Updated Headline Generation: Creating Updated Summaries for Evolving News Stories

Bloomberg Engineering

The 2022 Annual Meeting of the Association for Computational Linguistics (ACL 2022)
May 22-27, 2022

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[2]Bloomberg (Now at Google Research)
[3]Johns Hopkins University, Bloomberg

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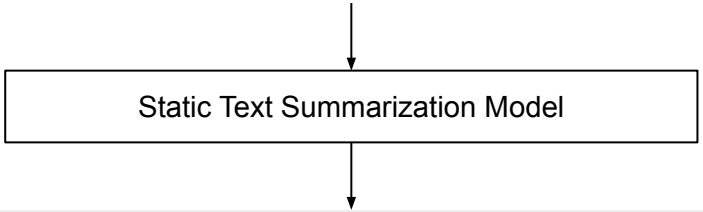
Headline Generation

A 22-year-old man has been charged after an ice cream van was stolen in Nottingham. The vehicle was reported stolen from Bobbers Mill Road and was spotted by officers on the A52 at about 01:20 BST on Thursday. Gavin Fouracres, of Briar Court, Long Eaton, has been charged with theft of a motor vehicle. Mr Fouracres is due to appear at Nottingham Magistrates' Court later. He has also been charged with driving without due care and attention, driving without insurance, driving otherwise than in accordance with a licence, and failing to stop for police.



Man charged with theft of ice cream van in Nottingham

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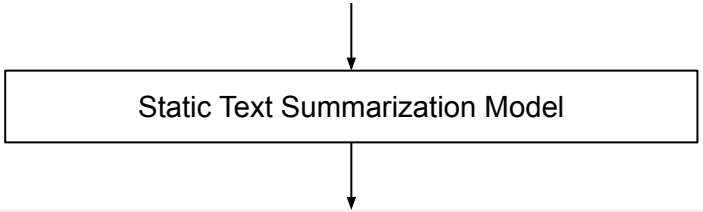

Man charged with theft of ice cream van in Nottingham

News stories evolve as…

- Events progress *(e.g., criminal investigations, election results, natural disasters, live events)*
- New/corrected information becomes available *(e.g., # people injured following accident)*
- People react to events *(e.g., political figure commenting on situation)*

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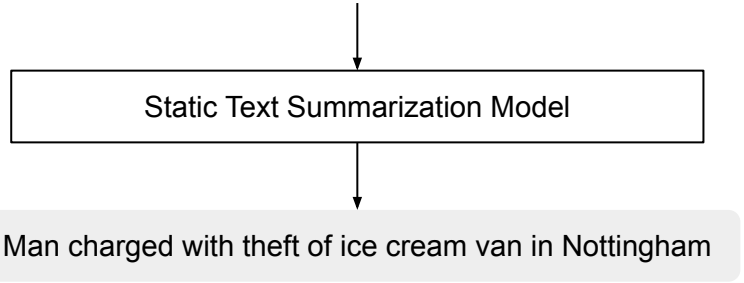

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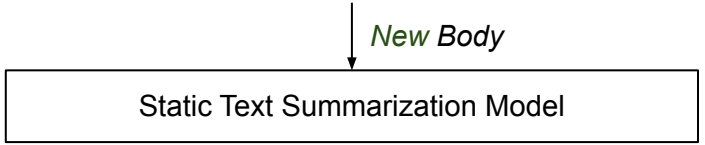

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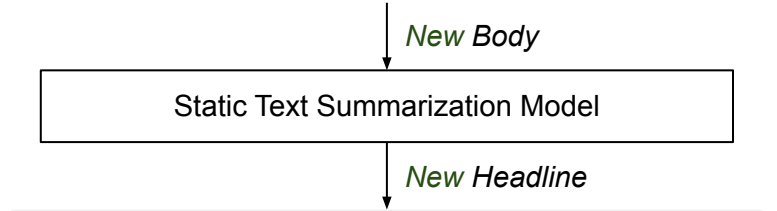

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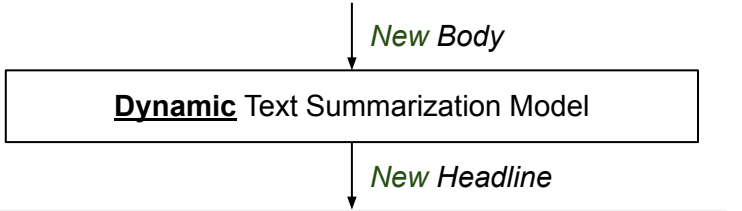

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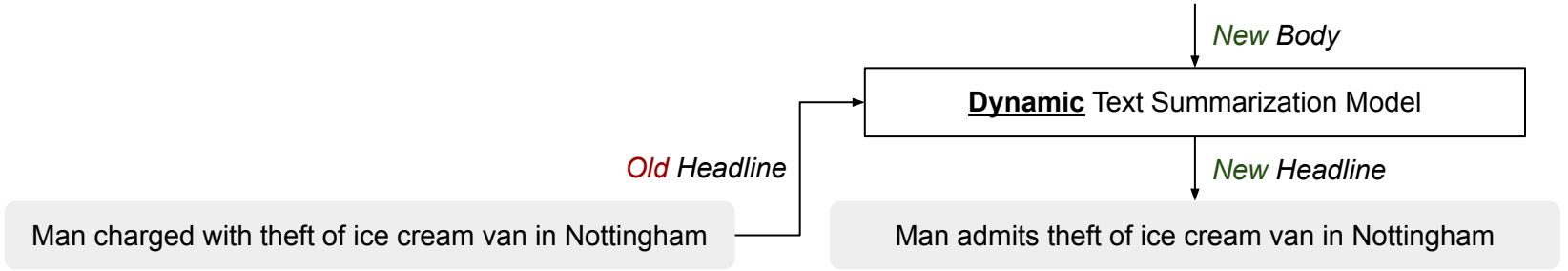

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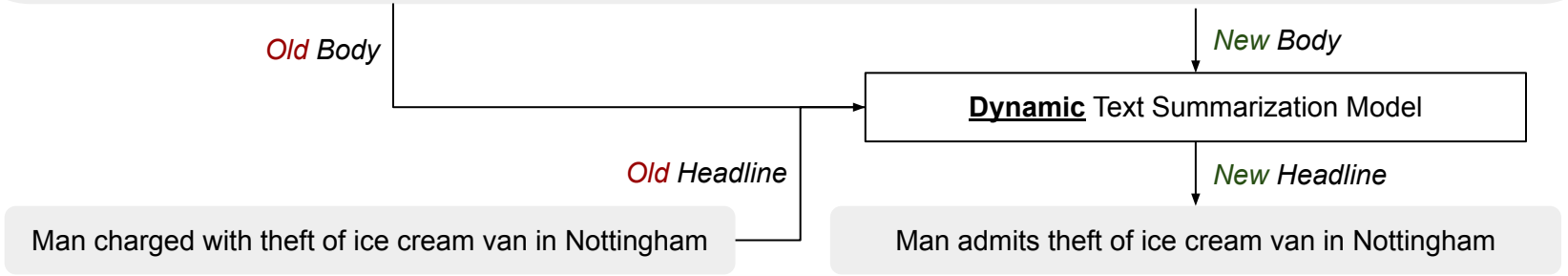

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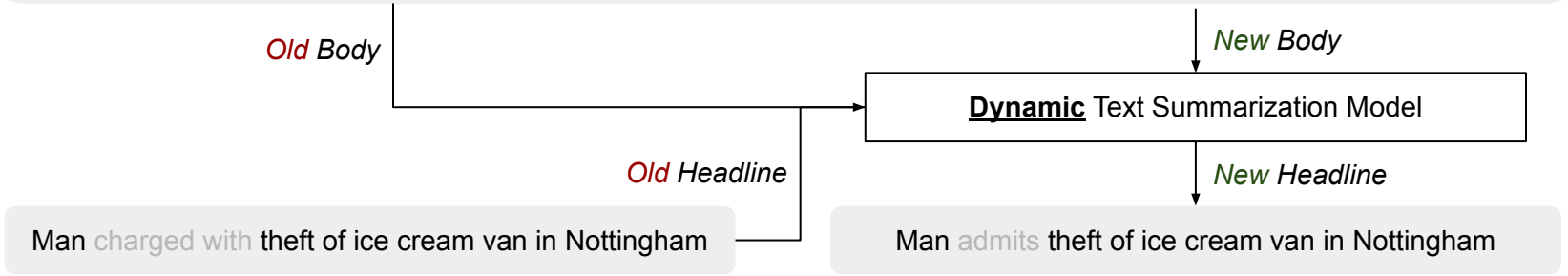

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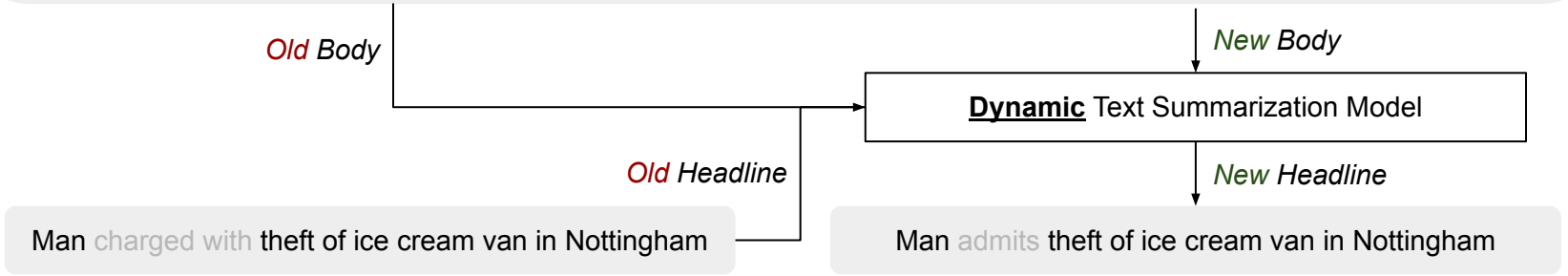

