Solving Crime Through Innovation: Investigating Homicides and Shootings in Los Angeles

Justice & Security Strategies
Los Angeles Police Department
UCLA

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JUSTICE & SECURITY STRATEGIES

Overview

Background and Context

Approach

Progress - Results and Outcomes

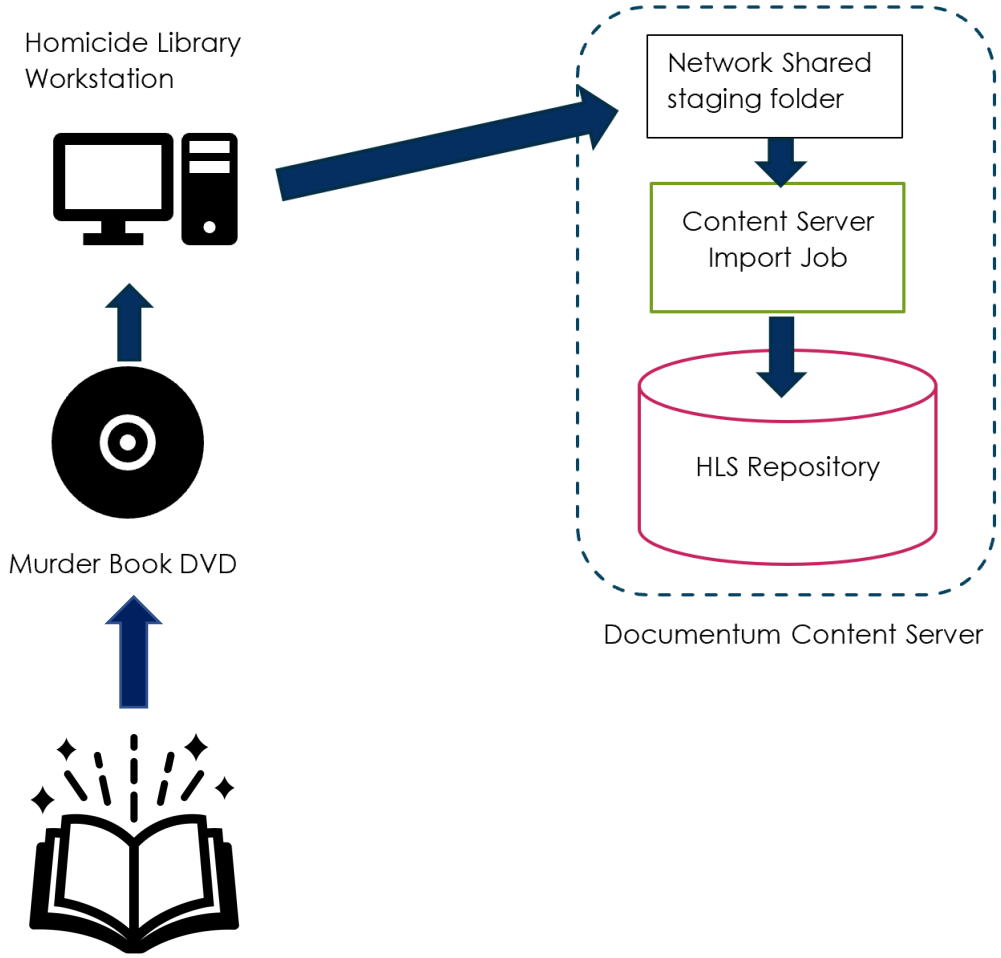
Next Steps

Background and Context

- In 2009 the FBI approached the LAPD about digitizing Murder Books
- Murder Books follow a consistent format:
  - A compilation of multiple forms, files, notes, and written entries, per case
  - Maintained in 26 sections with specific information placed in each section
  - Homicide investigators follow this model across the Department

Background and Context

- Over 4,000 optically scanned “Murder books” that cover a 21-year period (1990-2010)
- Creation of the Homicide Library System (HLS)



Background and Context

- Work done by detectives at the Homicide Library
  - Case requests from I/Os
  - City-wide requests for post-conviction information
- Current responsibilities
  - Locating all outstanding Murder Books
  - Coordinating Murder Book preparation with other Bureaus
  - Deconstruction and preparation of Murder Books for FBI scanning

Background and Context

- Funding from The Ahmanson Foundation and US Dept. of Justice
- Ahmanson – built the Library
- BJA grant – LAPD and JSS
  - Ends in 2022
- NIJ grant – Research funds for JSS and UCLA
  - Ends in 2021

Background and Context

- Grants allow LAPD, JSS and UCLA to:
  1. Determine characteristics of homicide clearances and convictions
  2. Create and use a new instrument/algorithm that assists in using the predictors in the field
  3. Determine the impact of adopting the instrument/algorithm on clearance rates, conviction rates, and homicide rates
- JSS is also collecting city-wide homicide data to examine trends over time and characteristics of homicides

Approach

Development of strategic plan and predictors

Data analyses

Identify key variables using advanced statistical analyses

Use of new machine learning methods

Creation and use of machine learning algorithm for use in the field

Employ a quasi-experimental or experimental design

Determine impact of investigative tool

Year 1: What was accomplished?

- General management
- Understand crime and homicides in Los Angeles
  - LAPD data
  - Preparation of Murder Books
  - Data validation
  - Datasets analyses and comparisons
- Detective Input

Outcomes

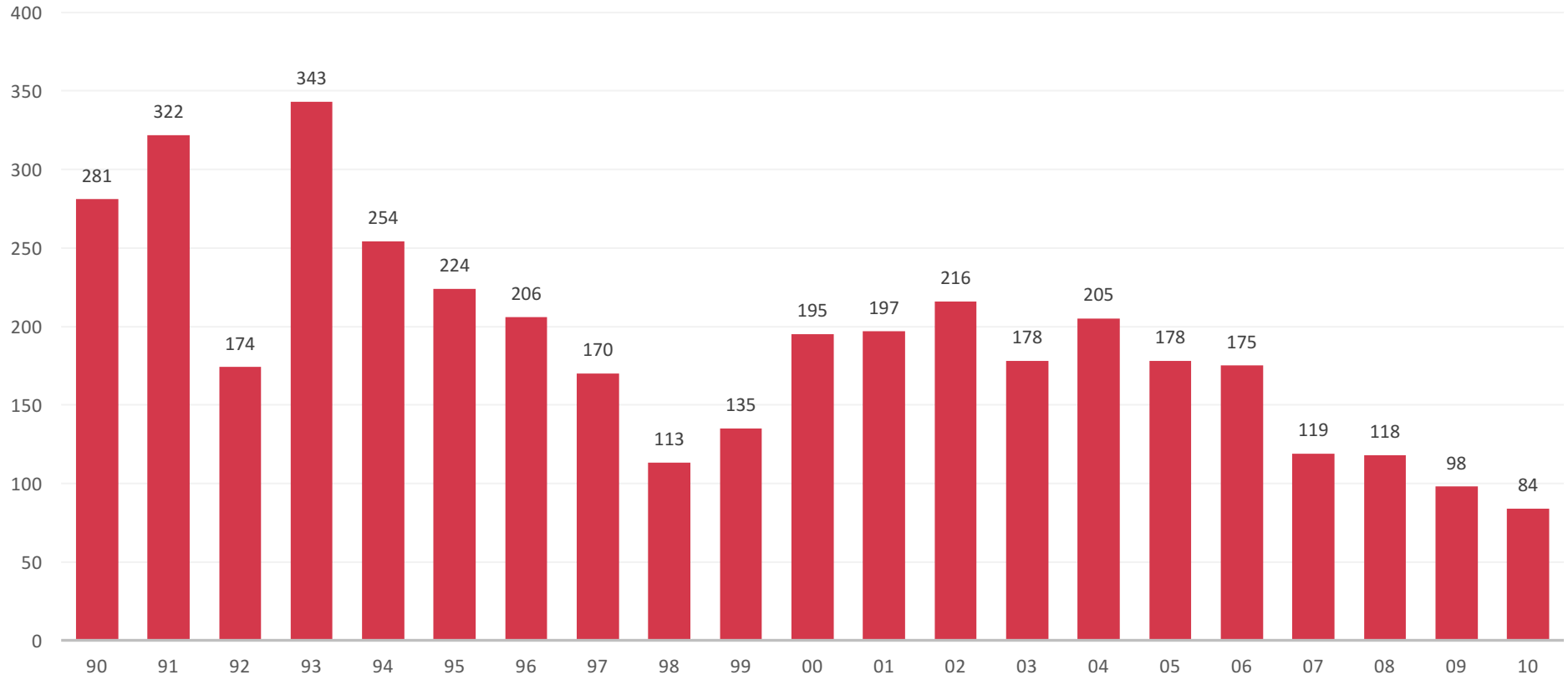
Homicide Library

- RHD and South Bureau Homicide Detectives
- JSS team

Murder Books

- LAPD Data
- Reviewed (4,150)
- Validated (10%)
- Uploaded (3,950)

