AI Tutorial

Sense Alignment of Wikipedia and WordNet

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https://github.com/NTHU-NLPLAB/AI_Tutorial

Motivation

- Word sense disambiguation (WSD)
  - A long-standing but open problem in NLP
  - Semi-supervised systems have been constantly observed as leading to the highest performance
    - The sense-tagged data bottleneck
- [Rada Mihalcea 2007]: Generating sense-tagged data using Wikipedia as a source of sense annotations

			baselines		word sense
Dataset	#s	#ex	MFS	LeskC	disambig.
SENSEVAL	4.60	226	51.53%	58.33%	68.13%
WIKIPEDIA	3.31	316	72.58%	78.02%	84.65%

Procedure (cont')

1. Develop Wiki sense inventory (WikiSI)
   - Using hyperlink references in Wikipedia:
     - [[political party|party]],[[party]],[[party (law)|party]]

Procedure

2. Disambiguate and align Wikipedia hyperlinked articles to WordNet senses
   - [[political party|party]] >= party.n.01
   - [[party]] >= party.n.04
   - [[party (law)|party]] >= party.n.05
3. Extract Wikipedia sentences with anchor | Wiki page | WN sense
   - party | Political_party | party.n.01 (865)
   - party | Party | party.n.04 (320)
   - party | Party (law) | party.n.05 (123)

Example

- In Wiki page “Superdelegate” (https://en.wikipedia.org/wiki/Superdelegate)
  - We extract the sentence for party.n.05 : In the party primary elections and caucuses in each U.S. state,

Hands-on Activity

- Preprocessing
  - Download Wiki Data from **Wikimedia Downloads** (https://dumps.wikimedia.org)
  - Extract useful information

Manual Alignment Guideline

- Align a WordNet sense with Wiki page if they are:
  - WordNet lemma is identical to page Identical
    - **bank.n.01** (*WordNet*): sloping land (especially the slope beside a body of water)
    - **Bank (geography)** (*Wikipedia*)
  - Else if a sister term is identical to page title
    - **disk.n.01**: something with a round shape resembling a flat circular plate
    - **Ball**
  - Else a daughter term is identical to page title
    - **party.n.05**: a person involved in legal proceedings
    - **Plaintiff**
- Exclude
  - Name entity and modifier
    - **Arms** industry

Evaluation

- Development set: 30 words in 158 senses and about 5,000 sentences
- Full set

	Unique Words	Synsets	Word-Sense Pairs	Ambig. words	(# of Sentences)
Wiki (2019/7/2)	41,615	-	(En) 88,571 (Zh) 22,781	12,159	3,741,348
WordNet	117,798	82,115	146,312	15,935	48,247

Alignment Methods

- Lemma
- Bilingual alignment
- # of transitive closures (hypos/hypers/ sisterms…) of a synset in the text/hyperlink of the Wiki page
- Category
- ……

