

QuaSE: Sequence Editing under Quantifiable Guidance

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Image Style Transfer



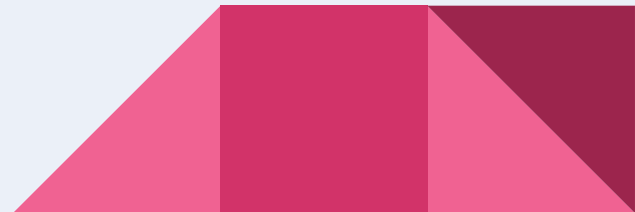
Text Style Transfer

- Style and content are abstract concepts in text !
- Sentiment, tense, writing style (formal/informal), topic
- Why? Constrained sentence generation, post-editing
- This work: Sentiment polarity / user rating (from reviews)

Outcome	Sentence
1.0	This food is terrible
3.1	This food is OK
4.5	This food is delicious

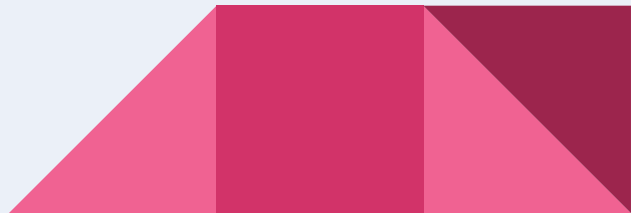
Challenges

- No parallel data available for transferring style
- Model should be able to perceive the association b/w outcomes and relevant words
- Edit only the “outcome” words; not the “content” words
- Only have [sentence : outcome] data

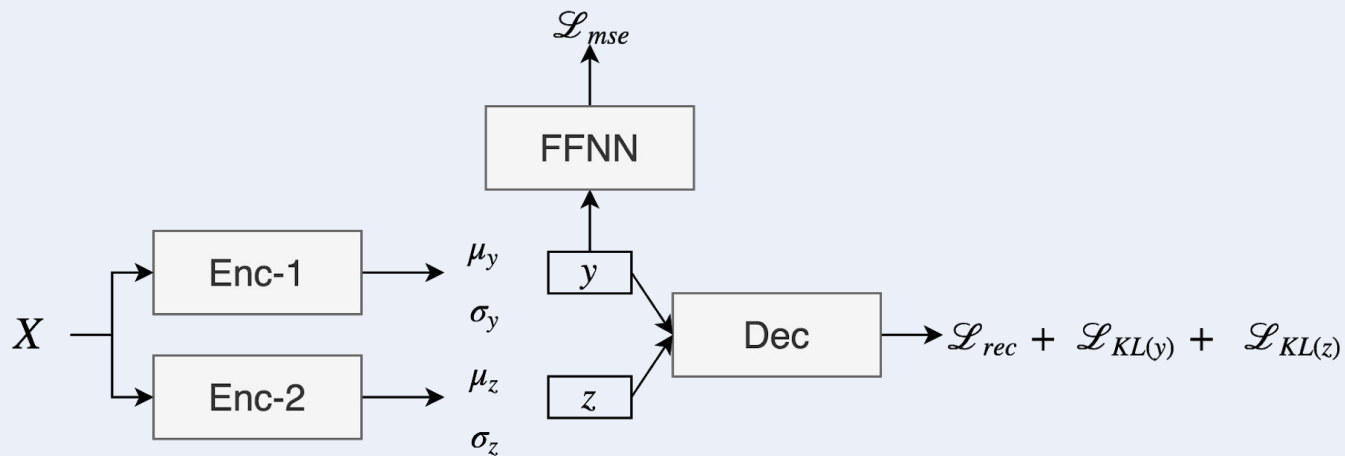


Problem Definition

- Input Sentence: X_0
- Target outcome: R^*
- Generate a new sentence X^* that satisfies R^* with high probability



