UTD at the KBP 2016 Event Track

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Plan for the Talk

- English/Chinese Event Nugget Detection
- English/Chinese Event Hopper Coreference
- Evaluation

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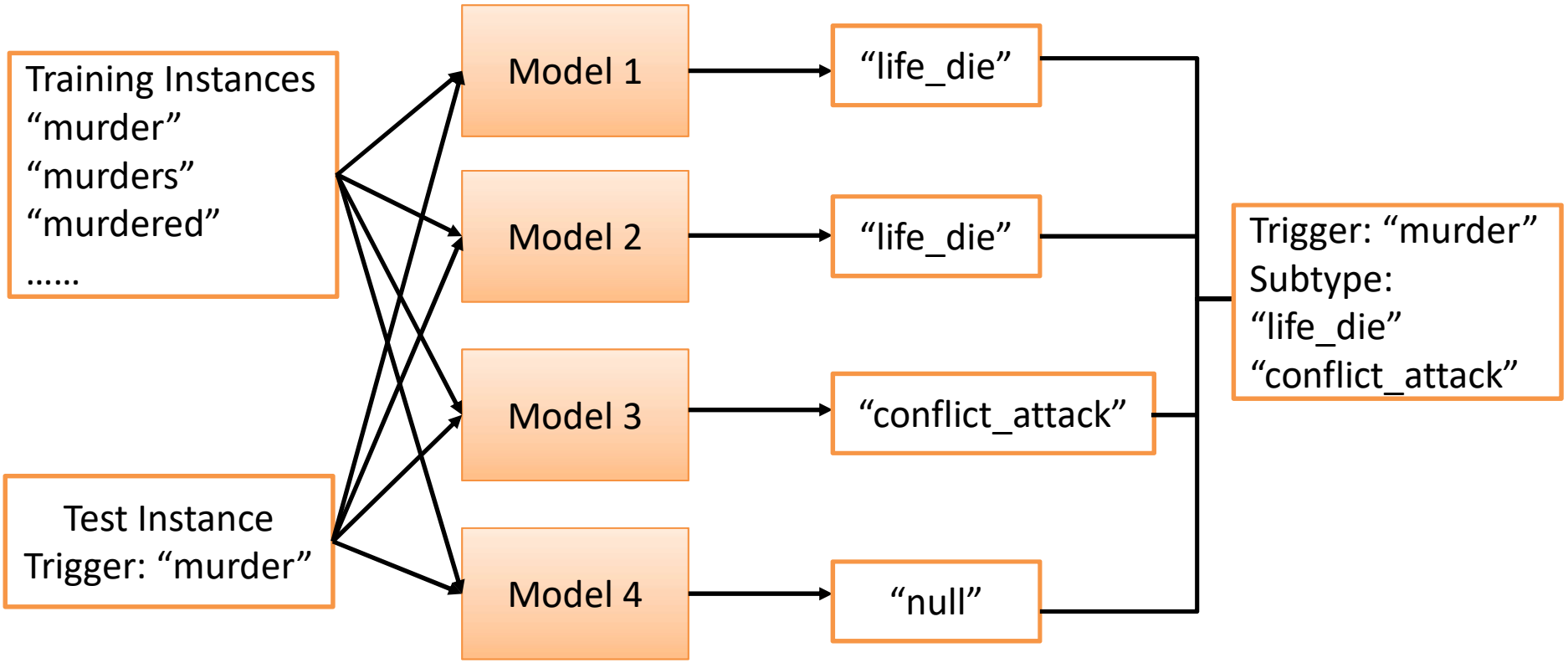
Event Nugget Detection

- Event nugget identification and subtyping
- REALIS value identification

Event Nugget Identification and Subtyping

- Ensemble of 1-nearest neighbor models that differ w.r.t. instance representation



English Event Nugget Identification and Subtyping

- Training instances created from
  - Single word
  - Multi-word phrases that are true triggers in training data
- Features
  - Model 1: head words of subjects and objects
  - Model 2: entity type of subjects and objects
  - Model 3: WordNet synset ids and hypernyms
  - Model 4: unigrams
- Test instances created from
  - Words/Phrases appeared in the training data as true triggers
  - All the verbs and nouns in the test documents.

