EntSUM: A Dataset for Entity-Centric Summarization

Bloomberg

60th Annual Meeting of the Association for Computational Linguistics (ACL 2022)
May 22-27, 2022

Mounica Maddela*# | Georgia Institute of Technology
Mayank Kulkarni* & Daniel Preoţiuc-Pietro | Bloomberg

TechAtBloomberg.com

* equal contribution
 # work done during an internship at Bloomberg

Summarization

The overall summary does not capture different perspectives of the document.

Summary: Bush administration advocates giving federal agencies greater role in nation's disaster response. Recommendations would reverse some steps taken after Sept 11 attacks to centralize responsibility for responding to natural disasters at Homeland Security Department, as well as creating larger coordinating role for White House. Some critics worry that diffusing responsibilities would leave no one clearly in charge.

No salient information in the summary for different entities.

Acknowledging the Hurricane Katrina failures, the Bush administration advocated giving federal agencies from the Pentagon to the Department of Justice a greater role in the nation's disaster response playbook.

If adopted through both legislation and executive order, the recommendations would reverse some of the steps taken after the Sept. 11 terrorist attacks to centralize responsibility for responding to natural disasters or terrorist attacks at the newly created Department of Homeland Security. And the plan could require the White House to play a larger coordinating role in future disasters.

Frances Fragos Townsend, President Bush's domestic security adviser, said that enlisting help from federal agencies made sense. But some critics worry that diffusing responsibilities among agencies could leave no one clearly in charge and not produce results. ''This may simply be rearranging the deck chairs on the Titanic,'' said Michael Greenberger, a law professor at the University of Maryland.

The Homeland Security Department and its **Federal Emergency Management Agency** will continue to be the lead federal player in disaster response efforts, according to the blueprint proposed by Ms. Townsend.
....
The **Department of Justice,** which now shares responsibility for disaster law enforcement efforts with the Homeland Security Department, would be primarily charged with that even in less severe disasters.
....
The Department of Health and Human Services, meanwhile, would take back from **FEMA** the disaster medical teams it used to supervise before the Department of Homeland Security was established. And the **Department of Housing and Urban Development** would be expected to find temporary housing for victims, a duty also now handled by **FEMA**, which Ms. Townsend said placed too much emphasis on buying travel trailers and mobile homes rather than on finding apartments or other options.
....
By emphasizing that the Homeland Security Department should prepare for any type of disaster, the report echoed frequent criticism that the agency was too focused on possible terrorist strikes.
....
Housing and Urban Department already works with 2,500 public housing authorities across the United States and indirectly with thousands of landlords, so it may be able to more quickly find housing alternatives for disaster victims than **FEMA**. The **Justice Department,** which is in charge of the F.B.I. and has long standing relations with the local and state police, may be able to more rapidly deploy huge numbers of law enforcement officers to help maintain public order.
....

Bloomberg
Engineering

Controllable Summarization

Summarize salient information for a target entity in the document.

Summary: Bush administration advocates giving federal agencies greater role in nation's disaster response. Recommendations would reverse some steps taken after Sept 11 attacks to centralize responsibility for responding to natural disasters at Homeland Security Department, as well as creating larger coordinating role for White House. Some critics worry that diffusing responsibilities would leave no one clearly in charge.

Acknowledging the Hurricane Katrina failures, the Bush administration advocated giving federal agencies from the Pentagon to the Department of Justice a greater role in the nation's disaster response playbook.

If adopted through both legislation and executive order, the recommendations would reverse some of the steps taken after the Sept. 11 terrorist attacks to centralize responsibility for responding to natural disasters or terrorist attacks at the newly created Department of Homeland Security. And the plan could require the White House to play a larger coordinating role in future disasters.

Frances Fragos Townsend, President Bush's domestic security adviser, said that enlisting help from federal agencies made sense. But some critics worry that diffusing responsibilities among agencies could leave no one clearly in charge and not produce results. ''This may simply be rearranging the deck chairs on the Titanic,'' said Michael Greenberger, a law professor at the University of Maryland.

