Finding Name Co-occurrences in WDY

Elif Yamangil & Rani Nelken

What are name co-occurrences?

What are name co-occurrences?

X	
Y	
Z	
	…
	…

What are name co-occurrences?

X	Y
Y	
Z	
	...
	...

What are name co-occurrences?

X	Y	Z
Y		
Z		
	...	
	...	

What are name co-occurrences?

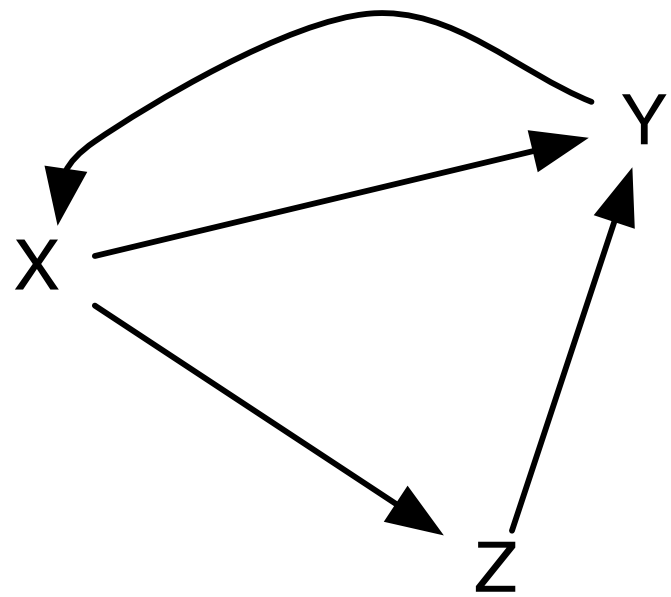
X	Y Z
Y	X
Z	
	...
	...

What are name co-occurrences?

X	Y Z
Y	X
Z	Y
	...
	...

What are name co-occurrences?

X	Y Z
Y	X
Z	Y
	...
	...



How do we find them?

- Simple search!
- Collect all names X, Y, Z, ...
- Iterate through all biographies
- Search for the names
- Report the longest earliest match

Example

Example

- 王翥　字一飛，成都人。篤學尚氣。吳曦謀反來請，翥陽病風瘖，潛往安丙，謀誅曦。事定，匿巴中，為農終身。

Example

- 王翥　字一飛，成都人。篤學尚氣。吳曦謀反來請，翥陽病風瘖，潛往安丙，謀誅曦。事定，匿巴中，為農終身。

Example

- 王翥　字一飛，成都人。篤學尚氣。吳曦謀反來請，翥陽病風瘖，潛往安丙，謀誅曦。事定，匿巴中，為農終身。

Example

- 王翥　字一飛，成都人。篤學尚氣。吳曦謀反來請，翥陽病風瘖，潛往安丙，謀誅曦。事定，匿巴中，為農終身。
- 丁偃　吳縣人。嘉祐四年與朱長文同登進士。其初試邇英延講藝有詩云：「白虎前芳掩，金華舊事經，天心非不寢，垂意在蒼生。」御前下第，後二十年方中選。

Example

- 王翥　字一飛，成都人。篤學尚氣。吳曦謀反來請，翥陽病風瘖，潛往安丙，謀誅曦。事定，匿巴中，為農終身。
- 丁偃　吳縣人。嘉祐四年與朱長文同登進士。其初試邇英延講藝有詩云：「白虎前芳掩，金華舊事經，天心非不寢，垂意在蒼生。」御前下第，後二十年方中選。

Example

- 王翥　字一飛，成都人。篤學尚氣。吳曦謀反來請，翥陽病風瘖，潛往安丙，謀誅曦。事定，匿巴中，為農終身。
- 丁傴　吳縣人。嘉祐四年與朱長文同登進士。其初試邇英延講藝有詩云：「白虎前芳掩，金華舊事經，天心非不寢，垂意在蒼生。」御前下第，後二十年方中選。

Example

- 王翥　字一飛，成都人。篤學尚氣。吳曦謀反來請，翥陽病風瘖，潛往安丙，謀誅曦。事定，匿巴中，為農終身。
- 丁傴　吳縣人。嘉祐四年與朱長文同登進士。其初試邇英延講藝有詩云：「白虎前芳掩，金華舊事經，天心非不寢，垂意在蒼生。」御前下第，後二十年方中選。

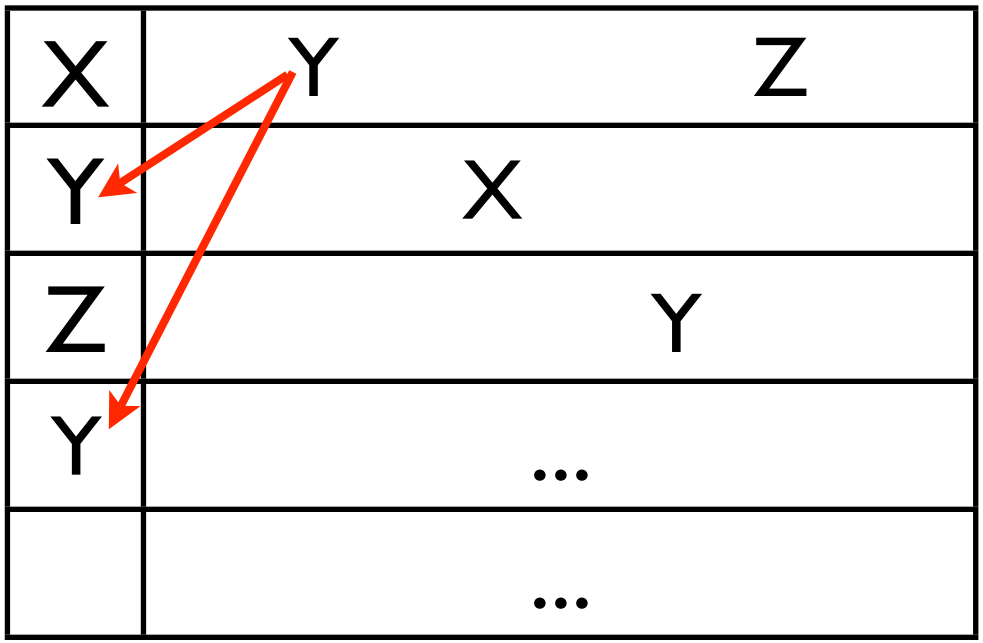
Problem: Name Ambiguity

X	Y Z
Y	X
Z	Y
	...
	...

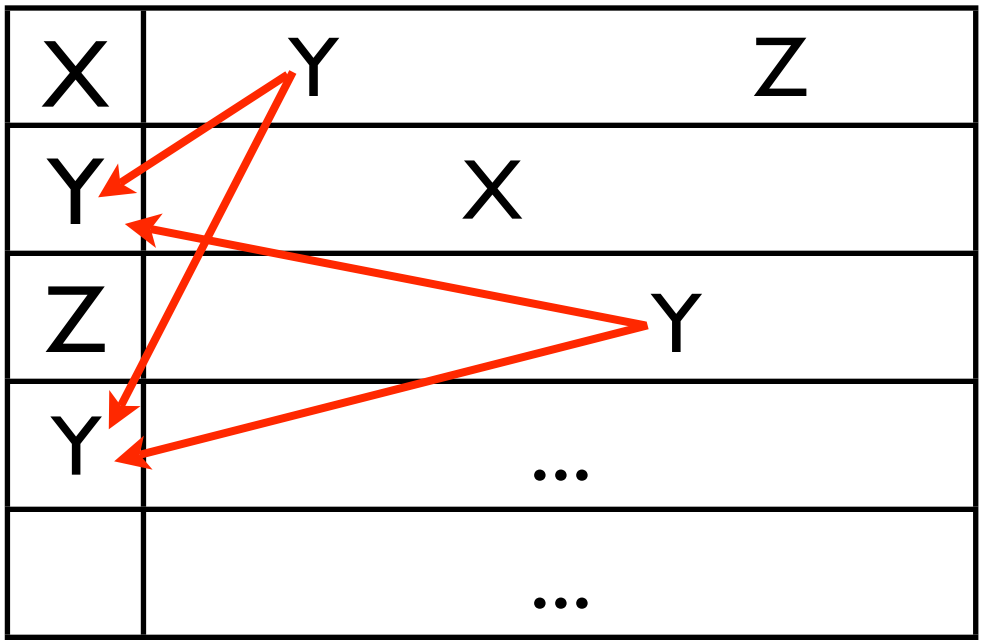
Problem: Name Ambiguity

X	Y Z
Y	X
Z	Y
Y	...
	...