Download

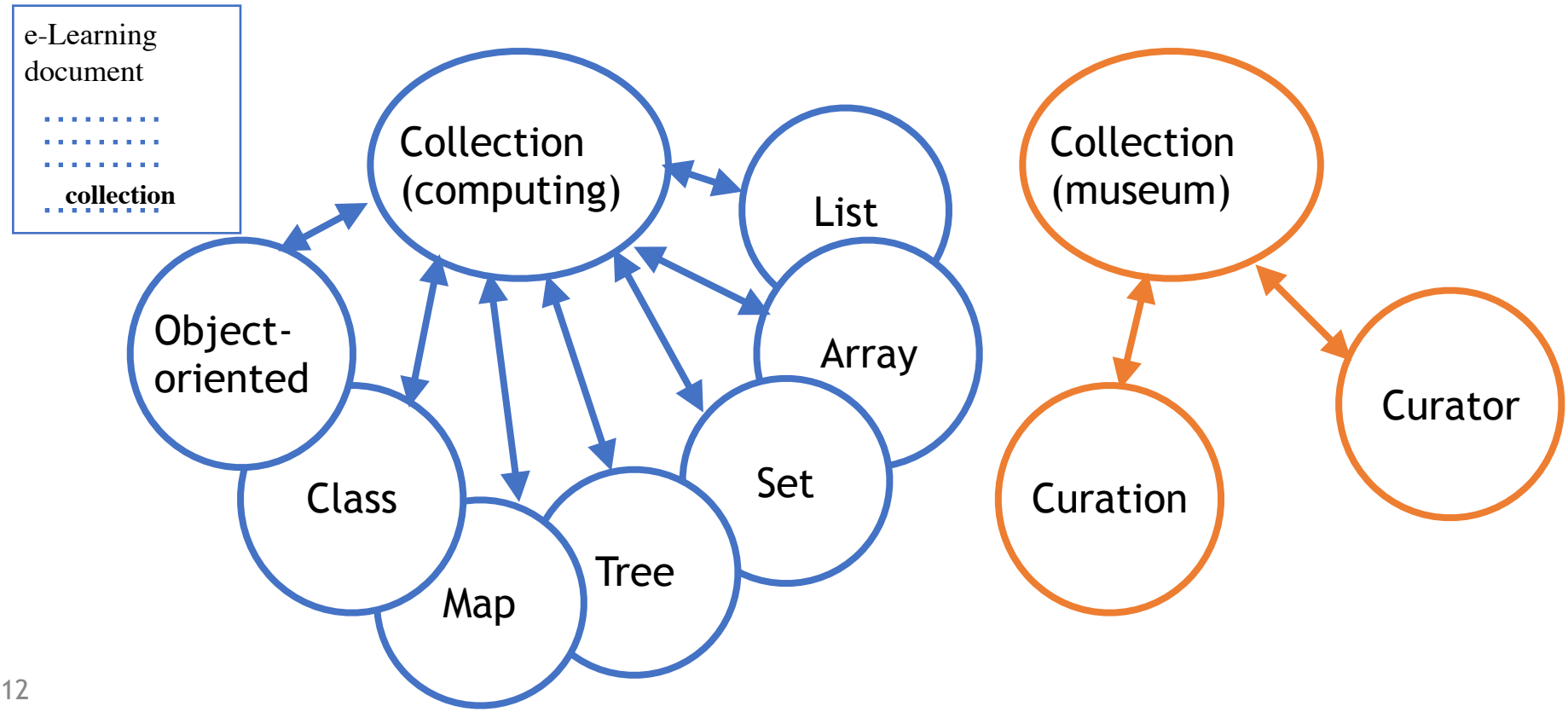
- Source code
  - https://github.com/NTHU-NLPLAB/AI_Tutorial
- TextNet
  - http://textnet.nlplab.cc
- Example Sentences
  - https://tinyurl.com/y4jjsuej

AI Tutorial

Graph Based Word Sense Disambiguation

WSD by Wiki Link Graph (cont')

- [A Fogarolli 2009]:Word Sense Disambiguation based on Wikipedia Link Structure



WSD by Wiki Link Graph (cont')