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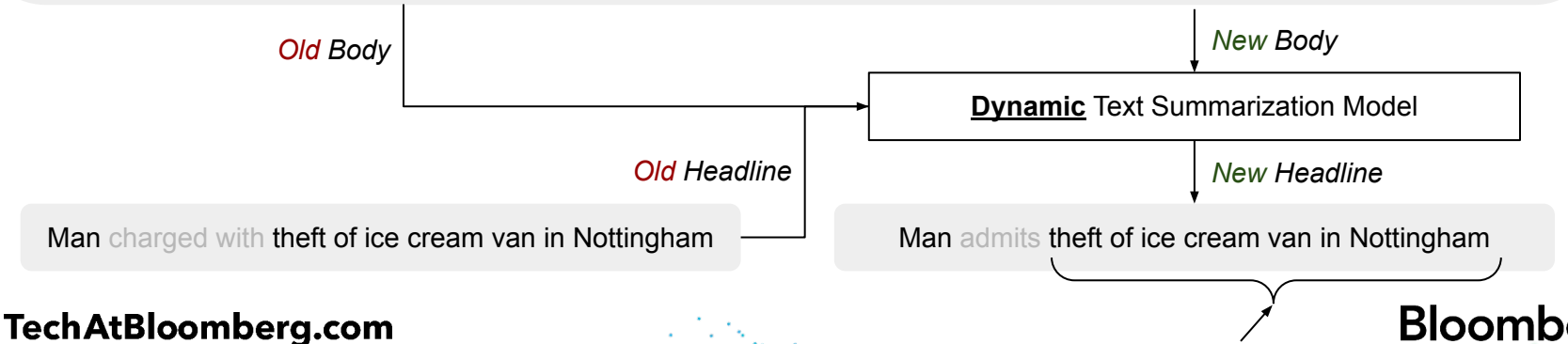

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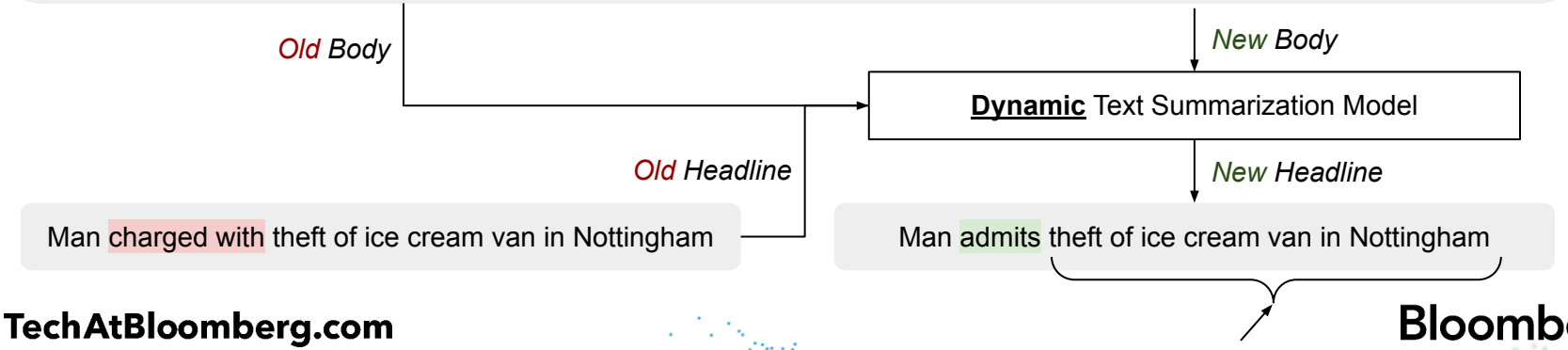

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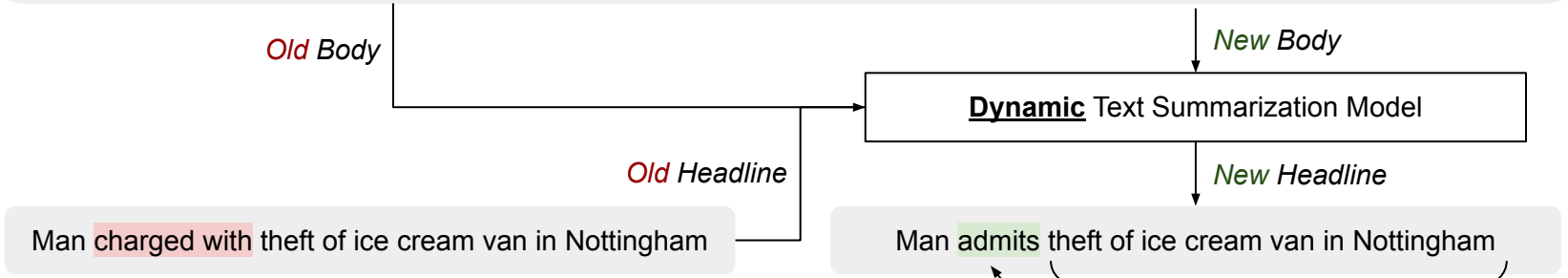

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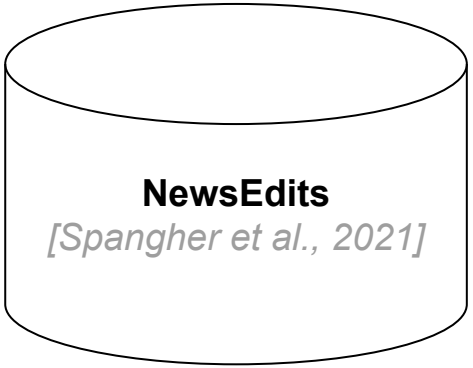

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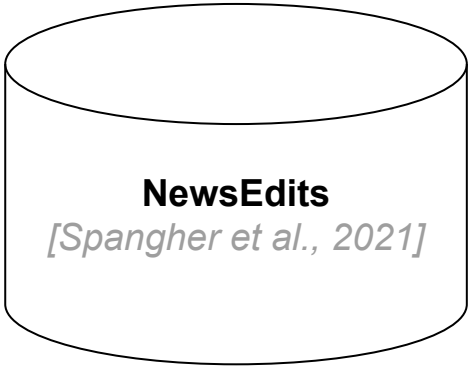

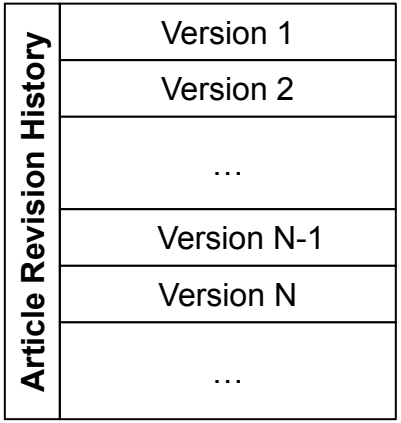

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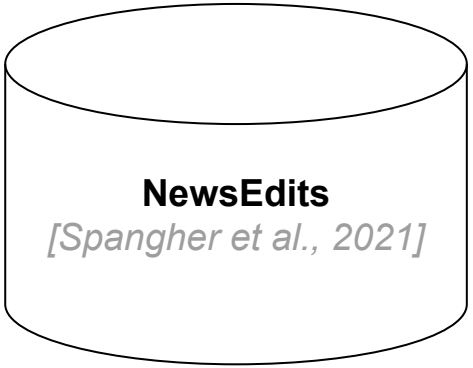

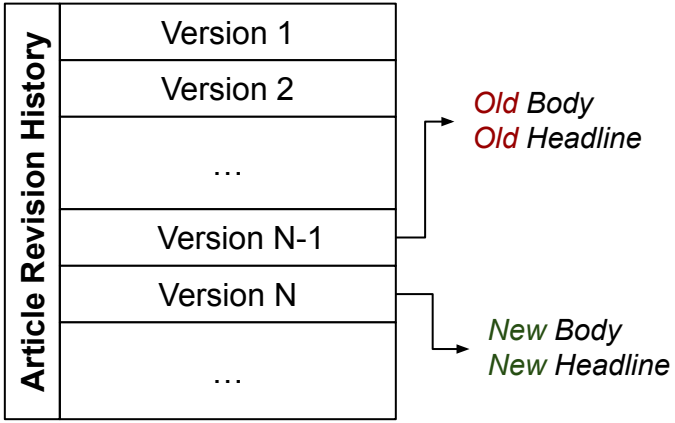

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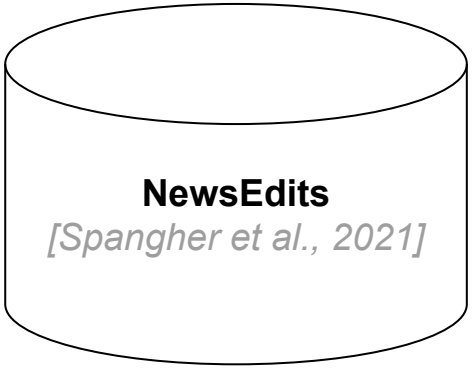