Chinese Event Nugget Identification and Subtyping

- Training instances
  - each single word
- Features
  - Model 1: head words of subjects and objects
  - Model 2: entity type of subjects and objects
  - Model 3: head word of the entity that is syntactically /textually closest to the trigger
  - Model 4: characters and the entry number in a Chinese synonym dictionary
  - Model 5: type of the entity that is syntactically/textually closest to the trigger
- Testing instances
  - Words appeared in the training data as true triggers
  - Additional words based on compositional semantics
    - 刺伤 [injure by stabbing], 刺[stab], 伤[injure]

REALIS value identification

- Training instances
  - Gold event mentions
  - Labels: ACTUAL, GENERIC or OTHER
- Features:
  - Group 1 (Event Mention features)
  - Group 2 (Syntactic features)
- Multi-class SVM classifier
- Test instances
  - Predicted event mentions

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Event Hopper Coreference

- Multi-pass sieve approach
- A sieve is composed of a classifier which finds an antecedent for an event mention
- Sieves are ordered in decreasing order of precision
- Later passes can exploit the decision made by previous passes
  - Errors can propagate

Applying Sieves for Event Coreference

- Resolver makes multiple passes over event mentions
  - in the i-th sieve, it finds an antecedent for each event mention.
  - the partial clustering of event mentions generated in the i-th sieve is then passed to the i+1-th sieve.
  - the i+1-th sieve will not reclassify event mention pairs which are already classified as coreferent in the earlier sieves.

Sieve 1: Lemma Match

- This sieve classifies a test mention pair if the trigger pair appears in the training data
- Step 1: Choose valid neighbors

Test Mention Pair
- "Murder-kill"
- "Attack-Attack"
- d_{test} =3 ± 2

Training Mention Pair
- ✘ "kill-kills"
- ✘ "Die-Attack"
- ✓ d_{train} =1

→ Not Valid

Training Mention Pair
- ✓ "killed-Murders"
- ✓ "Attack-Attack"
- ✓ d_{train} =4

→ Valid

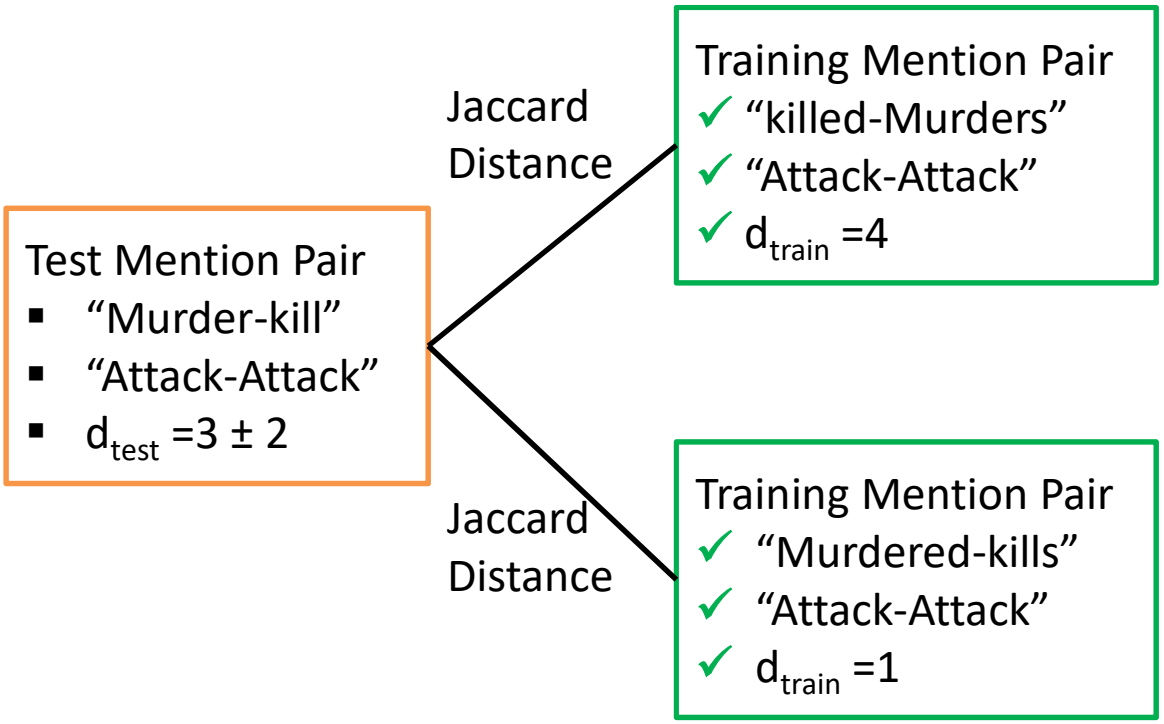
Training Mention Pair
- ✓ "Murdered-kills"
- ✓ "Attack-Attack"
- ✓ d_{train} =1