- Wikipedia Link Graph
  - Node: each article
  - Edge: each link between articles

```
<title>Twelve Year Silence
[[Album]]
[[Dark New Day]]
[[Nu metal]]
[[alternative metal]]
[[hard rock]]
[[Warner Bros. Records|Warner Bros.]]
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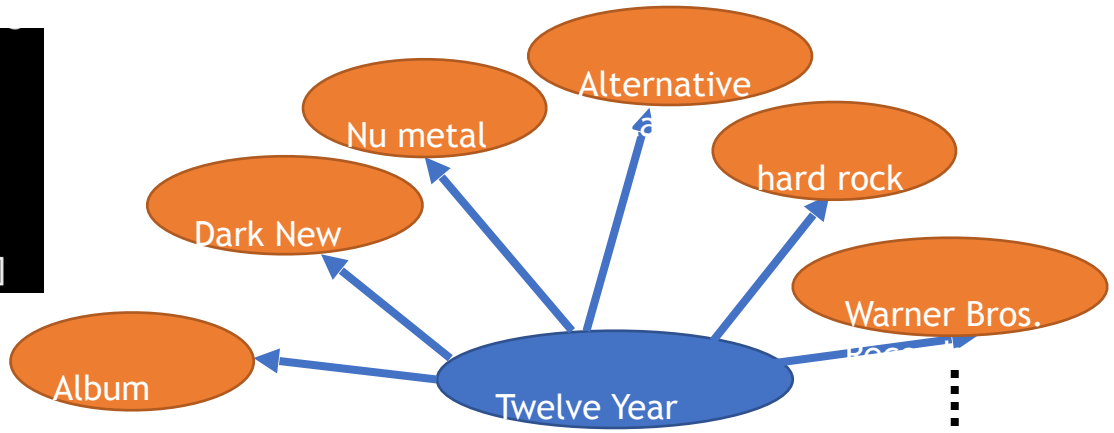
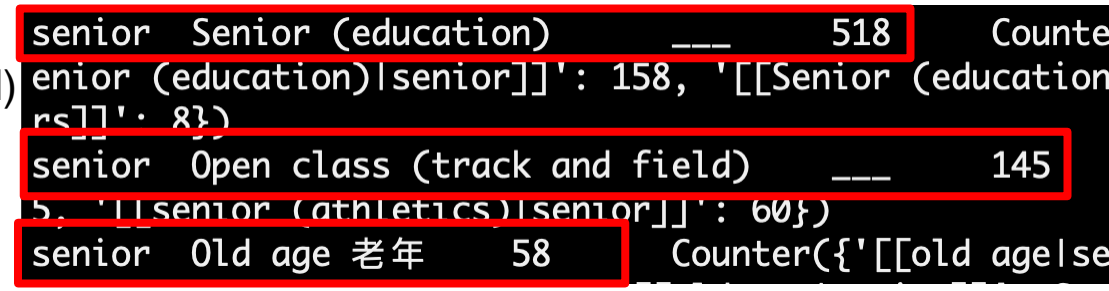


WSD by Wiki Link Graph (cont')

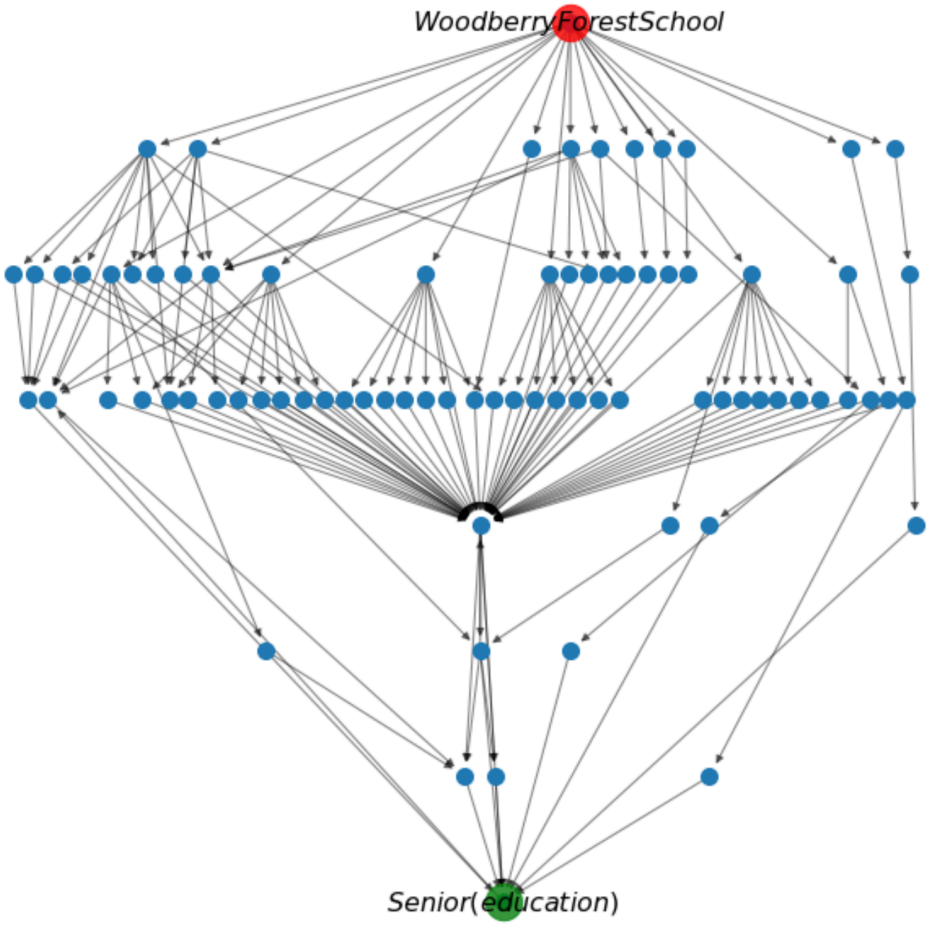
- Use Wikipedia link graph for WSD (without [[linklanchor]])
  - 檢索輸入句 (rising senior) 相關文章，
  - 在Wikipedia Link Graph, 經過較短且較多的路徑
  - 連到解答的linklanchor (例如 Senior (education) 節點)
- 以"rising senior"中的senior(升大四生)為例
  - "rising senior"中的 senior 不是有超連結的 anchor