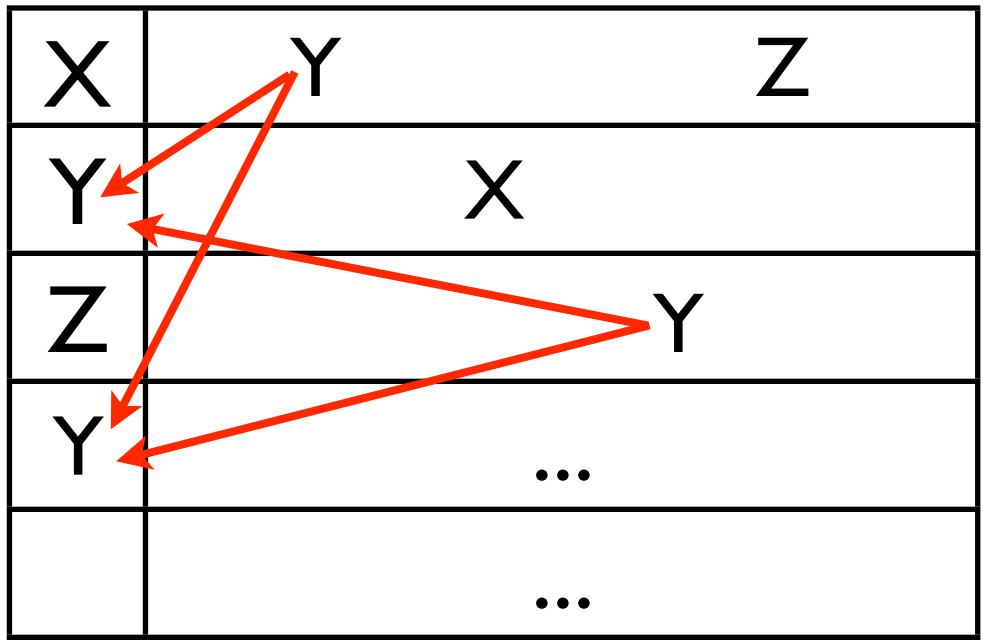
Problem: Name Ambiguity



Problem: Name Ambiguity



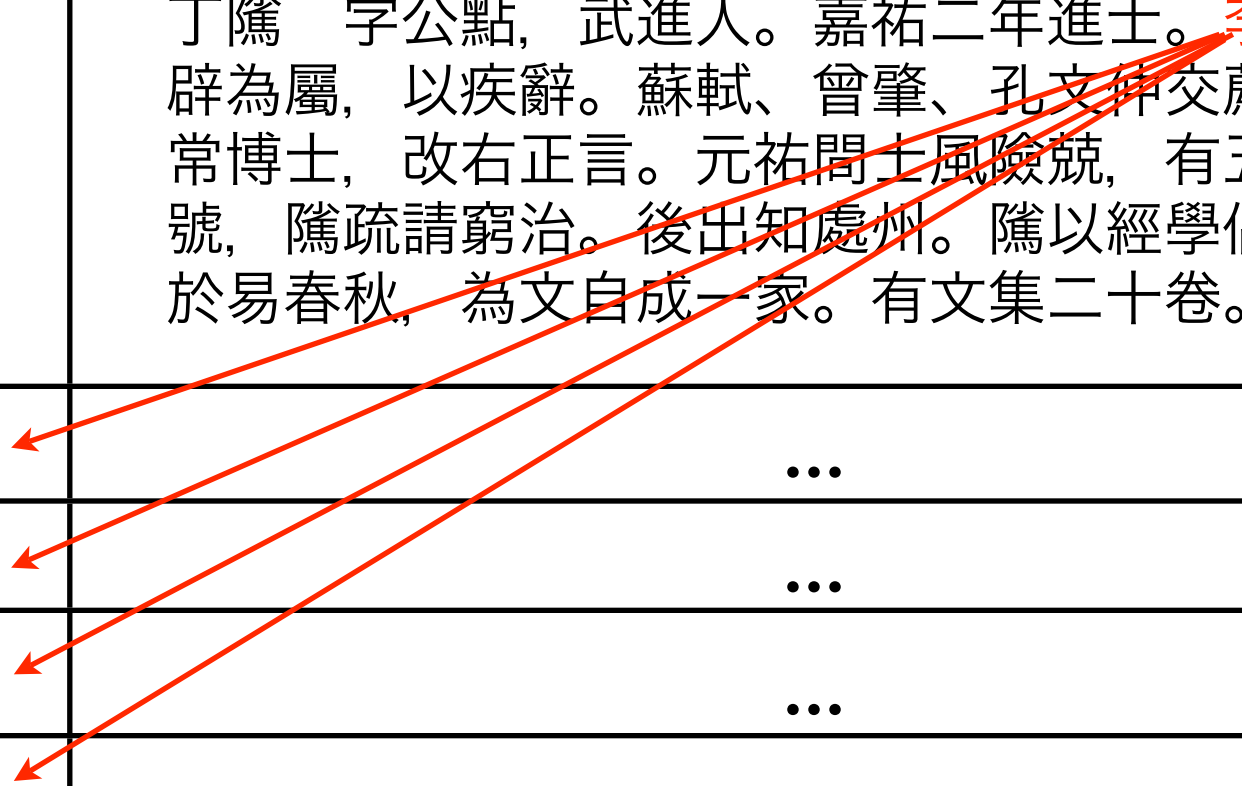
Problem: Name Ambiguity



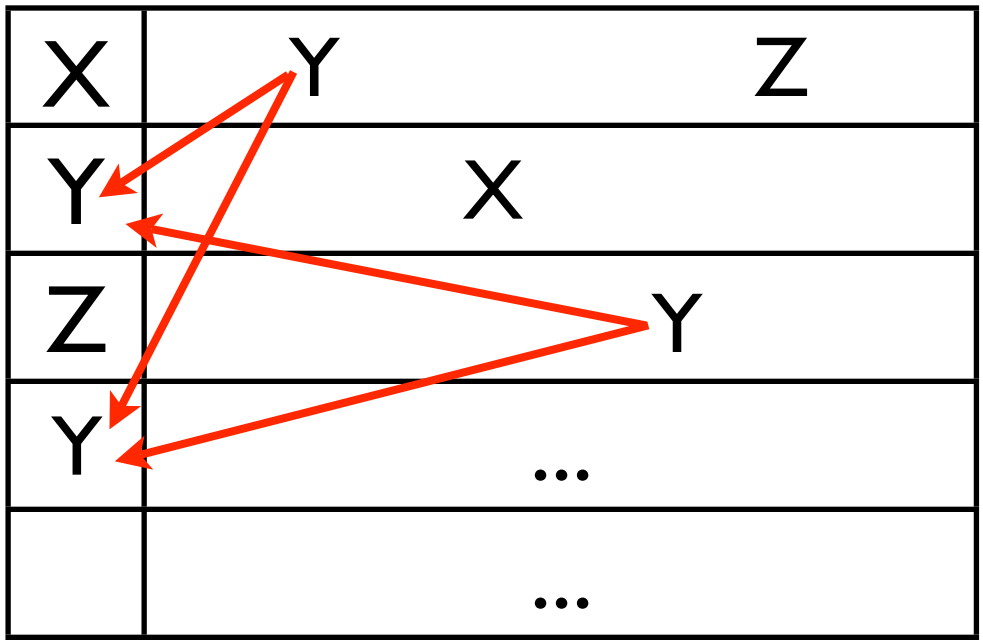
?

Example

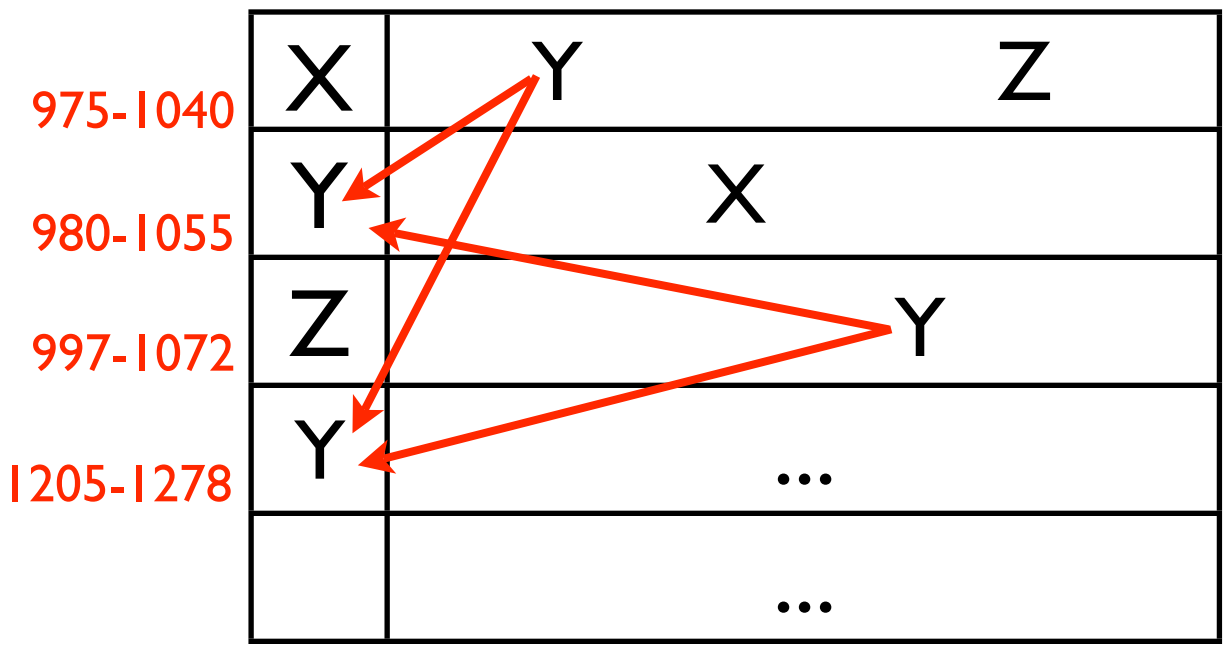
丁隲	丁隲　字公點，武進人。嘉祐二年進士。李定用事，辟為屬，以疾辭。蘇軾、曾肇、孔文仲交薦之，除太常博士，改右正言。元祐間上風險兢，有五鬼十物之號，隲疏請窮治。後出知處州。隲以經學倡後進，長於易春秋，為文自成一家。有文集二十卷。
李定	…
李定	…
李定	…
李定	…