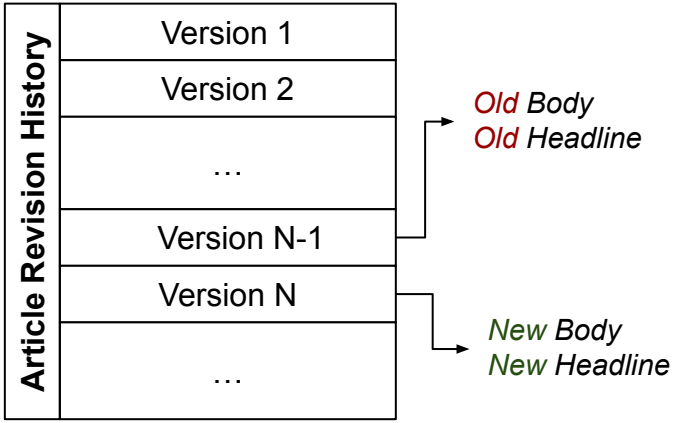

s.t. *Old* Body ≠ *New* Body
AND
Old Headline ≠ *New* Headline

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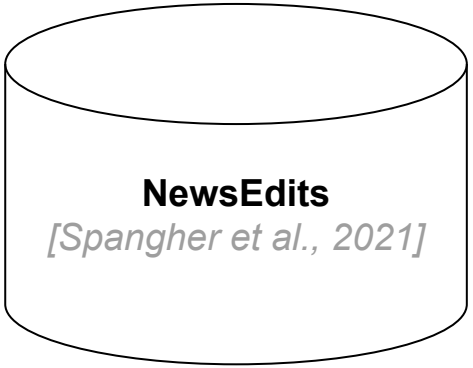

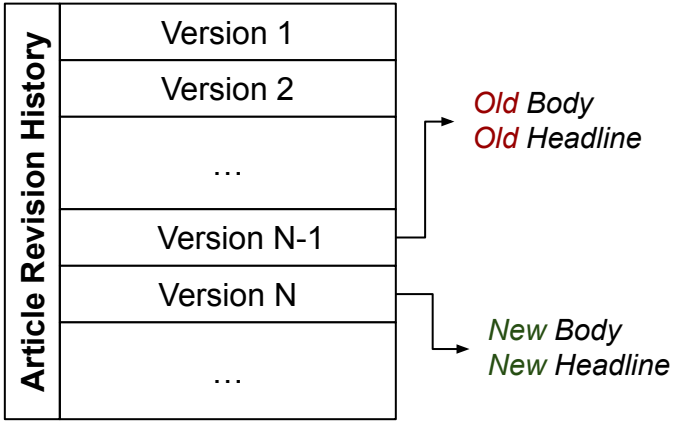

s.t. *Old Body* ≠ *New Body*
AND
Old Headline ≠ *New Headline*

Filtering to focus on <u>substantive headline changes</u>

- Heuristics to reduce simple stylistic headline changes (e.g., lemma change, dropped function word)
- Learned classifier for discarding headline changes that are unrelated to body changes

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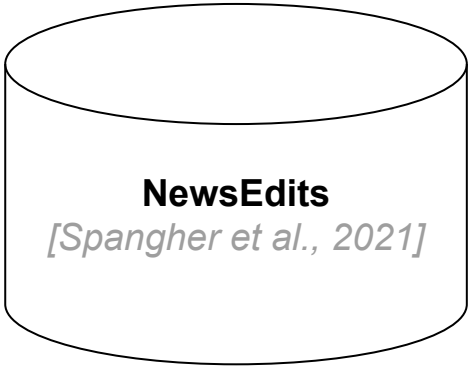

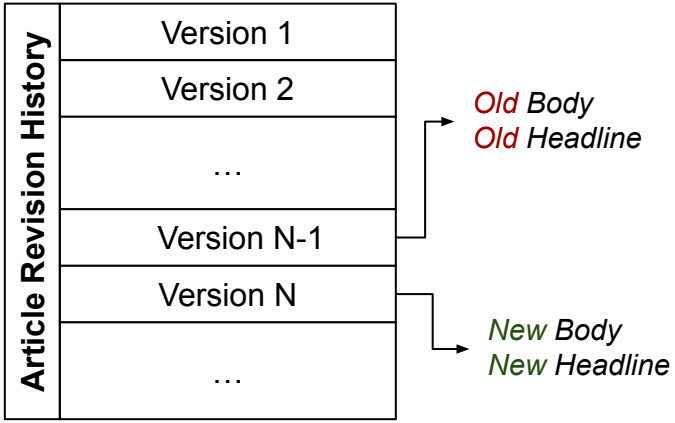

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Headline Revision for Evolving News (HREN)

Train	Valid	Test
57,285	5,769	6,189

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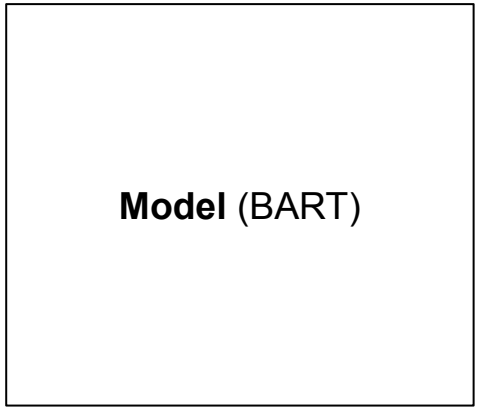

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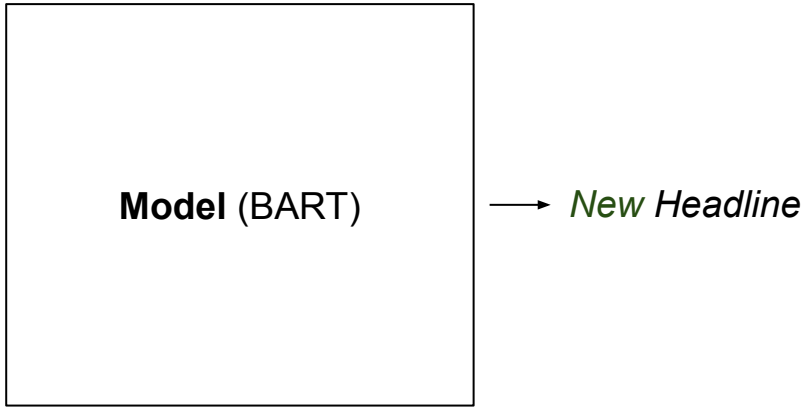

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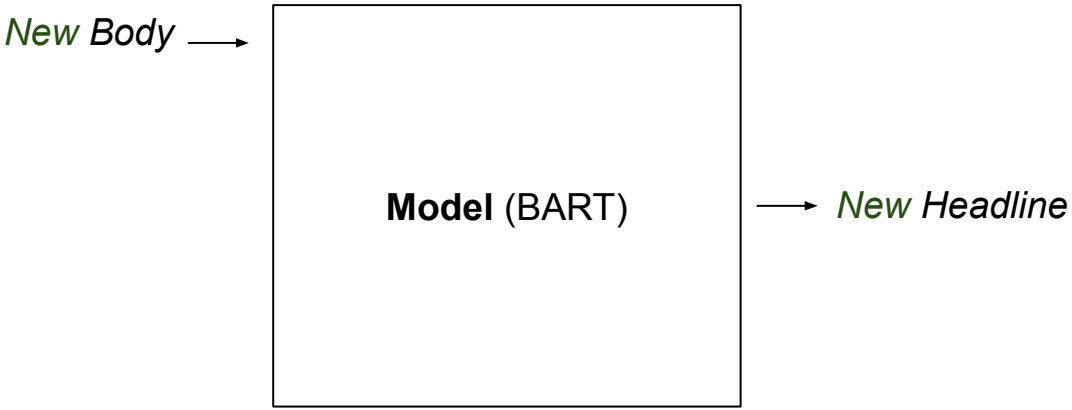

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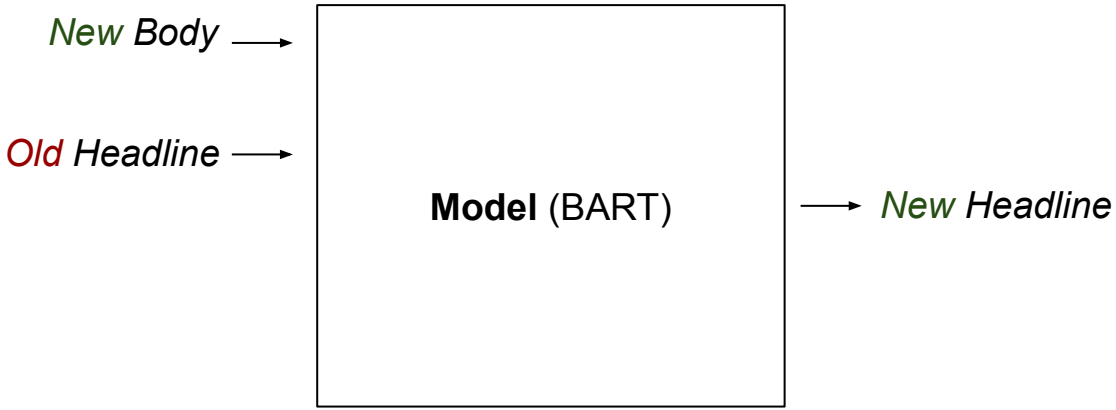

