Updated Headline Generation: Creating Updated Summaries for Evolving News Stories

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Sheena Panthaplackel¹, Adrian Benton², Mark Dredze³
¹The University of Texas at Austin* (Work done as intern at Bloomberg)
²Bloomberg (Now at Google Research)
³Johns 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.

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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)
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.

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Man admits theft of ice cream van in Nottingham
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Man admits theft of ice cream van in Nottingham.

Dynamic Text Summarization Model

New Headline

Man admits theft of ice cream van in Nottingham

Old Headline

Man charged with theft of ice cream van in Nottingham

New Body

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Data

NewsEdits

[Spangher et al., 2021]
**Data**

**NewsEdits**

[Spangher et al., 2021]

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NewsEdits

[Spangher et al., 2021]

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Old Body
Old Headline

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

New Body
New Headline
Data

NewsEdits
[Spangher et al., 2021]

Article Revision History

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Filtering to focus on substantive headline changes
- 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

\[ \text{Old Body} \neq \text{New Body} \]
\[ \text{Old Headline} \neq \text{New Headline} \]
Data

Data

NewsEdits

[Spangher et al., 2021]

Article Revision History

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Filtering to focus on substantive headline changes
- 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

s.t. $\text{Old Body} \neq \text{New Body}$

AND

$\text{Old Headline} \neq \text{New Headline}$

Headline Revision for Evolving News (HREN)

New Body

New Headline

Old Body

Old Headline

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Input Context Representations

Model (BART)
Input Context Representations

Model (BART) \rightarrow \text{New Headline}
Input Context Representations

New Body → Model (BART) → New Headline
Input Context Representations

New Body → Model (BART) → New Headline

Old Headline → Model (BART) → New Headline
Input Context Representations

- New Body
- Old Headline
- Old Headline + New Body

Model (BART) → New Headline
Input Context Representations

- New Body
- Old Headline
- Old Headline + New Body
- Old Headline + Edits in Body

Model (BART) → New Headline
A 22-year-old man has been charged after an ice cream van was stolen in Nottingham...

New Headline: A 22-year-old man has admitted stealing an ice cream van in Nottingham...

Model (BART)
Results: Automated Metrics

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

[Barnerjee and Lavie, 2005; Lin et al, 2004; Papineni et al, 2002; Napoles et al, 2015; Xu et al, 2016]
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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]
Results: Automated Metrics

[Barnerjee and Lavie, 2005; Lin et al, 2004; Papineni et al, 2002; Napoles et al, 2015; Xu et al, 2016]
Results: Automated Metrics

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

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

Δ GLEU For Varying Jaccard Similarity

Δ GLEU Over Headline Generation

Jaccard Similarity (Old Headline, New Headline)
India ‘asks banks to rescue Jet Airways’
Jet Airways grounds planes as crisis grows
Analyzing Edits

Δ GLEU For Varying Jaccard Similarity

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
Analyzing 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
Analyzing Edits

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

Abbildung: \[ \text{Jaccard Similarity (Old Headline, New Headline)} \]

- 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
Analyzing Edits

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
Results: Human Evaluation

Design:
- Model predictions and reference new headline
- 3 annotators (2 with journalism background)
- Likert scale (1-5)
Results: Human Evaluation

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

![Bar chart showing results of human evaluation.

- New Body [Headline Generation]
- Old Headline + New Body
- Old Headline + Edits in Body
- Reference

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Results: Human Evaluation

Design:
- Model predictions and reference new headline
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- 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
Results: Human Evaluation

Design:
- Model predictions and reference new headline
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Graph:
- New Body [Headline Generation]
- Old Headline + New Body
- Old Headline + Edits in Body
- Reference

Bar chart showing:
- Minimal Edits: 1.9, 3.2*, 3.4*
- Factual: 2.3, 4.9, 4.9, 4.9

*Statistically significant difference
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
Results: Human Evaluation

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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
- No significant difference for Factual
- No significant difference for Focus
Results: Human Evaluation

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

- Old Headline + New Body and Old Headline + Edits in Body 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.
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
Thank you!

Contact: Sheena Panthaplackel <spantha@cs.utexas.edu>