

# NEURAL TEXT GENERATION IN STORIES USING ENTITY REPRESENTATIONS AS CONTEXT

Elizabeth Clark   Yangfeng Ji   Noah A. Smith

Paul G. Allen School of Computer Science & Engineering  
University of Washington

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**Context:** All of a sudden, Emily walked towards the dragon.

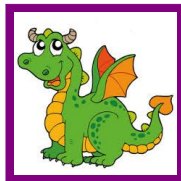
**Current Sentence:** Seth yelled at her to get back but  
\_\_\_\_\_

# MOTIVATION

Context: All of a sudden, [Emily]<sub>1</sub> walked towards [the dragon]<sub>2</sub>.

Current Sentence: [Seth]<sub>3</sub> yelled at [her]<sub>1</sub> to get back but

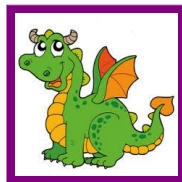
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# MOTIVATION

Context: All of a sudden, [Emily]<sub>1</sub> walked towards [the dragon]<sub>2</sub>.

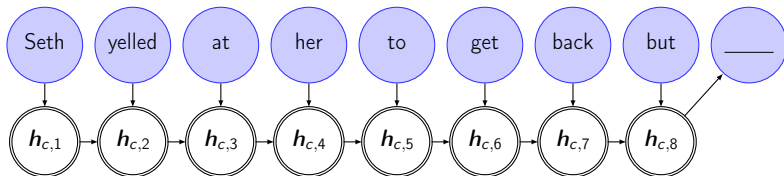
Current Sentence: [Seth]<sub>3</sub> yelled at [her]<sub>1</sub> to get back but [she]<sub>1</sub> ignored [him]<sub>3</sub>.



- Can we use entity representations as a form of context to improve text generation for stories?
- Three evaluations:
  1. Mention generation
  2. Sentence selection
  3. Human evaluation

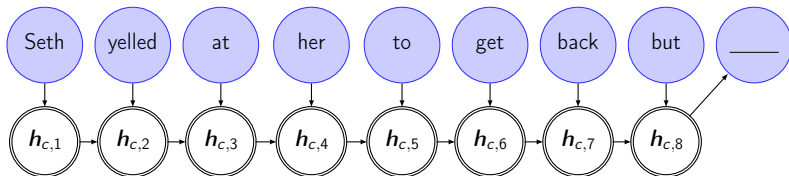
# SEQ2SEQ WITH ATTENTION

Current Sentence:

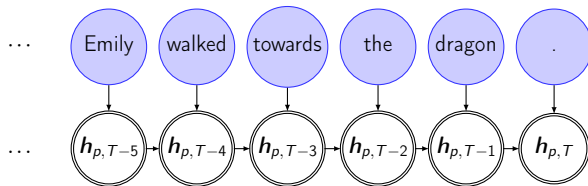


# SEQ2SEQ WITH ATTENTION

Current Sentence:

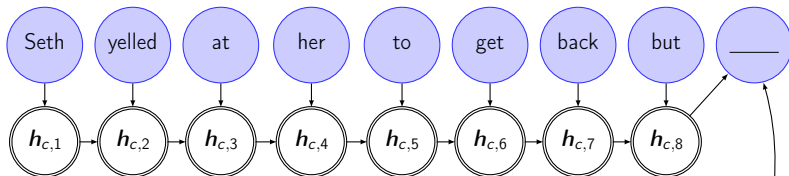


Previous Sentence:

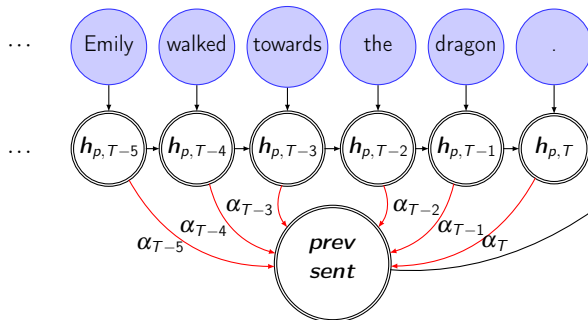


# SEQ2SEQ WITH ATTENTION

Current Sentence:



Previous Sentence:





# EXAMPLE STORY GENERATION



**Legend:**

- **Seq2Seq**
- **Human**

*(Clark et al., 2018)*

# EXAMPLE STORY GENERATION

“This is ridiculous,” said Duke.