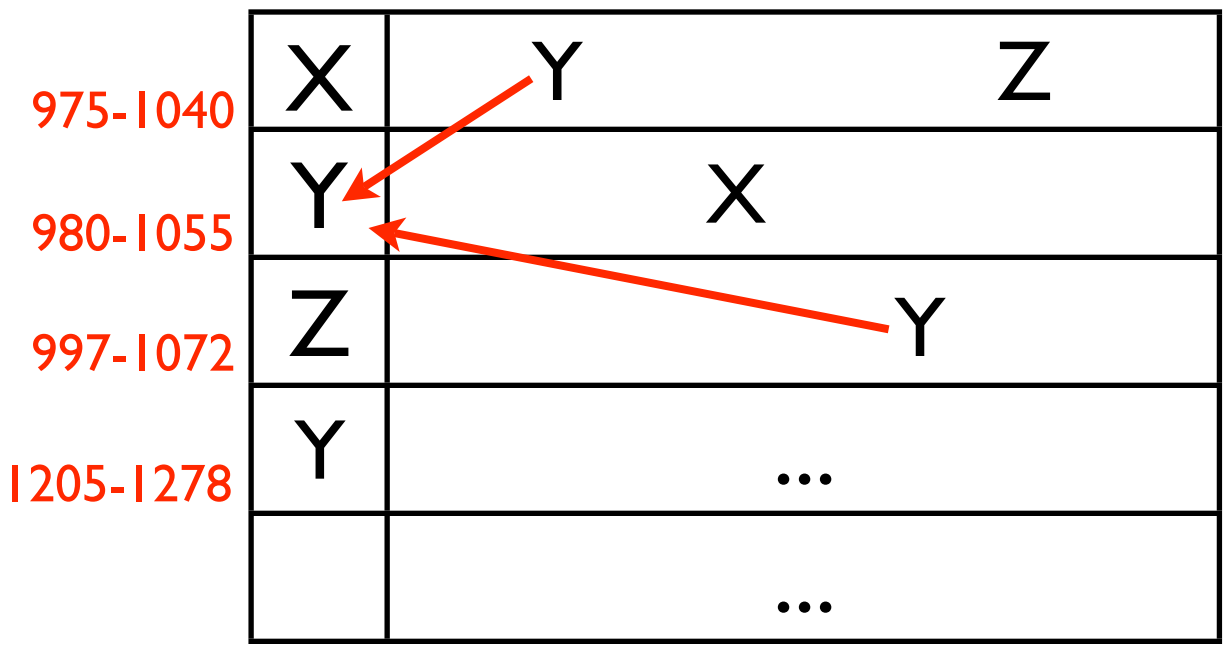
Disambiguation



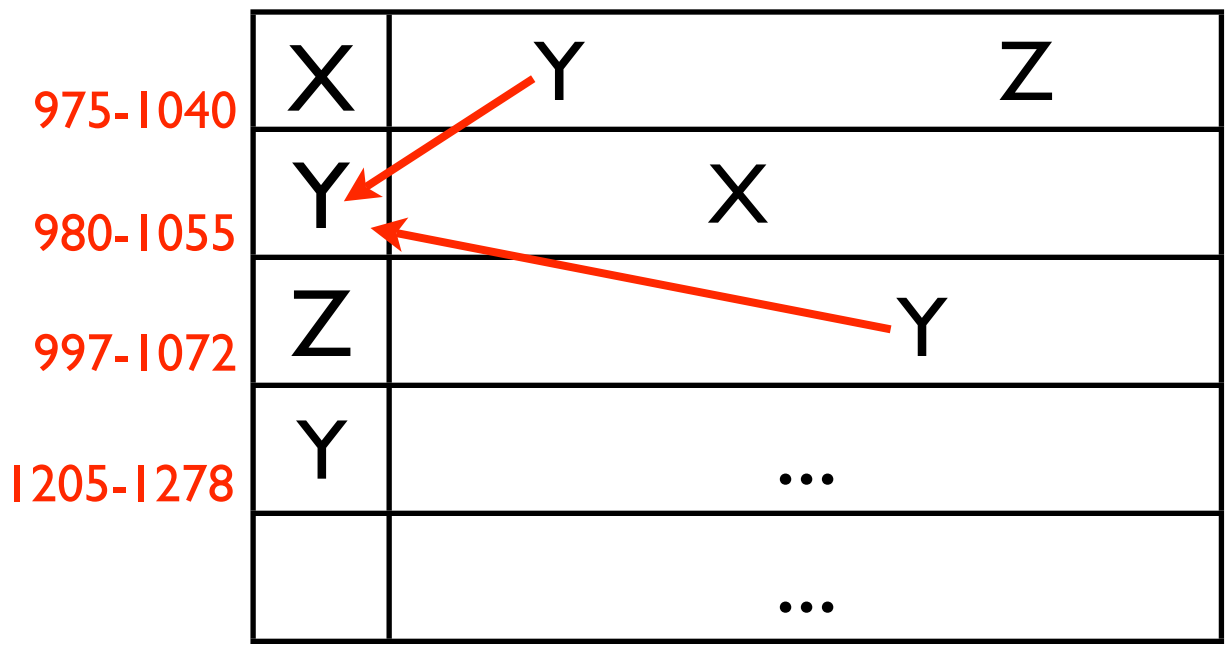
Disambiguation



Disambiguation



Disambiguation



Might be useful to look at when people lived!

Collecting Time Information

- Birth and death years are incomplete
- Only 5,000 out of 24,000
- Examples:
  - 王翥　？？？ 字一飛，成都人。篤學尚氣。吳曦謀反來請，翥陽病風瘖，潛往安丙，謀誅曦。事定，匿巴中，為農終身。
  - 王鈇　(？～1149)，字承可，號亦樂居士，豫章人。秦檜舅氏王本觀復之子。檜薦於朝，除樞屬，嘗提舉浙東茶鹽，官至戶部侍郎。紹興十七年知廣州，十九年卒於官。有亦樂居士集。

Collecting Time Information

- But we can infer them from the text!
  - Years of death
    "... died during the reign of ..."
  - Years of important events
    "... was a presented scholar during the reign of ..."
  - Temple names of emperors
    "... was summoned to the court by ..."
- Estimate when people lived

Pattern Search

- Searching for death dates, presented scholar dates etc.
- Cannot do simple search anymore
- Many “patterns” or “templates”

Pattern Search

- We want to find

  元祐三年卒

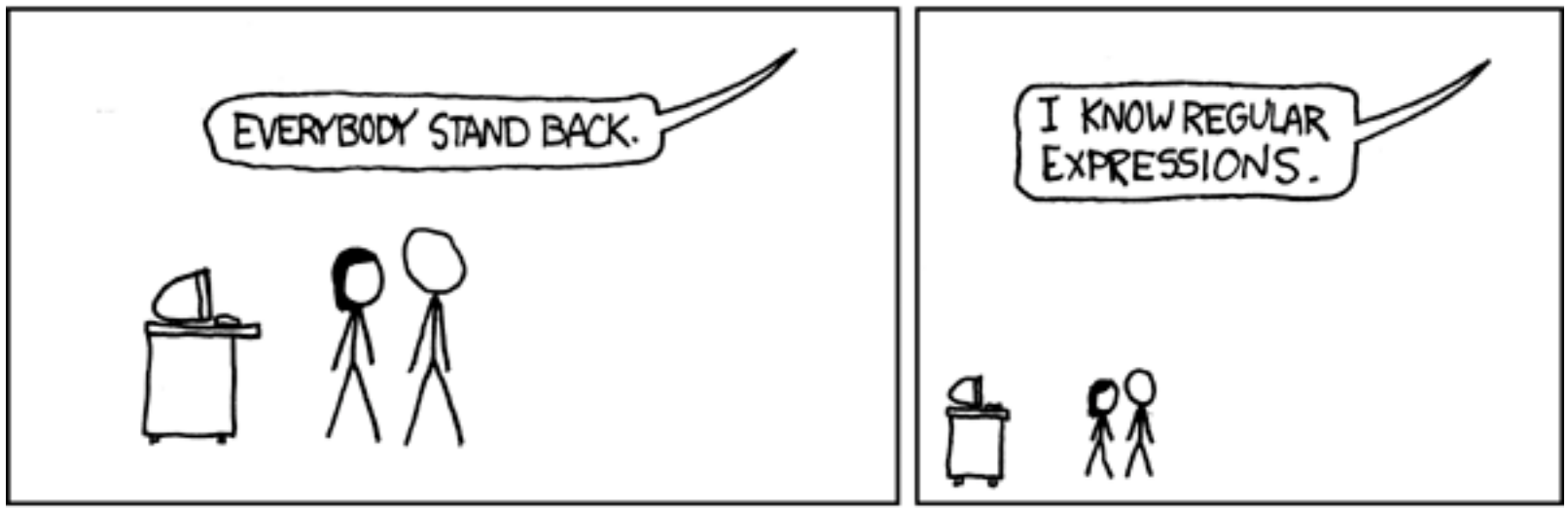
  (died during the 3rd year of the reign of 元祐)

- The "search pattern" is

  reign title number & year character death character

Regular Expressions

- Computational tools to "search for textual patterns"



Regular Expressions

- Using regular expressions to search for an email address
- ANY email address (without knowing)
- Search pattern:
  username @ domain name .com
- Regular expression:
  [a-z]+@[a-z]+\.com

