Opinion sentence and topic relevant sentence extraction by using coherent structure among the sentences

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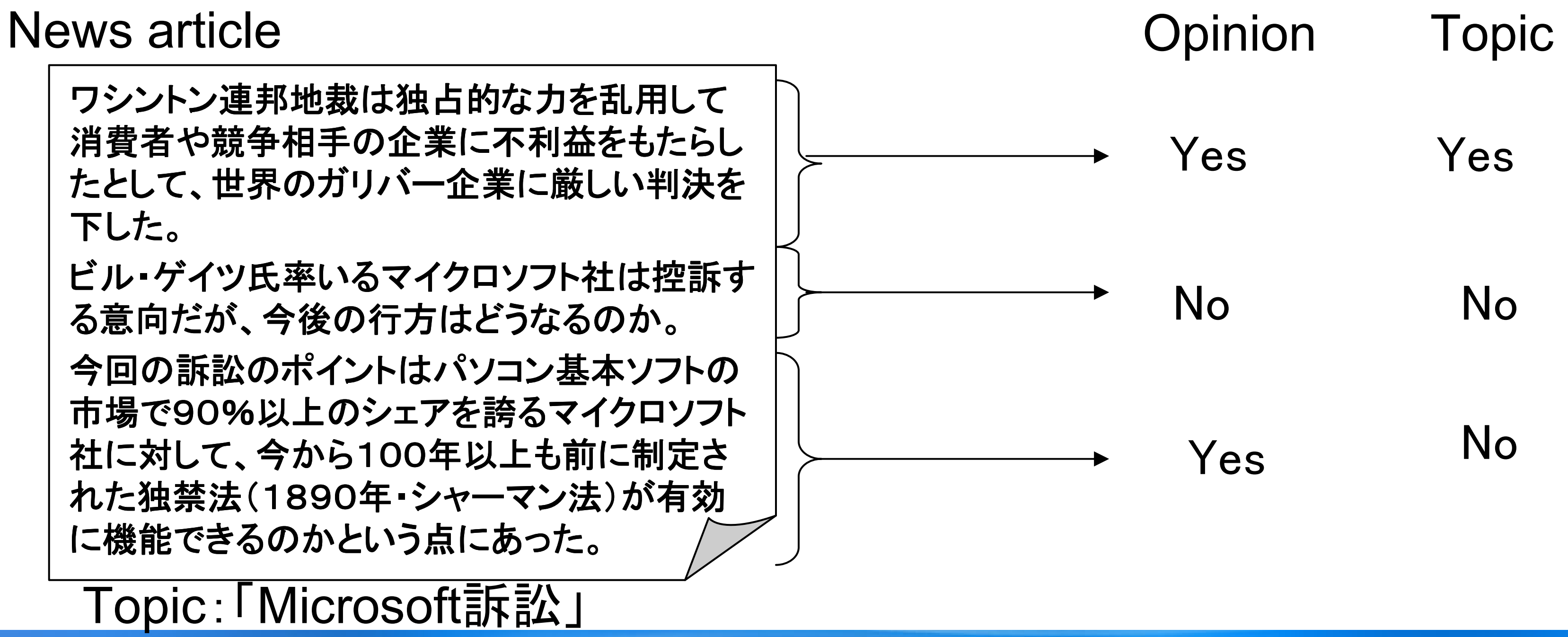
Abstract

- ✓ Two sub tasks:
  - ✓ Opinionated Sentence Extraction
  - ✓ Topic Relevant Sentence Extraction
- ✓ New sentence extraction framework, the **Sliding Window Framework**
  - ✓ Use coherent structure among the sentences
- ✓ Result
  - ✓ Very high recall ratio and a high F-value
  - ✓ Opinionated Sentence Extraction: **second best**
  - ✓ Topic Relevant Sentence Extraction: **best**
    - ✓ F-value in lenient result.