“Yesterday I felt fine, and now you’re telling me I’m at death’s door?!”



**Legend:**

- **Seq2Seq**
- **Human**

*(Clark et al., 2018)*

# EXAMPLE STORY GENERATION

“This is ridiculous,” said Duke.

“Yesterday I felt fine, and now you’re telling me I’m at death’s door?!”

“We’ll take care of Furbie tomorrow,” the doctor said.



**Legend:**

- **Seq2Seq**
- **Human**

*(Clark et al., 2018)*

# EXAMPLE STORY GENERATION

“This is ridiculous,” said Duke.

“Yesterday I felt fine, and now you’re telling me I’m at death’s door?!”

“We’ll take care of Furple tomorrow,” the doctor said.

“You’ve named my tumor?!” Duke shrieked.



**Legend:**

- Seq2Seq
- Human

*(Clark et al., 2018)*

# EXAMPLE STORY GENERATION

“This is ridiculous,” said Duke.

“Yesterday I felt fine, and now you’re telling me I’m at death’s door?!”

“We’ll take care of Furple tomorrow,” the doctor said.

“You’ve named my tumor?!” Duke shrieked.

“Yeah,” replied the doctor coolly, “we’ve found that anthropomorphizing tumors helps people in your position come to terms with their condition more easily.”



**Legend:**

- Seq2Seq
- Human

*(Clark et al., 2018)*

# EXAMPLE STORY GENERATION

“This is ridiculous,” said Duke.

“Yesterday I felt fine, and now you’re telling me I’m at death’s door?!”

“We’ll take care of Furple tomorrow,” the doctor said.

“You’ve named my tumor?!” Duke shrieked.

“Yeah,” replied the doctor coolly, “we’ve found that anthropomorphizing tumors helps people in your position come to terms with their condition more easily.”

Lance yells over the speakers “no sudden hammering”



## Legend:

- Seq2Seq
- Human

(Clark et al., 2018)

# COHERENT MENTION GENERATION

## Context:

All of a sudden, [Emily]<sub>1</sub> walked towards [the dragon]<sub>2</sub>.

## Current Sentence:

[Seth]<sub>3</sub> yelled at [her]<sub>1</sub> to get back but \_\_\_\_\_.

### Option A:

✓ [she]<sub>1</sub> ignored [him]<sub>3</sub>.

### Option B:

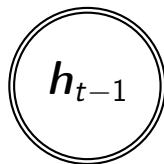
✗ [Emily]<sub>1</sub> ignored [Seth]<sub>3</sub>.

*(Grosz et al., 1995)*

*(Hobbs, 1979)*

## THREE FORMS OF CONTEXT

The current sentence



The previous sentence

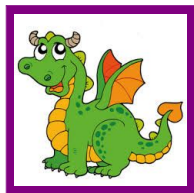


The entities





# ENTITY REPRESENTATIONS



## Context:

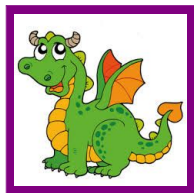
All of a sudden, [Emily]<sub>1</sub> walked towards [the dragon]<sub>2</sub>.

## Current Sentence:

[Seth]<sub>3</sub> yelled at [her]<sub>1</sub> to get back but \_\_\_\_\_

(Ji et al., 2017)

# ENTITY REPRESENTATIONS



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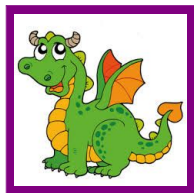
All of a sudden, [Emily]<sub>1</sub> walked towards [the dragon]<sub>2</sub>.

## Current Sentence:

[Seth]<sub>3</sub> yelled at [her]<sub>1</sub> to get back but \_\_\_\_\_

(Ji et al., 2017)

# ENTITY REPRESENTATIONS



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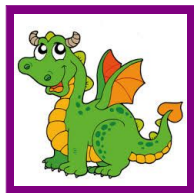
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# ENTITY REPRESENTATIONS



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All of a sudden, [Emily]<sub>1</sub> walked towards [the dragon]<sub>2</sub>.

