PIE: A Parallel Idiomatic Expression Corpus for Idiomatic Sentence Generation and Paraphrasing

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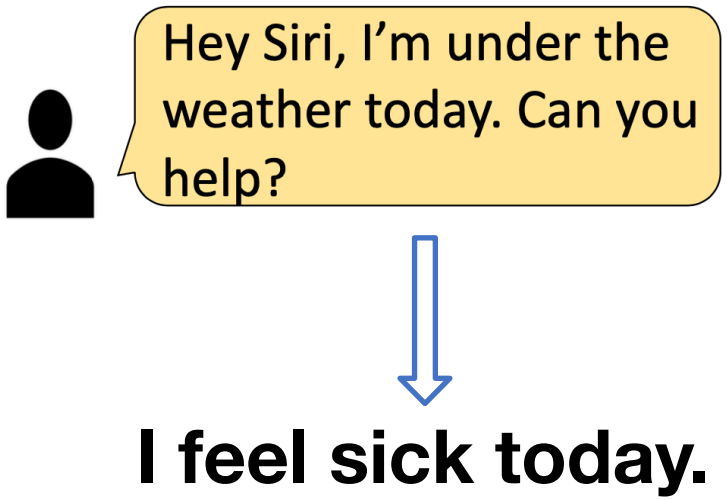
Outline

- Introduction
- Dataset
- Experiments

Introduction

Introduction



- Non-compositional
- Stylistic enhancement
- A ubiquitous part of daily language and social communication

Introduction

Joe , being one who is here today and gone tomorrow , stayed the night , ate some food and left early next morning .

Joe , being the bird of passage he is , stayed the night , ate some food and left early next morning.

Use of IEs often conveys stylistic enhancement and makes language more natural

Introduction

English	Vote them out!
Spanish	¡Vote para sacarlos!
Arabic	!التصويت لهم
Chinese	投票给他们！
Hindi	उन्हें वोट दें!
French	Votez-les!
German	Stimmen Sie sie ab!
Korean	투표하세요!
Russian	Проголосуйте за них!

Due to non-compositionality, Idiomatic Expressions (IEs) are difficult to process in NLP

Introduction

- **Motivation**

  1. Computer-aided style enhancement

  2. Combination of identification and paraphrasing as a preprocessing step

Introduction

Joe , being one who is here today and gone tomorrow , stayed the night , ate some food and left early next morning .

Idiomatic Sentence Generation (ISG)

Joe , being the bird of passage he is , stayed the night , ate some food and left early next morning.

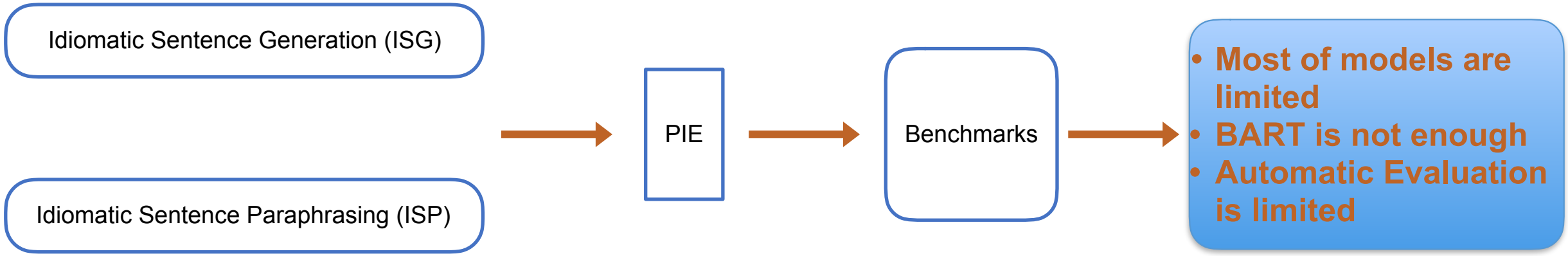
Introduction

Vote them out!

Idiomatic Sentence Paraphrasing (ISP)

Remove them from office!