The Homeland Security Department and its **Federal Emergency Management Agency** will continue to be the lead federal player in disaster response efforts, according to the blueprint proposed by Ms. Townsend.
....
The **Department of Justice,** which now shares responsibility for disaster law enforcement efforts with the Homeland Security Department, would be primarily charged with that even in less severe disasters.
....
The Department of Health and Human Services, meanwhile, would take back from **FEMA** the disaster medical teams it used to supervise before the Department of Homeland Security was established. And the **Department of Housing and Urban Development** would be expected to find temporary housing for victims, a duty also now handled by **FEMA**, which Ms. Townsend said placed too much emphasis on buying travel trailers and mobile homes rather than on finding apartments or other options.
....
By emphasizing that the Homeland Security Department should prepare for any type of disaster, the report echoed frequent criticism that the agency was too focused on possible terrorist strikes.
....
The Housing and Urban Department already works with 2,500 public housing authorities across the United States and indirectly with thousands of landlords, so it may be able to more quickly find housing alternatives for disaster victims than **FEMA**. The **Justice Department,** which is in charge of the F.B.I. and has long standing relations with the local and state police, may be able to more rapidly deploy huge numbers of law enforcement officers to help maintain public order. ....

Department of Justice: The Department of Justice shares responsibility for disaster law enforcement with the Homeland Security. **The Justice Department**, which is in charge of the F.B.I. and has long standing relations with the local and state police, can rapidly deploy law enforcement officers to maintain public order.

Federal Emergency Medical Response: The Department of Health would take back the disaster medical teams from **FEMA**. The Department of Housing and Urban Development would find temporary housing for victims, a duty also now handled by **FEMA**.

Department of Housing and Urban Development: The **Department of Housing and Urban Development** would find temporary housing for victims. **Housing and Urban Department** already works with 2,500 public housing authorities and so it can quickly find housing alternatives for disaster victims than FEMA.

Controllable Summarization

- Little work on controllable-summarization*

- No benchmark datasets

- Controllable summarization is useful for multiple tasks:
  - Improve search results for an entity by summarizing the document with respect to the searched entity
  - Highlight text salient to an entity in a long document
  - Improve other downstream tasks such as targeted sentiment analysis or QA.

*Fan et al. 2016, He et al. 2020; Avinesh et al., 2018; Shapira et al., 2021; Hirsch et al., 2021; Meng et al., 2021; Hsu and Tan et al., 2021

TechAtBloomberg.com

Bloomberg

Engineering

Contributions

- Proposed a new task: **entity-centric summarization**.

- Created **EntSUM**: the **first human-annotated** benchmark for controllable summarization.

Department of Justice **+**

Acknowledging the Hurricane Katrina failures, the Bush administration advocated giving federal agencies from the Pentagon to the Department of Justice a greater role in the nation's disaster response playbook.

If adopted through both legislation and executive order, the recommendations would reverse some of the steps taken after the Sept. 11 terrorist attacks to centralize responsibility for responding to natural disasters or terrorist attacks at the newly created Department of Homeland Security. And the plan could require the White House to play a larger coordinating role in future disasters.

Frances Fragos Townsend, President Bush's domestic security adviser, said that enlisting help from federal agencies made sense. But some critics worry that diffusing responsibilities among agencies could leave no one clearly in charge and not produce results. "This may simply be rearranging the deck chairs on the Titanic,'' said Michael Greenberger, a law professor at the University of Maryland.

The Homeland Security Department and its Federal Emergency Management Agency will continue to be the lead federal player in disaster response efforts, according to the blueprint proposed by Ms. Townsend. ....

The Department of Justice, which now shares responsibility for disaster law enforcement efforts with the Homeland Security Department, would be primarily charged with that even in less severe disasters. The reassignment was attributed to the slow and disorganized response to lawlessness in New Orleans.

The Department of Health and Human Services, meanwhile, would take back from FEMA the disaster medical teams it used to supervise before the Department of Homeland Security was established. And the Department of Housing and Urban Development would be expected to find temporary housing for victims, a duty also now handled by FEMA, which Ms. Townsend said placed too much emphasis on buying travel trailers and mobile homes rather than on finding apartments or other options. ....

By emphasizing that the Homeland Security Department should prepare for any type of disaster, the report echoed frequent criticism that the agency was too focused on possible terrorist strikes.

Housing and Urban Development already works with 2,500 public housing authorities across the United States and indirectly with thousands of landlords, so it may be able to more quickly find housing alternatives for disaster victims than FEMA. The Justice Department, which is in charge of the F.B.I. and has long standing relations with the local and state police, may be able to more rapidly deploy huge numbers of law enforcement officers to help maintain public order. ....

=

The Department of Justice shares responsibility for disaster law enforcement with the Homeland Security. **The Justice Department**, which is in charge of the F.B.I. and has long standing relations with the local and state police, can rapidly deploy law enforcement officers to maintain public order.

