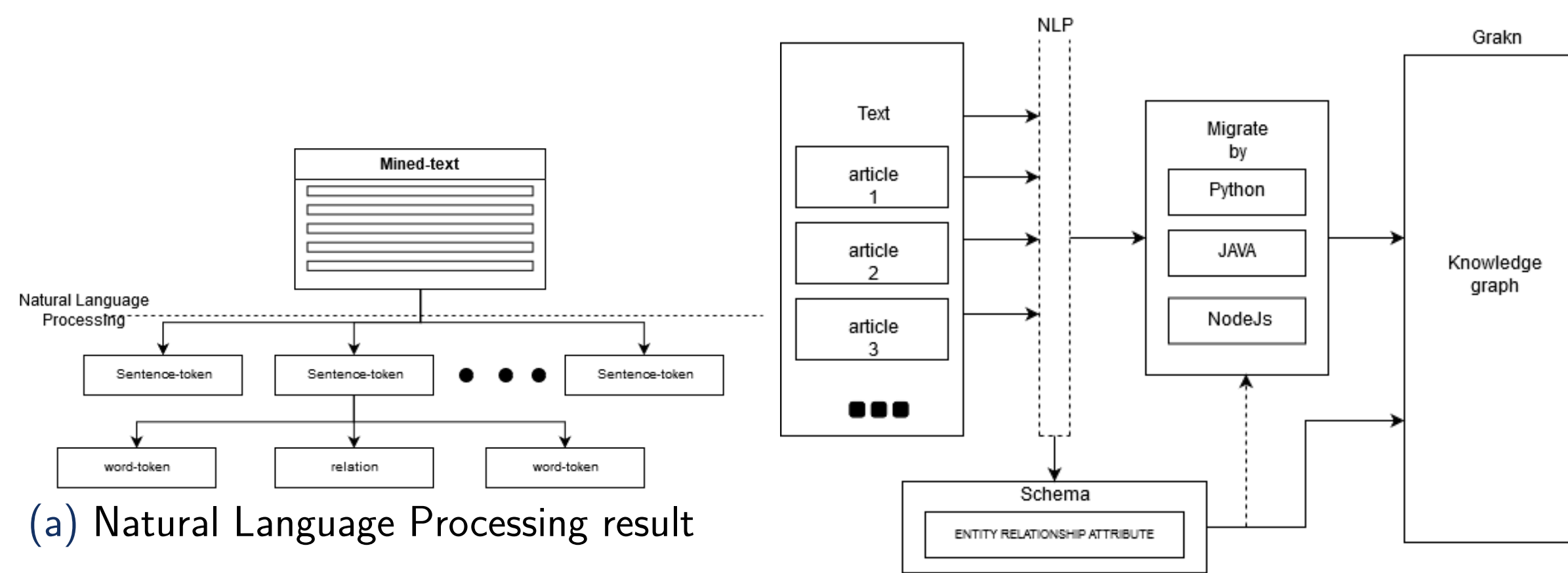
Anchored Correlation Explanation

- 0: family, just a know did told don school help lived
- 1: stoppers, anonymous, remain, crime, information, asked, contact, wishing, homicide, tips
- 2: murder, charged, attorney, arrested, district, court, count, suspicion, scheduled, prosecutors
- 3: officer, medical, tried, alleged, ftrms, was, identified, gun, later, did
- 4: bail, held, million, line, death, mother, son, day, facility, years
- 5: car, vehicle, colored, sedan, shot, drove, pulled, dark, away, gunman
- 6: home, women, husband, body, wife, house, went, couple, white, inside
- 7: police, latino, 318, wearing, winter, ed, heights, spokesman, gonna, detectives
- 8: release, news, officers, department, responded, arrived, beach, long, weapons, investigation
- 9: investigation, medical, center, past, version, sheriff, shooting, related, gang, earlier