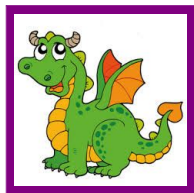
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# ENTITY REPRESENTATIONS



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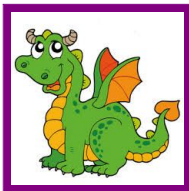
All of a sudden, [Emily]<sub>1</sub> walked towards [the dragon]<sub>2</sub>.

## Current Sentence:

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(Ji et al., 2017)

# ENTITY REPRESENTATIONS FOR GENERATION



## Context:

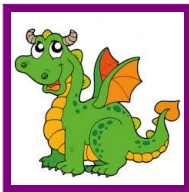
All of a sudden, [Emily]<sub>1</sub> walked towards [the dragon]<sub>2</sub>.

## Current Sentence:

[Seth]<sub>3</sub> yelled at [her]<sub>1</sub> to get back but \_\_\_\_\_



# ENTITY REPRESENTATIONS FOR GENERATION



## Context:

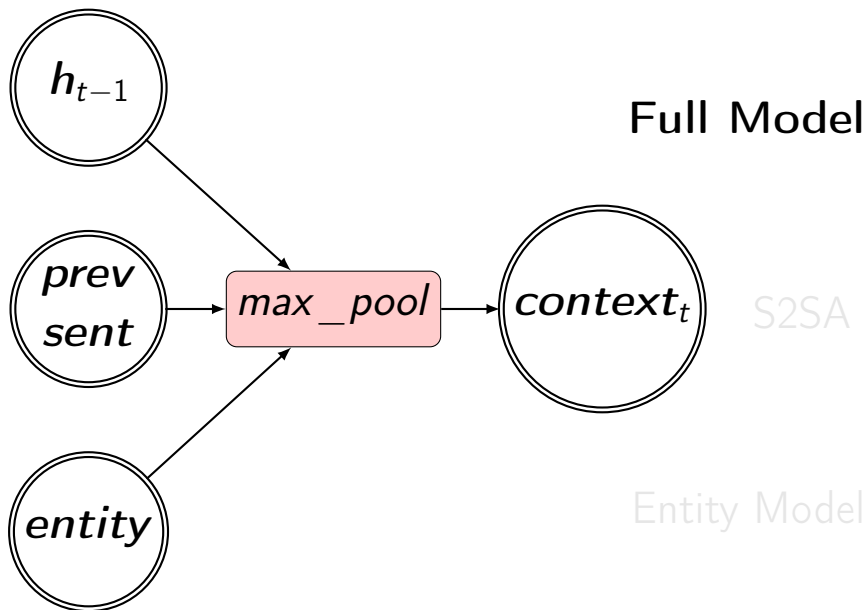
All of a sudden, [Emily]<sub>1</sub> walked towards [the dragon]<sub>2</sub>.