Task Overview

- Sentence based sub tasks
  - – Opinion sentence extraction (Japanese)
  - – Topic relevant sentence extraction (Japanese)



News article	Opinion	Topic
ワシントン連邦地裁は独占的な力を乱用して消費者や競争相手の企業に不利益をもたらしたとして、世界のガリバー企業に厳しい判決を下した。	Yes	Yes
ビル・ゲイツ氏率いるマイクロソフト社は控訴する意向だが、今後の行方はどうなるのか。	No	No
今回の訴訟のポイントはパソコン基本ソフトの市場で９０％以上のシェアを誇るマイクロソフト社に対して、今から１００年以上も前に制定された独禁法（１８９０年・シャーマン法）が有効に機能できるのかという点にあった。	Yes	No

Topic：「Microsoft訴訟」

Problem And Approach On Sentence Extraction

- Consider only one sentence at once to extract the sentence in previous systems.
- Not consider **coherent structure** among the sentences.
  - Ex.1) Opinion and fact are written in different parts of an article to avoid confusing these.
  - Ex.2) Sentences that relate to a certain topic are written on the same place.

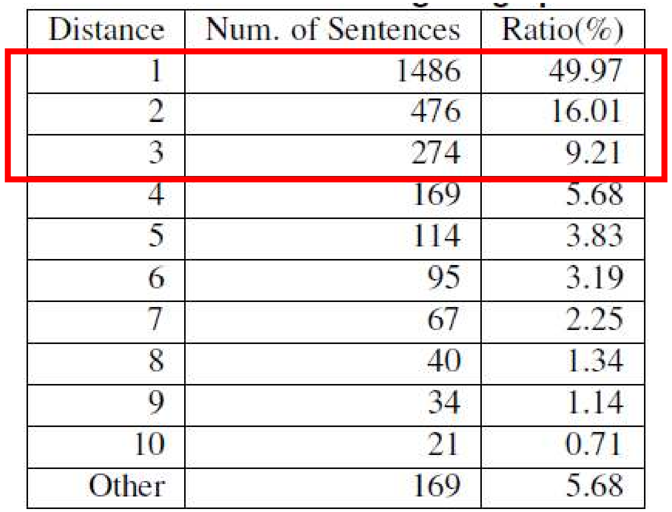
Use coherent structure.

- Same topics appear continuously.

Property Of Coherent Structure (Opinion / Topic Relevant Sentences)

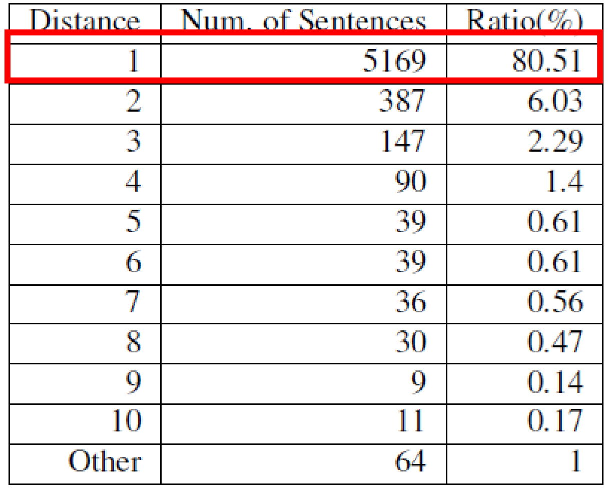
- Opinions and topic relevant sentences have a property of coherent structure.
  - 76% of opinion sentences exist within three sentences.
  - 80% of topic relevant sentences exist within one sentence.

Opinions



Distance	Num. of Sentences	Ratio(%)
1	1486	49.97
2	476	16.01
3	274	9.21
4	169	5.68
5	114	3.83
6	95	3.19
7	67	2.25
8	40	1.34
9	34	1.14
10	21	0.71
Other	169	5.68