(c) Correlation Explanation

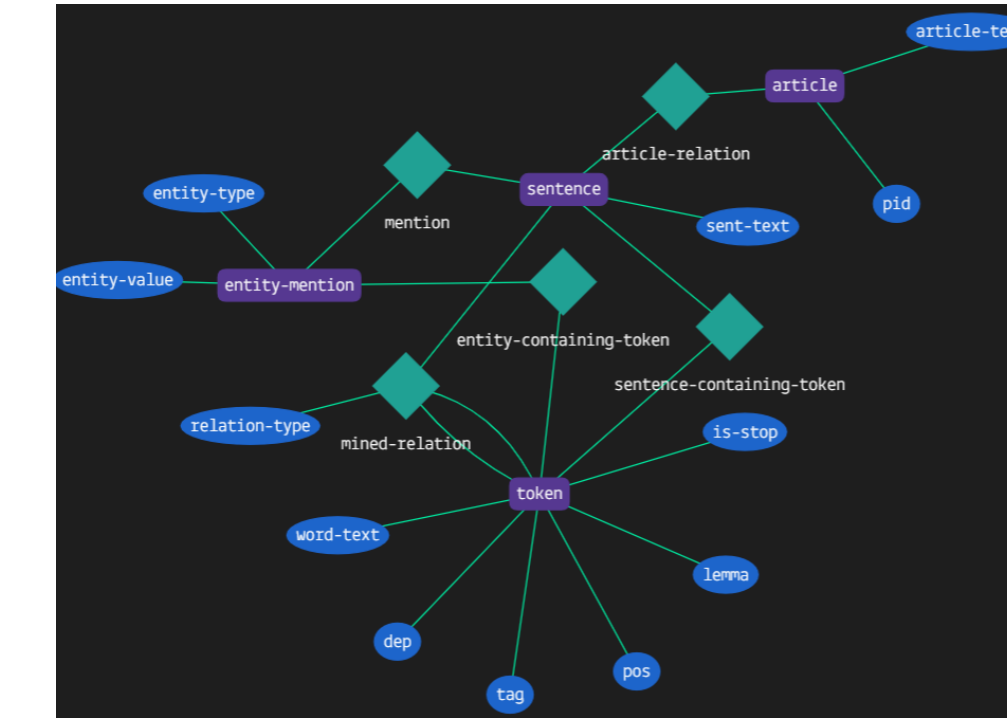
Text Mining and Knowledge Build



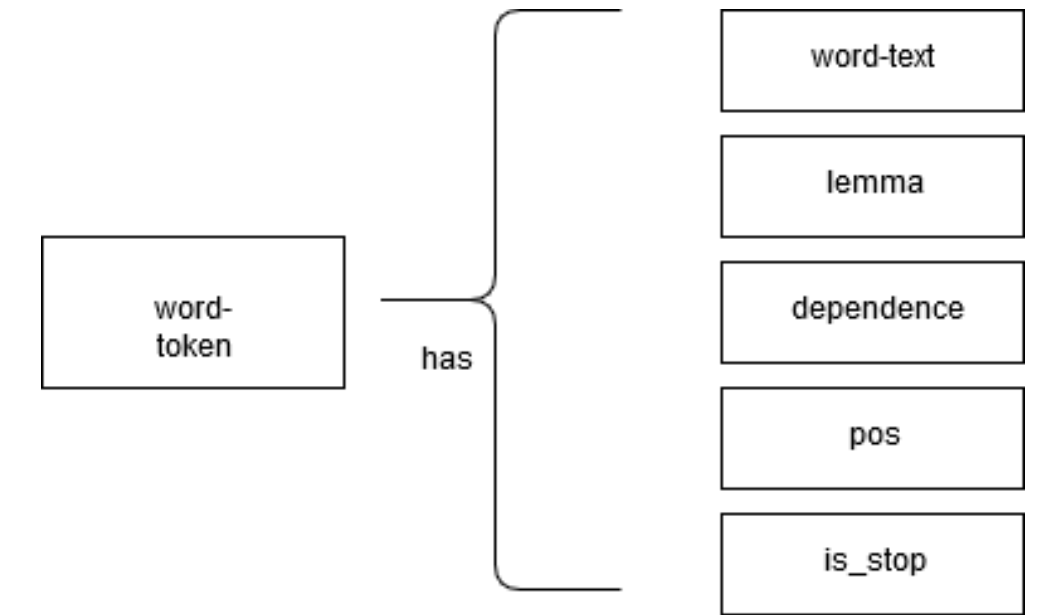
(a) Natural Language Processing result

(b) Procedure of text mining and knowledge graph build

An NLP tool is used to mine the text and produce some sort of output with a structure. That structure is used to create a schema (high level data model) to enforce a structure on the raw NLP output. Once that is done, we use one of Grakn's clients to migrate the instances of NLP output into Grakn making sure every insertion adheres to the schema.