Regular Expressions

Regular Expressions

- Regular expression:
  [a-z]+@[a-z]+\.com

Regular Expressions

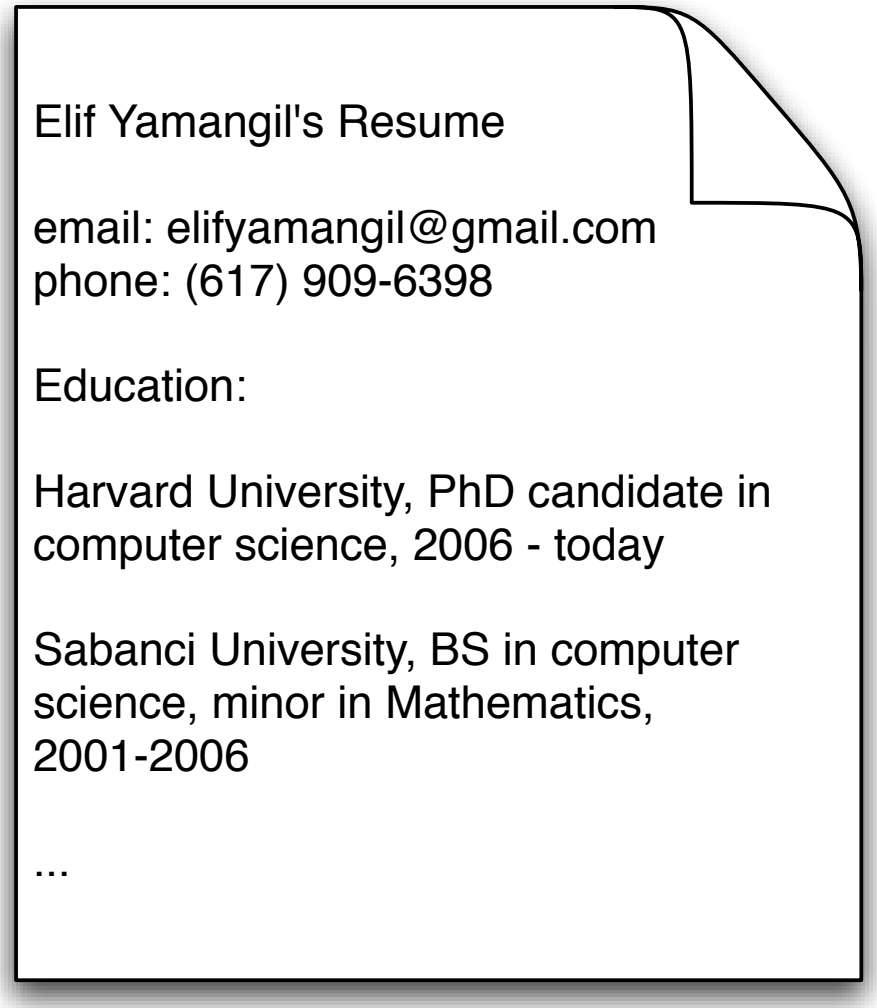
- Regular expression:
  [a-z]+@[a-z]+\.com

Regular Expressions

- Regular expression: [a-z]+@[a-z]+\.com
- Search my resume using this regular expression

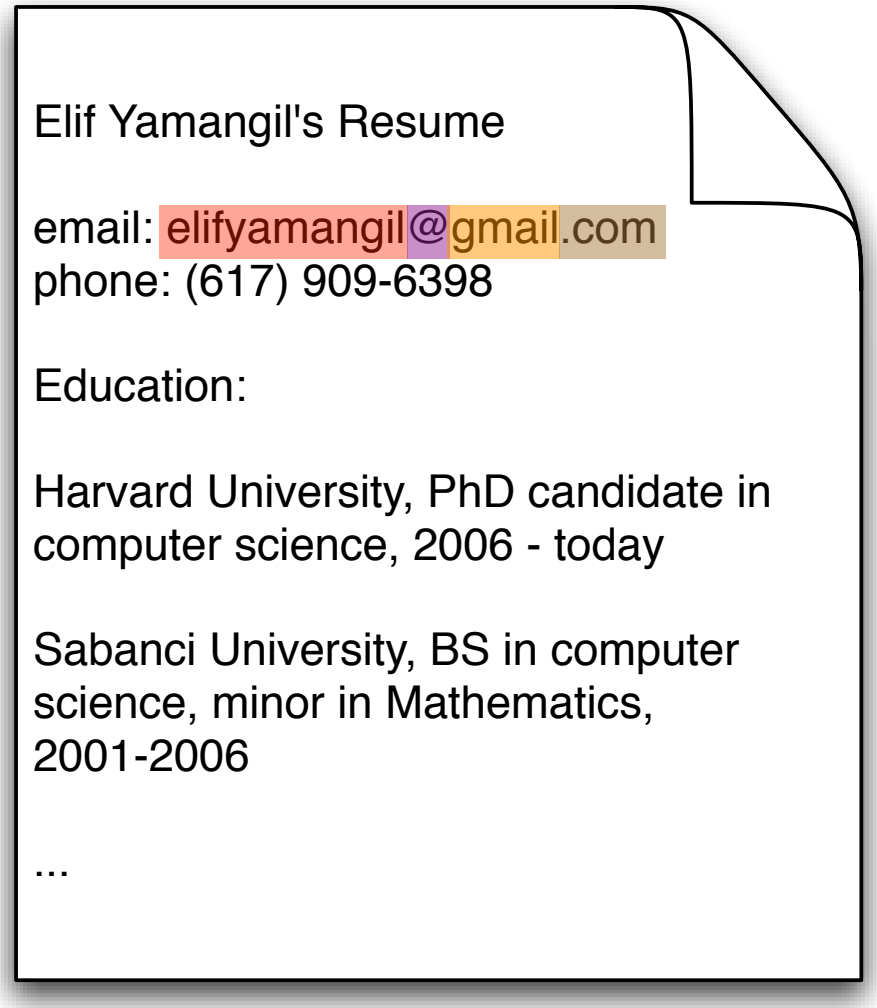
Regular Expressions

- Regular expression: [a-z]+@[a-z]+\.com
- Search my resume using this regular expression
- Finds my email address!



Regular Expressions

- Regular expression: [a-z]+@[a-z]+\.com
- Search my resume using this regular expression
- Finds my email address!



Regular Expressions

- Same idea!
- First convert Chinese numbers to Arabic
- Then use regular expression:
  元祐[0-9]+年卒

Regular Expressions

- Of course we want to search for any reign title:

  (元祐|元豐|...|紹興)[0-9]+年卒

- And use various other patterns:

  (元祐|元豐|...|紹興)[0-9]+年[0-9]+月卒
  (元祐|元豐|...|紹興)[0-9]+年[0-9]+月[0-9]+日卒
  (元祐|元豐|...|紹興)(初|中|末|間)卒
  (元祐|元豐|...|紹興) [0-9]+年(春|夏|秋|冬)卒

Regular Expressions

Regular Expressions

Using the regular expression:

(元祐|元豐|...|紹興)[0-9]+年卒

Regular Expressions

Using the regular expression:

(元祐|元豐|...|紹興)[0-9]+年卒

WDY
丁罕　(？～999)，潁州人。應募補衛士，以戰功累遷指揮使。淳化中為澤州團練使，知霸州，河決，以私錢募築，民咸德之，擢領靈環路都部署，破李繼遷有殊功。後拜密州觀察使，徙貝州。咸平二年卒，子守德能世其家。
丁明　(1127～1211)，舊名騭，字希閔，後改名明，字子公，金壇人，權子。閉門讀書二十年，手編事類及史通考等書百餘卷。奉祠家居，嘉定四年卒，年八十五。鄉里私謚博雅先生。

Regular Expressions

Using the regular expression:

(元祐|元豐|...|紹興)[0-9]+年卒

WDY
丁罕　(？～999)，潁州人。應募補衛士，以戰功累遷指揮使。淳化中為澤州團練使，知霸州，河決，以私錢募築，民咸德之，擢領靈環路都部署，破李繼遷有殊功。後拜密州觀察使，徙貝州。咸平二年卒，子守德能世其家。
丁明　(1127～1211)，舊名騫，字希閔，後改名明，字子公，金壇人，權子。閉門讀書二十年，手編事類及史通考等書百餘卷。奉祠家居，嘉定四年卒，年八十五。鄉里私謚博雅先生。

Regular Expressions

Using the regular expression:

(元祐|元豐|...|紹興)[0-9]+年卒

WDY
丁罕　(？～999)，潁州人。應募補衛士，以戰功累遷指揮使。淳化中為澤州團練使，知霸州，河決，以私錢募築，民咸德之，擢領靈環路都部署，破李繼遷有殊功。後拜密州觀察使，徙貝州。咸平二年卒，子守德能世其家。
丁明　(1127～1211)，舊名騫，字希閔，後改名明，字子公，金壇人，權子。閉門讀書二十年，手編事類及史通考等書百餘卷。奉祠家居，嘉定四年卒，年八十五。鄉里私謚博雅先生。

Regular Expressions

- Presented Scholar degree date patterns

  (元祐|元豐|...|紹興)[0-9]+年[四甲第十八名]{,9}進士
  (元祐|元豐|...|紹興) (初|中|末|間)[四甲第十八名]{,9}進士

- Temple names can be handled using simple search

Collected Dates

Collected Dates

ID: 24603, temple name (mid year: 1093)

ID: 24610, temple name (mid year: 1010)

ID: 24615, temple name (mid year: 1244)

ID: 24619, death date (year: 973)

ID: 24646, death date (year: 1030, month: 6, day: 15)

ID: 24670, temple name (mid year: 1065)

ID: 24695, death date (year: 1082, month: 10)

ID: 24708, death date (year: 1082, season: 4)

ID: 24709, presented scholar (year: 1106)

ID: 24710, presented scholar (year: 1053)

ID: 24720, presented scholar (year: 1148)

ID: 24723, temple name (mid year: 1076)

Collected Dates

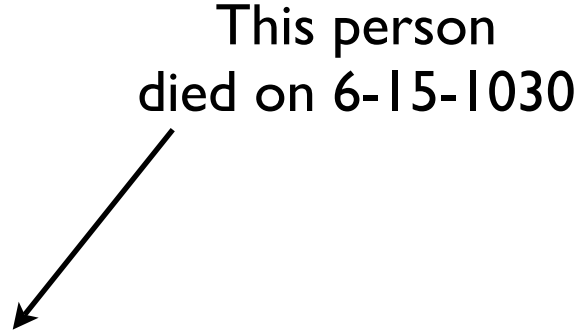
ID: 24603, temple name (mid year: 1093)

ID: 24610, temple name (mid year: 1010)

ID: 24615, temple name (mid year: 1244)

ID: 24619, death date (year: 973)

ID: 24646, death date (year: 1030, month: 6, day: 15)



ID: 24670, temple name (mid year: 1065)

