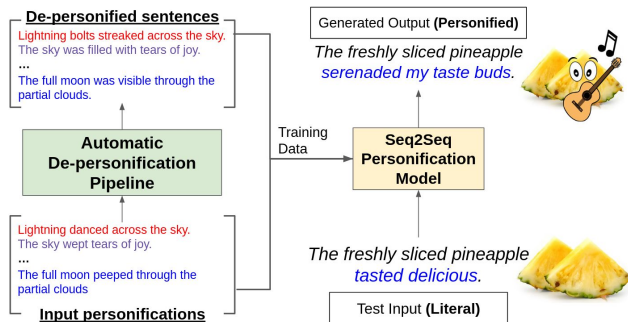# PINEAPPLE: Personifying INanimate Entities by Acquiring Parallel Personification data for Learning Enhanced generation

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(1) Background

- Personification is the attribution of animate actions or characteristics to an entity that is inherently inanimate.
- **Task:** Given a literal sentence, convert the sentence to one containing a personification
- Personification generation is useful for:
  - Dialogue systems
  - AI-assisted creative writing
- **Challenges:**
  - Personifications have no fixed structure (unlike similes)
  - Requires us to be able to successfully model animacy

De-personified sentences

Lightning bolts streaked across the sky.
The sky was filled with tears of joy.
...
The full moon was visible through the partial clouds.

Automatic De-personification Pipeline

Lightning danced across the sky.
The sky wept tears of joy.
...
The full moon peeped through the partial clouds

Input personifications

Training Data → Seq2Seq Personification Model

Generated Output (Personified)
The freshly sliced pineapple serenaded my taste buds.

The freshly sliced pineapple tasted delicious.

Test Input (Literal)

(2) *PersonifCorp* Dataset

- 511 diverse personifications
- Gathered from various sources
  - *CL Prior Art (e.g. Deja Image Captions Datast (Chen et al., 2015))
  - Kaggle/SemEval datasets
- Test set: Human-annotated list of (literal, personification) pairs

Original Personification	Result After De-Personifying
How far that little candle throws its beams!	How far that little candle can spread its beams!
A book is a fragile creature, it suffers the wear of time, it fears rodents, the elements and clumsy hands.	A book is fragile, it can break from the wear of time, it can be eaten by rodents, the elements and clumsy hands.
The camera loves her since she is so pretty.	The camera is always on her since she is so pretty.
Any trust I had for him walked right out the door.	Any trust I had for him had gone right out the door.
The full moon peeped through partial clouds.	The full moon was visible through partial clouds.
Opportunity was knocking at her door.	Opportunity was knocking at her door.
The killing moon will come too soon.	The killing moon will be here too soon.

(3) Automatic Parallel Corpus Creation

This "de-personification" pipeline has 3 main steps, outlined below:

1. **TOPIC-ATTRIBUTE Extraction**
   - TOPIC = a noun phrase that acts as a logical subject
   - ATTRIBUTE = the distinctly animate action or characteristic that is being ascribed to the TOPIC
   - Dependency parse trees + iterative merging algorithm to determine the TOPICs and ATTRIBUTEs of a given sentence.

ATTRIBUTE Type	Example
Noun	The planet earth is our mother.
Verb	My alarm clock yells at me to get out of bed every morning.
Adjective	Justice is blind and, at times, deaf.

2. **Candidate Generation**
   - Filter out the animate TOPICs, and keep only the inanimate TOPICs
   - How to determine which TOPICs are inanimate? → Use COMET's (Bosselut et al., 2019) ConceptNet relations (Speer et al., 2017) as a proxy for animacy.
     - Specifically, use the IsA(x, "person") relation
   - Mask out the ATTRIBUTE and use BART to generate the top k=10 candidate replacements
   - E.g. "She did not realize that opportunity was knocking on her door" →"She did not realize that opportunity <mask>"

3. **Candidate Selection**
   - Given k=10 replacement candidates, design a ranking system to select the most appropriate candidate:
     a. Animacy – use COMET's CapableOf relation
     b. Fluency – user BART's generation scores
     c. Meaning Preservation – use BERTScore(original, new)
     $$S_i = \alpha \cdot (-\log(S_{anim.})) + \beta \cdot S_{flue.} + \gamma \cdot S_{mean.}$$
   - Select candidate with highest composite score (defined above).

(4) Models

1. **COMET** – No training at all. Use COMET's IsA, CapableOf relations to generate and rank candidates personification replacements.
2. **Baseline-BART** – Similar to COMET except use BART to generate the candidate replacements.
3. **PINEAPPLE-BART** – Our proposed model; seq2seq training with personification+literal training pairs

(5) Results

Automatic metrics:
- BLEU and BERTScore – for meaning preservation
- Fluency – generation losses (log perplexity) using GPT2
- Animacy – use COMET's CapableOf relation scores

	BLEU		BERTScore		Fluency ↓	Animacy
	Input	Gold	Input	Gold		
Human Annotation	0.172	1.000	0.749	1.000	5.264	0.332
COMET	0.127	0.128	0.655	0.569	6.366	-2.028
BL-BART	0.132	0.133	0.728	0.617	**4.573**	0.106
PA-BART	**0.153**	**0.160**	0.748	**0.636**	5.460	**0.679**

Human evaluation metrics: personificationhood, appropriateness, fluency, interstingness, meaning preservation (all rated on a scale of 1-5).

	Personificationhood	Appropriateness	Fluency	Interestingness	Meaning Preservation
Human Annotation	3.763	4.175	4.138	3.667	3.913
COMET	3.525	3.563	3.738	1.801	3.550
BL-BART	3.500	3.938	**4.188**	2.006	3.750
PA-BART	**3.738**	**4.000**	4.138	**2.782**	**3.875**

(6) Sample Outputs

Literal Input	In most horror settings, silence is key. (ex.2)
Human Ref	In most horror settings, silence is the protagonist.
COMET	In most horror settings, silence scary.
BL-BART	In most horror settings, silence is preferred.
PA-BART	In most horror settings, silence is a ghost.
Literal Input	The sound hit Frank loud enough to make your ear hurt (ex.6)
Human Ref	The sound slapped Frank loud enough to make your ear hurt
COMET	The sound echo Frank loud enough to make your ear sense sound
BL-BART	The sound of Frank Sinatra is loud enough to make your ear ring.
PA-BART	The sound clapped loud enough to make your ear cry
Literal Input	It was a moonless nights, the air was still and the crickets were silent (ex.5)
Human Ref	It was a moonless nights, the air was asleep and the crickets were silent
COMET	It cold outside a moonless nights, the air cold outside still and the crickets noisy
BL-BART	It was a moonless nights, the air was still and the crickets were calling.
PA-BART	It was one of those moonless nights, the air was tired and the crickets were silent

- Can generate multiple ATTRIBUTE types: noun ("a ghost"), verb ("cry"), and adjective ("tired")
- Can replace multiple segments in a single sentence (2nd example)