

# Make Lead Bias in Your Favor: Zero-shot Abstractive News Summarization

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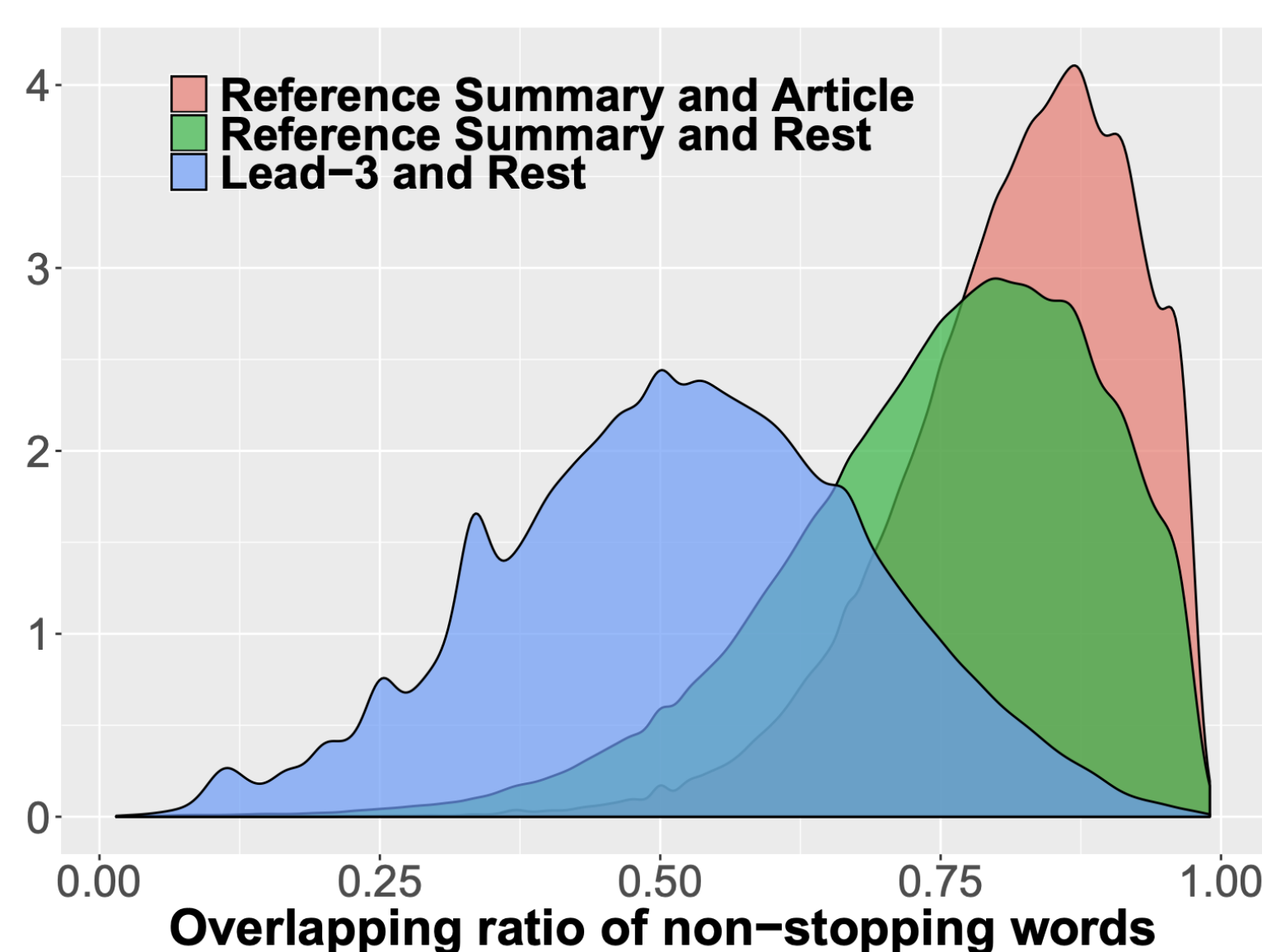
## Introduction

- Lead bias is common in news articles, but poses challenge to abstractive summarization systems
- Abstractive summarization models lack sufficient training data
- We leverage lead bias in news articles to pre-train abstractive summarization models: **produce top three sentences from the rest**
- The pre-trained model can be directly applied under zero-shot scenarios