## Current Sentence:

[Seth]<sub>3</sub> yelled at [her]<sub>1</sub> to get back but \_\_\_\_\_

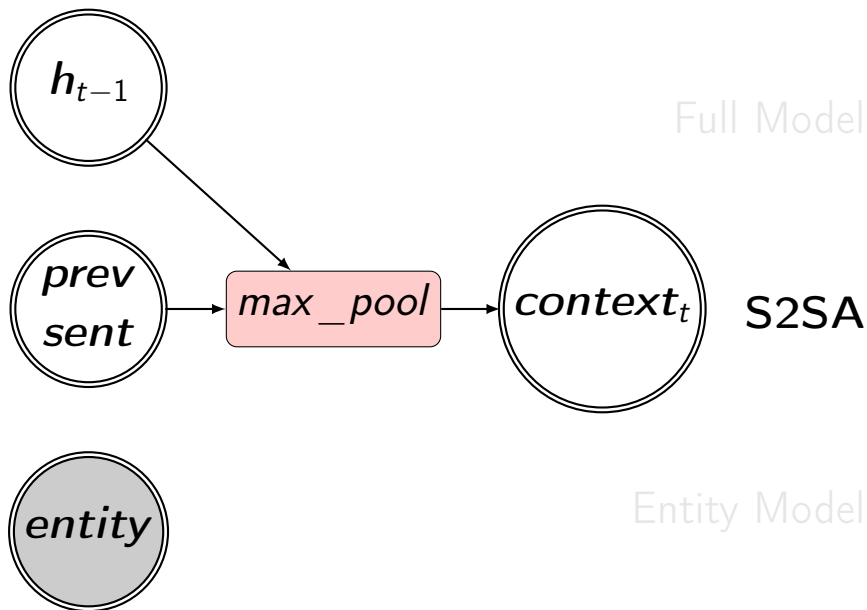


## COMBINING THE CONTEXT REPRESENTATIONS

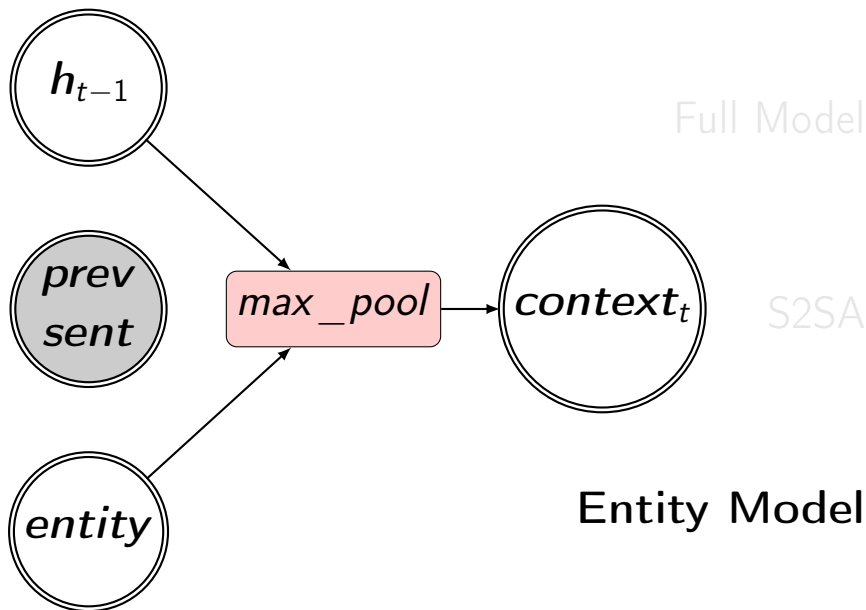




# COMBINING THE CONTEXT REPRESENTATIONS



## COMBINING THE CONTEXT REPRESENTATIONS



- Toronto Book Corpus: Adventure books
- 390 books split into 42,000 segments
- 43 million tokens, 35,000 types
- Annotations from Stanford CoreNLP

*(Zhu et al., 2015)*

*(Clark and Manning, 2016a,b)*

# EVALUATION #1: MENTION GENERATION

## Passage:

All of a sudden, \_\_\_\_\_ walked  
towards \_\_\_\_\_.

\_\_\_\_\_ yelled at \_\_\_\_\_ to get  
back but \_\_\_\_\_ ...

## Candidates:

[Emily]<sub>1</sub> (gold)

# EVALUATION #1: MENTION GENERATION

## Passage:

All of a sudden, [Emily]<sub>1</sub> walked  
towards \_\_\_\_\_.  
\_\_\_\_\_ yelled at \_\_\_\_\_ to get  
back but \_\_\_\_\_ ...

## Candidates:

[Emily]<sub>1</sub>

[the dragon]<sub>2</sub> (gold)

# EVALUATION #1: MENTION GENERATION

## Passage:

All of a sudden, [Emily]<sub>1</sub> walked  
towards [the dragon]<sub>2</sub>.

\_\_\_\_\_ yelled at \_\_\_\_\_ to get  
back but \_\_\_\_\_ ...

## Candidates:

[Emily]<sub>1</sub>

[the dragon]<sub>2</sub>

[Seth]<sub>3</sub> (gold)

# EVALUATION #1: MENTION GENERATION

## Passage:

All of a sudden, [Emily]<sub>1</sub> walked  
towards [the dragon]<sub>2</sub>.  
[Seth]<sub>3</sub> yelled at \_\_\_\_\_ to get  
back but \_\_\_\_\_ ...