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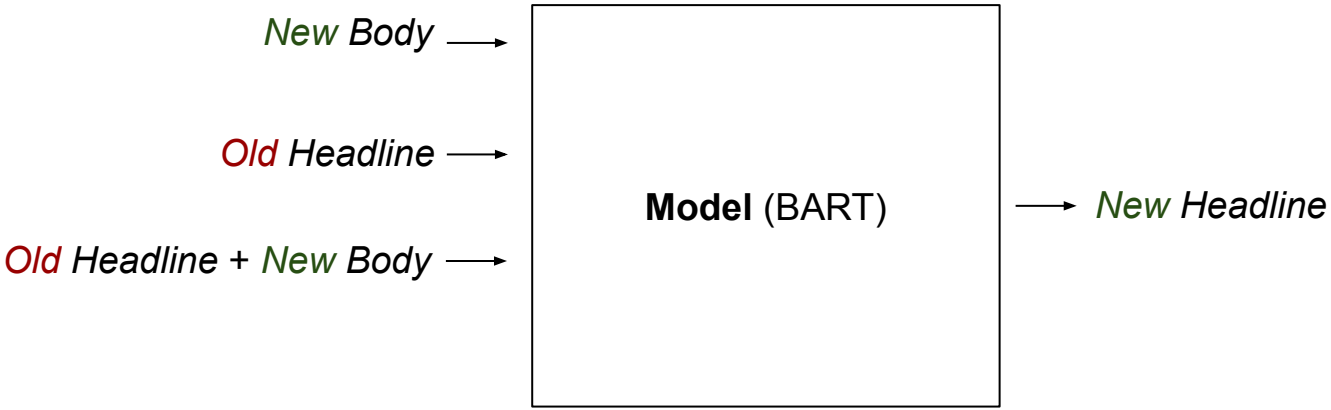

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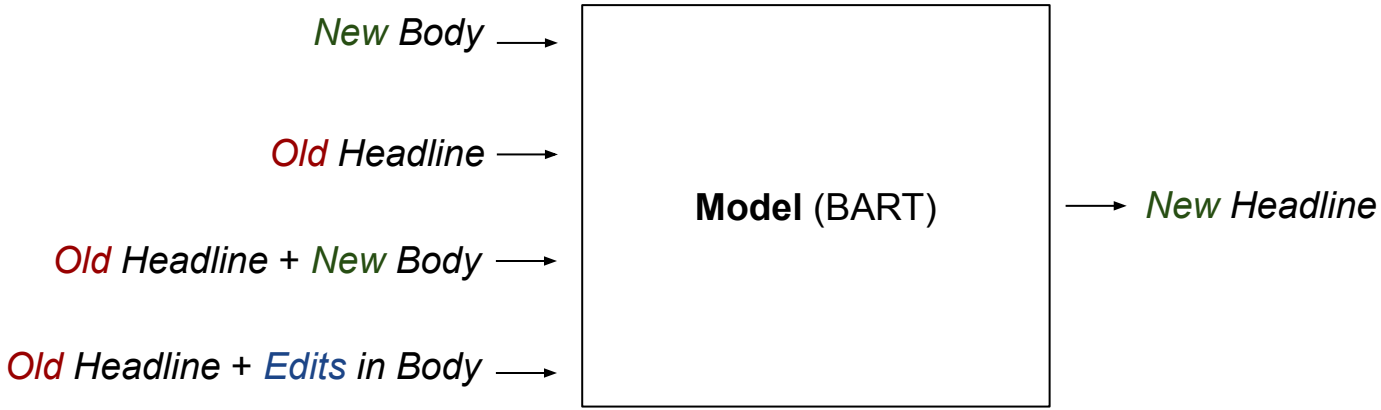
Input Context Representations



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Input Context Representations

A 22-year-old man has been charged after an ice cream van was stolen in Nottingham…

A 22-year-old man has admitted stealing an ice cream van in Nottingham…

<REPLACE_OLD> been charged after <REPLACE_NEW> admitted stealing <REPLACE_END>
<DELETE> was stolen <DELETE_END>

[Panthaplackel et al., 2020]

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Results: Automated Metrics

[Banerjee and Lavie, 2005; Lin et al, 2004; Papineni et al, 2002; Napoles et al, 2015; Xu et al, 2016]

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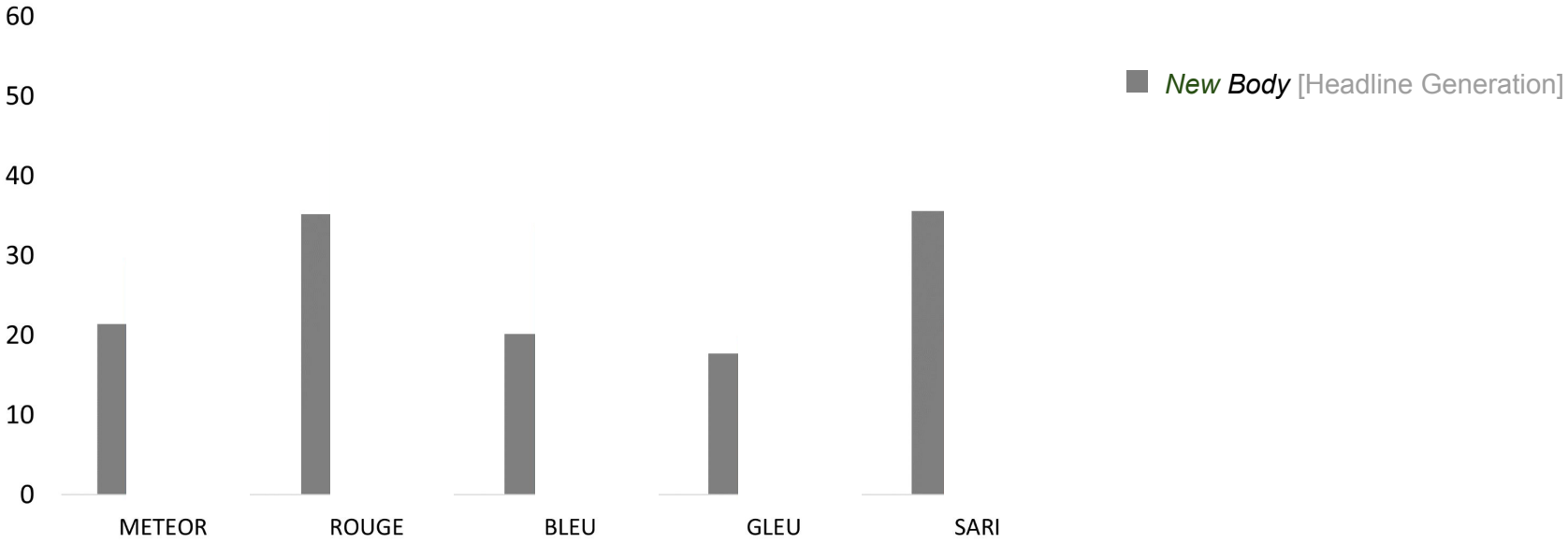
Results: Automated Metrics



[Banerjee and Lavie, 2005; Lin et al, 2004; Papineni et al, 2002; Napoles et al, 2015; Xu et al, 2016]

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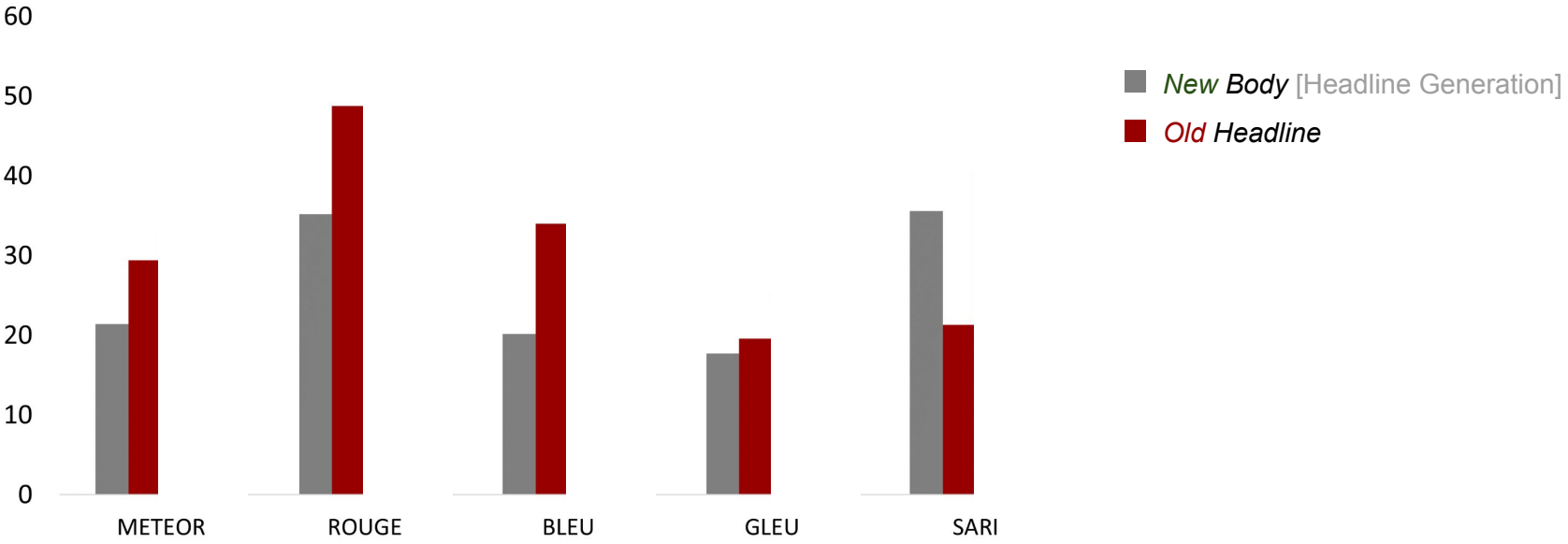
Results: Automated Metrics