→ Valid

Parameter:
$d_{train} \in [d_{test}-m_1, d_{test}+m_1]$

Sieve 1: Lemma Match

- Step 2: Find the nearest neighbor



Labels:
True/False

Features:
unigrams of the two sentences

Sieve 2: Same Lemma

- This sieve only classifies a test mention pair if the two triggers have the same lemma
  - Step 1: Choose valid neighbors

Test Mention Pair
- "kill-kill"
- "Attack-Attack"
- d_{test} =3 ± 2

Training Mention Pair
✓ "Murder-Murder"
✓ "Attack-Attack"
✓ d_{train} =1
→ Valid

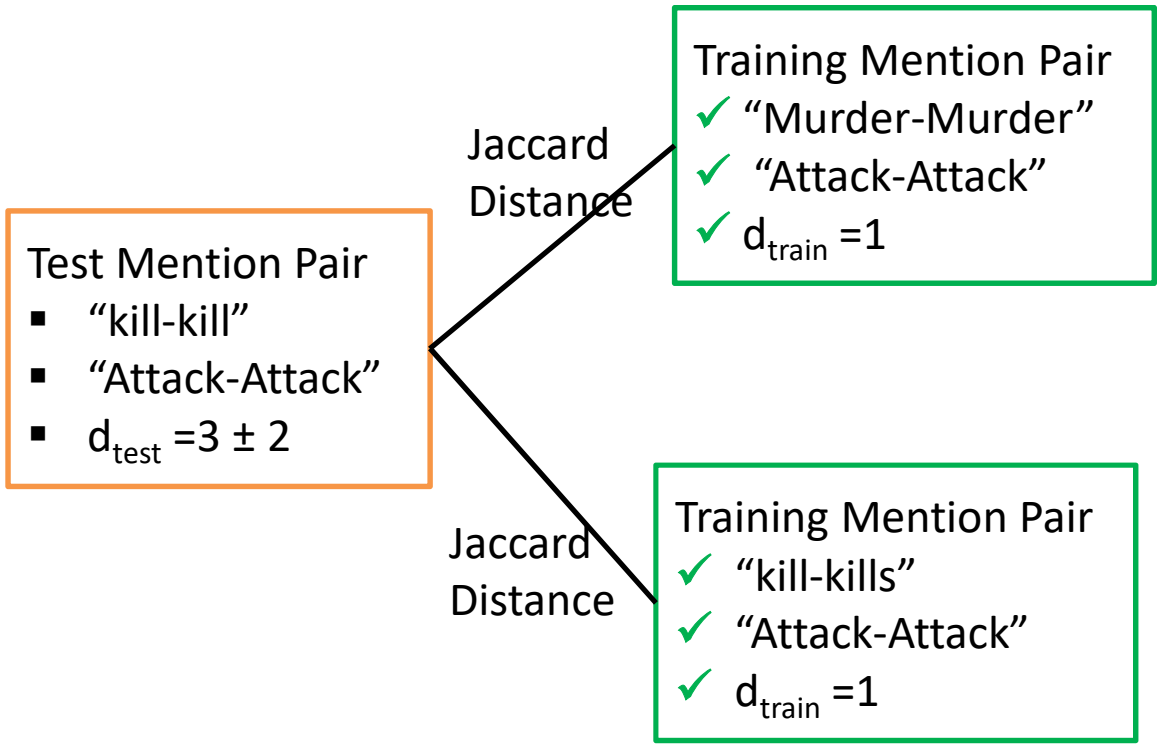
Training Mention Pair
✗ "killed-Murders"
✓ "Attack-Attack"
✓ d_{train} =4
→ Not Valid