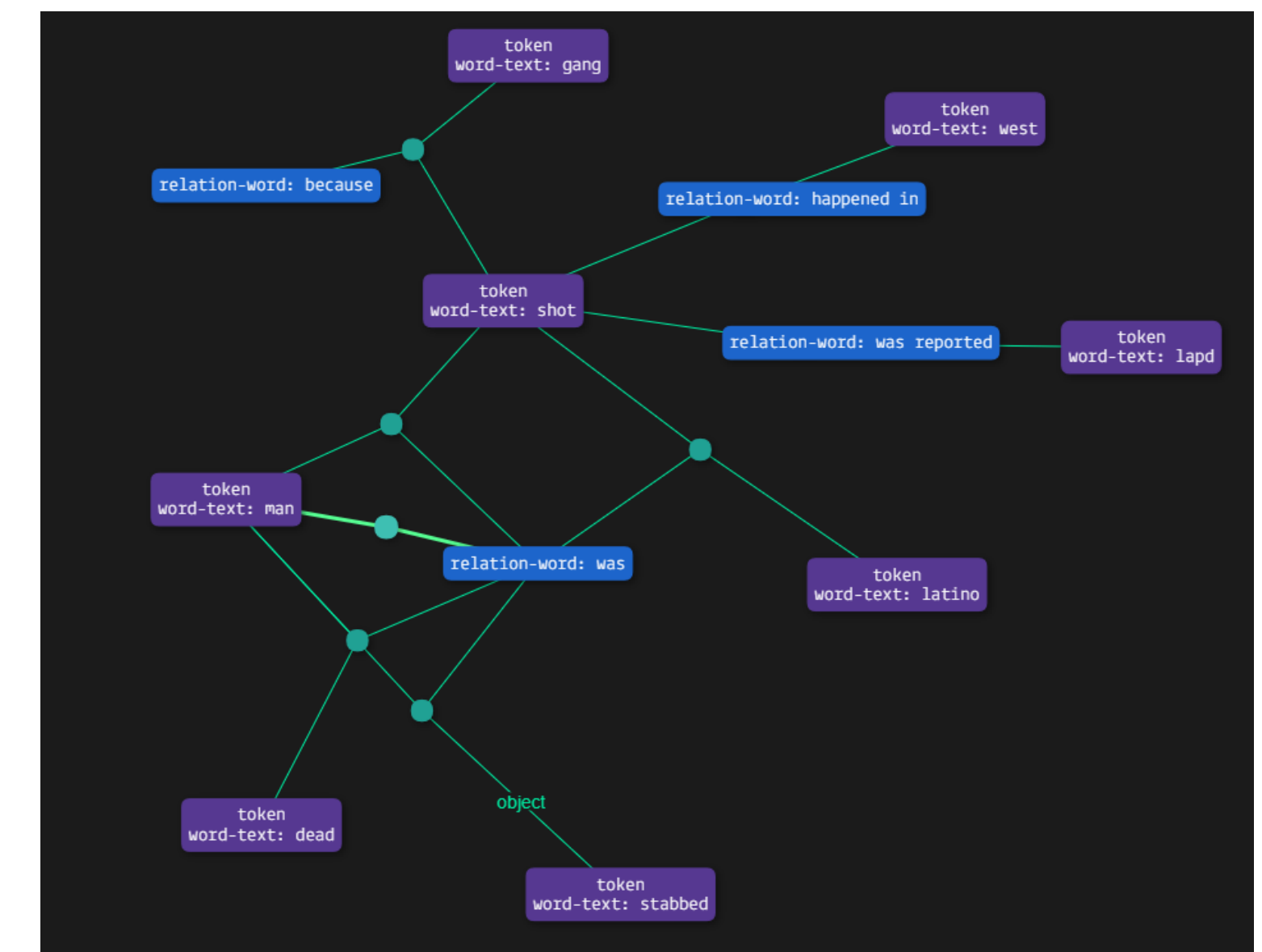
(a) Attribute, Entity, Relation in knowledge graph