Federal Emergency Medical Response **+** **=**

The Department of Health would take back the disaster medical teams from **FEMA**. The Department of Housing and Urban Development would find temporary housing for victims, a duty also now handled by **FEMA**.

TechAtBloomberg.com
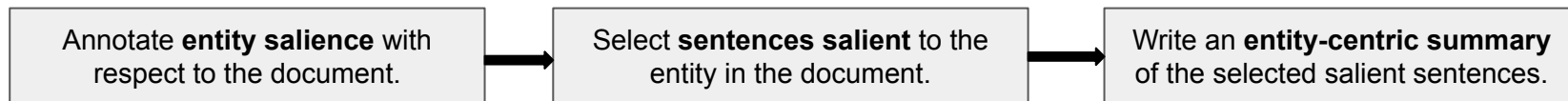
Bloomberg
Engineering

Construction of EntSUM

Bloomberg

Engineering

Data Annotation Pipeline

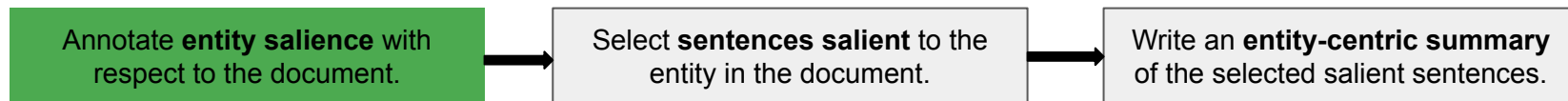| Annotate **entity salience** with respect to the document.	→	Select **sentences salient** to the entity in the document.	→	Write an **entity-centric summary** of the selected salient sentences.

*Fan et al. 2016, He et al. 2020; Avinesh et al., 2018; Shapira et al., 2021; Hirsch et al., 2021; Meng et al., 2021; Hsu and Tan et al., 2021

Bloomberg

Engineering

Data Annotation Pipeline

Annotate **entity salience** with respect to the document.	→	Select **sentences salient** to the entity in the document.	→	Write an **entity-centric summary** of the selected salient sentences.

We annotated salient information to focus only on salient entities for the next step.

Acknowledging the multitude of Hurricane Katrina failures, the Bush administration on Thursday advocated giving federal agencies from the Pentagon to the ==Department of Justice== a greater role in the nation's disaster response playbook. If adopted through both legislation and executive order, the recommendations would reverse some of the steps taken after the Sept. 11 terrorist attacks to centralize responsibility for responding to natural disasters or terrorist attacks at the newly created Department of Homeland Security. And the plan could require the White House to play a larger coordinating role in future disasters. Frances Fragos Townsend, President Bush's domestic security adviser, said that enlisting help from federal agencies made sense. ''There's a lot of expertise resident in the federal government,'' Ms. Townsend said at a White House briefing, where she released the report she and her staff had prepared. But some critics worry that diffusing responsibilities among agencies could leave no one clearly in charge and not produce results. ''This may simply be rearranging the deck chairs on the Titanic,'' said Michael Greenberger, a law professor and domestic security expert at the University of Maryland. The Homeland Security Department and its Federal Emergency Management Agency will continue to be the lead federal player in disaster response efforts, according to the blueprint proposed by Ms. Townsend. But the Pentagon may take over the commanding role during catastrophes ''of extraordinary scope and nature,'' like a nuclear attack or ''multiple simultaneous terrorist attacks causing a breakdown in civil society,'' the report says, citing examples even more extreme than Hurricane Katrina. More routinely, the military will be expected to provide logistical support, including sending troops to deliver supplies or rescue victims. The ==Justice Department==, which now shares responsibility for disaster law enforcement efforts with the , would be primarily charged with that even in less severe disasters. The reassignment was attributed to the slow and disorganized response to lawlessness in New Orleans. The Department of Health and Human Services, meanwhile, would take back from FEMA the disaster medical teams it used to supervise before the Department of Homeland Security was established. And the Department of Housing and Urban Development would be expected to find temporary housing for victims, a duty also now handled by FEMA, which Ms. Townsend said placed too much emphasis on buying travel trailers and mobile homes rather than on finding apartments or other options. David Heyman, director of the Homeland Security Program at the Center for Strategic and International Studies, a research group in Washington, said that once the changes were in place, the Homeland Security Department would have more reliable federal partners to orchestrate its response. ''It's pretty clear that D.H.S. is still the boss,'' he said. But Professor Greenberger said the changes might dilute the homeland security secretary's powers. ''The pendulum is swinging, and it is swinging to someone being in charge of the response by the whole government, working out of the White House, not in the Department of Homeland Security,'' Mr. Greenberger said. Ms. Townsend said the White House would in fact create a Disaster Response Group ''to make sure that if there are any disagreements or any bureaucracy, there's a mechanism here at the White House to break through that.'' A new National Operations Center that provides ''situational awareness'' for all federal agencies would also be set up, taking away some of the duties now handled by the Homeland Security Operations Center, which only opened in July 2004. Homeland Security Secretary Michael Chertoff did not attend Ms. Townsend's briefing on the 217-page report, which was titled ''The Federal Response to Hurricane Katrina, Lessons Learned.'' His only public comment was in a one-paragraph statement, in which he praised the report and said it should help create ''a more seamless federal disaster management system.'' By emphasizing that the Homeland Security Department should prepare for any type of disaster, the report indirectly echoed frequent criticism that the agency was too focused on possible terrorist strikes. Perhaps most fundamentally, the report argues that the federal government must be prepared to intervene when local and state agencies are so overwhelmed that they cannot clearly articulate what help they need. This new approach, which could send troops to a disaster zone, has provoked opposition by some governors, including Jeb Bush of Florida and Haley Barbour of Mississippi, who have argued that the states should lead the response. Unlike a report released last week by a House committee that investigated the response to the hurricane, the White House inquiry provides little detailed criticism of the performance of top leaders after the storm, including President Bush and his staff, Mr. Chertoff and Michael D. Brown, the former FEMA director. The report also does not explain how federal agencies that would pick up new assignments in future disasters are supposed to pay for the required staff and equipment or how their new disaster response duties will be managed. Predicting the impact of the proposed changes is difficult, domestic