Scanned Murder Books by Year (1990-2010)

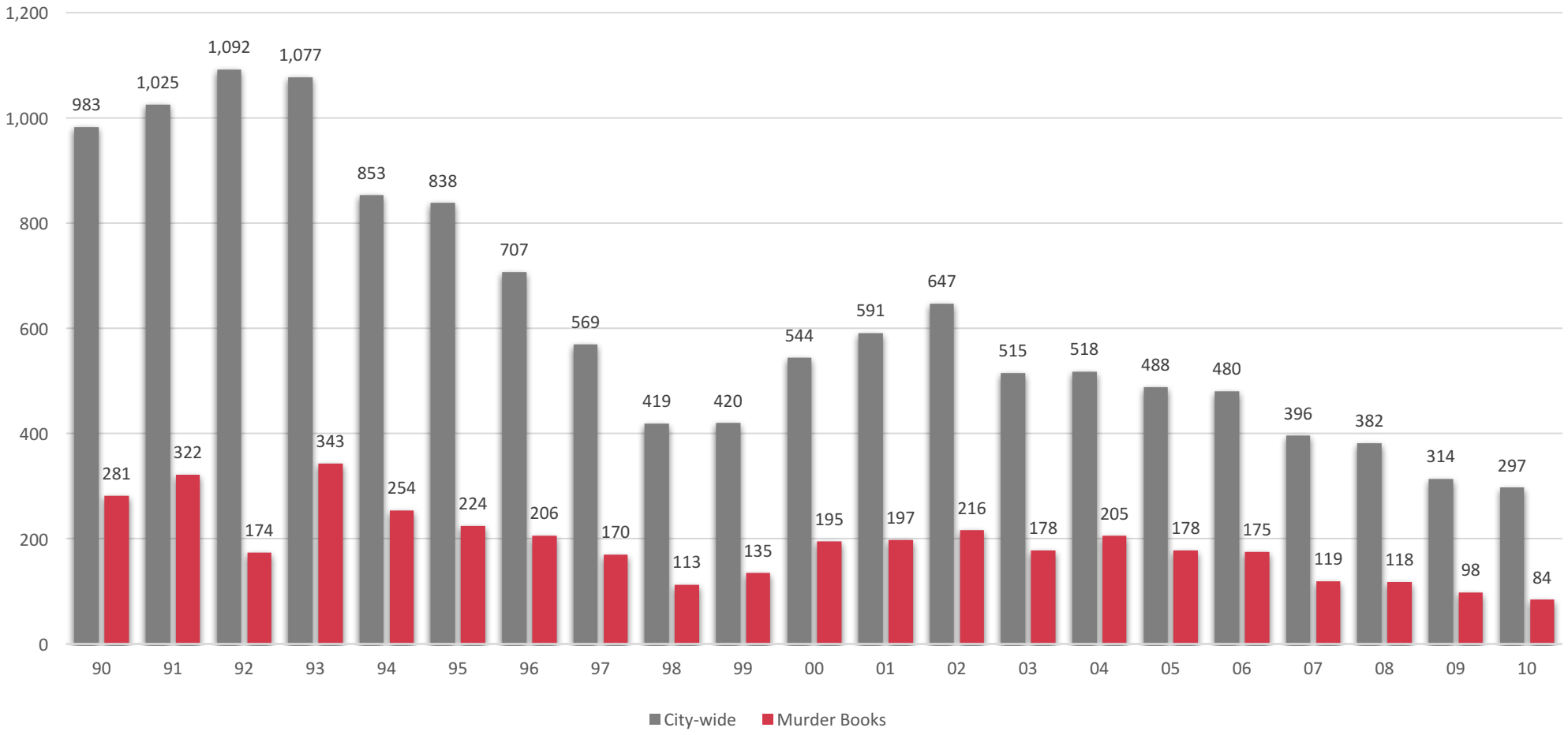


Total cases: 3,993

Cases omitted for input errors: 8

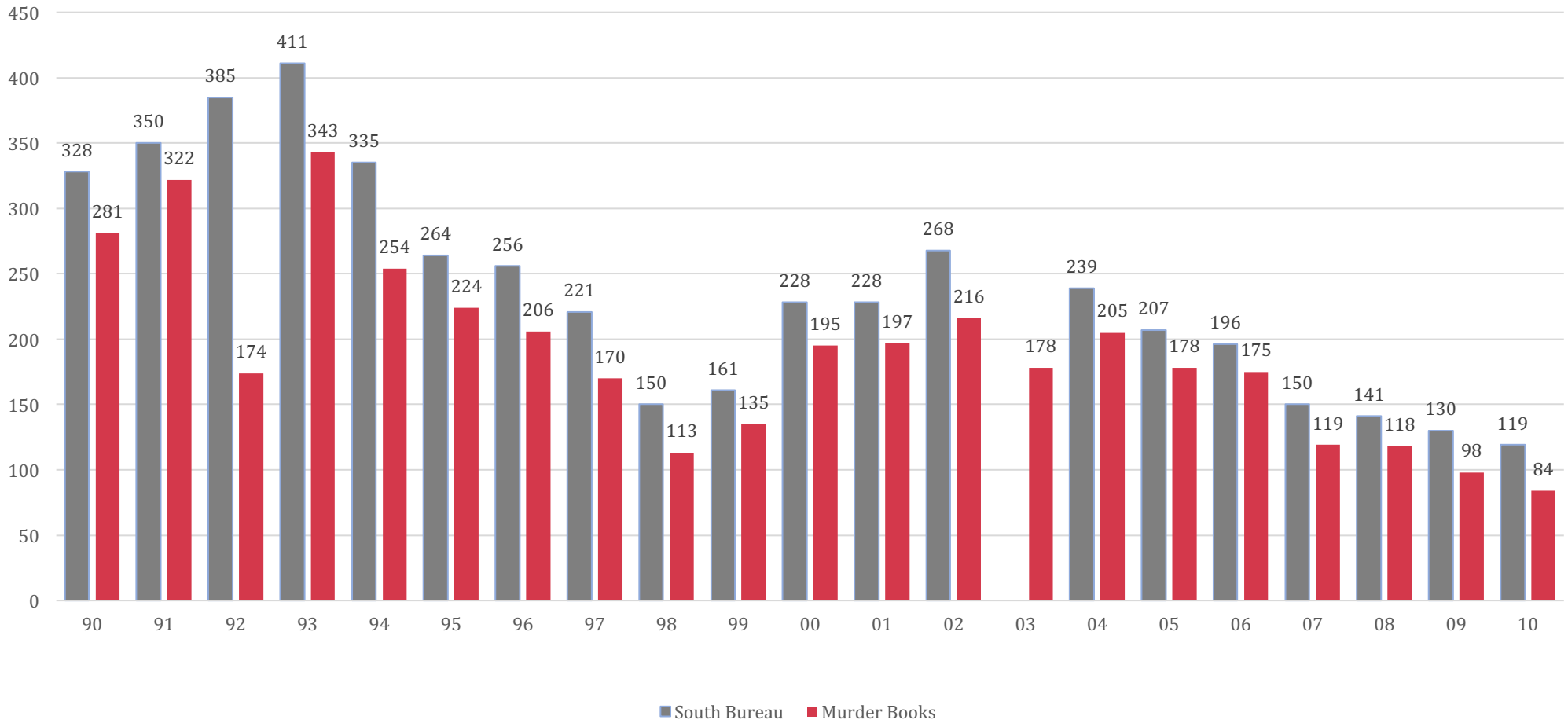
Final sample: 3,985

Homicides City Wide vs. Murder Books by Year (1990-2010)