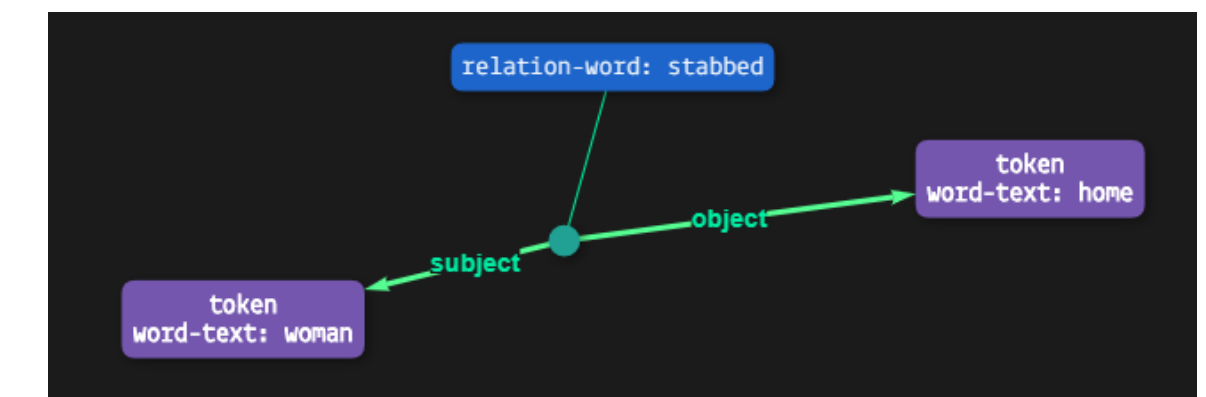
(b) Attributes of Word Token

We have 3 different relation, relation between mined-text and sentences; relation between sentences and word-token; relation between word-token. By using the relation between mined-text and sentences, we can easily find one specific sentence come from which article. By using relation between sentences and word-token, we can find all the sentences that containing certain word. The relation between token tells use the relationship between two tokens, to be clear that, not all two tokens have relation

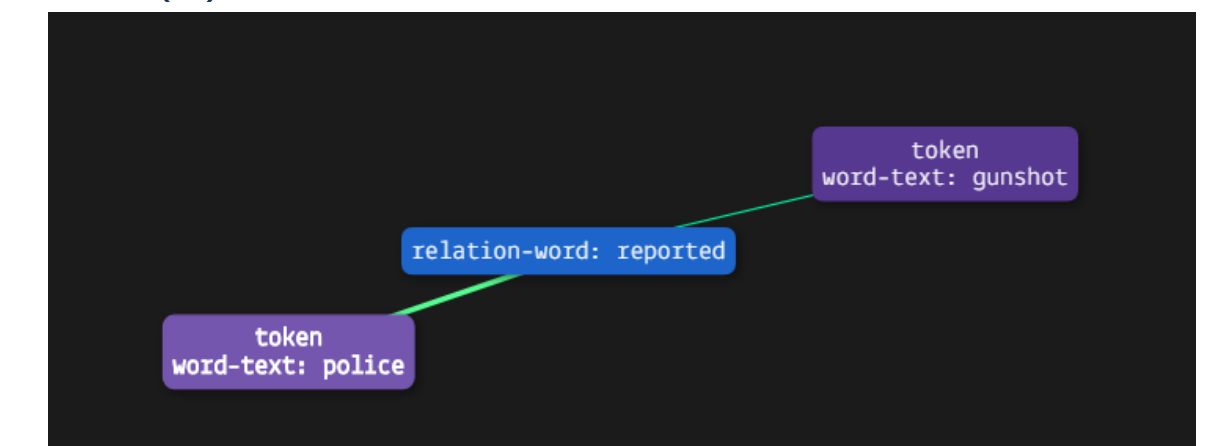
Knowledge Samples



Relation in knowledge graph



(a) Small knowledge graph sample 1



(b) Small knowledge graph sample 2