[Banerjee and Lavie, 2005; Lin et al, 2004; Papineni et al, 2002; Napoles et al, 2015; Xu et al, 2016]

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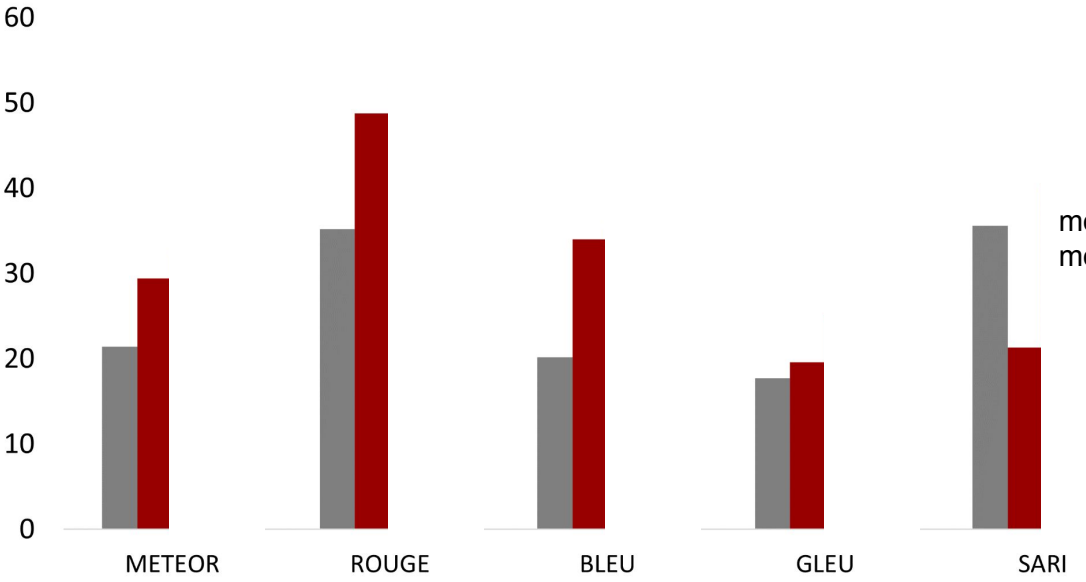
Results: Automated Metrics



New Body [Headline Generation]

Old Headline

more glasgow and aberdeen airport strikes set to begin
more glasgow and aberdeen airport strikes begin

[Banerjee and Lavie, 2005; Lin et al, 2004; Papineni et al, 2002; Napoles et al, 2015; Xu et al, 2016]

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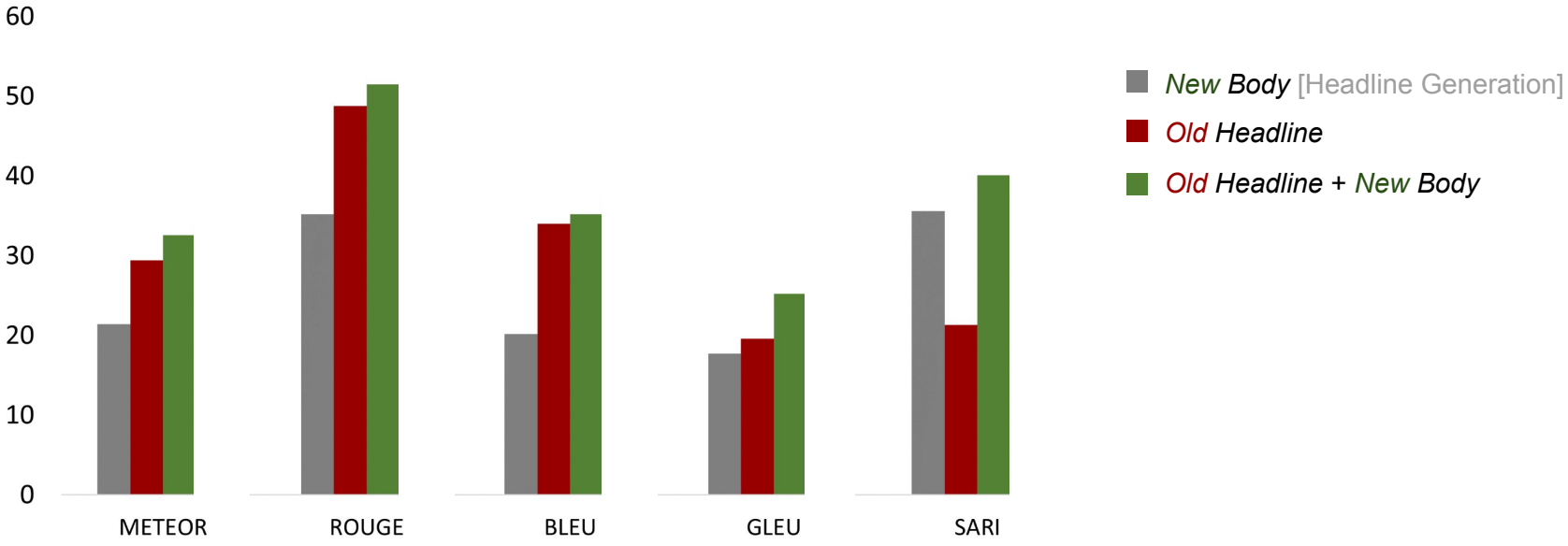
Results: Automated Metrics



[Banerjee and Lavie, 2005; Lin et al, 2004; Papineni et al, 2002; Napoles et al, 2015; Xu et al, 2016]

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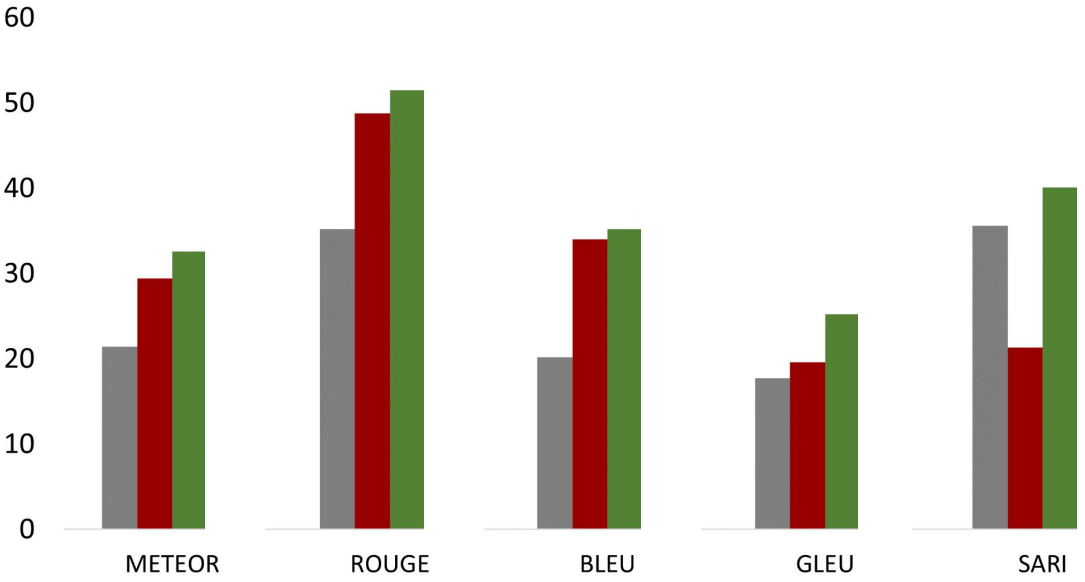
Results: Automated Metrics



Takeaway #1: Including *Old Headline* yields consistent improvement

[Banerjee and Lavie, 2005; Lin et al, 2004; Papineni et al, 2002; Napoles et al, 2015; Xu et al, 2016]

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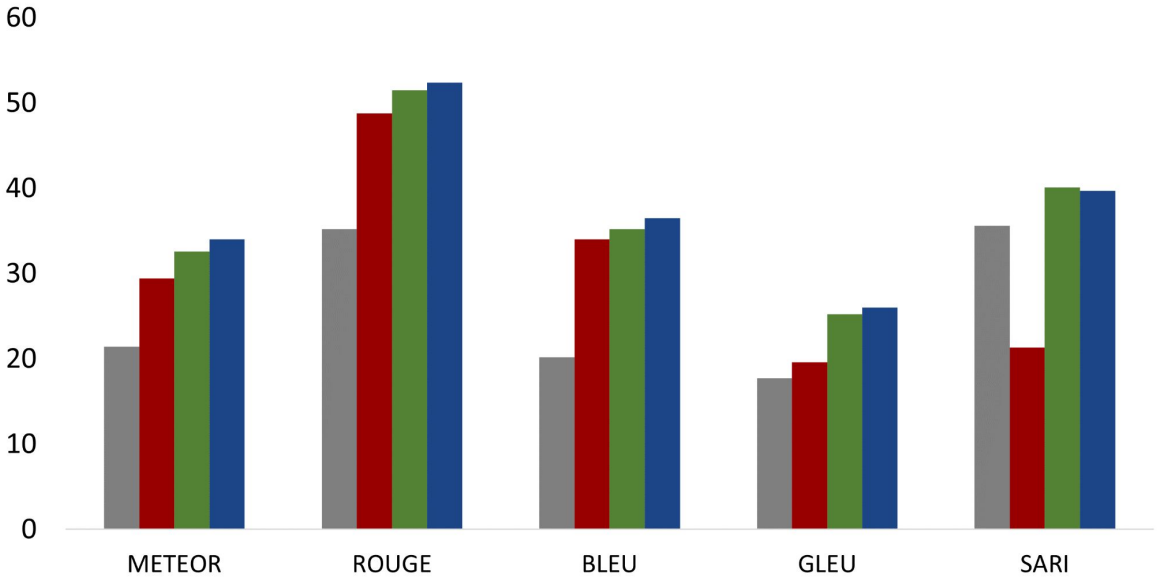
Results: Automated Metrics