Homicide data counts were extracted from LAPD Digest Reports

South Bureau Homicides vs. Murder Books (1990-2010)

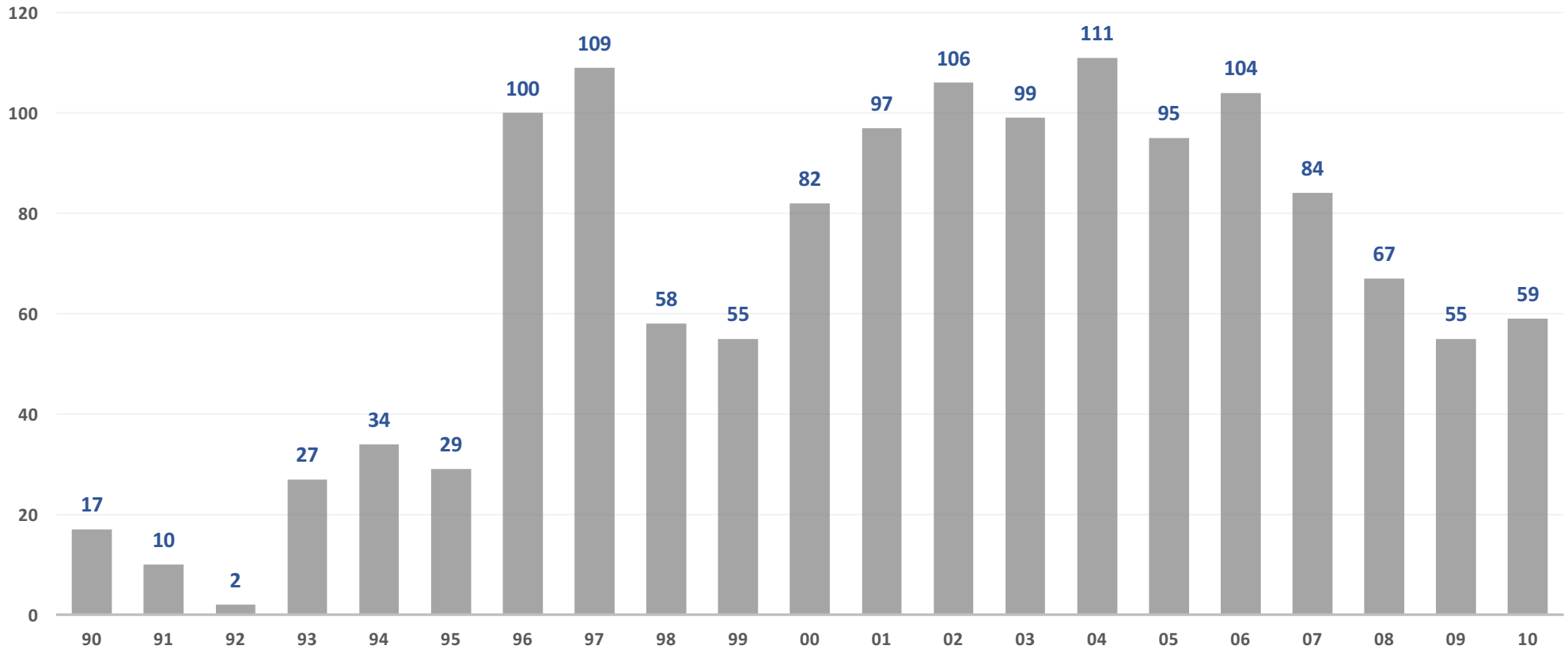


SB Homicide data counts were extracted from LAPD Digest Reports

Percentages of Completion

- The Murder Books have 26 separate sections
- JSS went through all 3,993 books and determined the percentages of completion within each section
- Results:
  - 99% of Section 1 is complete – Chronologies
  - 99% of Section 4 is complete – Death Reports
  - 98% of Section 3 is complete – Crime Reports
  - 98% of Section 11 is complete -- Victim Information
  - Other sections varied from 26% to 97%

Typed Chronos by Year



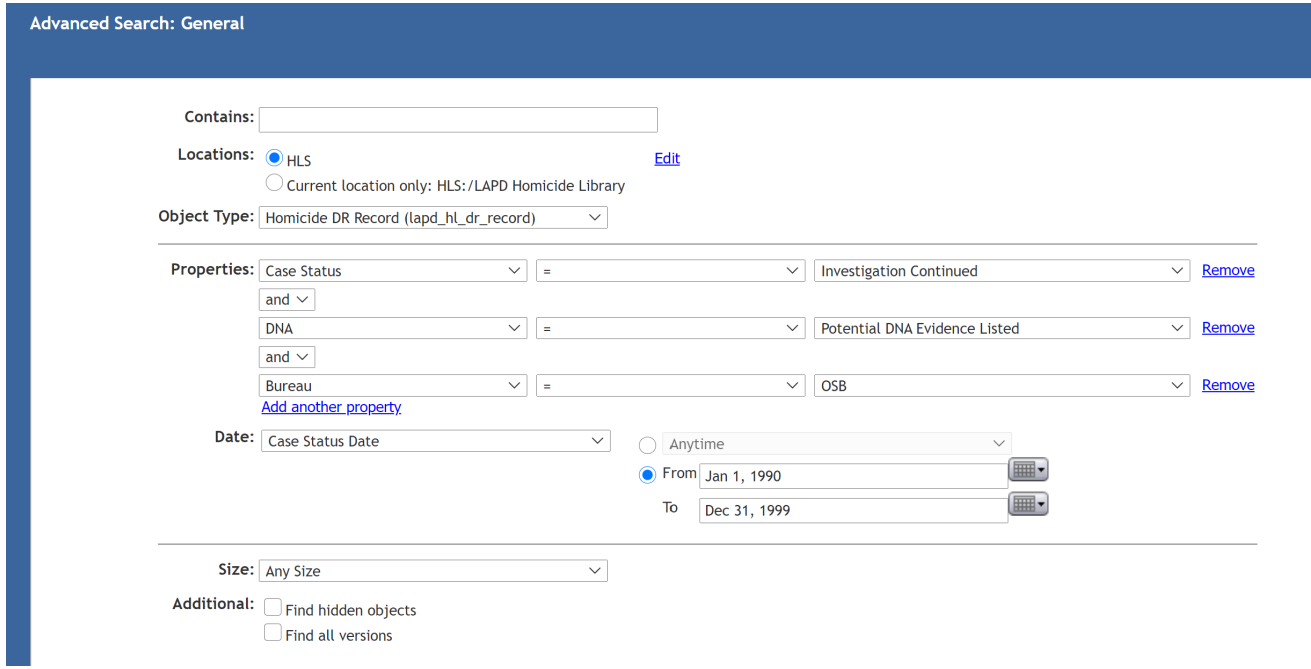
Typed total: 1400 Total Murder Books: 3,994

Years 2 and 3

- Murder Book Prep
- Tag Sheet data entry
- Data Analysis
  - Case Status
  - Identify key predictors using advanced statistical analyses
  - Crime assessments of South Bureau
- Develop new machine learning methods
  - Implementation of Investigator tool
- Collect homicide data city-wide for 1990 to the present

Tag Sheets

- Coding instrument that allows detectives to query HLS
  - All fields can be searched
- Searches can be edited, saved, and shared with others
- Results can be exported for later use