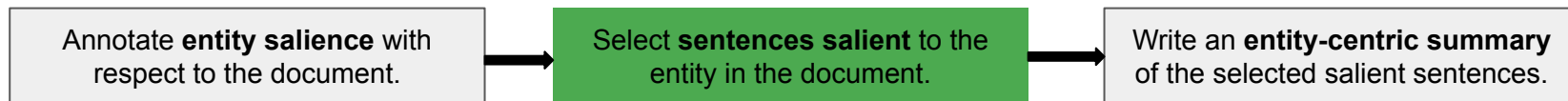How salient is the following entity highlighted in the story?

Department of Justice

○ 3 - High Salience

○ 2 - Medium Salience

○ 1 - Low Salience

○ 0 - Not Salient

○ This is not a named entity

☐ The entity description is incorrect

☐ Not all highlighted mentions refer to the same entity

☐ Not all entity mentions are highlighted

Majority of up to 5 annotations
IAA Alpha = 0.71

Bloomberg
Engineering

Data Annotation Pipeline

| Annotate **entity salience** with respect to the document. | → | Select **sentences salient** to the entity in the document. | → | Write an **entity-centric summary** of the selected salient sentences. |

Select sentences salient to the entity.

Please select the sentences important to the entity **Department of Justice.**

Sentences (same order as in the article)	Salient?
Acknowledging the multitude of Hurricane Katrina failures, the Bush administration on Thursday advocated giving federal agencies from the Pentagon to the **Department of Justice** a greater role in the nation's disaster response playbook.	☑
If adopted through both legislation and executive order, the recommendations would reverse some of the steps taken after the Sept. 11 terrorist attacks to centralize responsibility for responding to natural disasters or terrorist attacks at the newly created Department of Homeland Security.	☐
And the plan could require the White House to play a larger coordinating role in future disasters.	☐
Frances Fragos Townsend, President Bush's domestic security adviser, said that enlisting help from federal agencies made sense.	☐
''There's a lot of expertise resident in the federal government,'' Ms.	☐

Sentences with the entity string are pre-marked.
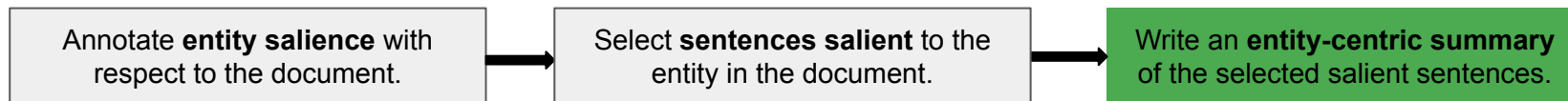Majority vote over three annotations
IAA Alpha = 0.74