Takeaway #1: Including *Old Headline* yields consistent improvement

[Banerjee and Lavie, 2005; Lin et al, 2004; Papineni et al, 2002; Napoles et al, 2015; Xu et al, 2016]

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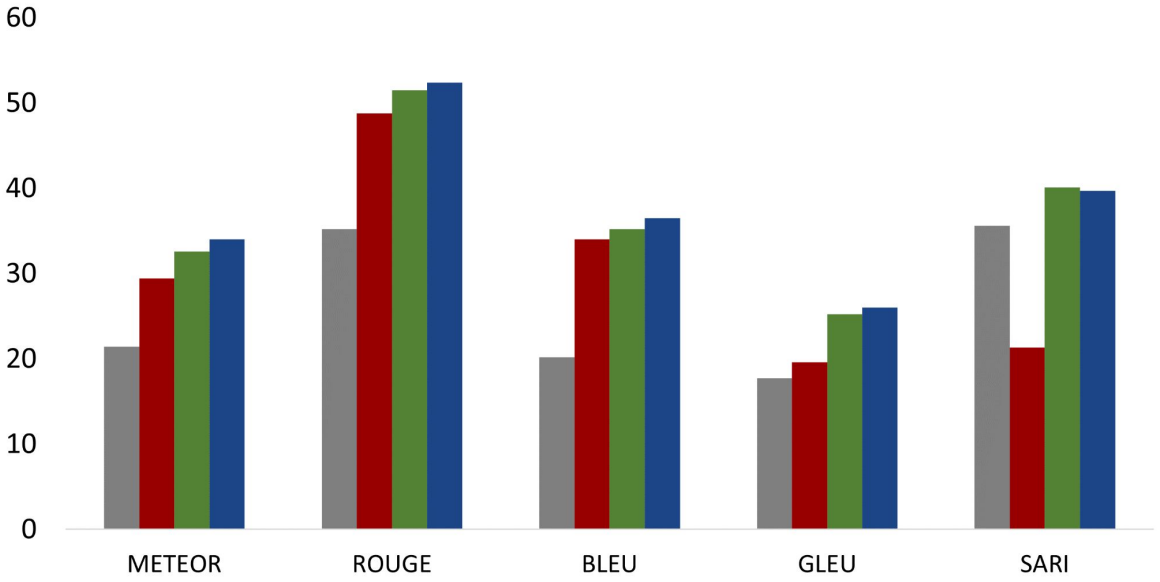
Results: Automated Metrics



Takeaway #1: Including *Old Headline* yields consistent improvement

Takeaway #2: Including *Edits in Body* improves performance across most metrics

[Banerjee and Lavie, 2005; Lin et al, 2004; Papineni et al, 2002; Napoles et al, 2015; Xu et al, 2016]

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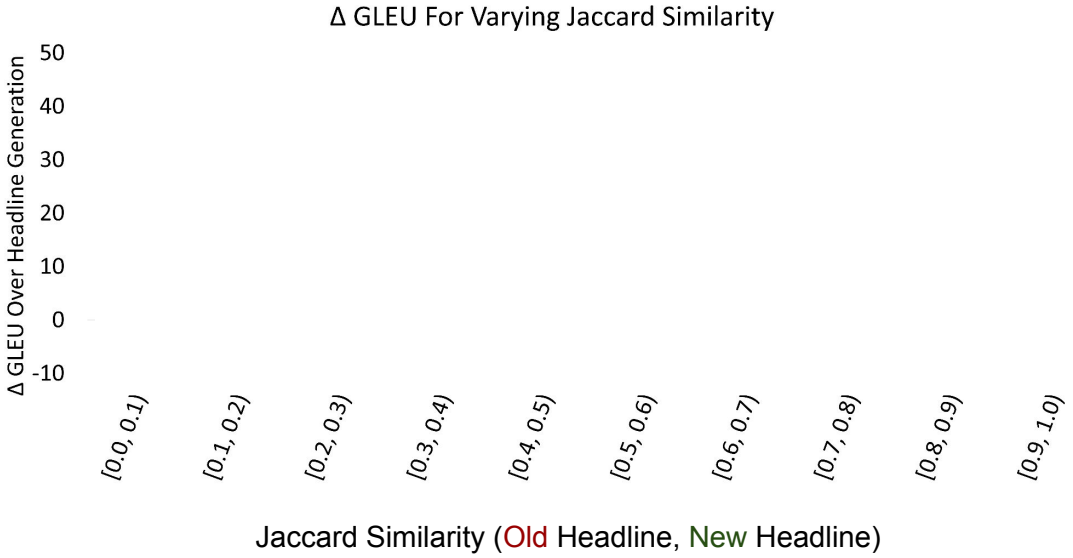
Analyzing Edits



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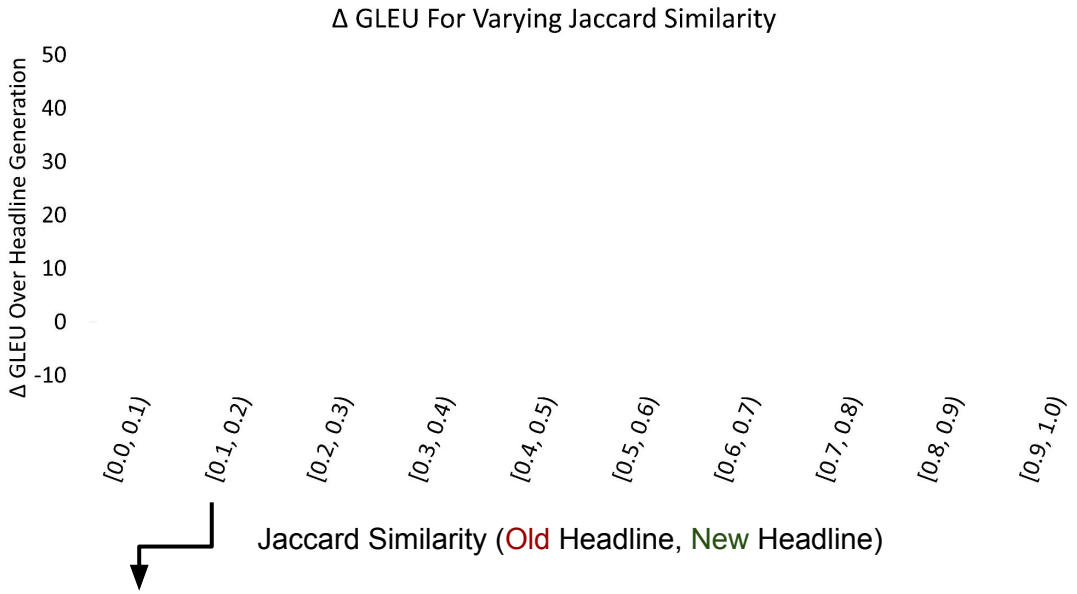
Analyzing Edits



India ‘asks banks to rescue Jet Airways'
Jet Airways grounds planes as crisis grows

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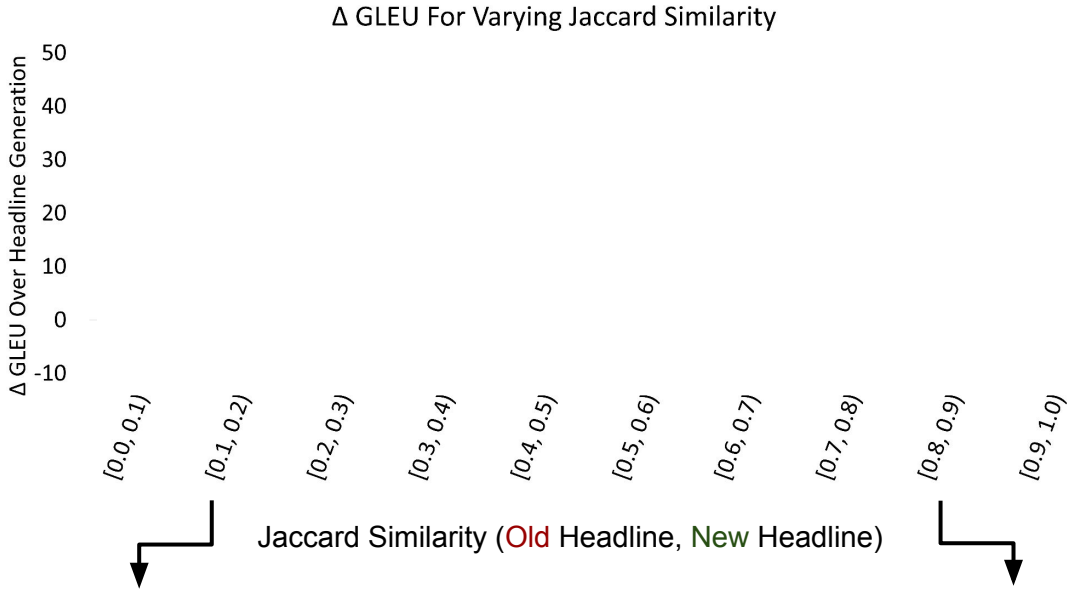
Analyzing Edits



India ‘asks banks to rescue Jet Airways'
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Australian Border Force refuses to give UK doctor permission to fly home to work
Australian Border Force grants UK doctor permission to fly home to work