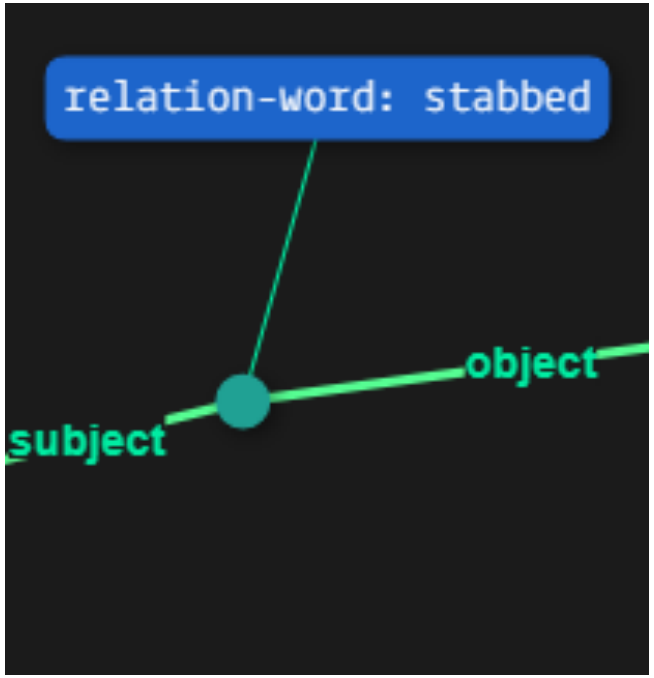
Search Results

5 Results in HLS - 4/23/2021 9:42 AM

DR/ID	Master ID	Type	Victim Name Info	Bureau	Division	# of Volumes	# of Victims	Loc Housed	Disc Loc	Info Added
980307072	M980307072	HLS DR Record	Moore, Morris Eugene	OSB	Southwest	1	1	G01	G01	0
940330509	M940330509	HLS DR Record	Adams, Neile Lemar	OSB	Southwest	1	1	1994 Southwest	T09	0
940308504	M940308504	HLS DR Record	Spence, Arthur	OSB	Southwest	1	1	HL	T20	0
901806405	M901806405	HLS DR Record	Mosby, Thomas	OSB	Southeast	1	1	5.B.3	disk 01	0
961230660	M961230660	HLS DR Record	Andrews-Bey, Charles	OSB	77th Street	1	1	P08	none	0

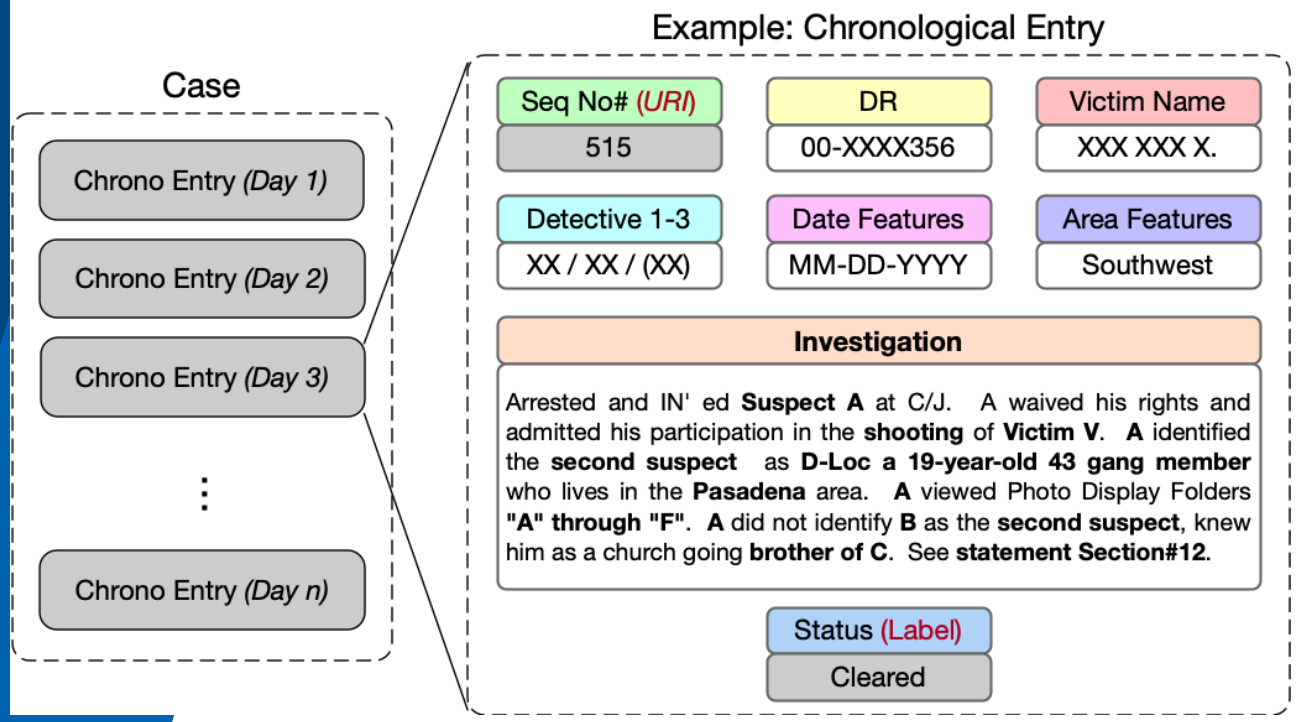
Machine-Learning Methods

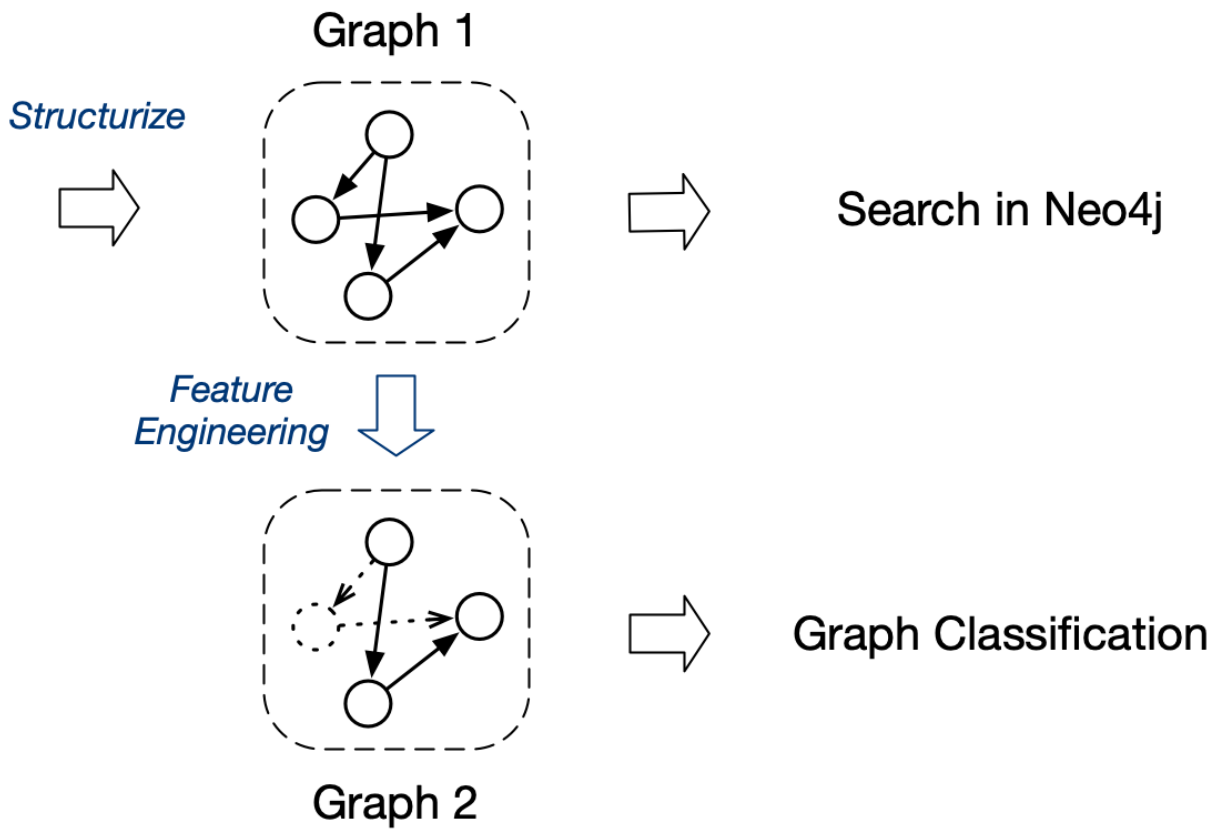
- Machine Learning -- development of algorithms to construct knowledge graphs with little or no human supervision.
- Knowledge graphs offer a compact way to represent complex information.
  - What are the interactions associated with a homicide?
  - How do we link and demonstrate the associations?
- Let theory be our guide: Routine Activities Theory
  - Offender, Victim, and Setting
  - Homicides occur within a setting with an offender and victim
- Test the use of Knowledge Graphs to depict relationships: Does this method work?