Training Mention Pair
✓ "kill-kills"
✓ "Attack-Attack"
✓ d_{train} =1
→ Valid

Parameter:
$d_{train} \in [d_{test}-m_2, d_{test}+m_2]$

Sieve 2: Same Lemma

- Step 2: Find the nearest neighbor

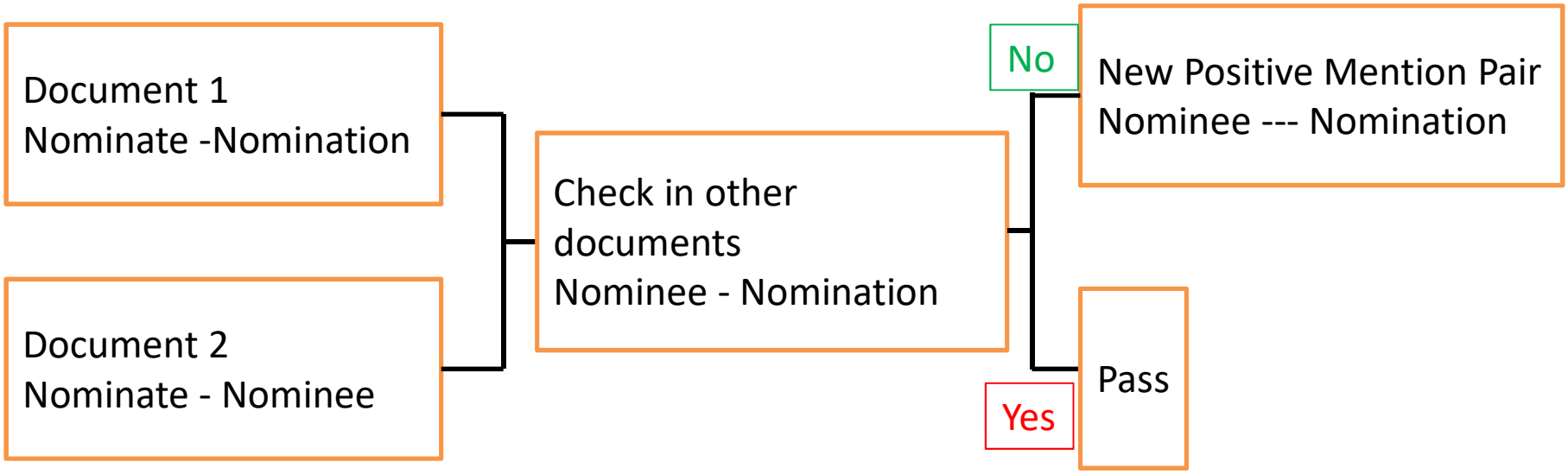


Labels:
True/False

Features:
unigrams of the two sentences

Sieve 3

- Goal: automatically increase positive training mention pairs



- Model structure is the same as Sieve 1

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Training Datasets

- English: LDC2015E29, LDC2015E68, LDC2015E73 (2015 trainining data) , LDC2015E94 (2015 evaluation data)
- Chinese: LDC2015E78, LDC2015E105, LDC2015E112
- 80% for model training, and 20% for development

Training	English			Chinese	
	Newswire	**Forum**	**Total**	**Newswire**	**Forum**
Documents	227	319	546	-	383
Event Mentions	7578	8960	16538	-	4246
Event Hoppers	5000	4955	9955	-	4238

Event Mentions, Event Hoppers: all 38 subtypes

Results: Event Nugget Detection

- English Event Nugget Detection
  - 1st in English nugget identification and subtyping
  - 2nd in English realis value identification, type+realis
- Chinese Event Nugget Detection
  - 2nd in all four tasks

	English			Chinese		
	Recall	**Precision**	**F1**	**Recall**	**Precison**	**F1**
Plain	55.36	53.85	**54.59**	47.23	43.16	45.10
Type	47.66	46.35	**46.99**	41.90	38.29	40.01
Realis	40.34	39.23	39.78	35.27	32.23	33.68
Type+Realis	34.05	33.12	33.58	31.76	29.02	30.33

Results: Event Hopper Coreference

- Run 1: The resolver employs all three sieves.
- Run 2: The resolver employs only the first two sieves
- 1st in both English and Chinese event hopper coreference
  - 1st in all four metrics and averaged F1 score

	English—Run 2			Chinese—Run 1		
	Recall	**Precision**	**F1**	**Recall**	**Precison**	**F1**
MUC	28.42	24.59	**26.37**	23.59	25.00	**24.27**
B^3	39.78	35.45	**37.49**	32.49	33.18	**32.83**
$CEAF_e$	32.8	35.76	**34.21**	29.34	32.45	**30.82**
BLANC	23.51	21.62	**22.25**	17.33	18.45	**17.80**
AVG			**30.08**			**26.43**

Error Analysis

- Multi-label errors
  - an event was labeled as belonging to different subtypes of ”Contact” in different models
  - Example:
    - Khaled Salih, director of the media office and member of the executive board in the SNC, revealed four major candidates at a press conference.
    - Predicted “contact_meet”, “contact_broadcast” for “conference”
- Feature extraction for discussion forum document
  - Informal writing style
  - Example:
    - How long do you think Steve Jobs will remain at apple for? I really have no idea but i think he'll stay for a long time to come... also who will take over if jobs does leave?
    - Wow, I never thought of that. Interesting topic, though. Who would take over? How is Jobs gonna leave? Being fired? Or just resigning.... wow.... cool topic
- Unseen or rarely-occurring words/phrases

Future Work

- Consider more semantic features
  - Current: WordNet, synonym dictionary
  - Future: Semantic roles
- Use entity coreference information and event arguments for event hopper coreference