Updated Headline Generation: Creating Updated Summaries for Evolving News Stories

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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)
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Man admits theft of ice cream van in Nottingham
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Data

NewsEdits
[Spangher et al., 2021]
Data

NewsEdits
[Spangher et al., 2021]

Article Revision History

| Version   |
|-----------|
| Version 1 |
| Version 2 |
| ...       |
| Version N-1 |
| Version N |
| ...       |
### NewsEdits

[Spangher et al., 2021]

| Article Revision History |
|--------------------------|
| Version 1                |
| Version 2                |
| ...                      |
| Version N-1              |
| Version N                |
| ...                      |

- **Old Body**
- **Old Headline**

- **New Body**
- **New Headline**

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Data

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
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
Headline Revision for Evolving News (HREN)

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

Data

NewsEdits
[Spangher et al., 2021]

Article Revision History

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Filtering to focus on substantive headline changes
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Input Context Representations

Model (BART)
Input Context Representations

Model (BART) → New Headline
Input Context Representations

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

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

New Body → Model (BART) → New Headline

Old Headline →

Old Headline + New Body →
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 admitted stealing an ice cream van in Nottingham…

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…

<REPLACE_OLD> been charged after <REPLACE_NEW> admitted stealing <REPLACE_END> [Panthaplackel et al., 2020]

<DELETE> was stolen <DELETE_END>
### Results: Automated Metrics

| METEOR | ROUGE | BLEU | GLEU | SARI |
|--------|-------|------|------|------|
| 60     | 50    | 40   | 30   | 20   |
| 50     | 40    | 30   | 20   | 10   |
| 40     | 30    | 20   | 10   | 0    |

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

[Bar graph showing performance metrics for METEOR, ROUGE, BLEU, GLEU, and SARI]

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

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Results: Automated Metrics

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

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Results: Automated Metrics

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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

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[Banerjee 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

**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

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.

Old Headline

Old Headline + New Body

Old Headline + Edits in Body

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

Delta GLEU for Varying Jaccard Similarity

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.](chart.png)
Results: Human Evaluation

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

![Bar chart showing results]

- **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

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

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Results: Human Evaluation

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No significant difference for Factual.
Results: Human Evaluation

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Results: Human Evaluation

Design:
- Model predictions and reference new headline
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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!

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