Knowledge Graphs

- Build graphs by using the Murder Book Chronologies
  - Typically, a 120-150-word statement per entry with details of investigative steps
  - Hundreds of entries per case

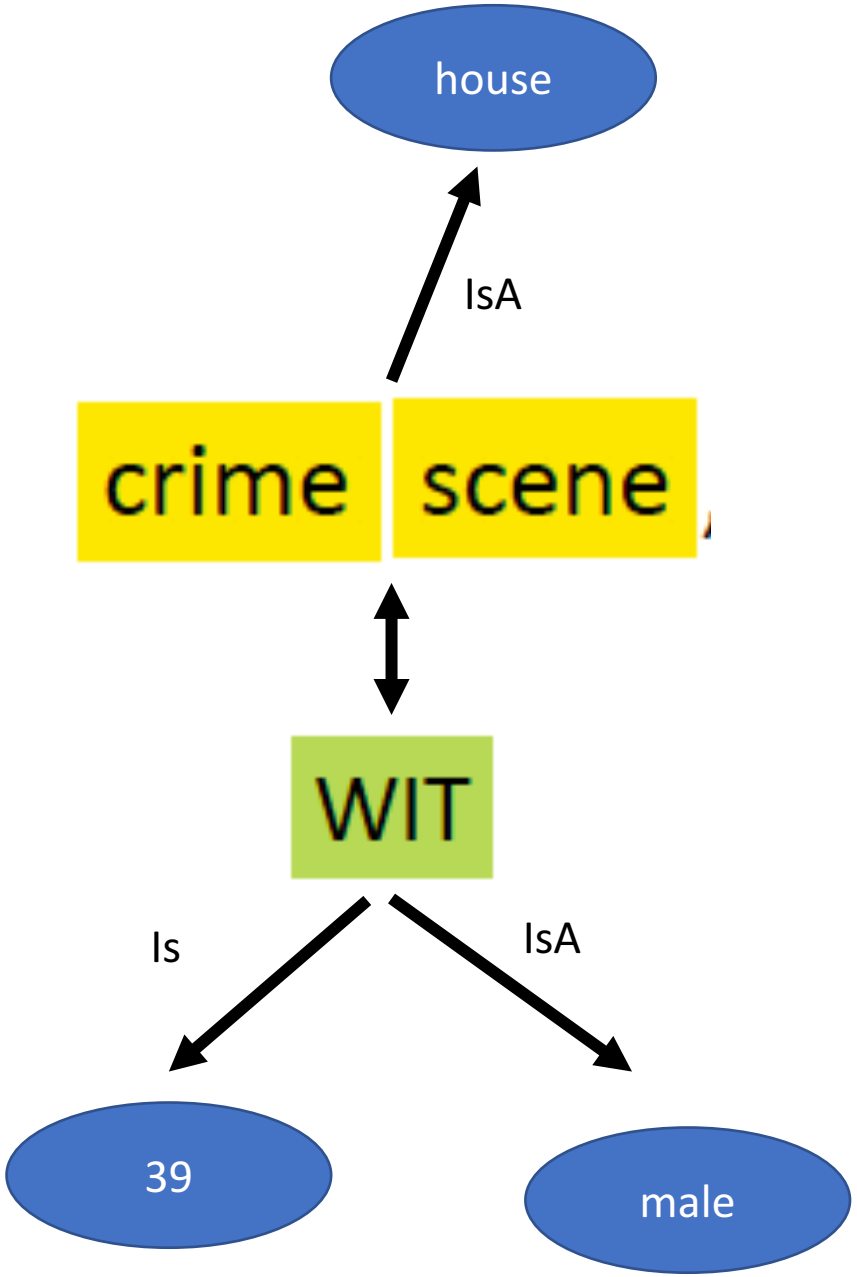




Knowledge Graphs

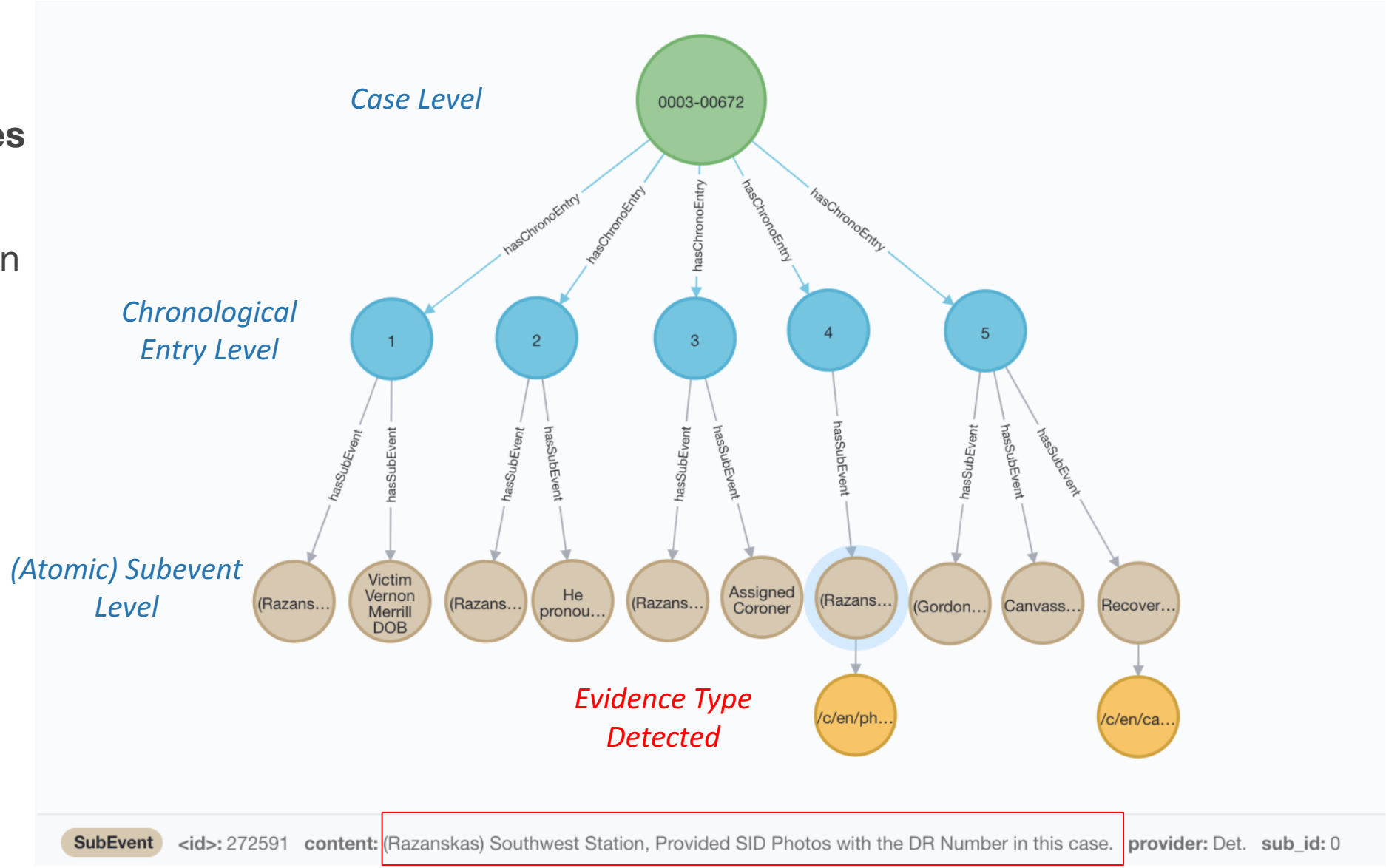
DET1 and DET2 arrived at crime scene, located at ADDRESS . Victim in streetcovered with sheet . Victim identified at scene by his Sister WIT as VICT , GENDER/ETHNICITY AGE . Victim had multiple gunshot wounds to his chest , back and possibly to BODYPART . I/O 's conducted crime scene investigation See IR Report and Notes .Recoveredevidence, two .45 caliber casings . Coroner 's Investigator DET3 took charge of thevictim's body and assigned Coroner 's Case No . XXXX . DET1 took possession oftwo cell phones in victim 's pockets and searched victim 's MODEL MAKE , parked on westcurb on ADDRESS . Provided victim 's vehicle keys to WIT . SID PhotographerNAME XXXX took photos that were directed by DET1 , C # XXXX .