Bloomberg
Engineering

Data Annotation Pipeline

| Annotate **entity salience** with respect to the document. | → | Select **sentences salient** to the entity in the document. | → | Write an **entity-centric summary** of the selected salient sentences. |

Only salient sentences are highlighted and can be selected.
1/2 annotations; keep multiple references in the data
IAA Alpha = 0.54

Please write a summary for the entity **Department of Justice.**

Sentences (same order as in the article)	Sentences in Summary
Acknowledging the multitude of Hurricane Katrina failures, the Bush administration on Thursday advocated giving federal agencies from the Pentagon to the Department of Justice a greater role in the nation's disaster response playbook.	☑
If adopted through both legislation and executive order, the recommendations would reverse some of the steps taken after the Sept. 11 terrorist attacks to centralize responsibility for responding to natural disasters or terrorist attacks at the newly created Department of Homeland Security.	☐
And the plan could require the White House to play a larger coordinating role in future disasters.	☐
Frances Fragos Townsend, President Bush's domestic security adviser, said that enlisting help from federal agencies made sense.	☐
''There's a lot of expertise resident in the federal government,'' Ms.	☐

Bloomberg
Engineering

Data Annotation Pipeline

Annotate **entity salience** with respect to the document.	→	Select **sentences salient** to the entity in the document.	→	Write an **entity-centric summary** of the selected salient sentences.

Only salient sentences are highlighted and can be selected.
1/2 annotations; keep multiple references in the data
IAA ROUGE-2 = 62.6, ROUGE-L 69.0

Please write the summary within **150** words.

Words in the summary: 0

Bloomberg
Engineering

Data Set Statistics

Annotated part of the **test set** of **The New York Times** summarization data set.*

Total number of entities	**2,788**
Entity Types	People (**PER**) and Organizations (**ORG**)
Number of documents	645
Number of entities per document	4.3
Average document length	34.7 sentences / 1014.2 words
Average summary length	**2.4** sentences / 80.9 words
% of novel bigrams in the summary when compared to the input article.	**5.93%**

Bloomberg
Engineering

Experiments

Bloomberg
Engineering

Summarization Methods

Extractive Summarization

Abstractive Summarization

Heuristics

- Lead 3 - overall

- Lead 3 - entity

- SentBERTSUM

- CTRLSum

- CNN encoder decoder

- GSUM

Neural Models

Bloomberg

Engineering

Experimental Setup

- Trained on NYT corpus

- Entity-centric summaries for training extracted using heuristics
  - e.g., Sentences in the generic summary that contained the target entity

- Tested on EntSUM, NYT entity-centric summaries.

- Evaluation metrics:
  - **ROUGE*** measures the n-gram overlap between the output and the reference.
  - **BERTScore**** captures the semantic similarity between the output and the reference.

ROUGE: A Package for Automatic Evaluation of Summaries, ACL 2004
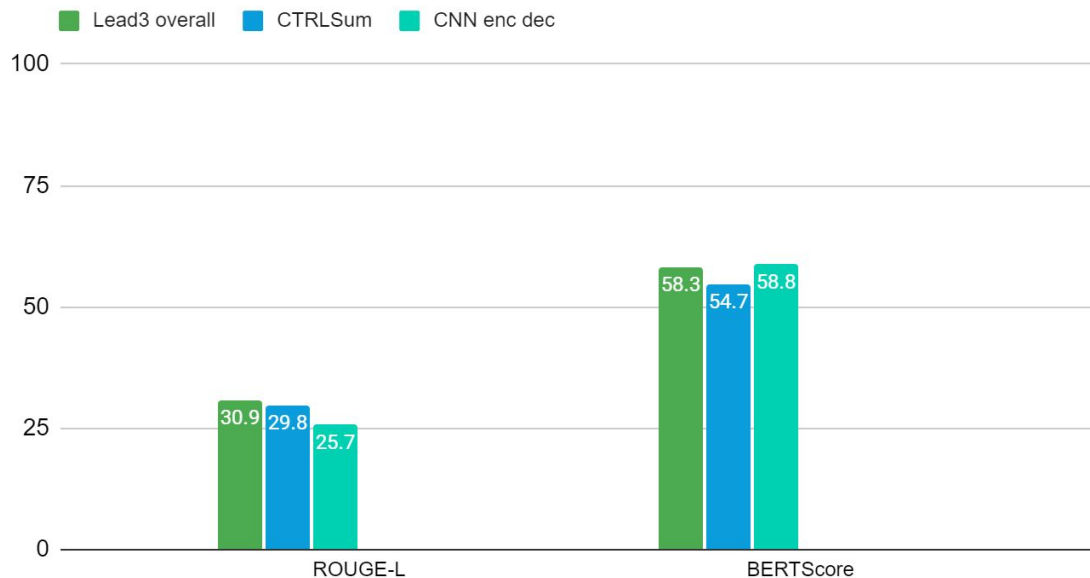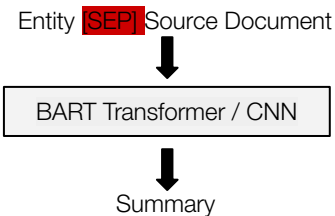***BERTScore: Evaluating Text Generation with BERT, ICLR 2020*