Contribution



Task Definition

Idiomatic Sentence Generation

- Transform a literal sentence without idioms into a sentence with idiomatic expressions

Joe , being one who is here today and gone tomorrow , stayed the night , ate some food and left early next morning .

Joe , being the bird of passage he is , stayed the night , ate some food and left early next morning.

- Context surrounding the literal phrase will be retained
- Only literal phrase will be replaced with IE

Idiomatic Sentence Paraphrasing

- Transform idiomatic expressions within a sentence into literal expressions.

Joe , being the bird of passage he is , stayed the night , ate some food and left early next morning.

Joe , being one who is here today and gone tomorrow , stayed the night , ate some food and left early next morning .

- Most context surrounding IEs will be retained
- Only IEs will be replaced with literal counterparts
- Semantic simplification instead of syntactic or lexical simplification

Dataset

Data

Idiom	Tick Off	
Sense	to complete an item on a list	to make someone angry or offended
Idiomatic Sentence	I would like to tick off some more items on my list before going home	My decision is going to tick off my entire family.
Idiomatic Labels	O O O O **B I** O O O O O O O O O	O O O O O **B I** O O O.
Literal Sentence	I would like to cross out some more items on my list before going home	My decision is going to anger my entire family.
Literal Labels	O O O O **B I** O O O O O O O O O	O O O O O **B** O O O.

- IEs
- Definitions
- Sentences with IEs
- Position information about IEs
- Sentences with literal expressions
- Position information about literal expressions

Data

- Idiom-oriented
- Longer sentences
- Most contexts same but target parts different

Pose challenges to the text generation models performing the proposed tasks.

Statistics	# of instances	Avg. # of words
Idioms	823	3.2
Sense	862	7.9
Idiomatic sent	5170	19.0
Literal sent	5170	18.5

Experiments

Baselines

- Both new tasks are text generation tasks

- High similarity
- Much context is unchanged

- State-of-the-art performance of BART

- Our tasks are similar to paraphrasing and style transfer
- Good performance of pipeline model

Translation Models

- Seq2Seq-LSTM
- Transformer

Copy Models

- Seq2Seq-LSTM + Copy
- Transformer + Copy

BART

Pipeline Model

1. **Retrieve: Select Idiom**
2. **Delete: Remove idiom or literal phrase**
3. **Generate: Insert literal phrase or idiom**

Evaluation

Automatic Evaluation:

- ROUGE, BLEU, METEOR
- SARI
- Perplexity and GRUEN

Human Evaluation:

1. Context Preservation
2. Target Inclusion
3. Fluency
4. Overall

Results & Analysis

Results

- ISG & ISP:
  - Copy-enriched transformer, pretrained BART and Pipeline model
  - BART model achieved best performance in BLEU and GRUEN
  - Pipeline model achieved best performance in SARI

- High scores are due to the high similarity between idiomatic sentences and literal sentences

Model	BLEU		SARI		GRUEN	
	ISP	ISG	ISP	ISG	ISP	ISG
Transformer with copy	59.56	57.91	39.93	45.10	59.27	52.25
Pretrained BART	**79.32**	**78.53**	62.30	61.82	**77.49**	**78.03**
Pipeline	65.56	70.03	**67.64**	**62.45**	67.27	74.16

Results

- Limitation
  - Mainly measure overlapping tokens, some synonymous idioms or literal phrases are ignored while they are still appropriate
  - IEs are non-compositional, which will have high perplexity scores

Results

- Overall inter-annotator agreement score is 0.76

- Human Evaluation:
  - BART best-performing model in Context Preservation and Fluency

  - Pipeline best-performing model in Target Inclusion and Overall

Model	Context		Target		Fluency		Overall	
	ISP	ISG	ISP	ISG	ISP	ISG	ISP	ISG
Transformer with copy	5.4	5.3	1.2	1.6	4.6	4.6	3.9	4.2
Pretrained BART	**5.9**	**5.9**	1.5	2.1	**5.9**	**5.9**	4.4	5.0
Pipeline	5.6	5.8	**1.7**	**2.2**	5.1	5.3	**4.5**	**5.1**

Limitation of Automatic Evaluation

- Correlation scores between automatic evaluation and human judgements are not high enough.