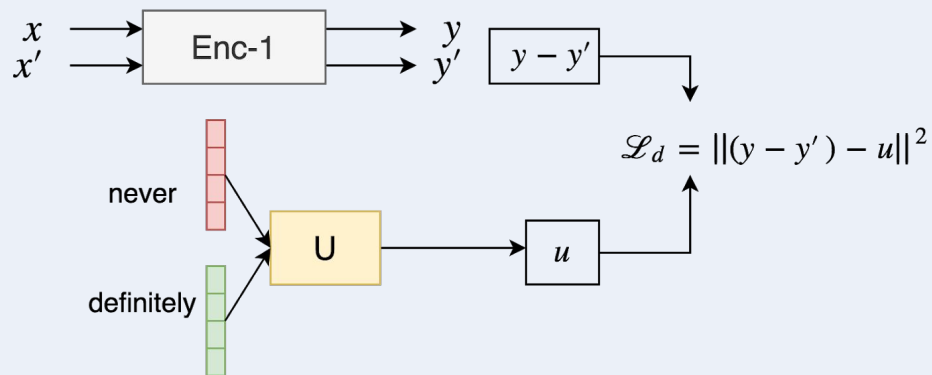
Modeling Single Sentences



Modeling Pseudo-Parallel Sentences

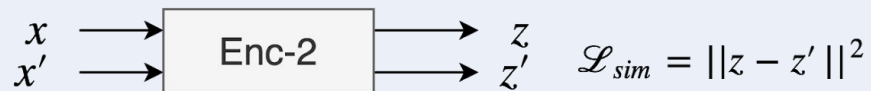
x	I will never come back to the restaurant.
x'	I will definitely come back to the restaurant, recommend!