## Candidates:

[Emily]<sub>1</sub>  
[the dragon]<sub>2</sub>  
[Seth]<sub>3</sub>  
[her]<sub>1</sub> (gold)

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## Passage:

All of a sudden, [Emily]<sub>1</sub> walked towards [the dragon]<sub>2</sub>.

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## Candidates:

[Emily]<sub>1</sub>

[the dragon]<sub>2</sub>

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[she]<sub>1</sub> (gold)



# EVALUATION #1: MENTION GENERATION

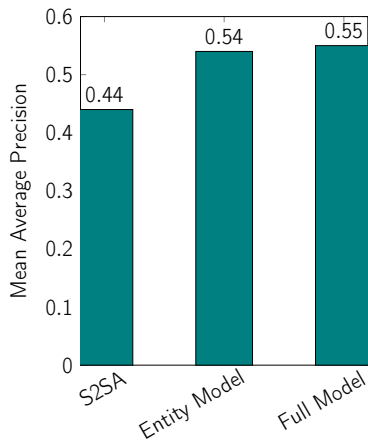
## Passage:

All of a sudden, [Emily]<sub>1</sub> walked towards [the dragon]<sub>2</sub>. [Seth]<sub>3</sub> yelled at [her]<sub>1</sub> to get back but \_\_\_\_\_ ...

## Candidates:

[Emily]<sub>1</sub>  
[the dragon]<sub>2</sub>  
[Seth]<sub>3</sub>  
[her]<sub>1</sub>  
[she]<sub>1</sub> (gold)

## Mention Generation



## EVALUATION #2: SENTENCE SELECTION

### Context:

... All of a sudden, [Emily]<sub>1</sub> walked towards [the dragon]<sub>2</sub>.

### Gold sentence:

[Seth]<sub>3</sub> yelled at [her]<sub>1</sub> to get back but [she]<sub>1</sub> ignored [him]<sub>3</sub>.

### Distractor sentence:

[She]<sub>1</sub> patted [its head]<sub>4</sub> and [it]<sub>2</sub> curled up outside [the cave]<sub>5</sub>.

## EVALUATION #2: SENTENCE SELECTION

### Context:

... All of a sudden, [Emily]<sub>1</sub> walked towards [the dragon]<sub>2</sub>.

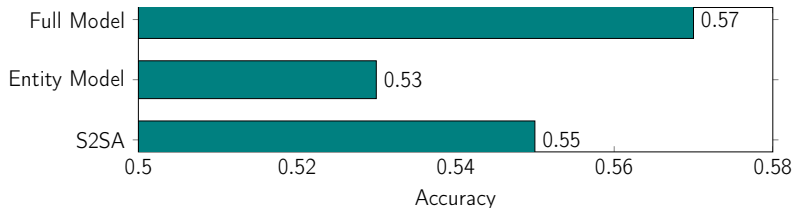
### Gold sentence:

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### Distractor sentence:

[She]<sub>1</sub> patted [its head]<sub>4</sub> and [it]<sub>2</sub> curled up outside [the cave]<sub>5</sub>.

### Sentence Selection Accuracy



# EVALUATION #3: HUMAN EVALUATION

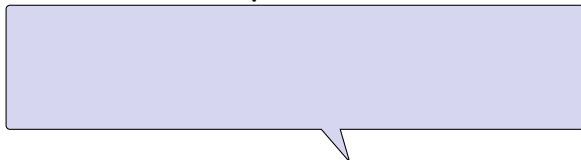
**Context**



**Full Model**

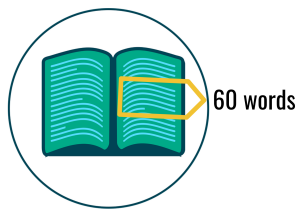
**S2SA Model**

**Explanation**



# EVALUATION #3: HUMAN EVALUATION

Context



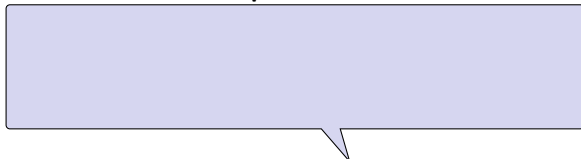
Full Model

27 passages

S2SA Model

23 passages

Explanation



# EVALUATION #3: HUMAN EVALUATION

## Context

Scared of us hoodlums, they are. Like we ever would touch 'em," and he spat on the pavement. "The big city gang go where we want, when we want, no stopping us," he stated proudly.