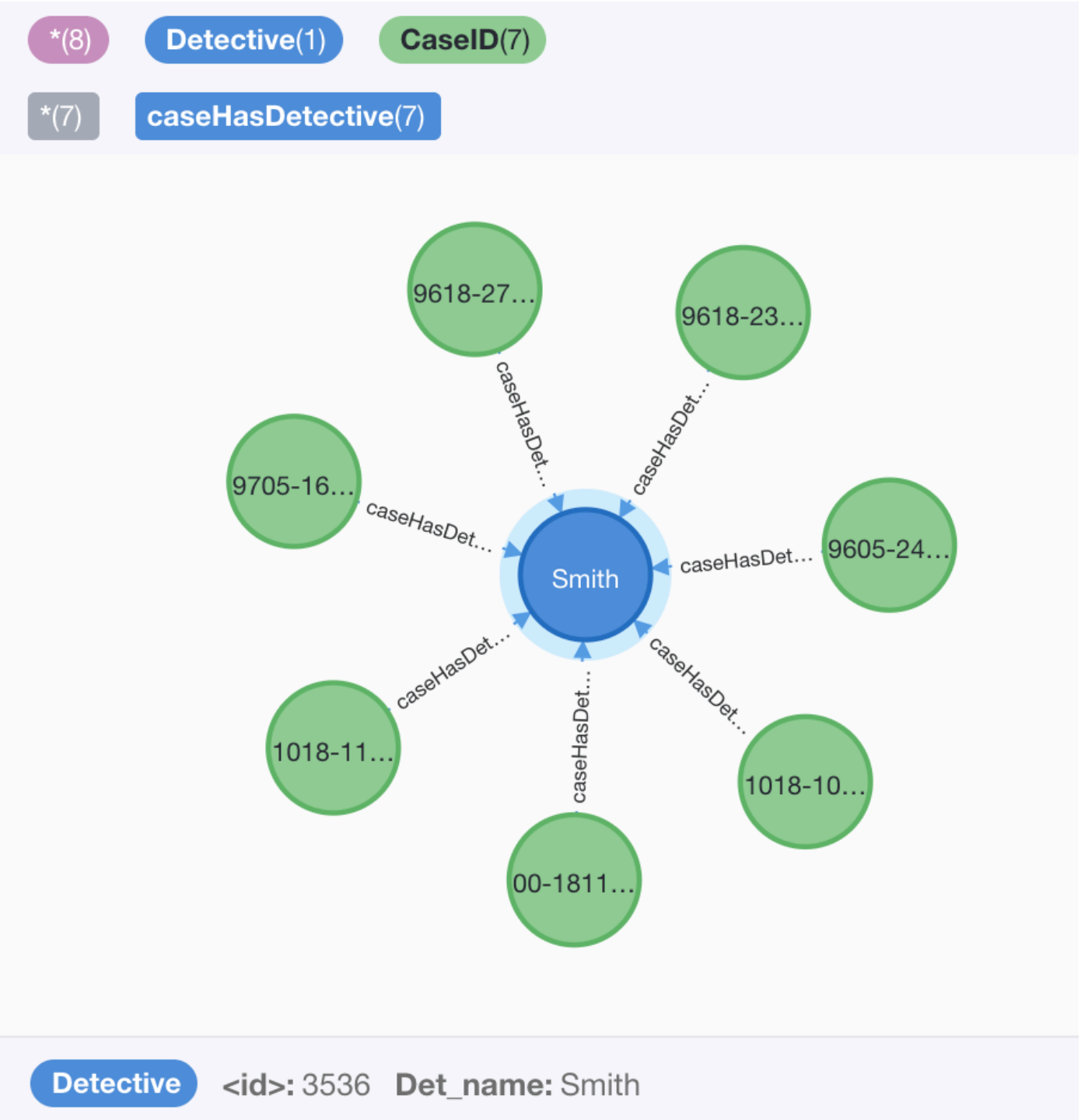
Chrono Entry



Organized in hierarchy:
Case → ChoroEntry → **Subevents → Evidences (newly curated)**

Note that not all nodes in this case are shown for demonstration purpose.





homicide case search engine

cases associated with detective Smith

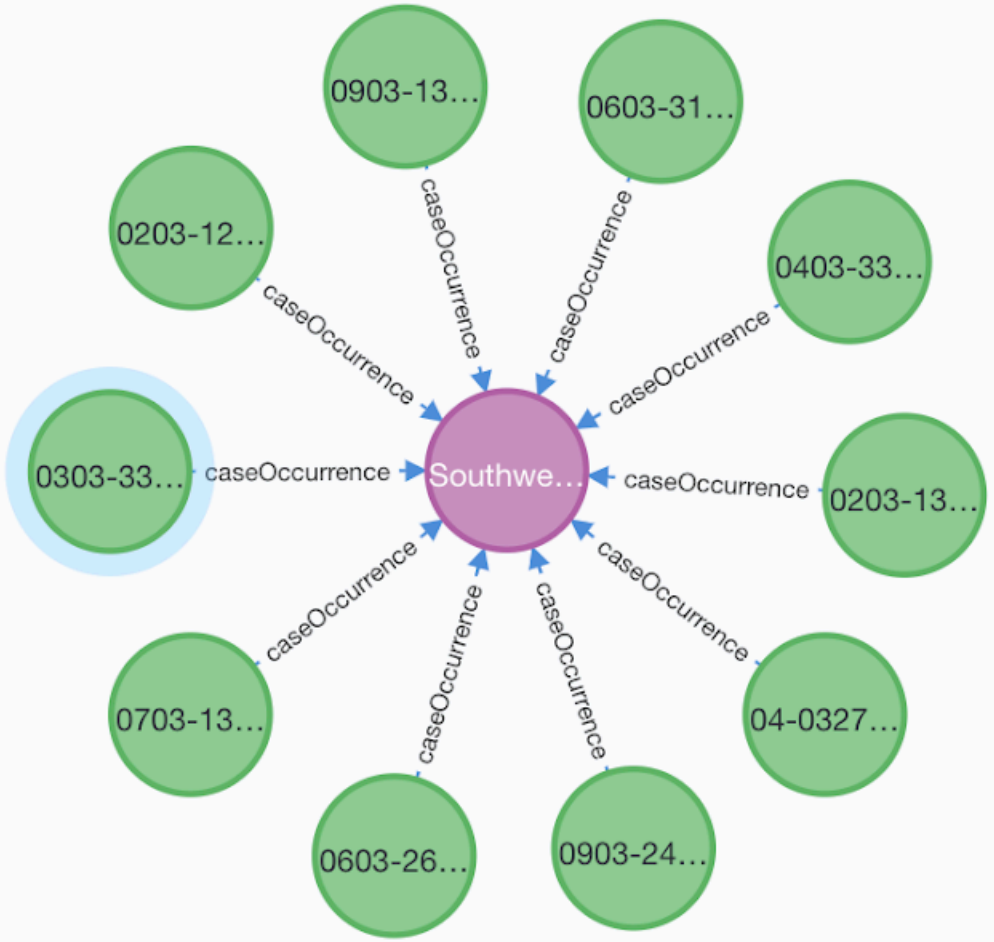
```
MATCH (c)-[r:caseOccurrence]→(a:AreaOfOccurrence {name:
'Southwest'})
RETURN a, r, c LIMIT 10
```