Modeling outcome differences



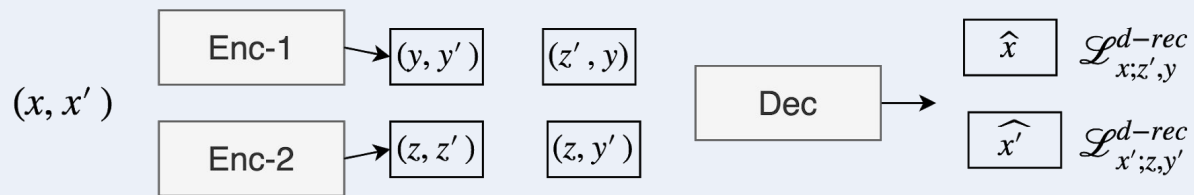
Modeling Pseudo-Parallel Sentences

Modeling content similarity



Modelling Pseudo-Parallel Sentences

Dual Reconstruction

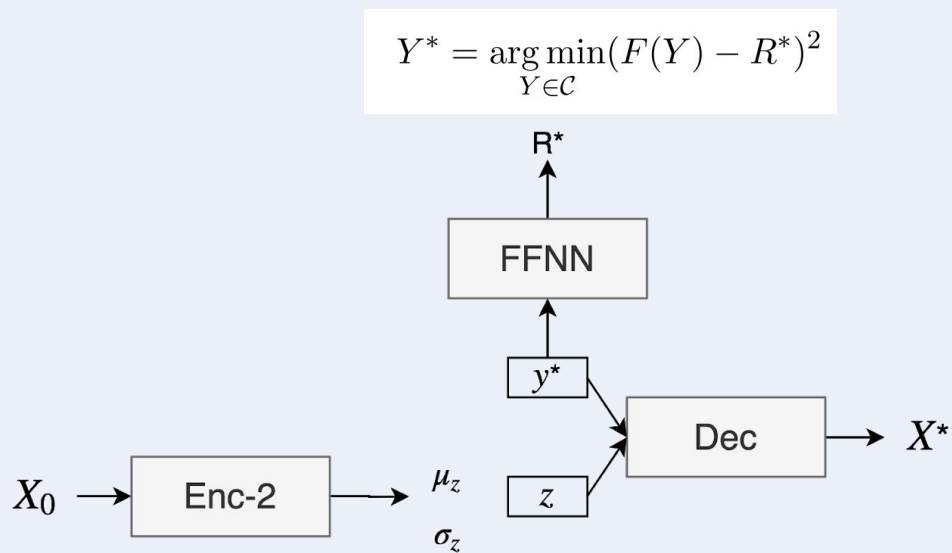


Joint Training

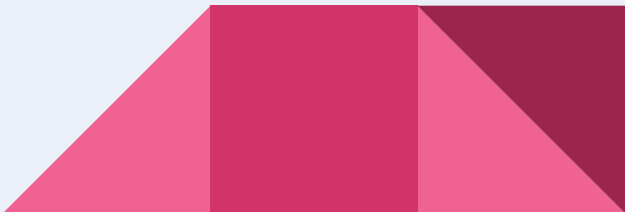
$$\mathcal{L}_{joint} = \lambda_{rec} \mathcal{L}_{rec} + \lambda_{kl} \mathcal{L}_{kl} + \lambda_{mse} \mathcal{L}_{mse} + \\ \lambda_{diff} \mathcal{L}_{diff} + \lambda_{sim} \mathcal{L}_{sim} + \lambda_{d-rec} \mathcal{L}_{d-rec}$$

Inference

- Recap Objective: Generate a new sentence X^* that satisfies R^* with high probability



Experiments

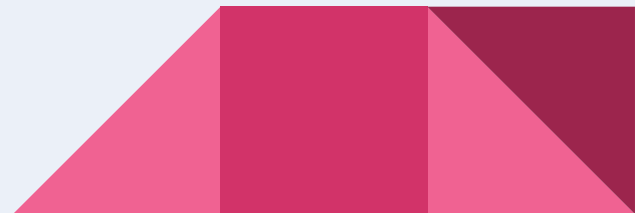
- Yelp Dataset - but the ratings are for each review
 - CoreNLP Sentiment Analyzer to obtain sentence level ratings (sentiment)
 - Since ratings given by different users may not be consistent
 - Preparation of pseudo-parallel sentence data from corpus:
 - Jaccard Similarity ≥ 0.5
 - Keep only sentences whose difference in rating ≥ 2
- 

Evaluation

- Metrics: Mean absolute error (based on the CoreNLP predicted sentiment of the generated sentence)

$$MAE = \frac{1}{|S|} \sum_{X_i \in S} |R_i - R^*|$$

- Edit Distance between the original and revised sentence
- Baselines:
 - Sequence to Better Sequence (Mueller+ 2017)
 - Text Style Transfer (Shen+ 2017)



Results

	MAE					Edit Distance				
	T=1	T=2	T=3	T=4	T=5	T=1	T=2	T=3	T=4	T=5
Original	2.2182	1.2379	0.8259	0.9279	1.7818	N/A	N/A	N/A	N/A	N/A
S2BS	1.6839	0.9444	0.7567	0.7572	1.3024	6.6439	5.342	4.9390	5.005	6.2290
Our Model	1.4162	0.6298	0.7408	0.5377	0.9408	7.9191	4.7	3.4505	4.13	8.0094

Table 3: MAE and **Edit Distance** for our proposed model and S2BS. T refers to the target outcome.

Results

	Neg. to Pos.	Pos. to Neg.
TST	0.7280	0.7097
Our Model	0.8836	0.7862

Table 4: Accuracy comparison with TST.

	Content Preservation (Range: [0, 2])	Fluency (Range: [1, 4])
TST	1.02	2.56
S2BS	0.70	2.53
Our Model	1.38	2.48

Table 5: Manual evaluation.

Case Study

	Generated sentence
E.g. 1	this tire center is amazing .
T=1	this tire center is horrible .
T=3	this tire center is really good .
T=5	this tire center is amazing .
E.g. 2	horrible food !
T=1	horrendous
T=3	their food amazing !
T=5	amazing delicious food ! recommend !
E.g. 3	decent food and wine selection , but nothing i will rush back for .
T=1	decent food and wine selection , but nothing i will rush for no .
T=3	decent food and wine selection , but i will never look back for .
T=5	decent food and wine selection , but excellent service, will return !
E.g. 4	our first time and we had a great meal , wonderful service .
T=1	our first time and we had a terrible meal , stale service .
T=3	our first time and we had a great meal , we have service .
T=5	our first time and we had a great meal , wonderful service .
E.g. 5	food is very addiction tasty !
T=1	food is just horrible here ?
T=3	food is just addiction here !
T=5	food is very yummy addiction !

Thank You

Questions?