Bloomberg

Engineering

Baselines

● Lead-3 overall chooses the first three sentences in the document.
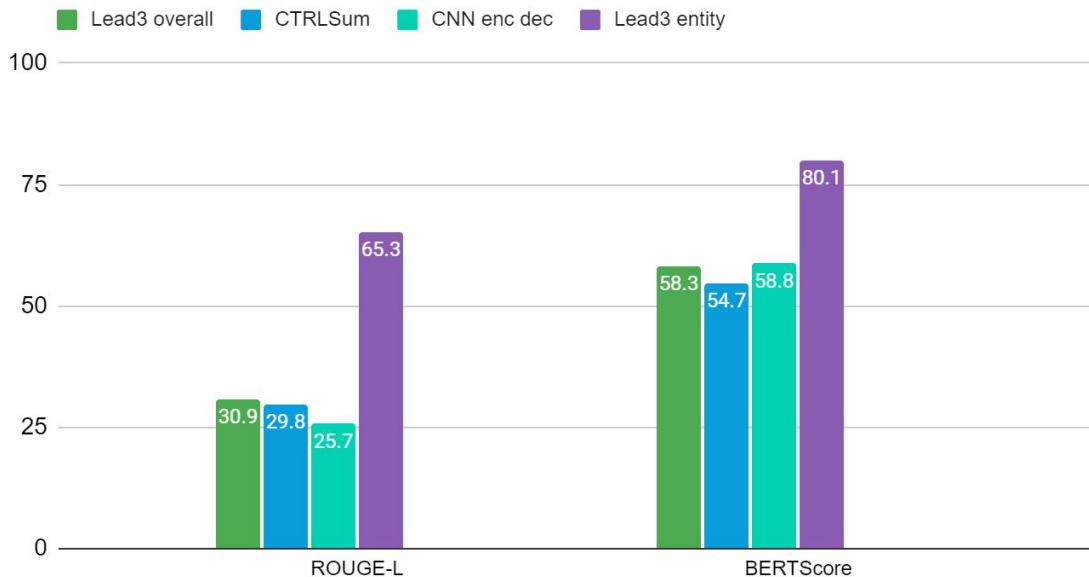
Bloomberg