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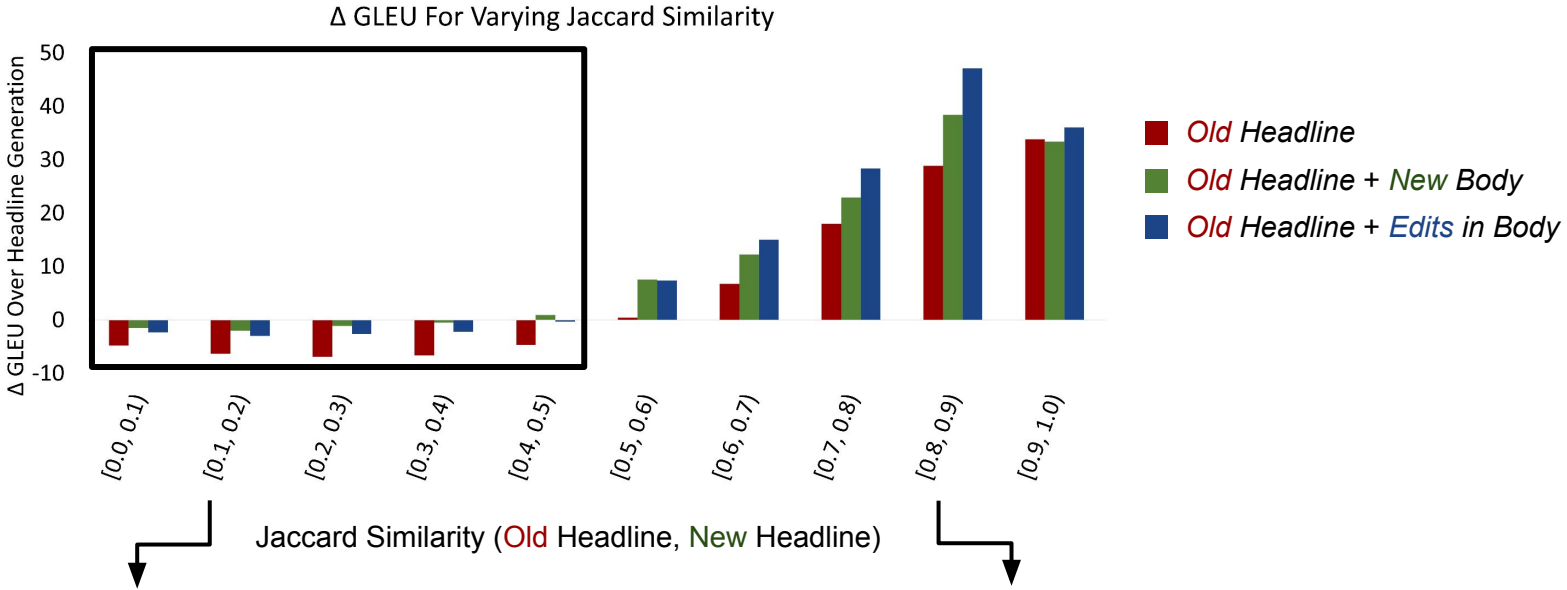
Engineering

Analyzing Edits



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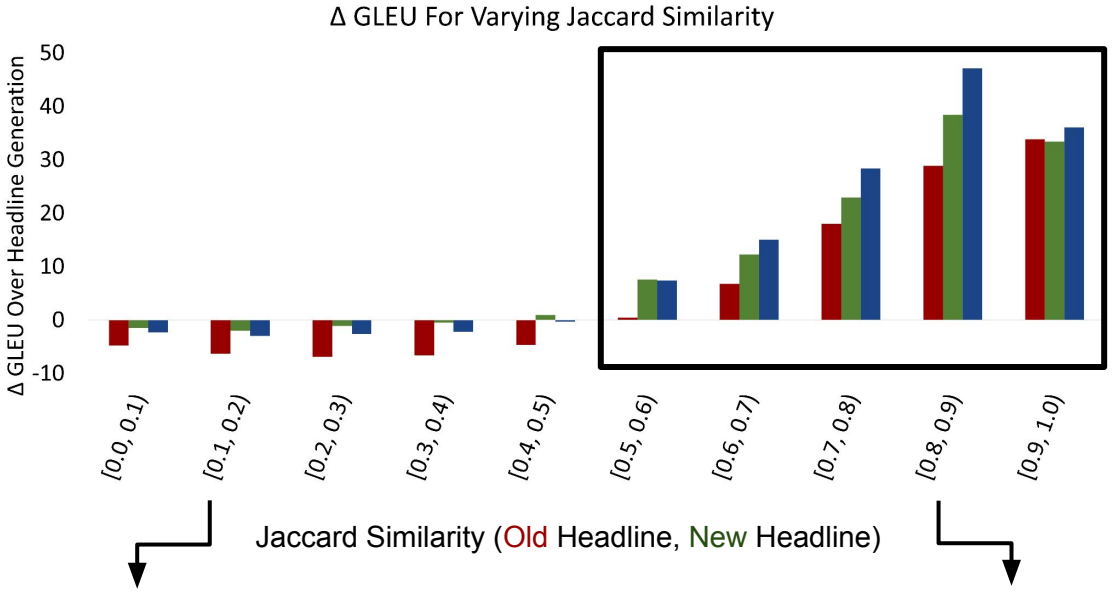
Analyzing Edits



Old Headline

Old Headline + *New Body*

Old Headline + *Edits in Body*

Takeaway #3: As the similarity increases, Old Headline becomes more useful.

India ‘asks banks to rescue Jet Airways'
Jet Airways grounds planes as crisis grows

Australian Border Force refuses to give UK doctor permission to fly home to work
Australian Border Force grants UK doctor permission to fly home to work

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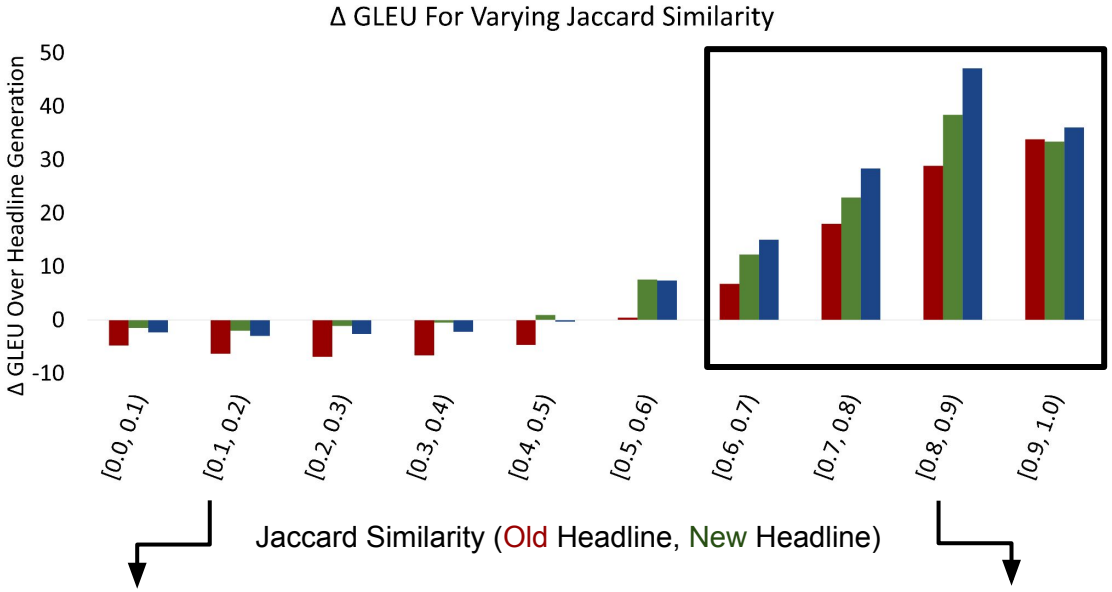
Analyzing Edits



Old Headline

Old Headline + *New Body*

Old Headline + *Edits in Body*

Takeaway #3: As the similarity increases, Old Headline becomes more useful.

Takeaway #4: With *Edits in Body*, a model learns to make more fine-grained edits.