## Pre-training

### Data

- Three years of online news articles (2016-2019) via Bing Search Engine
- Limit the length of articles
  - 10-150 words in top three sentences
  - 150-1200 words in the rest
  - At least 6 sentences
- Sufficient overlap between Lead-3 and Rest
  - Portion of shared non-stopping words
  - Threshold set at 0.65
- End up with 21.4M articles
  - Avg. #words in Lead-3: 60.0
  - Avg. #words in Rest: 602.5
  - In total: 14.2 billion tokens



### Model

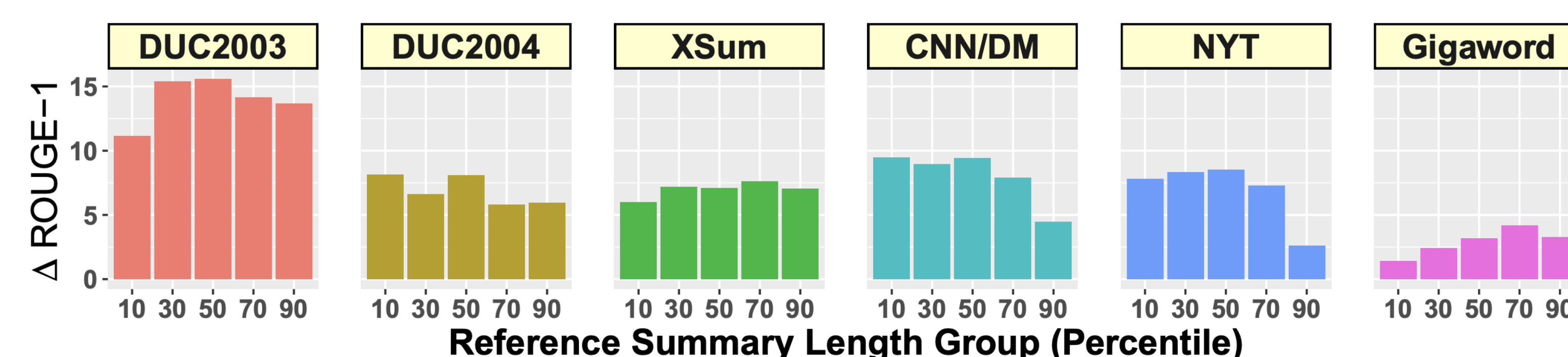
- Further pre-train BART-Large and T5-Large with lead bias data
- BART-LB and T5-LB

## Experiments

Model	DUC2003			DUC2004			XSum		
	R-1	R-2	R-L	R-1	R-2	R-L	R-1	R-2	R-L
Lead	21.30	6.38	18.82	20.91	5.52	18.20	16.30	1.60	11.95
Supervised									
ABS [23]	28.48	8.91	23.97	28.18	8.49	23.81	/	/	/
PEGASUS <sup>FT</sup> [29]	/	/	/	/	/	/	47.21	24.56	39.25
Unsupervised									
SEQ <sup>3</sup> [2]	20.90	6.08	18.55	22.13	6.18	19.30	/	/	/
Zero-shot									
PEGASUS [29]	/	/	/	/	/	/	19.27	3.00	12.72
BART <sub>LARGE</sub> [13]	6.69	1.56	5.94	13.58	2.91	12.10	19.26	3.30	14.67
T5 <sub>LARGE</sub> [22]	10.11	2.43	9.25	13.61	2.91	12.23	19.66	2.91	15.31
BART-LB	<b>20.43</b>	<b>5.80</b>	<b>17.89</b>	<b>21.88</b>	<b>6.24</b>	<b>19.22</b>	<b>26.18</b>	<b>7.60</b>	<b>20.92</b>
T5-LB	20.05	5.62	17.83	21.22	5.92	18.74	26.06	6.77	20.47
Model	CNN/DM			NYT			Gigaword		
	R-1	R-2	R-L	R-1	R-2	R-L	R-1	R-2	R-L
Lead	40.34	17.70	36.57	39.58	20.11	35.78	21.86	7.66	20.45
Supervised									
BERTSUM [17]	43.85	20.34	39.90	49.02	31.02	45.55	/	/	/
PEGASUS <sup>FT</sup> [29]	44.17	21.47	41.11	/	/	/	39.12	19.86	36.24
Unsupervised									
SEQ <sup>3</sup> [2]	23.24	7.10	22.15	17.85	3.94	19.53	25.39	8.21	22.68
Brief [27]	28.11	9.97	25.41	/	/	/	21.26	5.60	18.89
TED [28]	38.73	16.84	35.40	/	/	/	25.58	8.94	22.83
Zero-shot									
GPT-2 [21]	29.34	8.27	26.58	/	/	/	/	/	/
PEGASUS [29]	32.90	13.28	29.38	/	/	/	23.39	7.59	20.20
BART <sub>LARGE</sub> [13]	32.83	13.30	29.64	32.18	13.90	28.67	22.07	7.47	20.02
T5 <sub>LARGE</sub> [22]	39.68	17.24	36.28	32.78	14.91	29.91	15.67	4.86	14.38
BART-LB	<b>40.52</b>	<b>17.63</b>	<b>36.76</b>	<b>37.41</b>	<b>19.60</b>	<b>33.99</b>	<b>25.14</b>	<b>8.72</b>	<b>22.35</b>
T5-LB	38.47	16.62	35.23	<b>40.27</b>	<b>20.81</b>	<b>36.88</b>	24.00	8.19	21.62