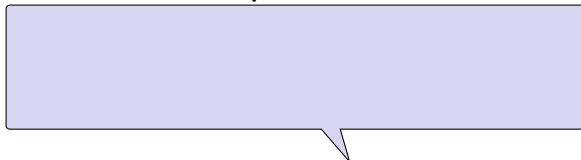
"These people here are all just sheep.

Baa, baa, one after the other.

**Full Model**

**S2SA Model**

## Explanation



# EVALUATION #3: HUMAN EVALUATION

## Context

Scared of us hoodlums, they are. Like we ever would touch 'em," and he spat on the pavement. "The big city gang go where we want, when we want, no stopping us," he stated proudly.

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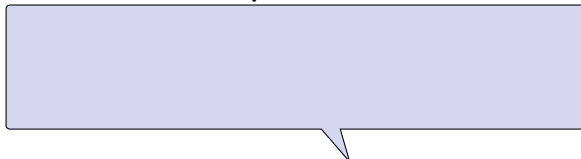
## Full Model

There is nothing I can do."

## S2SA Model

She didn't know what happened

## Explanation



# EVALUATION #3: HUMAN EVALUATION

## Context

Scared of us hoodlums, they are. Like we ever would touch 'em," and he spat on the pavement. "The big city gang go where we want, when we want, no stopping us," he stated proudly.

"These people here are all just sheep.

Baa, baa, one after the other.

## Full Model

There is nothing I can do."

## S2SA Model

She didn't know what happened

## Explanation

" 'She' isn't mentioned in the paragraph."



## EVALUATION #3: HUMAN EVALUATION

### Context

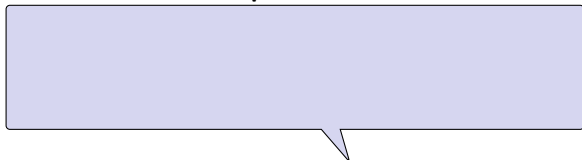
He was wearing brown slacks and a tan button-down shirt, with wool slippers. He looked about sixty, a little paunchy, with balding brown hair and a bushy mustache. Ice blue eyes observed Alejo keenly, then drifted over to Wara.

“Welcome to my home.” The man’s voice was deep and calm.

**Full Model**

**S2SA Model**

**Explanation**



# EVALUATION #3: HUMAN EVALUATION

## Context

He was wearing brown slacks and a tan button-down shirt, with wool slippers. He looked about sixty, a little paunchy, with balding brown hair and a bushy mustache. Ice blue eyes observed Alejo keenly, then drifted over to Wara.

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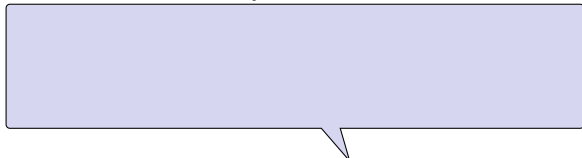
## Full Model

“I’m proud of you,” he said.

## S2SA Model

“What’s going on ?”

## Explanation



# EVALUATION #3: HUMAN EVALUATION

## Context

He was wearing brown slacks and a tan button-down shirt, with wool slippers. He looked about sixty, a little paunchy, with balding brown hair and a bushy mustache. Ice blue eyes observed Alejo keenly, then drifted over to Wara.

“Welcome to my home.” The man’s voice was deep and calm.

## Full Model

“I’m proud of you,” he said.

## S2SA Model

“What’s going on ?”

## Explanation

“The introduction makes the man sound like he is a stranger, so ‘I’m proud of you’ seems out of place.”

# FUTURE DIRECTIONS

- Deeper entity knowledge: social commonsense, modeling inter-entity relationships
- Structure in story generation: discourse structure, semantics, story structure
- New domains: news articles, recipes

*(Rashkin et al., 2018)*

*(Bosselut et al., 2018)*

THANK YOU!

## Questions?

eaclark7@cs.washington.edu