ID: 24695, death date (year: 1082, month: 10)

ID: 24708, death date (year: 1082, season: 4)

ID: 24709, presented scholar (year: 1106)

ID: 24710, presented scholar (year: 1053)

ID: 24720, presented scholar (year: 1148)

ID: 24723, temple name (mid year: 1076)

Collected Dates

ID: 24603, temple name (mid year: 1093)

ID: 24610, temple name (mid year: 1010)

ID: 24615, temple name (mid year: 1244)

ID: 24619, death date (year: 973)

ID: 24646, death date (year: 1030, month: 6, day: 15)

ID: 24670, temple name (mid year: 1065)

ID: 24695, death date (year: 1082, month: 10)

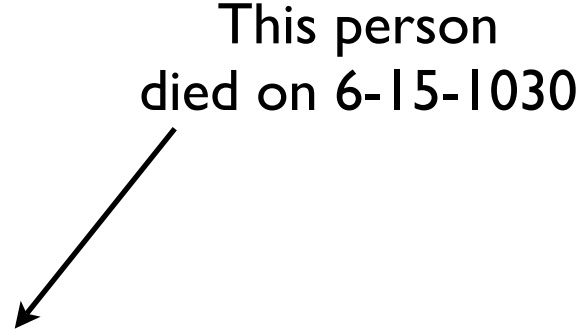
ID: 24708, death date (year: 1082, season: 4)

ID: 24709, presented scholar (year: 1106)

ID: 24710, presented scholar (year: 1053)

ID: 24720, presented scholar (year: 1148)

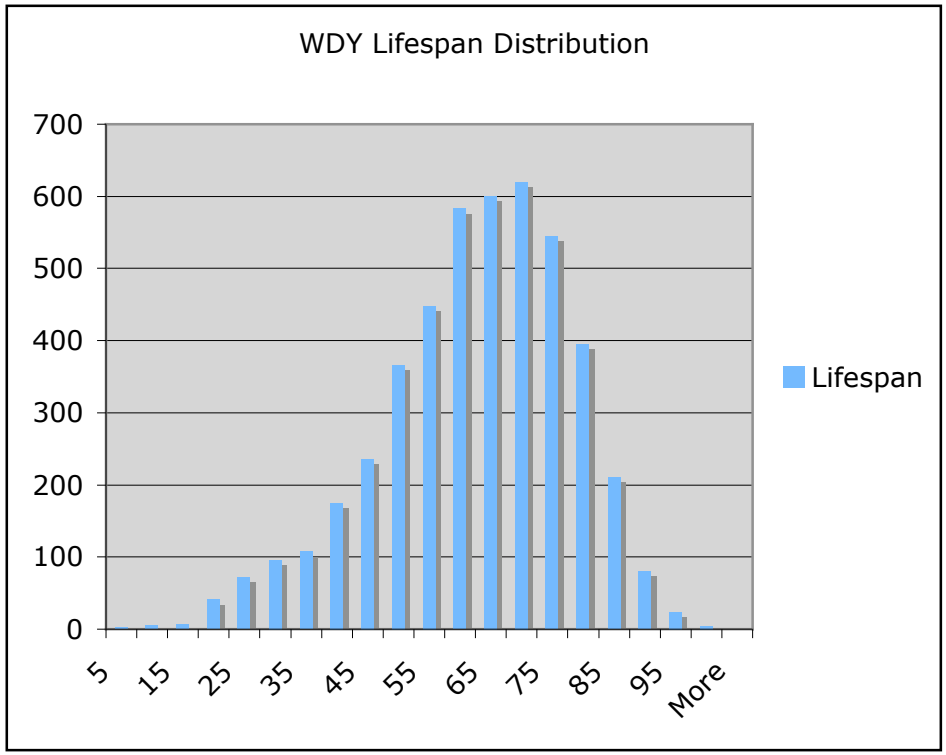
ID: 24723, temple name (mid year: 1076)



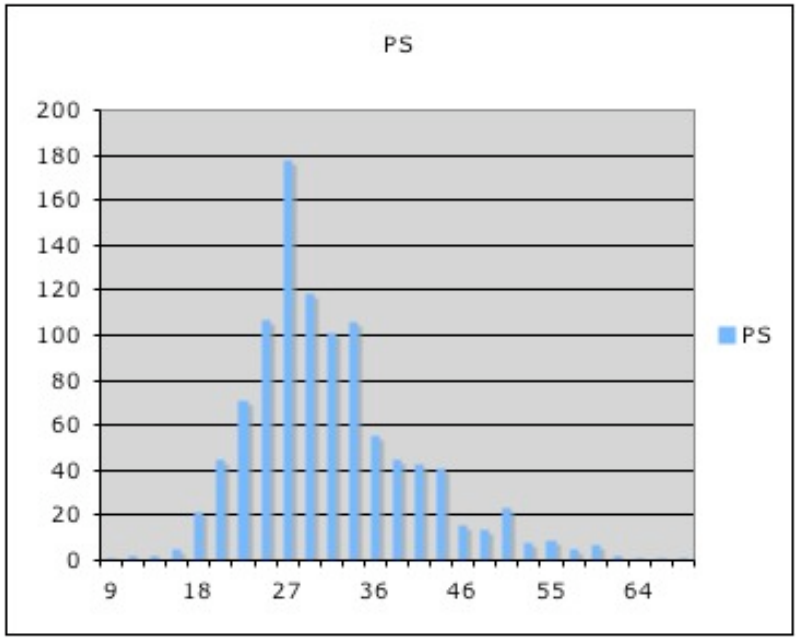
91% of the death dates found agreed on year with Arabic death years (9% must be incorrect!)

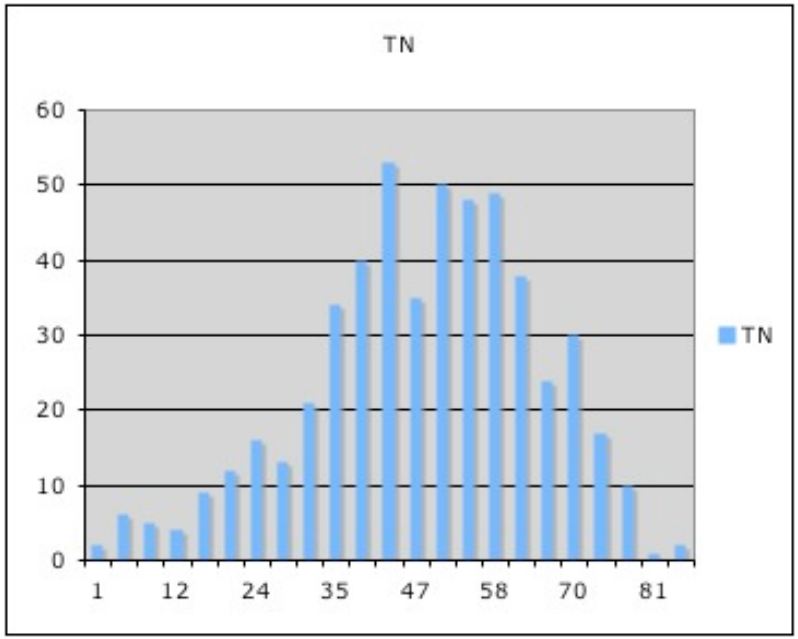
Collected Dates

- Lifespan distribution
- Average lifetime ≈ 60 years



Collected Dates





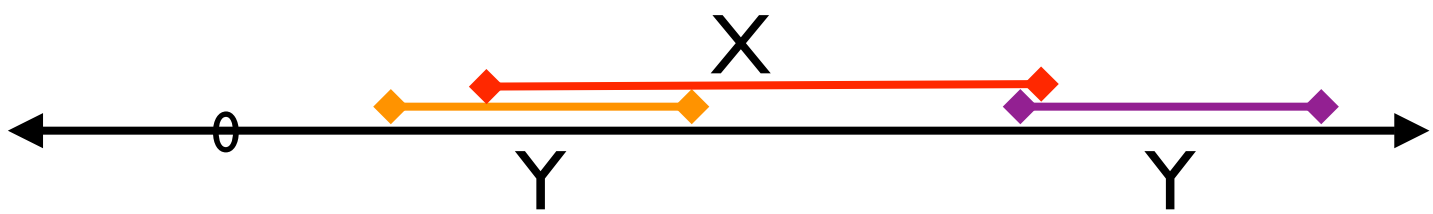
- PS corresponds to ≈ 30th year of life
- TN correspond to ≈ 45th year of life

Reconstructing Lifetimes

- We "re-construct" unknown lifespans
- How do we use these dates?
  - Death year = 60th year of life
  - PS year = 30th year of life
  - TN midpoint = 45th year of life
- In this order
- 19,000 unknown → 14,000 unknown
- 2,000 "other" dates were found

