



# Digital “Mad Men”: Training RNN as an Ad Copywriter

Christina Lin, Paul Shved, Sridatta Thatipamala

CS224N Spring 2019

## Problem

Can we use neural style transfer for text to generate short text ads, given a set of keywords?

Generating ad copy can improve efficiency of a **\$100B+ industry!**

Natural language generation challenges:

- Should sound grammatical/realistic
- Should not be generic or boring sentences
- Should contain the keywords that we want to include

Existing approaches:

- Language modeling: generic output, not much control over output
- **Prototype-then-edit [2]:** transfer new content to an existing “prototype” sentence

We investigated the prototype-then-edit approach

## Data

### Prototype sentences

277,228 one-sentence Amazon product reviews.

Examples:

- “It’s easy to use and easy to clean out too”
- “These Pyrex dishes were are great buy for the price”
- “Great for the price”

### Ad keywords

814 keyword phrases of 1-2 words each. Used to synthesize edits to the prototype sentence

Examples:

- “car loans”
- “life insurance”
- “holiday quotes”

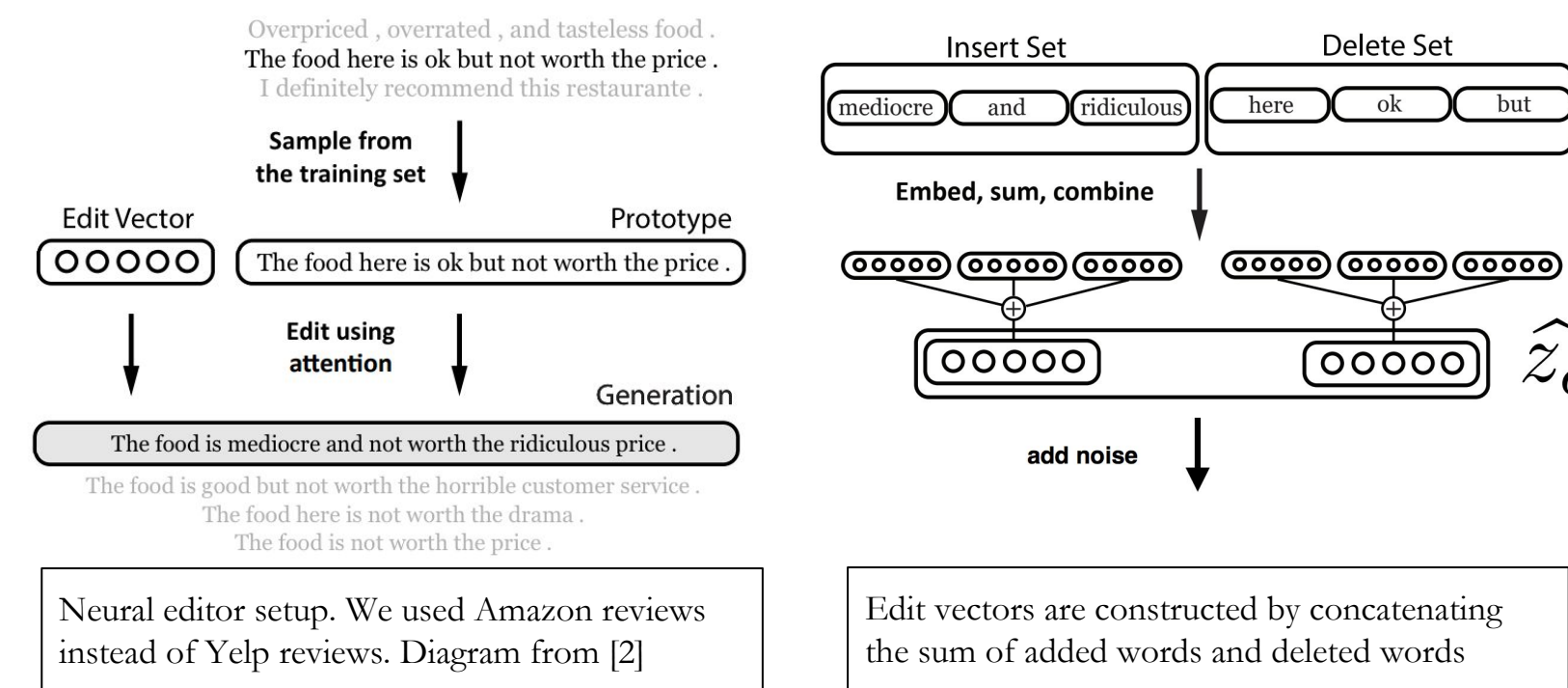
### References

- [1] Zhenxin Fu, Xiaoye Tan, Nanyun Peng, Dongyan Zhao, and Rui Yan. Style transfer in text: Exploration and evaluation. In *Thirty-Second AAAI Conference on Artificial Intelligence*, 2018.
- [2] Kelvin Guu, Tatsunori B. Hashimoto, Yonatan Oren, and Percy Liang. Generating sentences by editing prototypes. *CoRR*, abs/1709.08878, 2017.