Topic

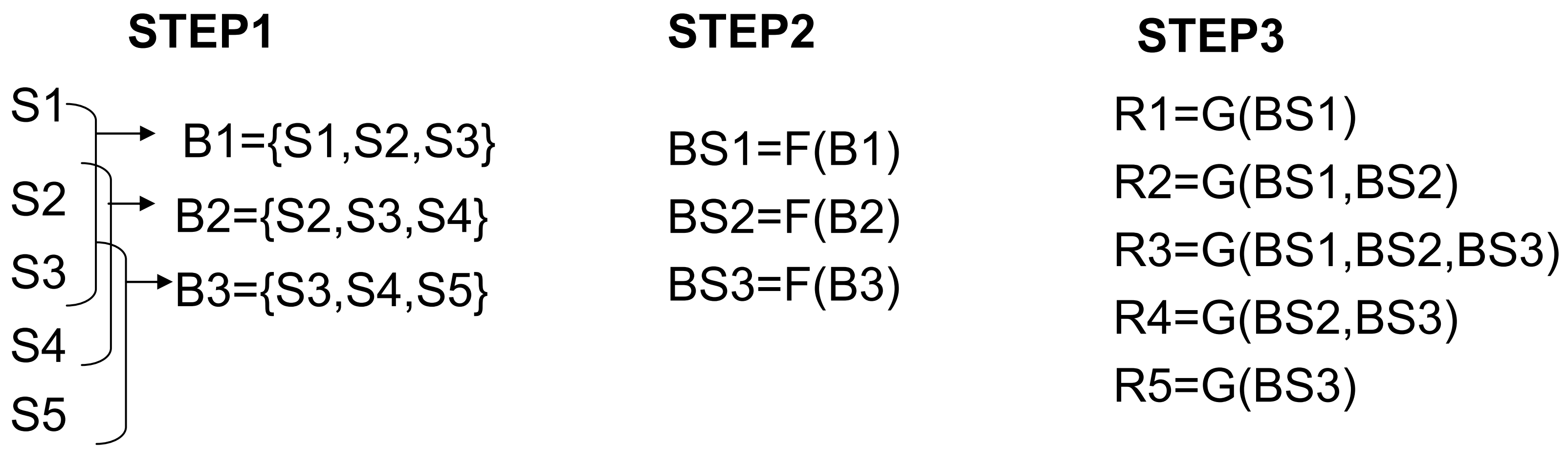


Distance	Num. of Sentences	Ratio(%)
1	5169	80.51
2	387	6.03
3	147	2.29
4	90	1.4
5	39	0.61
6	39	0.61
7	36	0.56
8	30	0.47
9	9	0.14
10	11	0.17
Other	64	1

Distance is the number of sentences between opinion or topic relevant sentence and the next these sentence.

Sliding Window Framework

- Utilize the **surrounding sentences** of the target sentence as the coherent structure,
- Judge the target sentence whether opinion-related or not, or whether topic-related or not.



STEP1

S1
S2
S3
S4
S5

B1={S1,S2,S3}
B2={S2,S3,S4}
B3={S3,S4,S5}

STEP2

BS1=F(B1)
BS2=F(B2)
BS3=F(B3)

STEP3

R1=G(BS1)
R2=G(BS1,BS2)
R3=G(BS1,BS2,BS3)
R4=G(BS2,BS3)
R5=G(BS3)

STEP1 Make blocks(B1,B2,B3) by sliding the window from sentence to sentence.

STEP2 Estimate the score of the relationship of each block by using predefined Function F.

STEP3 Judge whether each sentence should be extracted by using Function G with the score of blocks that contain the target sentence.

Sub Task1:
Opinionated Sentence Extraction

- Function F
  - Regression function that returns the number of opinion sentences in the input block.
  - Leaning by training dataset given by organizer with linguistic features (details in next slides).
- Function G
  - G(S) = Yes if F(BSm)+ … +F(BSn) > win_size
    No else
  - Judges the sentence as opinion if all blocks that contain the target sentence have one or more opinion sentences

Features At Function F

1. Original form, part of speech and surface string of morpheme
2. Semantic attribute of clause
3. Pair of semantic attributes of two clauses of dependency relation
4. Whether or not character “「” and “」” are in the same sentence
5. Original form, part of speech and surface string of morpheme between “「” and “」”
6. Original form, part of speech and surface string of morpheme before “「”
7. Original form, part of speech and surface string of morpheme after “」”