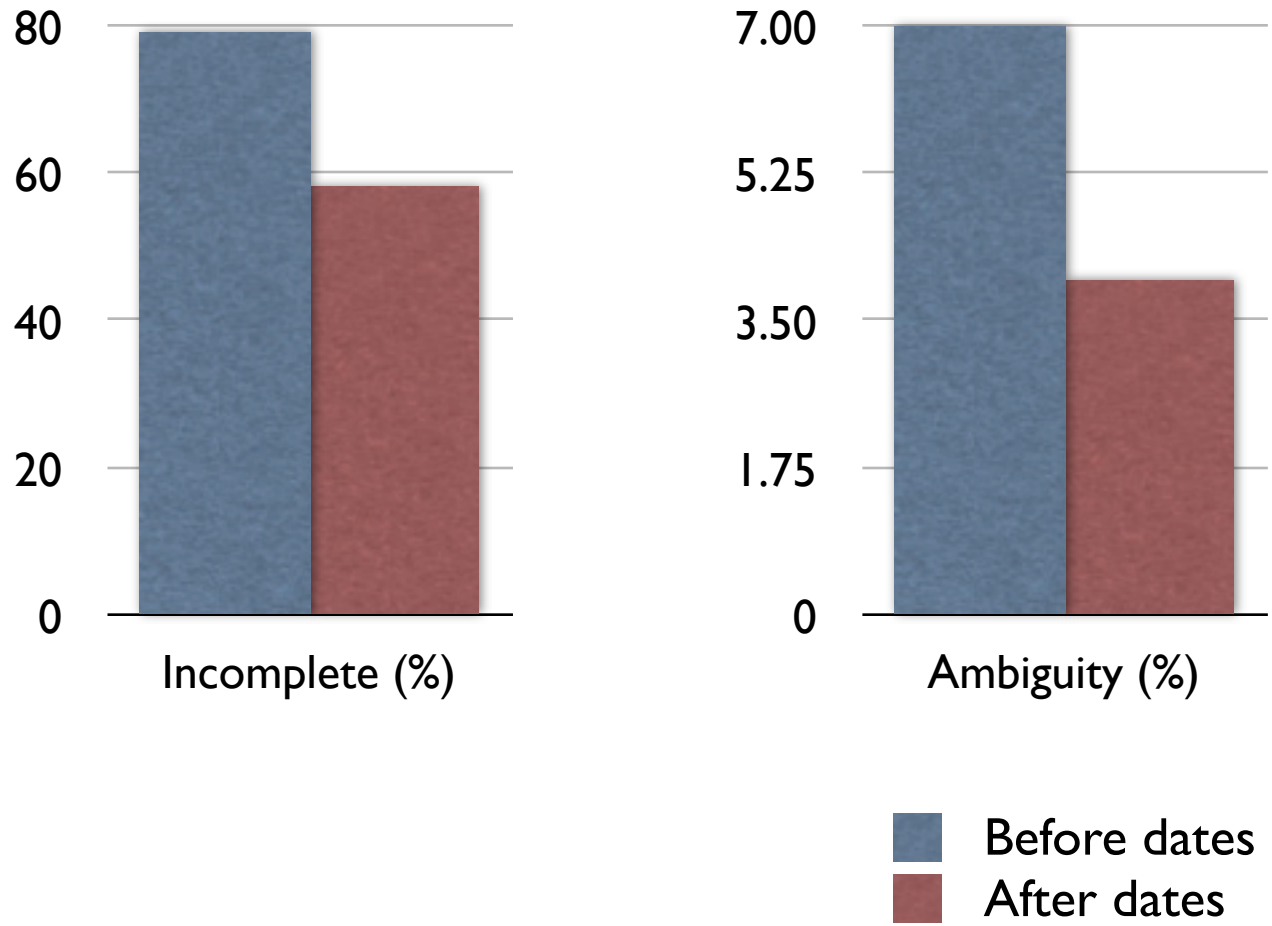
Disambiguating Name Co-occurrences

- How do we use lifespans to disambiguate?

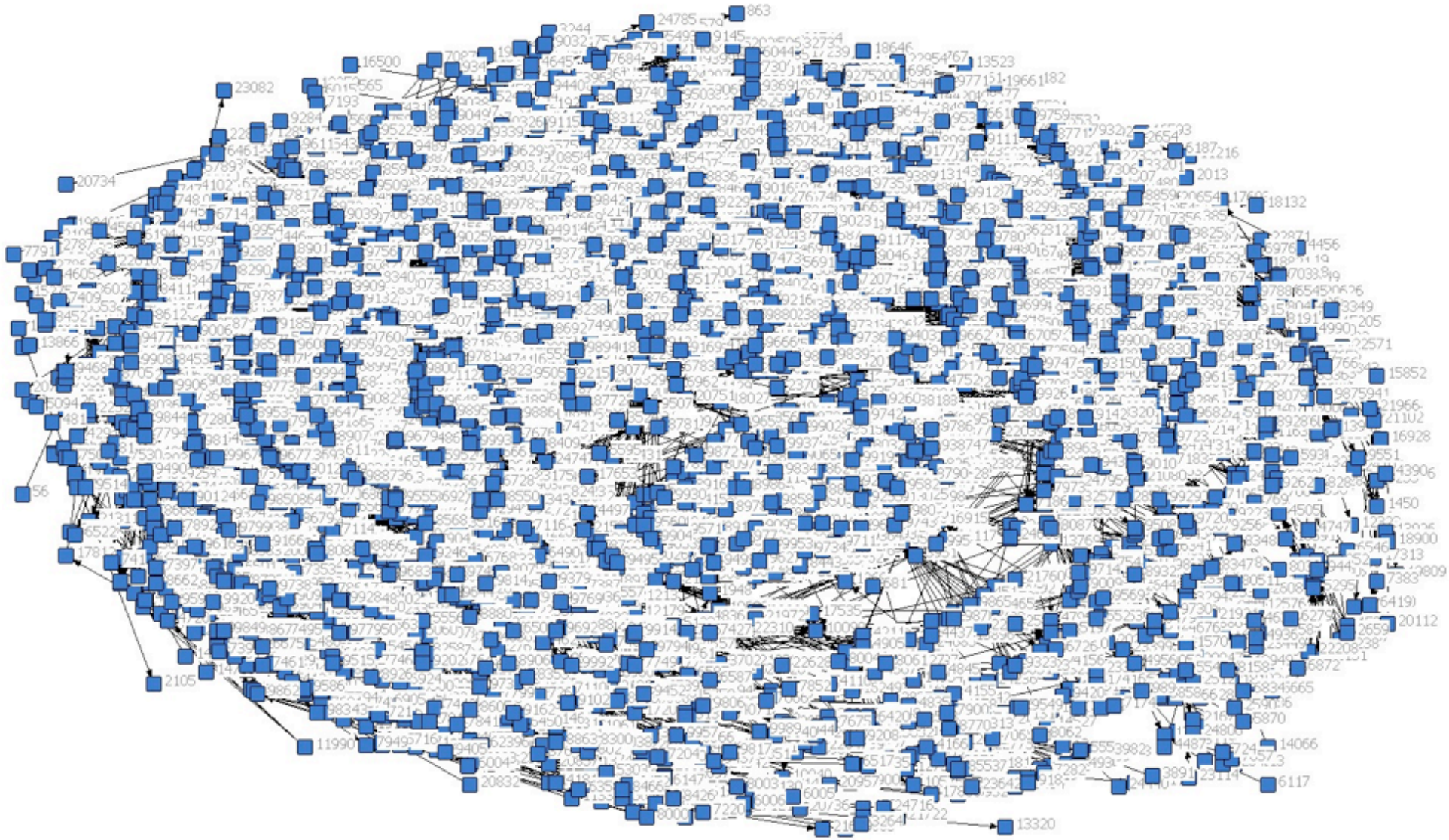


- We check for longest overlap

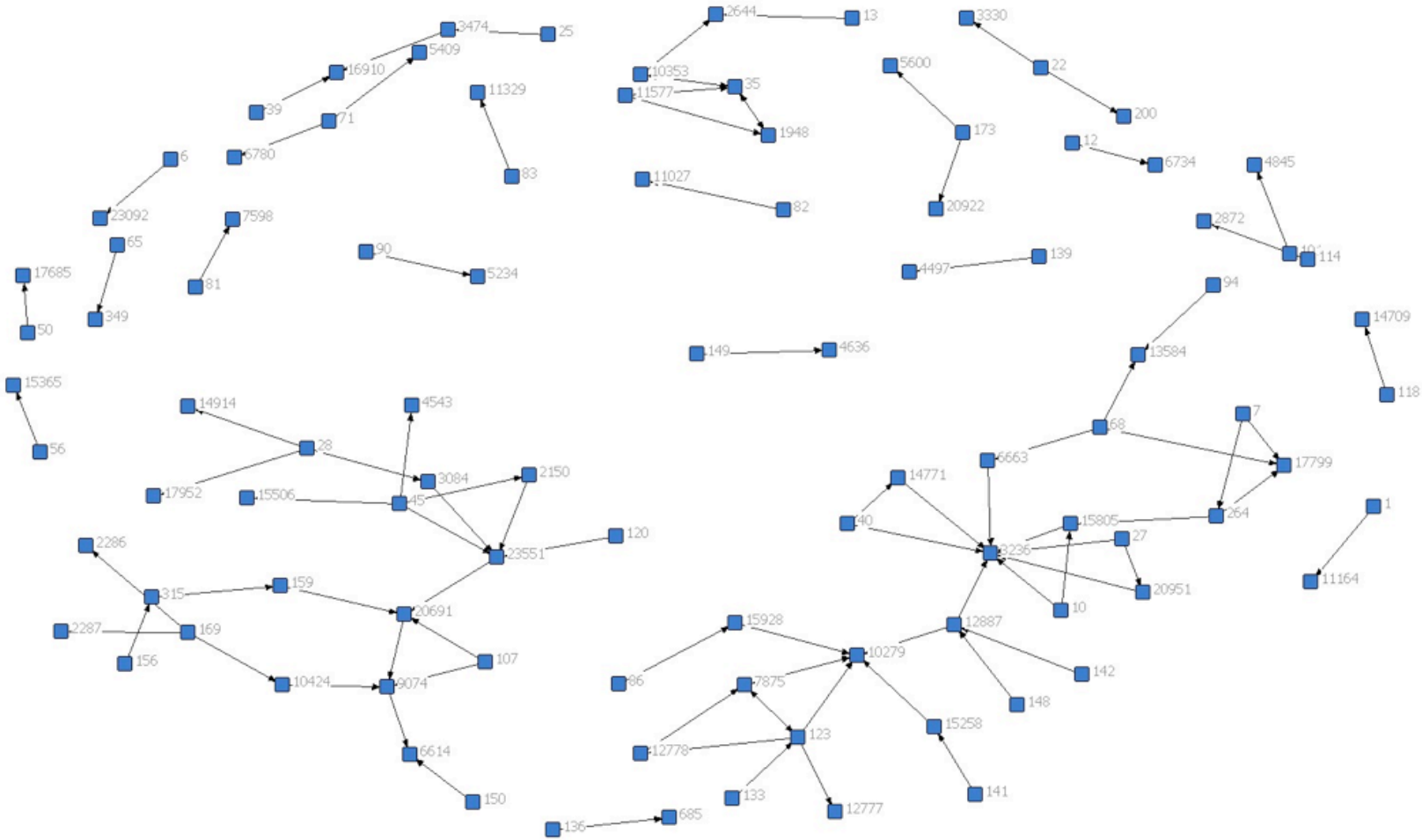
Results


80
60
40
20
0
Incomplete (%)
7.00
5.25
3.50
1.75
0
Ambiguity (%)
Before dates
After dates