## Approach

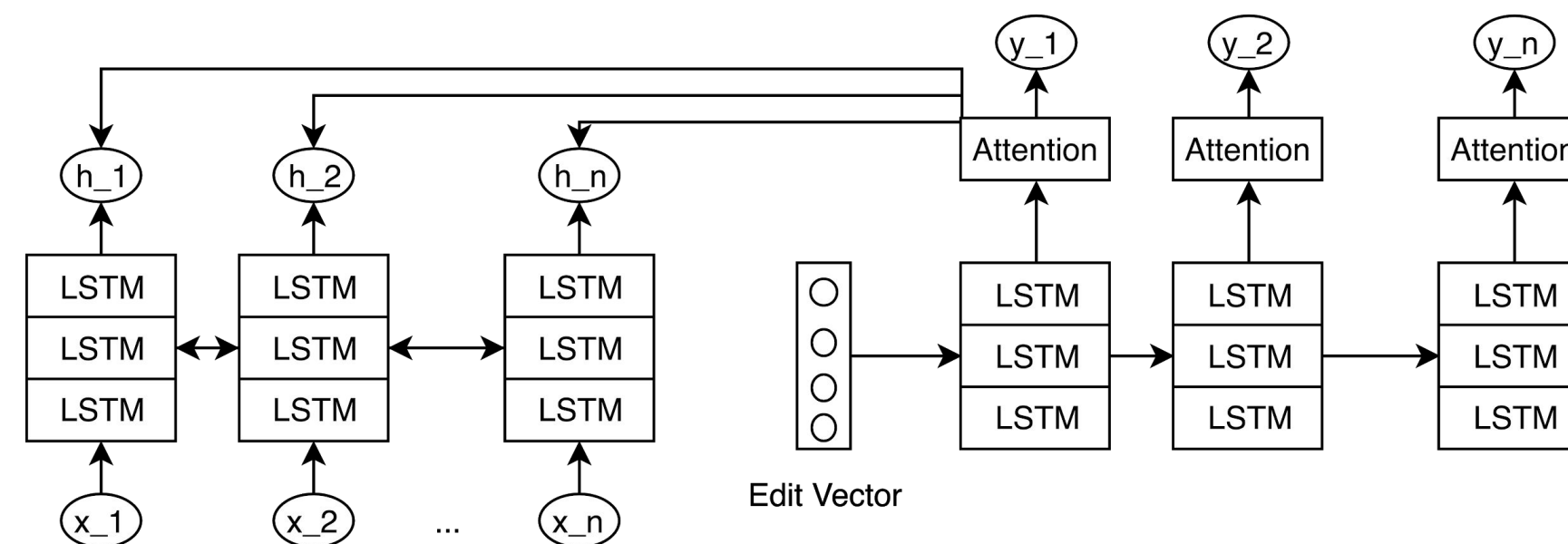
### Task

Train a “neural editor” that accepts a prototype sentence and an “edit vector,” and applies the edit to the sentence.



### Model

Seq2Seq architecture. 3-layer BiLSTM encoder. 3-layer LSTM decoder with source attention, conditioned on edit vector



### Training

Pairs of Amazon reviews with Jaccard similarity of  $\geq 0.4$

Source	Edits	Target
Not bad for the price	Add: {"not", "bad"} Delete: {"great", "headset"}	Great headset for the price

### Inference

For each Keyword, randomly sample 1,000 Reviews, decode, select best.