India 'asks banks to rescue Jet Airways'
Jet Airways grounds planes as crisis grows

Australian Border Force refuses to give UK doctor permission to fly home to work
Australian Border Force grants UK doctor permission to fly home to work

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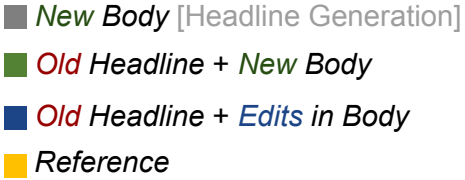
Engineering

Results: Human Evaluation

Design:

- Model predictions and reference new headline
- 3 annotators (2 with journalism background)
- Likert scale (1-5)



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Engineering

Results: Human Evaluation

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Results: Human Evaluation

Design:

- Model predictions and reference new headline
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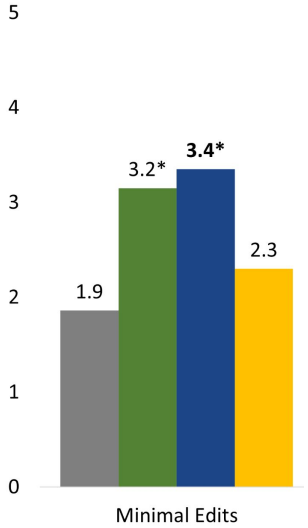
- Likert scale (1-5)



New Body [Headline Generation]

Old Headline + *New Body*

Old Headline + *Edits in Body*

Reference

- *Old Headline* + *New Body* and *Old Headline* + *Edits* in Body perform significantly better than Headline Generation and the Reference on *Minimal Edits*

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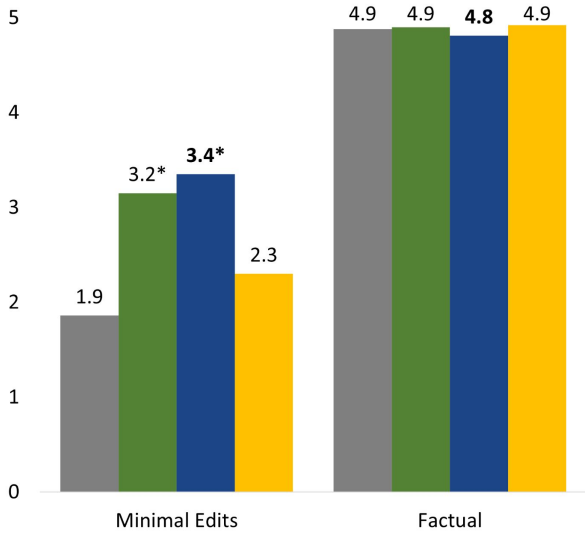
Engineering

Results: Human Evaluation

Design:

- Model predictions and reference new headline
- 3 annotators (2 with journalism background)
- Likert scale (1-5)



New Body [Headline Generation]

Old Headline + *New Body*

Old Headline + *Edits in Body*

Reference

- *Old Headline* + *New Body* and *Old Headline* + *Edits* in Body perform significantly better than Headline Generation and the Reference on *Minimal Edits*

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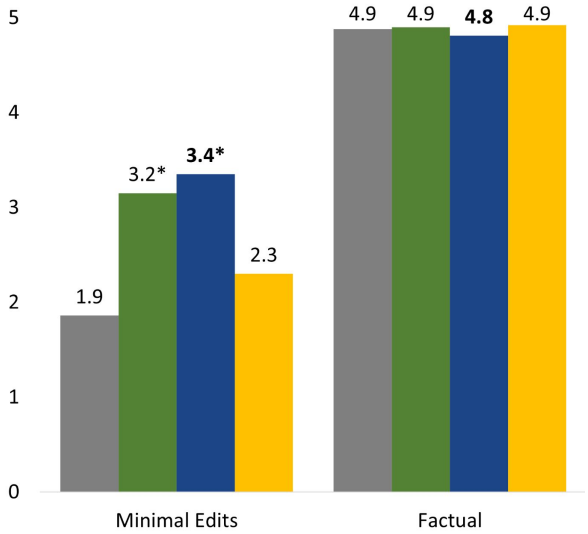
Engineering

Results: Human Evaluation

Design:

- Model predictions and reference new headline
- 3 annotators (2 with journalism background)
- Likert scale (1-5)



New Body [Headline Generation]

Old Headline + *New Body*

Old Headline + *Edits in Body*

Reference

- *Old Headline* + *New Body* and *Old Headline* + *Edits* in Body perform significantly better than Headline Generation and the Reference on *Minimal Edits*
- No significant difference for *Factual*

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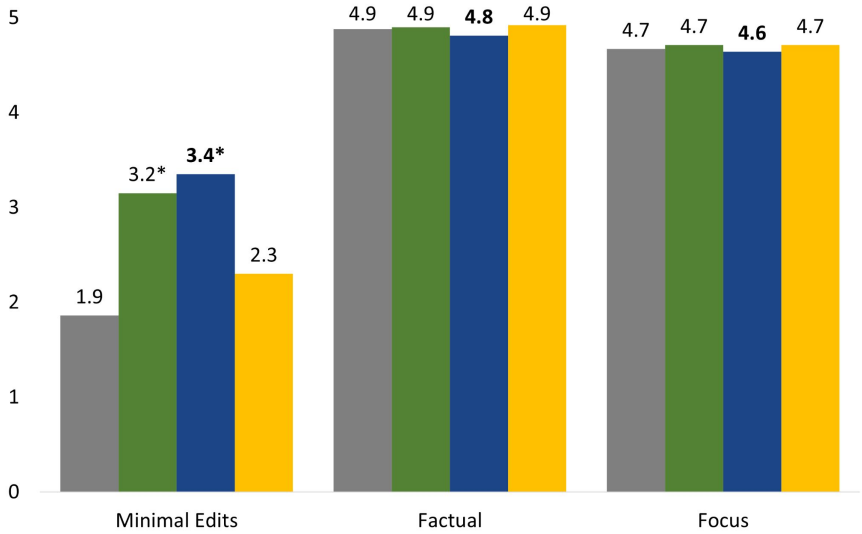
Engineering

Results: Human Evaluation

Design:

- Model predictions and reference new headline
- 3 annotators (2 with journalism background)
- Likert scale (1-5)



New Body [Headline Generation]

Old Headline + *New Body*

Old Headline + *Edits in Body*

Reference

- *Old Headline* + *New Body* and *Old Headline* + *Edits* in Body perform significantly better than Headline Generation and the Reference on *Minimal Edits*
- No significant difference for *Factual*

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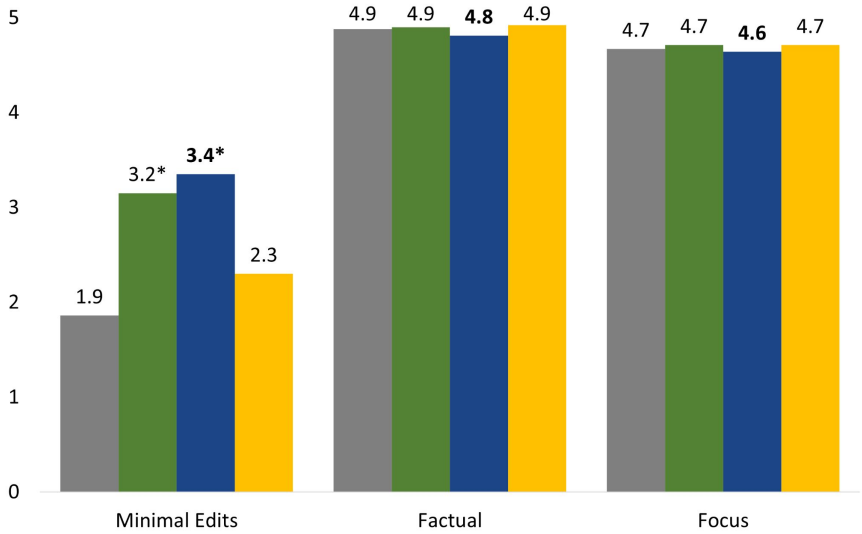
Results: Human Evaluation

Design:

- Model predictions and reference new headline
- 3 annotators (2 with journalism background)
- Likert scale (1-5)



New Body [Headline Generation]

Old Headline + *New Body*

Old Headline + *Edits in Body*

Reference

- *Old Headline* + *New Body* and *Old Headline* + *Edits* in Body perform significantly better than Headline Generation and the Reference on *Minimal Edits*
- No significant difference for *Factual*
- No significant difference for *Focus*

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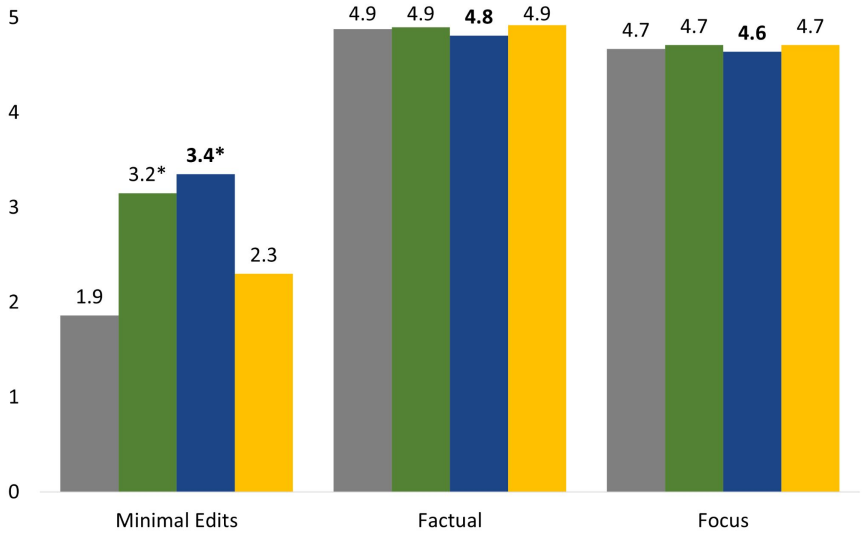
Engineering

Results: Human Evaluation

Design:

- Model predictions and reference new headline
- 3 annotators (2 with journalism background)
- Likert scale (1-5)



New Body [Headline Generation]

Old Headline + *New Body*

Old Headline + *Edits in Body*

Reference

- *Old Headline* + *New Body* and *Old Headline* + *Edits* in Body perform significantly better than Headline Generation and the Reference on *Minimal Edits*
- No significant difference for *Factual*
- No significant difference for *Focus*

Takeaway #5: With *Old Headline* + *Edits in Body*, a model makes fewer unnecessary edits while maintaining factuality and focus.

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Summary

- Presented the task of updated headline generation
- Analyzed the effect of different input representations
- Demonstrated that models incorporating *Old Headline* + *Edits in Body* makes fewer unnecessary edits while maintaining factuality and focus on revised content
- Curated dataset of over 69K examples to train and evaluate updated headline generation models

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Thank you!

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