Graph Analysis

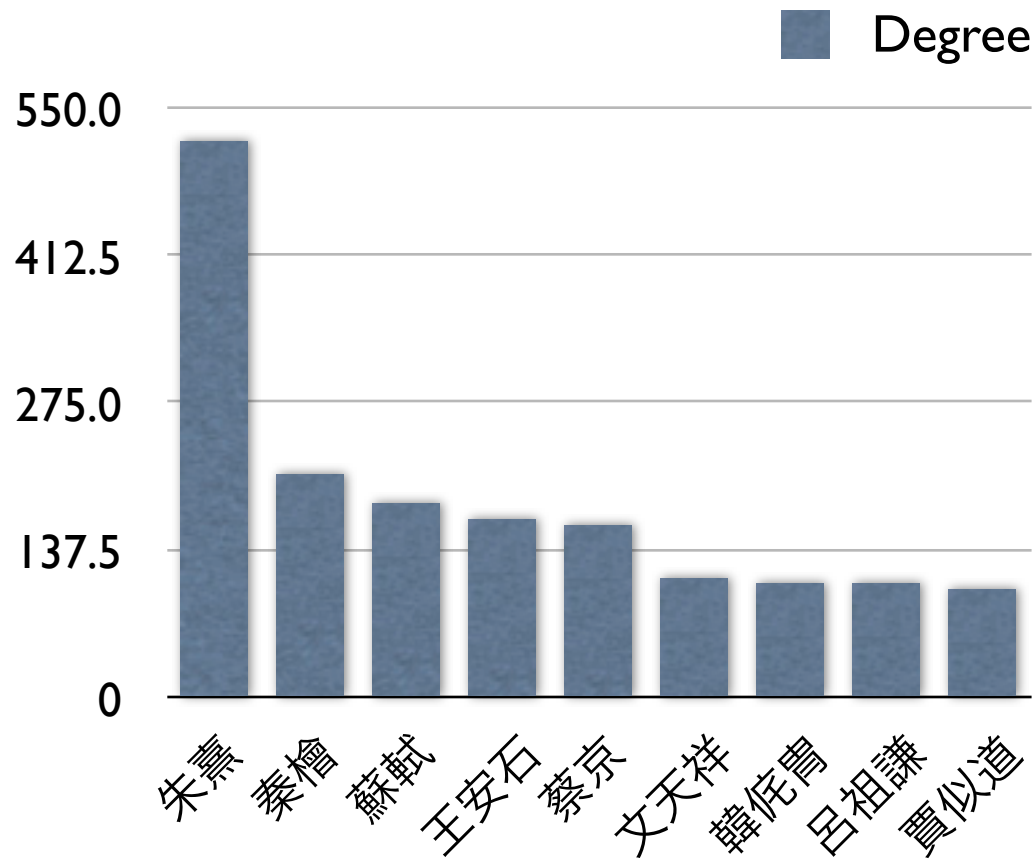


Graph Analysis

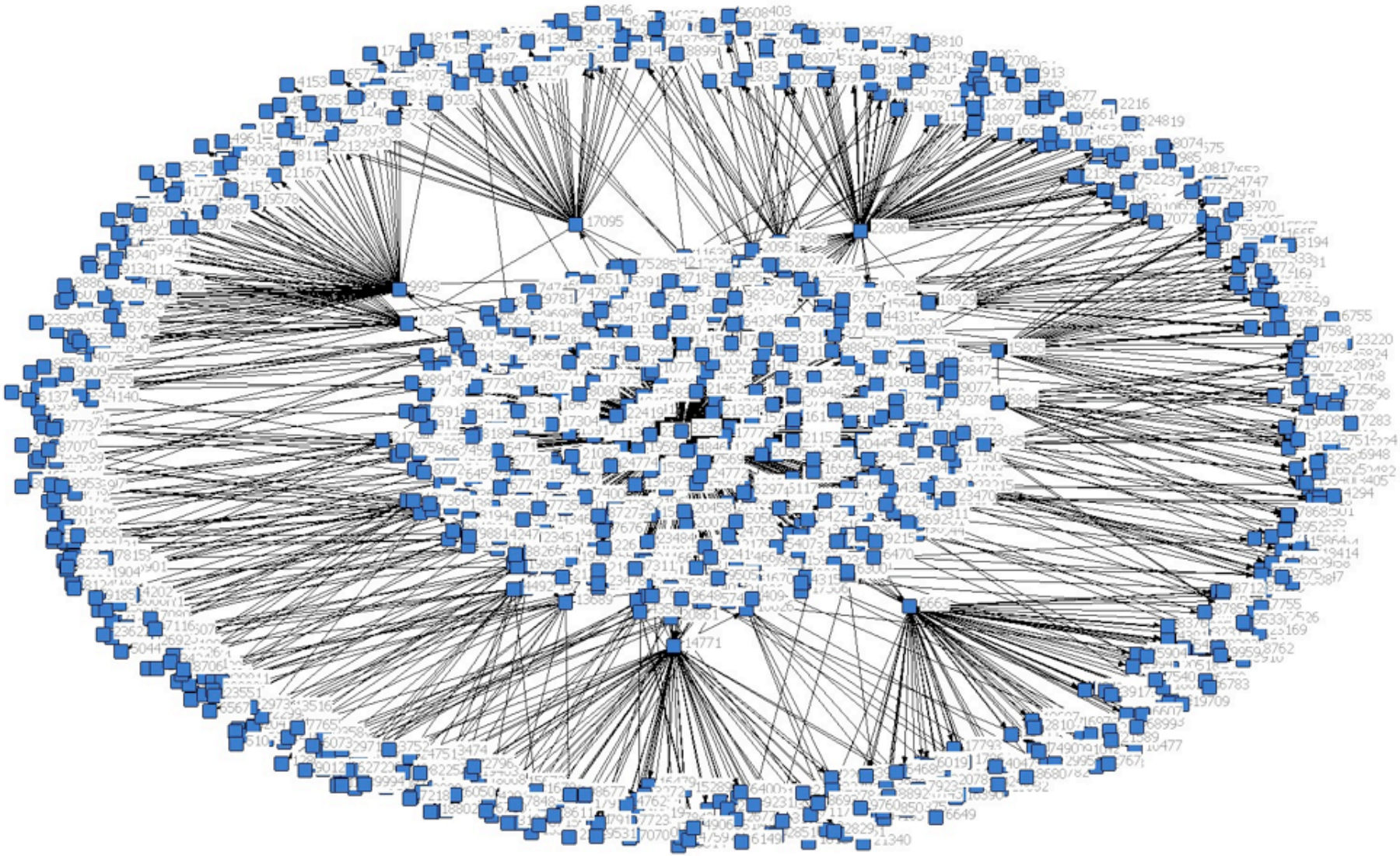


Graph Analysis

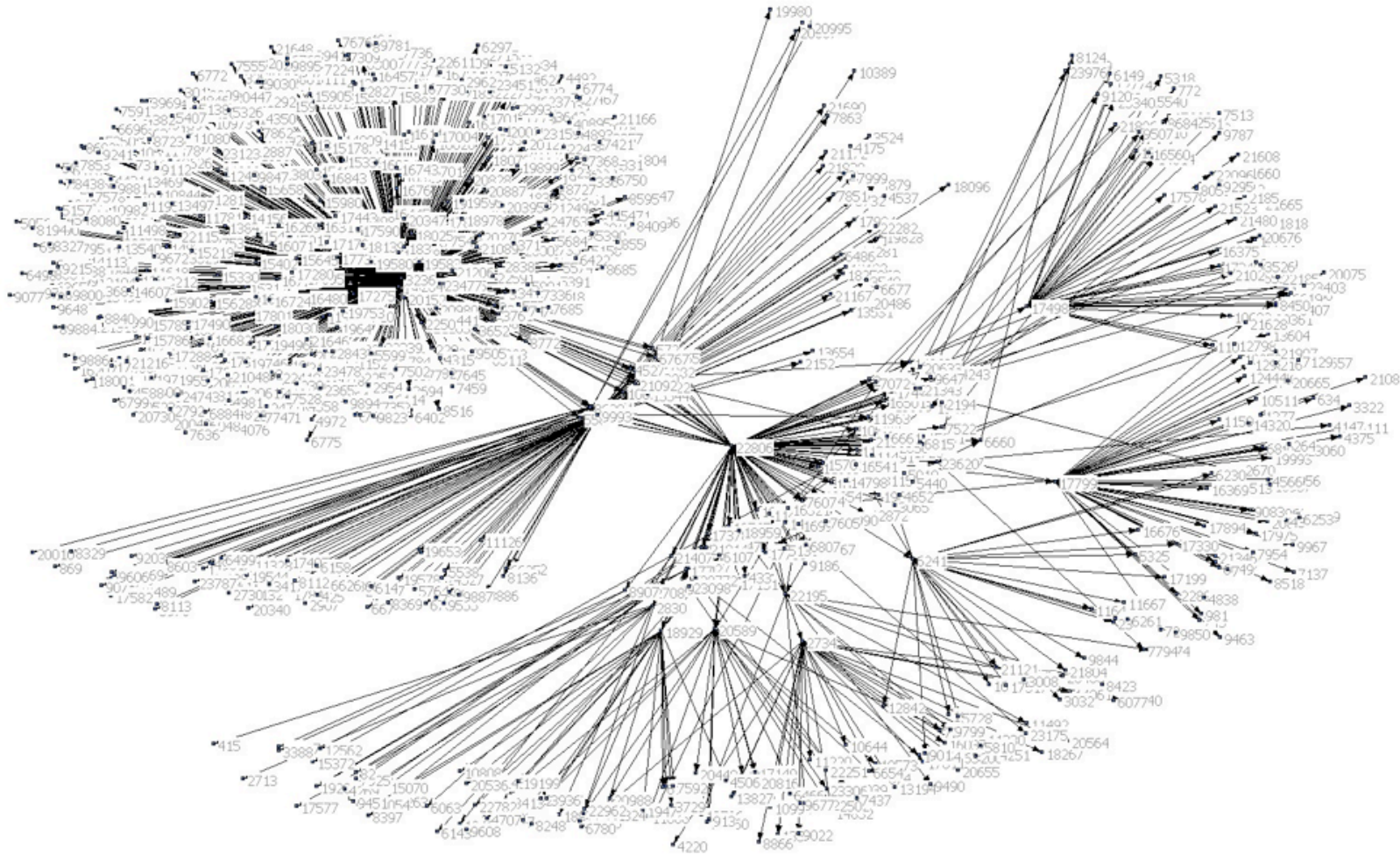
- Degree distribution
- Important figures have high degree