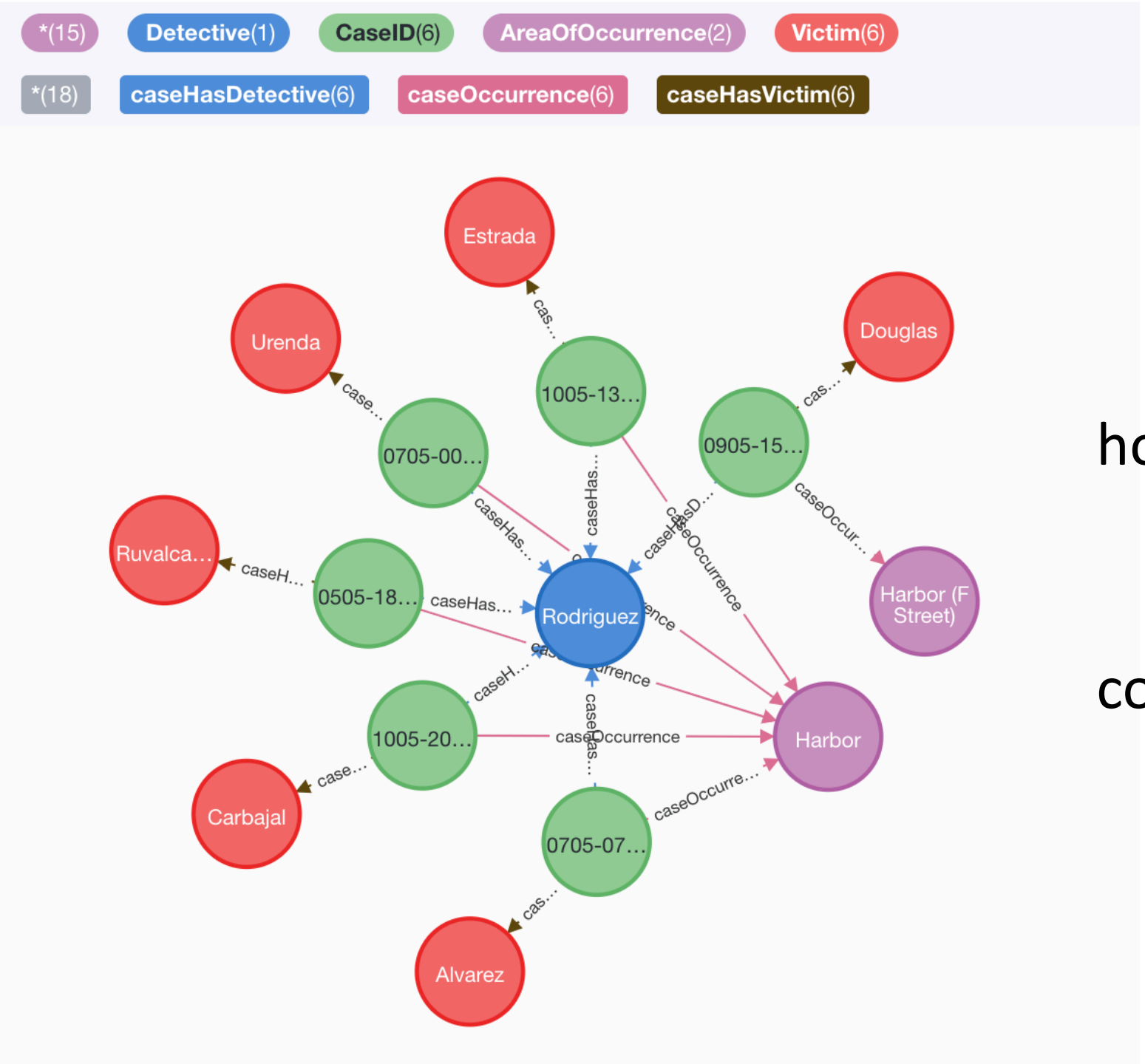
*(11) AreaOfOccurrence(1) CaseID(10)

*(10) caseOccurrence(10)

homicide case search engine

cases associated with Southwest Division





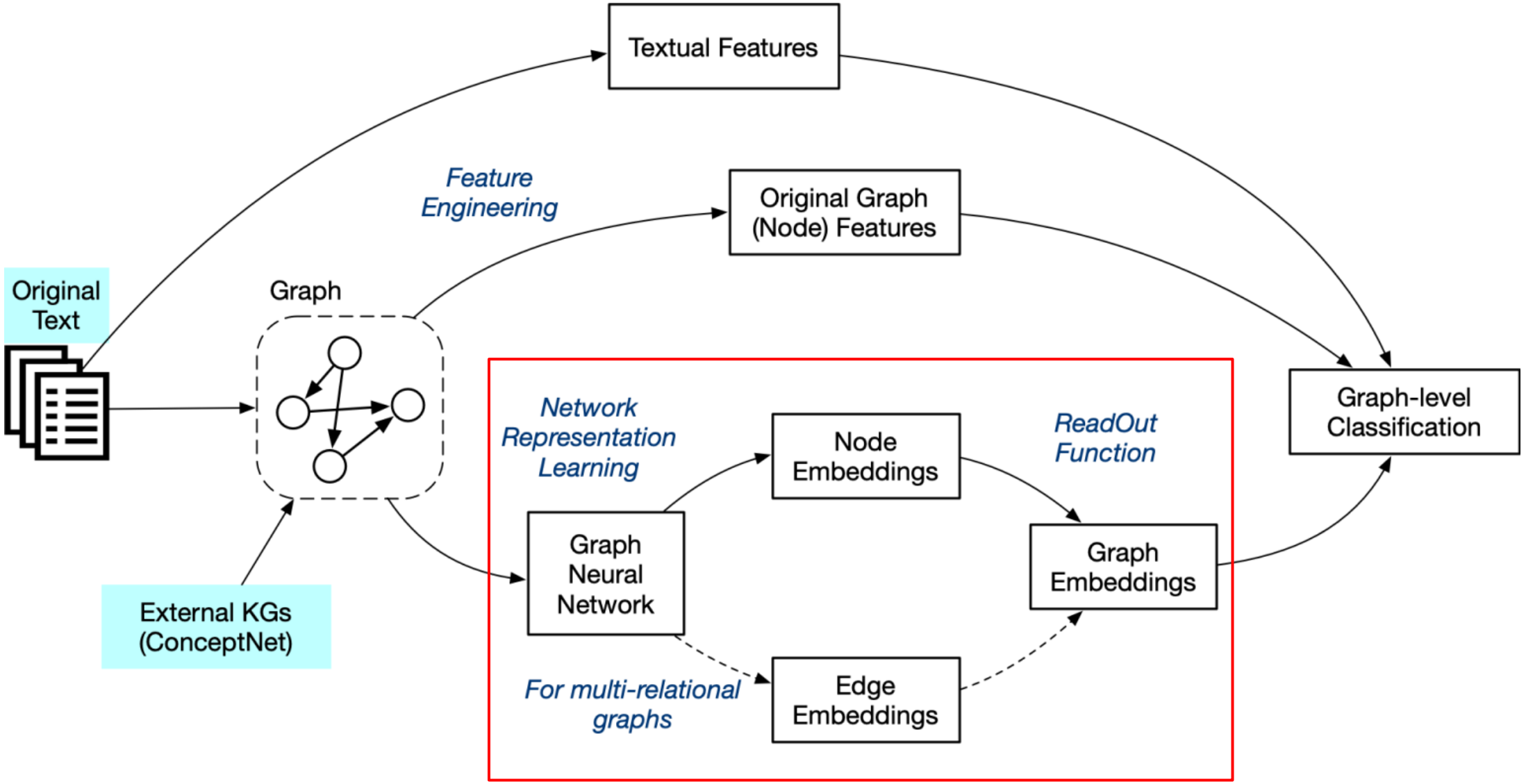
Node types

Edge/Relation types

homicide case search engine

complex associations

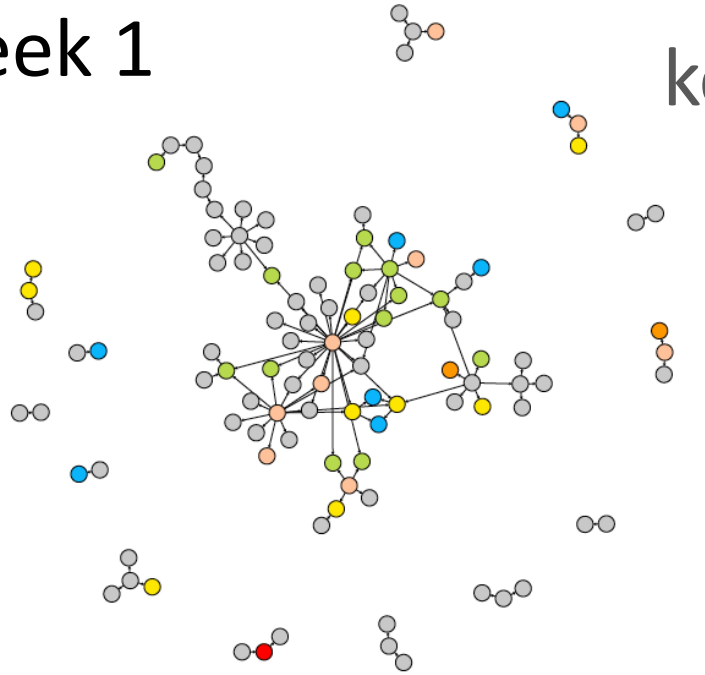
MurderBook Case Classification (Beyond Graph)