Sub Task2:
Topic Relevant Sentence Extraction

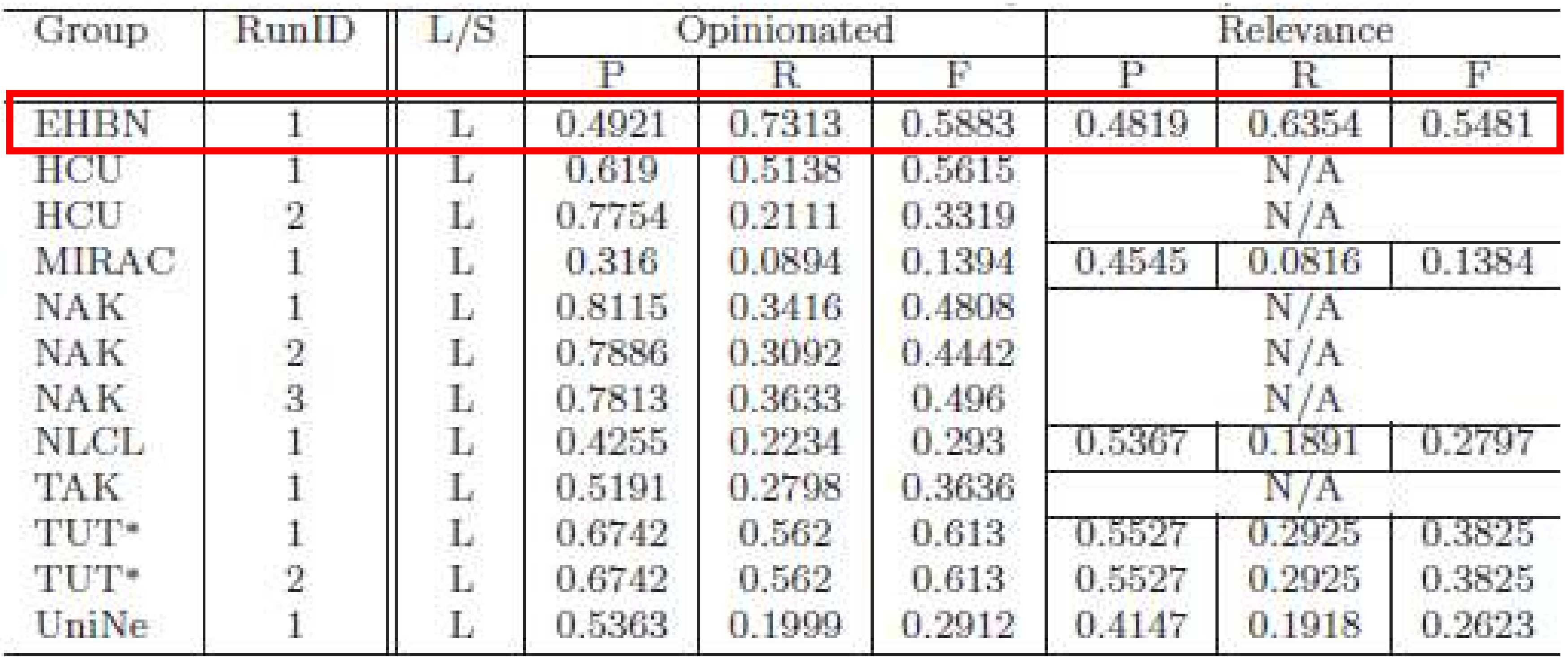
- Extend topic description by using web search engine
  - Topic description given by organizer is poor.
- Function F
  - F(BSn) = Cosine similarity between extended topic and Block BSn.
- Function G
  - G(S) = Yes if (F(BSn)+…+F(BSm))/win_size > T
    No else