Corr	Context		Target		Fluency		Overall	
	ISP	ISG	ISP	ISG	ISP	ISG	ISP	ISG
BLEU	0.27	0.17	0.56	0.28	0.09	0.02	0.64	0.29
SARI	0.21	0.17	0.61	0.40	-0.02	-0.01	0.61	0.39
GRUEN	-0.18	-0.07	-0.11	0.12	0.23	0.15	-0.18	0.11

Model Comparison

- Copy mechanism benefit from the ability of explicitly retaining the context

- BART and Pipeline model greatly outperform other baselines
  - BART leveraged large pretrained corpora.
  - Pipeline model utilized the selective idiomatic expression information.

Model	BLEU		SARI		GRUEN	
	ISP	ISG	ISP	ISG	ISP	ISG
Seq2Seq	25.16	42.96	24.13	33.89	32.25	33.45
Seq2Seq with copy	38.02	47.58	43.02	49.69	27.79	32.84
Transformer	45.58	46.65	36.67	38.62	44.05	44.06
Transformer with copy	59.56	57.91	39.93	45.10	59.27	52.25
Pretrained BART	**79.32**	**78.53**	62.30	61.82	**77.49**	**78.03**
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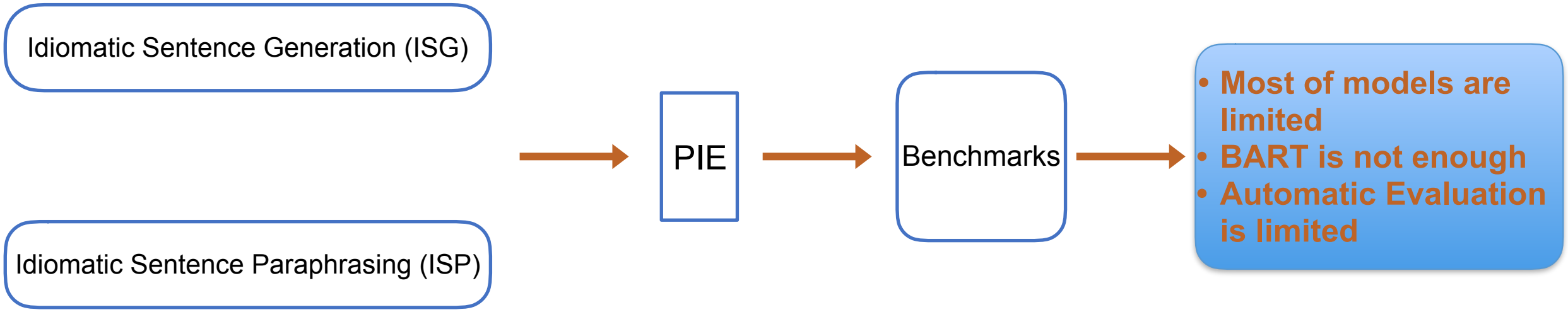
Model Comparison

- BART:
  - Better at retaining the contexts surrounding idiomatic expressions
  - Better at copying instead of inserting idioms or literal paraphrases.

- Pipeline:
  - Because of retrieve and delete stage, pipeline model is better at including target idioms or literal phrases.
  - Suffer from error propagation.

Attribute	low non-compositionality
Literal sentence	Finding the ruins of Babylon was the archaeologist 's greatest find .
Reference	Finding the ruins of Babylon was the archaeologist 's treasure trove .
Seq2Seq	Missing the aftermath of pouring down the cake 's share of the city .
Transformer	catching up with silver lining of the challenges 's volatility .
Seq2Seq with copy	finding the ruins of unk was the 's 's trove .
Transformer with copy	finding the ruins of babylon was the archaeologist 's greatest silver spoons .
Pretrained BART	Finding the ruins of Babylon was the archaeologist's greatest find.
Pipeline	Finding the ruins of babylon was the archaeologist' treasure trove.

Summary


Idiomatic Sentence Generation (ISG)
Idiomatic Sentence Paraphrasing (ISP)
PIE
Benchmarks
• Most of models are limited
• BART is not enough
• Automatic Evaluation is limited

Q&A

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