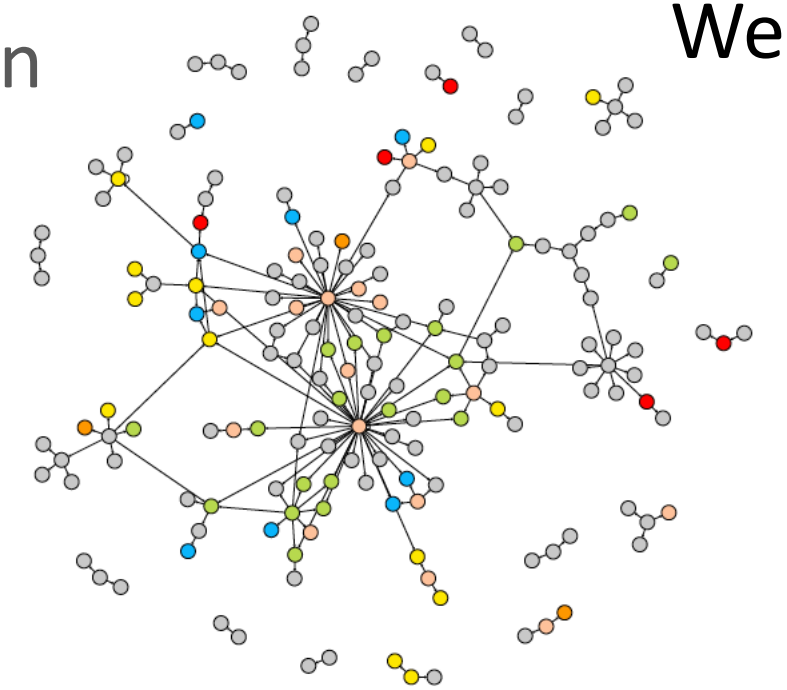


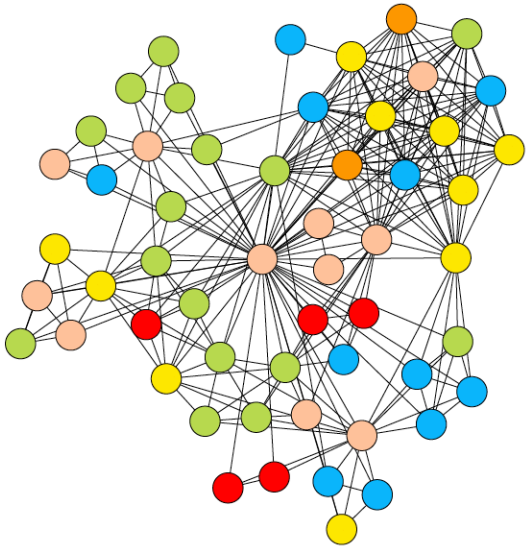
Week 1

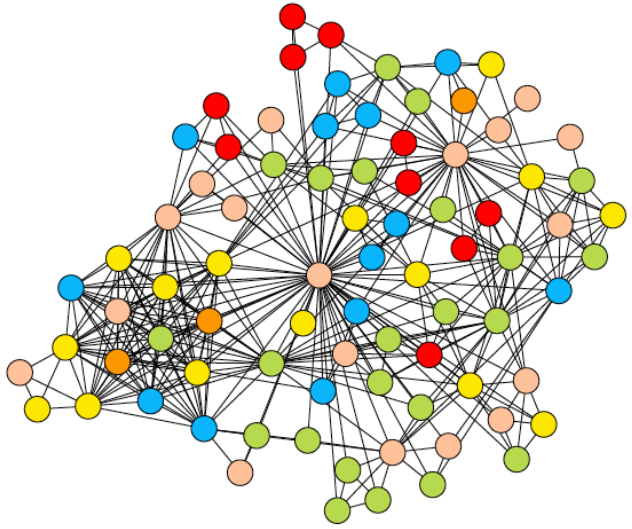
keyword expansion

Week 10



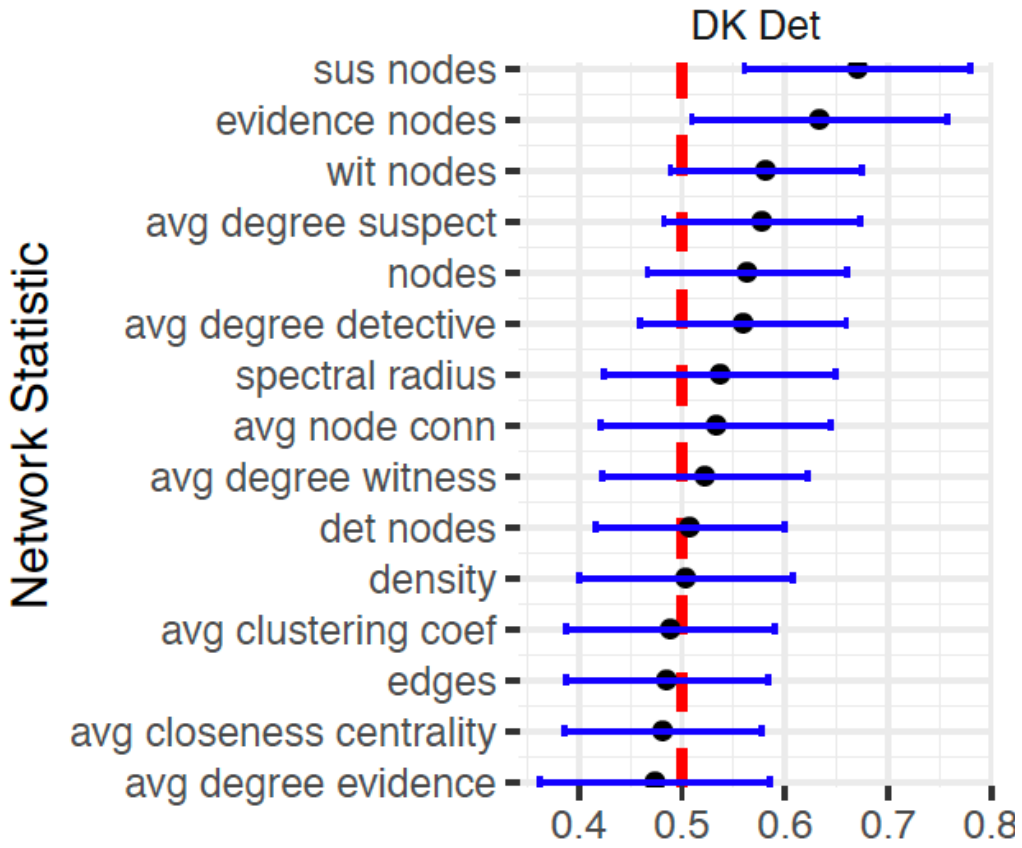






domain knowledge

Knowledge Graph Features that Matter



presence of witness nodes matter, but average "connectedness" of witnesses to other features of the investigation does not.

Year 4

- *Assist with new, Department-wide Murder Books*
- *Test the tag sheets*
- *Analyze tag sheet info*
- *Write Final report*

Next Steps

- House all murder books at the Homicide Library
  - 1990 to present for all divisions
- Configure incoming murder books for proper storage
  - Prepped, logged into HLS, information is updated
- Tag all South Bureau murder books by the end of the year
  - About 900 cases
  - HLS can go live next year
  - Detective feedback

Next Steps

- Index homicides prior to 1990
  - 1970s and 1980s cases
  - Appeals and family inquiries
- All death investigations in HLS
  - Information from CCAD
  - Monthly updates
- Interns


LAPD ------ FBI
HOMICIDE LIBRARY