Evaluation By Organizer

Opinion sentence: 2nd F-value

Topic relevant sentence: 1st F-value

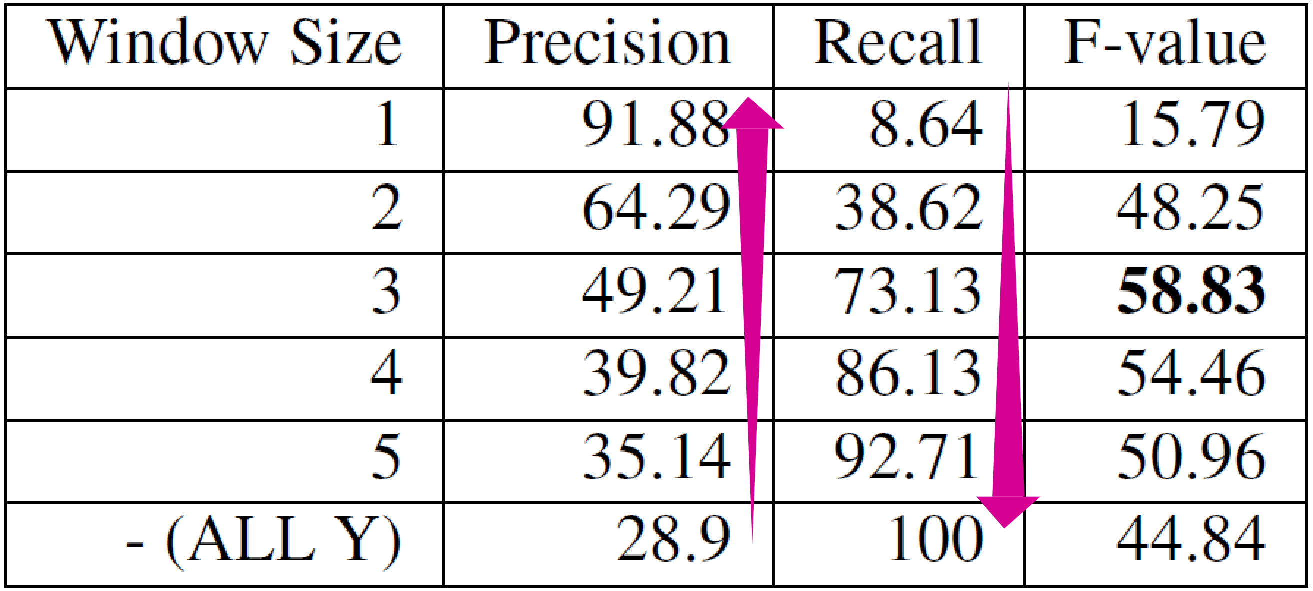
- Lenient dataset



Group	RunID	L/S	Opinionated			Relevance		
			P	R	F	P	R	F
EHBN	1	L	0.4921	0.7313	0.5883	0.4819	0.6354	0.5481
HCU	1	L	0.619	0.5138	0.5615		N/A	
HCU	2	L	0.7754	0.2111	0.3319		N/A	
MIRAC	1	L	0.316	0.0894	0.1394	0.4545	0.0816	0.1384
NAK	1	L	0.8115	0.3416	0.4808		N/A	
NAK	2	L	0.7886	0.3092	0.4442		N/A	
NAK	3	L	0.7813	0.3633	0.496		N/A	
NLCL	1	L	0.4255	0.2234	0.293	0.5367	0.1891	0.2797
TAK	1	L	0.5191	0.2798	0.3636		N/A	
TUT*	1	L	0.6742	0.562	0.613	0.5527	0.2925	0.3825
TUT*	2	L	0.6742	0.562	0.613	0.5527	0.2925	0.3825
UniNe	1	L	0.5363	0.1999	0.2912	0.4147	0.1918	0.2623