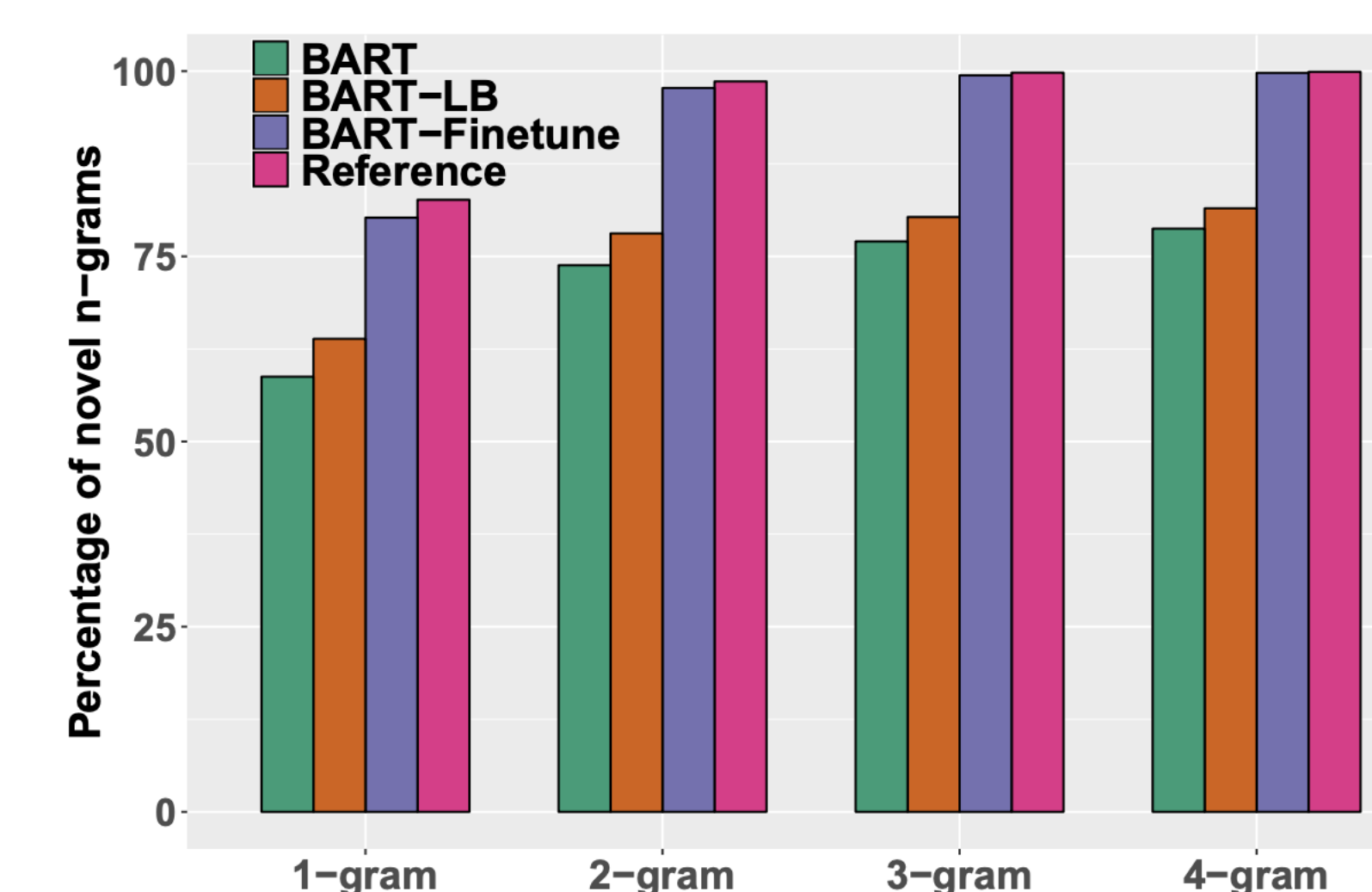
- BART-LB** and **T5-LB** set new SoTA in zero-shot news summarization, greatly enhancing the results of BART-Large and T5-Large
- Outperforms most unsupervised news summarization
- Outperforms Lead baseline in 5 out of 6 datasets