Engineering
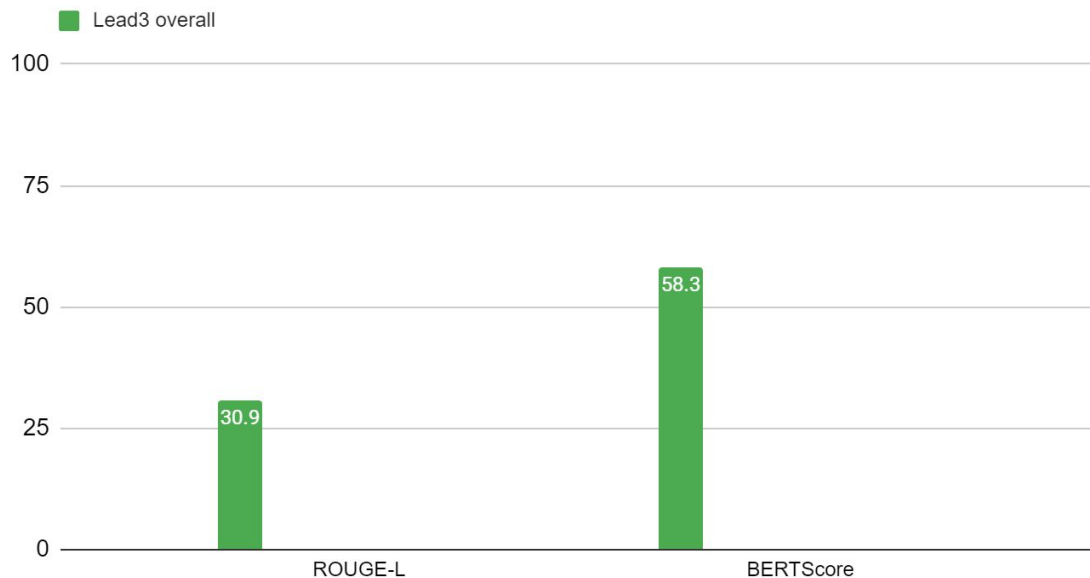
Baselines

- Existing entity-centric summarization approaches are abstractive.

- Both methods perform worse than the generic lead-3 summary.

Entity [SEP] Source Document

↓

BART Transformer / CNN

↓

Summary

Legend: Lead3 overall, CTRLSum, CNN enc dec

ROUGE-L: Lead3 overall 30.9, CTRLSum 29.8, CNN enc dec 25.7

BERTScore: Lead3 overall 58.3, CTRLSum 54.7, CNN enc dec 58.8

Bloomberg

Engineering

Baselines

- Lead-3 entity chooses the first three sentences in the document that contain the entity (including co-references).

- Highlights that entity-centric similarity is a very different task to generic summarization
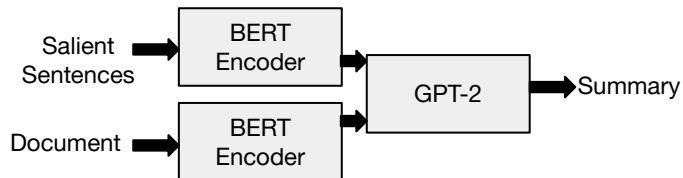

Bloomberg
Engineering

Our Methods

Adapted SOTA document summarization approaches for entity-centric summarization

GSum:
- Abstractive Summarization approach
- Consists of two encoders: input and guidance signal encoder
- Entity name / sentences as guidance signal

Bloomberg

Engineering

Our Methods

Adapted SOTA document summarization approaches for entity-centric summarization

GSum:
- Abstractive Summarization approach
- Consists of two encoders: input and guidance signal encoder
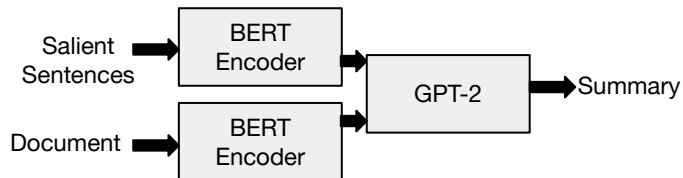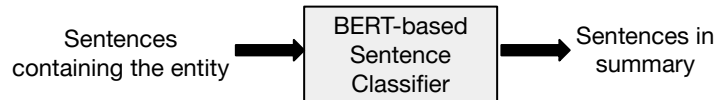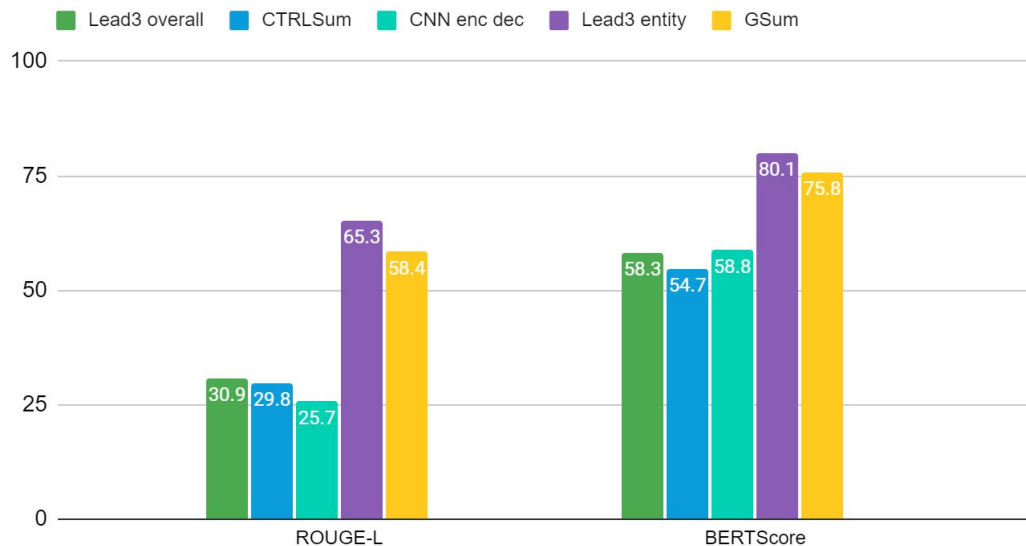- Entity name / sentences as guidance signal