Evaluation Of Sub Task1: Opinion Sentence Extraction

- Window size and accuracy



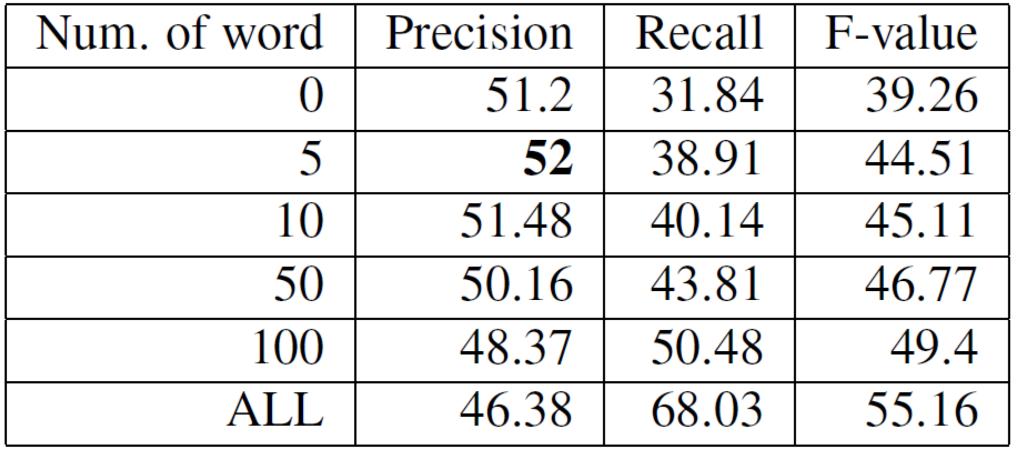
Window Size	Precision	Recall	F-value
1	91.88	8.64	15.79
2	64.29	38.62	48.25
3	49.21	73.13	**58.83**
4	39.82	86.13	54.46
5	35.14	92.71	50.96
- (ALL Y)	28.9	100	44.84

BaseLine

"(ALL Y)" is the result in the case of all sentences as opinion.

Evaluation Of Sub Task 2:
Topic Relevant Sentence Extraction

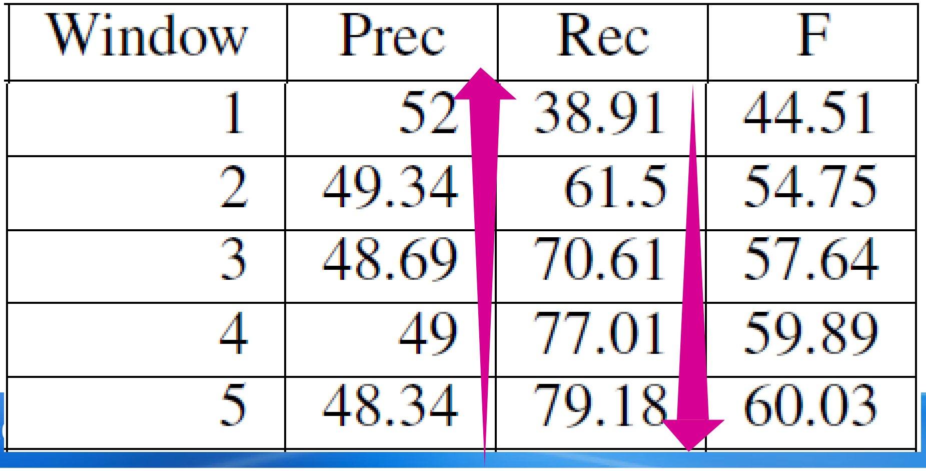
Extended topic description and accuracy



Num. of word	Precision	Recall	F-value
0	51.2	31.84	39.26
5	**52**	38.91	44.51
10	51.48	40.14	45.11
50	50.16	43.81	46.77
100	48.37	50.48	49.4
ALL	46.38	68.03	55.16

BaseLine

Window size and accuracy



Window	Prec	Rec	F
1	52	38.91	44.51
2	49.34	61.5	54.75
3	48.69	70.61	57.64
4	49	77.01	59.89
5	48.34	79.18	60.03

BaseLine

Discussion

- Our framework (SWF) contributes to getting high recall and F-value.
- However, the precision is low.
  - This result as we had expected.
  - Because our framework judges based on block and mistakes the non-opinion sentence between the opinion sentences as opinion sentence.
- To improve this, we will develop a method making the correct judgment of non-related sentences in the future.

Conclusions

- Sliding Window Framework
  - New sentence extraction framework using coherent structure.
  - We applied our framework to the opinion sentence extraction subtask and the topic relevant sentence extraction subtask.
- Result of NTCIR7 MOAT task
  - Opinion sentence extraction : second best performance
  - Topic relevant sentence extraction : best performance
    - F-value under the lenient standard.
- High recall, but low precision.