## Improvement w.r.t different summary length: BART-LB vs BART-Large



## Insights

### Abstractiveness



### Human Evaluation

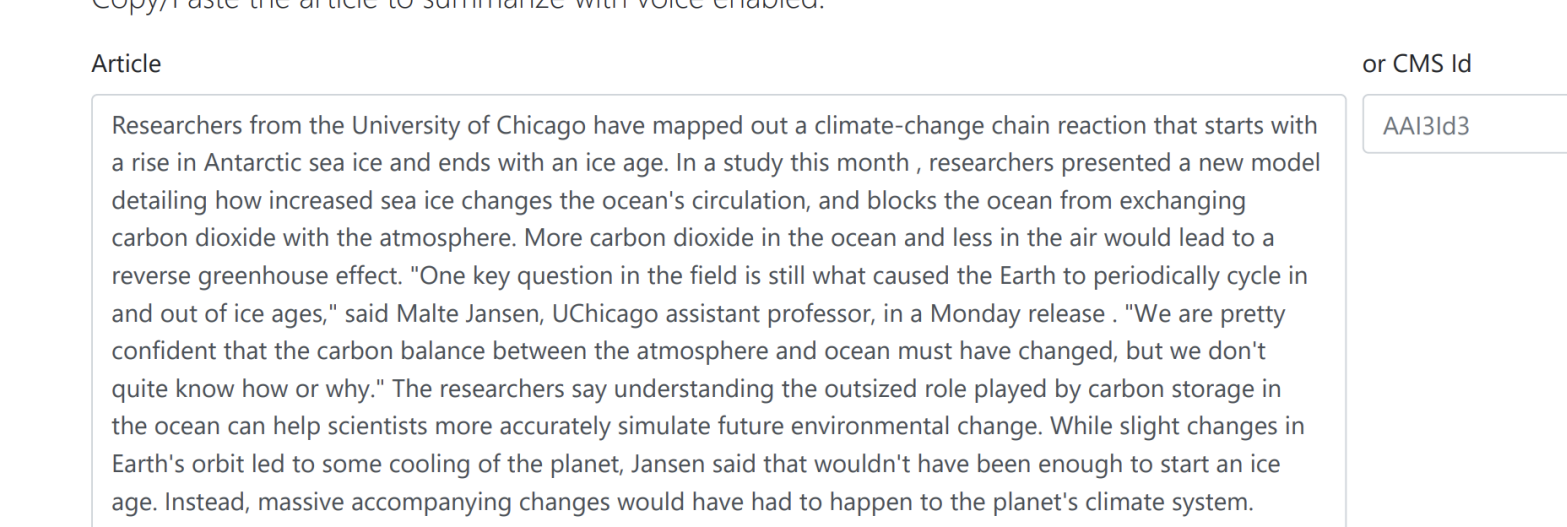
Dataset	DUC2003		XSum	
	Read.	Rel.	Read.	Rel.
Reference	4.90	4.85	4.95	4.79
Lead	<b>4.92</b>	3.83	<b>4.88</b>	3.17
BART <sub>LARGE</sub>	3.72	2.91	4.09	3.33
T5 <sub>LARGE</sub>	3.09	2.85	3.65	3.75
BART-LB	4.27	<b>3.95</b>	4.10	<b>4.25</b>
T5-LB	4.39	3.78	4.02	4.12

## Deployed System

### Demo website

#### Microsoft News Summarizer

Copy/Paste the article to summarize with voice enabled.



Market: en-us Summary with voice: en-us

#### Summary

- Researchers from the University of Chicago have mapped out a climate-change chain reaction that starts with a rise in Antarctic sea ice and ends with an ice age.
- In a study this month, researchers presented a new model detailing how increased sea ice changes the ocean's circulation, and blocks the ocean from exchanging carbon dioxide with the atmosphere.
- The researchers say understanding the outsized role played by carbon storage in the ocean can help scientists more accurately simulate future environmental change.

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### Public API