Source	Edits	Desired Target
Great for the price	Add: {"car", "insurance"}	Great car insurance for the price

## Results

Only about 2,3% of results produced desired edits

Source	Edits	Actual decoded target
one rug now has an odd nap to it that makes it harder to vacuum	Add {"cookware"}	mine has this complicated <unk> <b>carafe</b> that makes it harder to do
to my surprise , you can invent a better shower curtain ring , and this is it	Add {"keyboard"}	to my surprise , the <b>keyboard</b> is very nice , and more importantly to charge easily

Most results

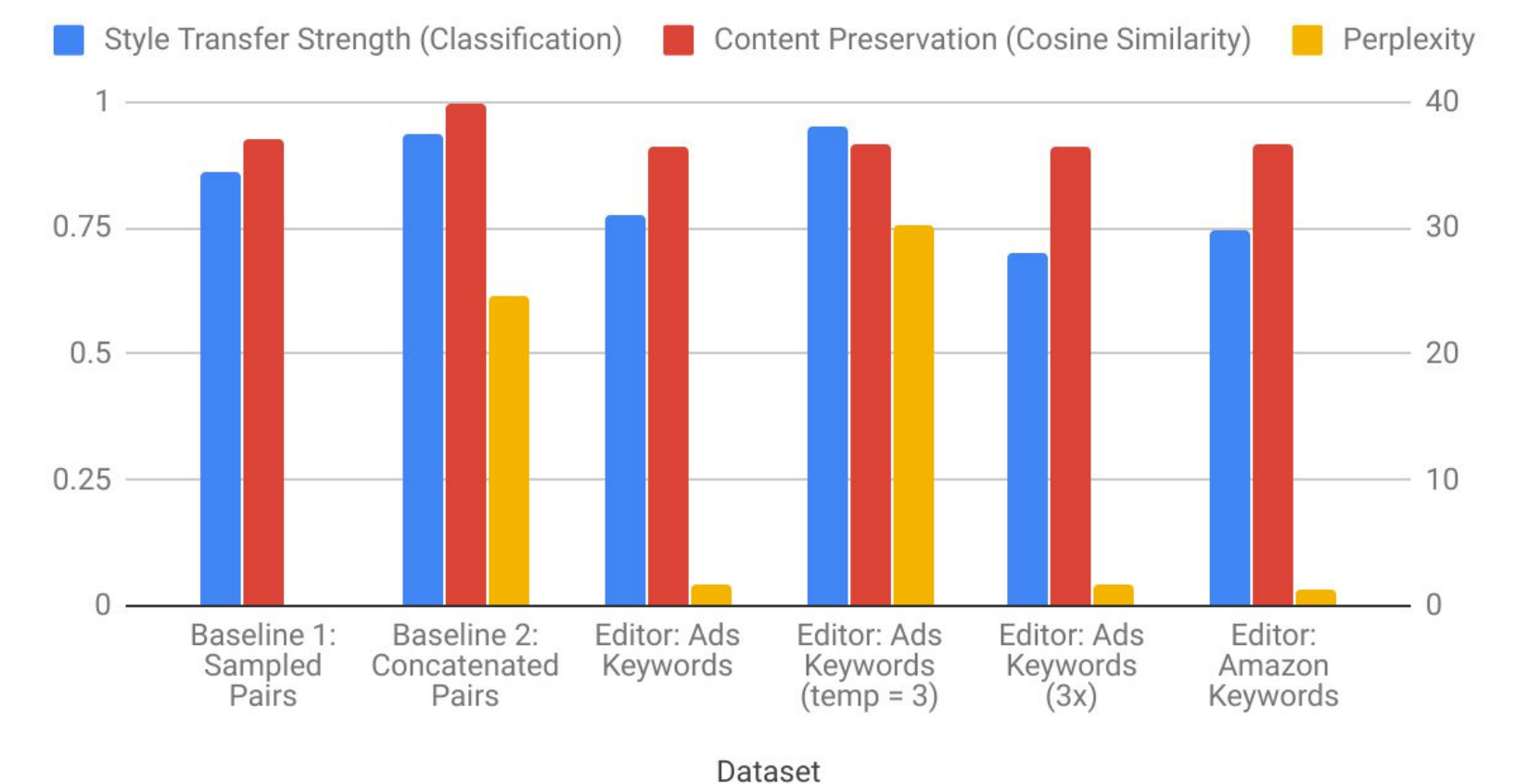
- Achieved style transfer
- Did not actually add keywords

Source	Edits	Actual decoded target
not only is this my favorite whisk , it is truly well made	Add {"stock", "quotes"}	you won t regret these additions to your kitchen , it is industry worth
i have used this headset for a couple of years now and it still works great	Add {"auto", "loans"}	have had it for a couple of months
it s also extremely durable and should last forever if you take care of it	Add {"home", "equity"}	it s also a heavy weight pan so it should last forever if you take care of it

## Analysis

- We can trade off one metric for the other, but we can not achieve all
- Baseline #2 performs well

### Style Transfer Metrics



Quote: “when it didn’t help, it didn’t help, stop, it just didn’t help”