  - 無法直接連接到與senior較相關的wiki page

— Senior (education)
— Open class (track and field)
— Old age



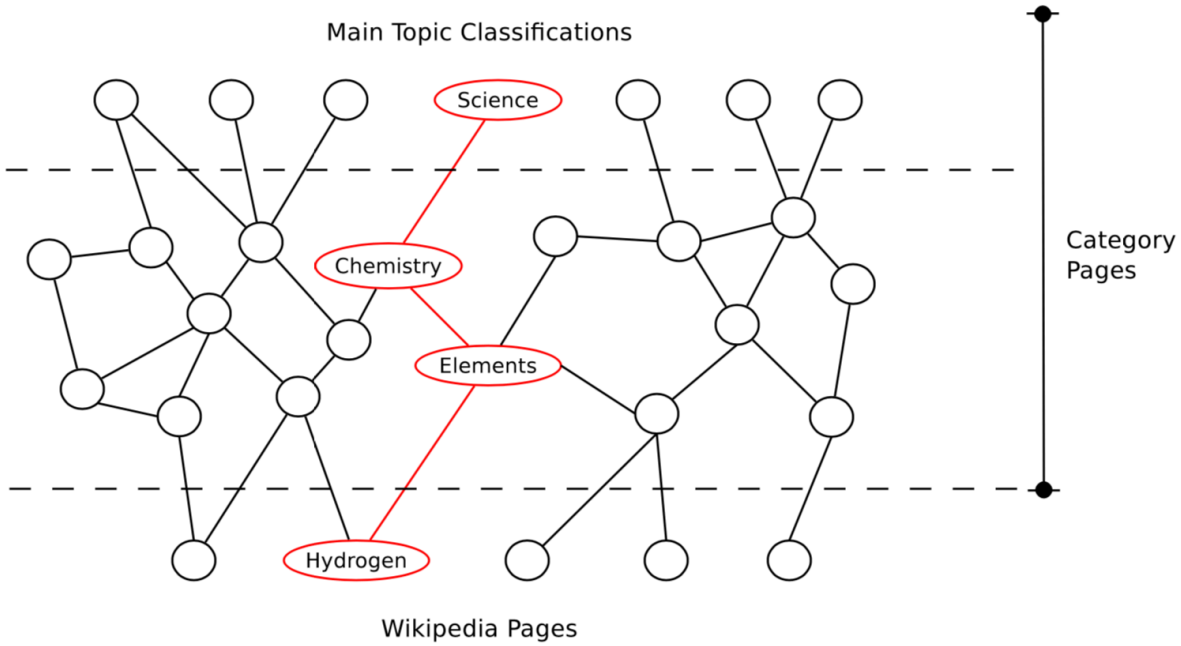
WSD by Wiki Link Graph (cont')

- 實驗步驟
  - 找出所有含"rising senior"的wiki pages set *RS*
  - 令set *S*= {"Senior (education)", "Open class (track and field)", "Old age"}
  - 找出所有set *RS*到*S*距離小於5的path, 以這些path建立*G*的subgraph *G_rs*
    - 範例圖為*RS*裡"Woodberry ForestSchool"到*S*裡"Senior (education)" 的subgraph
  - 計算*G_rs*的page rank
- 實驗結果
  - Page rank 值:
    - Senior (education): 0.1037
    - Old age: 0.0083
  - Open class (track and field)不在*G_rs*中



Hands-on Activity

- Category



Source: Christopher M. De Vries et al., 2010