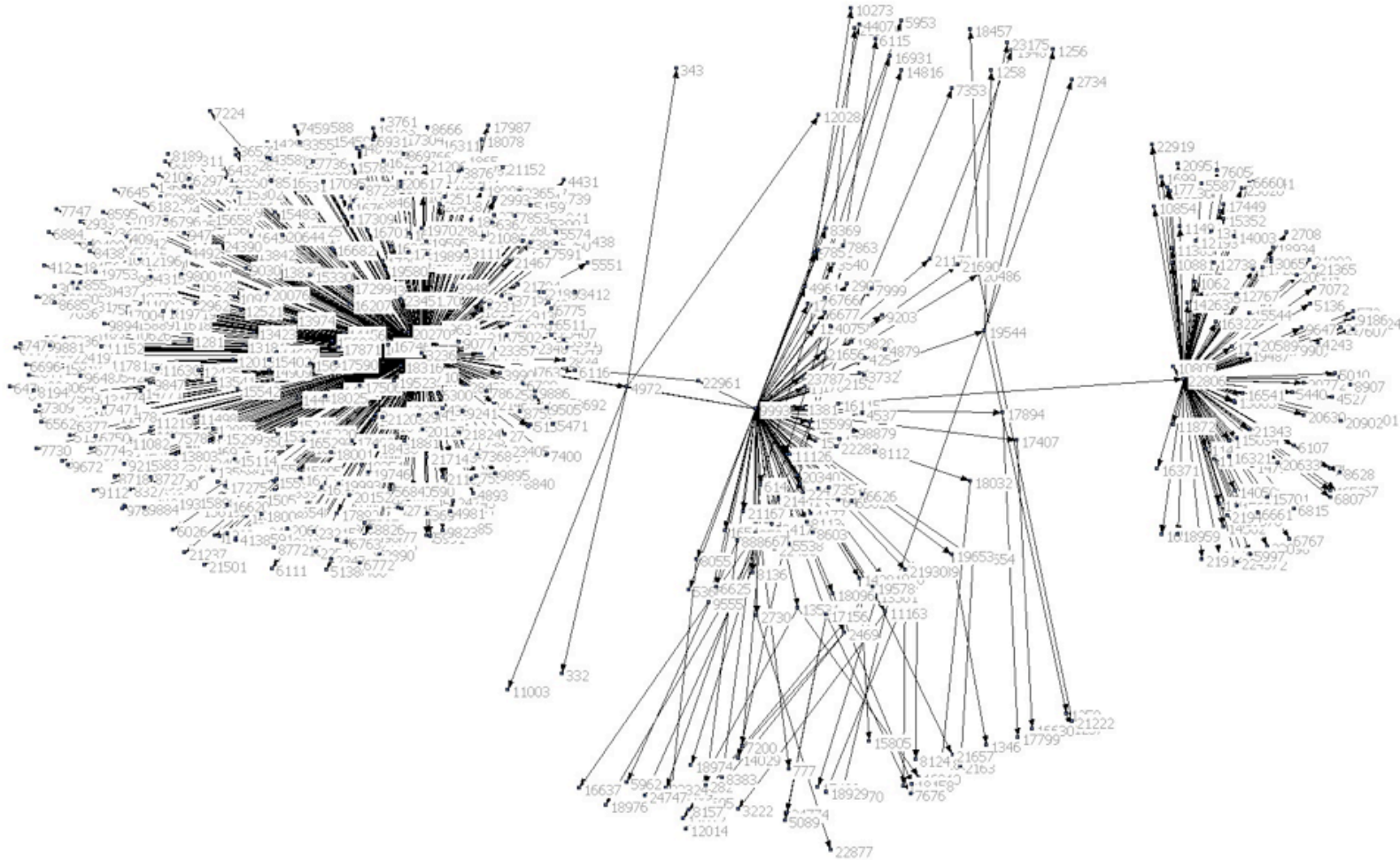
Graph Analysis



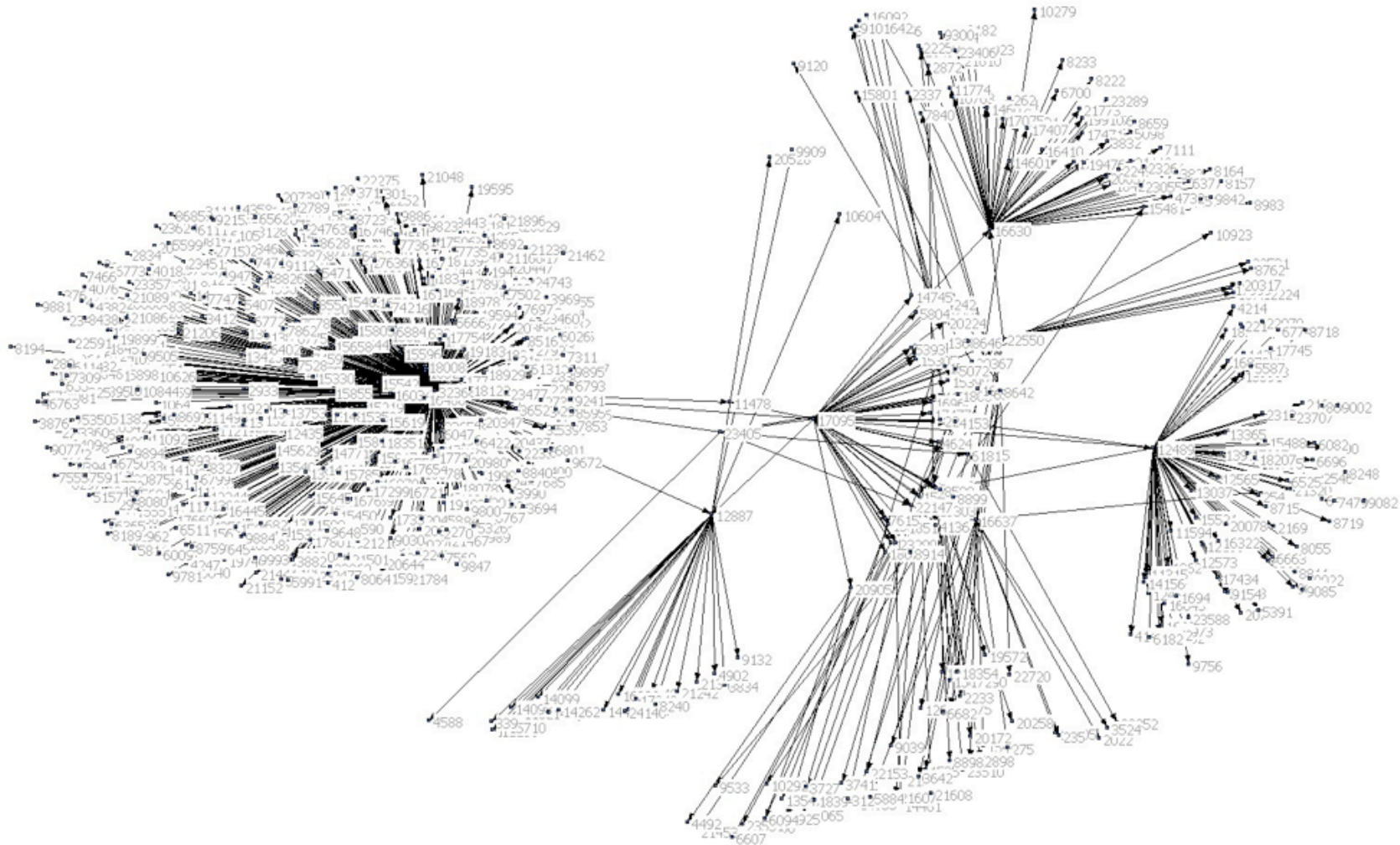
Graph Analysis



Graph Analysis



Graph Analysis



Summary

- Searching for **name co-occurrences**
- Regular expressions help us pick up **important dates**
- From which we infer unknown **lifespans**
- Lifespans help us **disambiguate**
- Graphs hint at **interesting structure**

Next Steps

- Evaluate disambiguation (using hand-annotation)
- Improve search and disambiguation
  - Kinship information
  - Place names
  - Alternate names (capping names, posthumous names, studio names)
- Collecting data is interesting in its own right

Thanks!