SentBERTSUM:
- Extractive Summarization approach
- BERT-based classifier
- Input is a list sentences containing the entity (including co-references)

Salient Sentences → BERT Encoder →
Document → BERT Encoder → GPT-2 → Summary

Sentences containing the entity → BERT-based Sentence Classifier → Sentences in summary
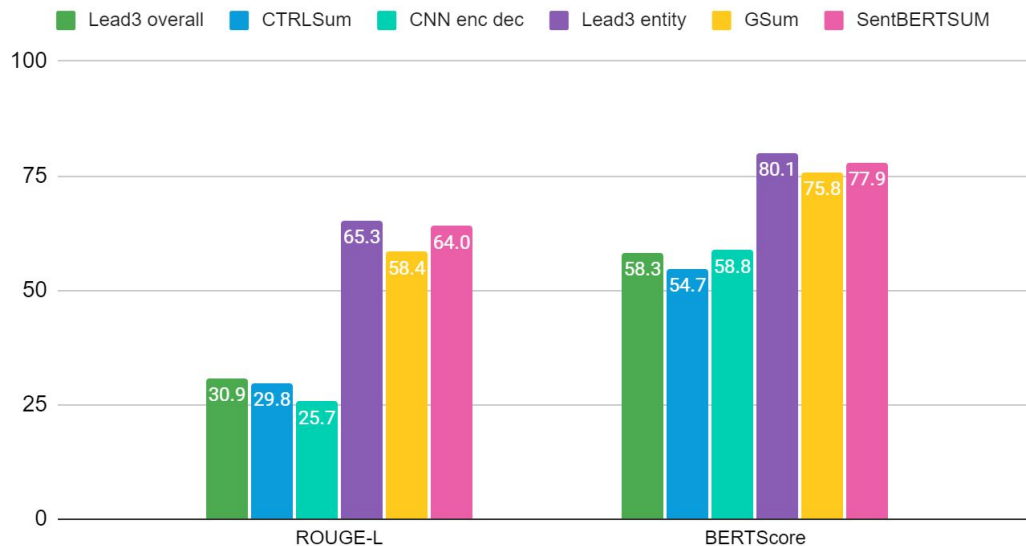
Bloomberg
Engineering

Our Methods

- GSum (abstractive) achieves results close to the lead-3 entity method

- Performs significantly better than generic summary lead-3

Legend: Lead3 overall | CTRLSum | CNN enc dec | Lead3 entity | GSum

ROUGE-L: 30.9, 29.8, 25.7, 65.3, 58.4
BERTScore: 58.3, 54.7, 58.8, 80.1, 75.8

Bloomberg

Engineering

Our Methods

- SentBERTSUM (extractive) performs better than GSUM (abstractive) and close to the Lead-3 entity method

- Still room for improvement on this data set

Legend: Lead3 overall | CTRLSum | CNN enc dec | Lead3 entity | GSum | SentBERTSUM

	Lead3 overall	CTRLSum	CNN enc dec	Lead3 entity	GSum	SentBERTSUM
ROUGE-L	30.9	29.8	25.7	65.3	58.4	64.0
BERTScore	58.3	54.7	58.8	80.1	75.8	77.9

Bloomberg
Engineering

Thank you!

Our **EntSUM** summarization dataset is available:
https://zenodo.org/record/6359875#.Yk9Gg8jMLZk

PyTorch code and pre-trained models are available:
https://github.com/bloomberg/entsum

We are hiring: bloomberg.com/engineering
Learn more: TechAtBloomberg.com/AI

Contact Us:
- Mounica Maddela (mmaddela3@gatech.edu)
- Mayank Kulkarni (mkulkarni24@bloomberg.net)

Engineering

Bloomberg

TechAtBloomberg.com