Digital "Mad Men": Training RNN as an Ad Copywriter

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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"
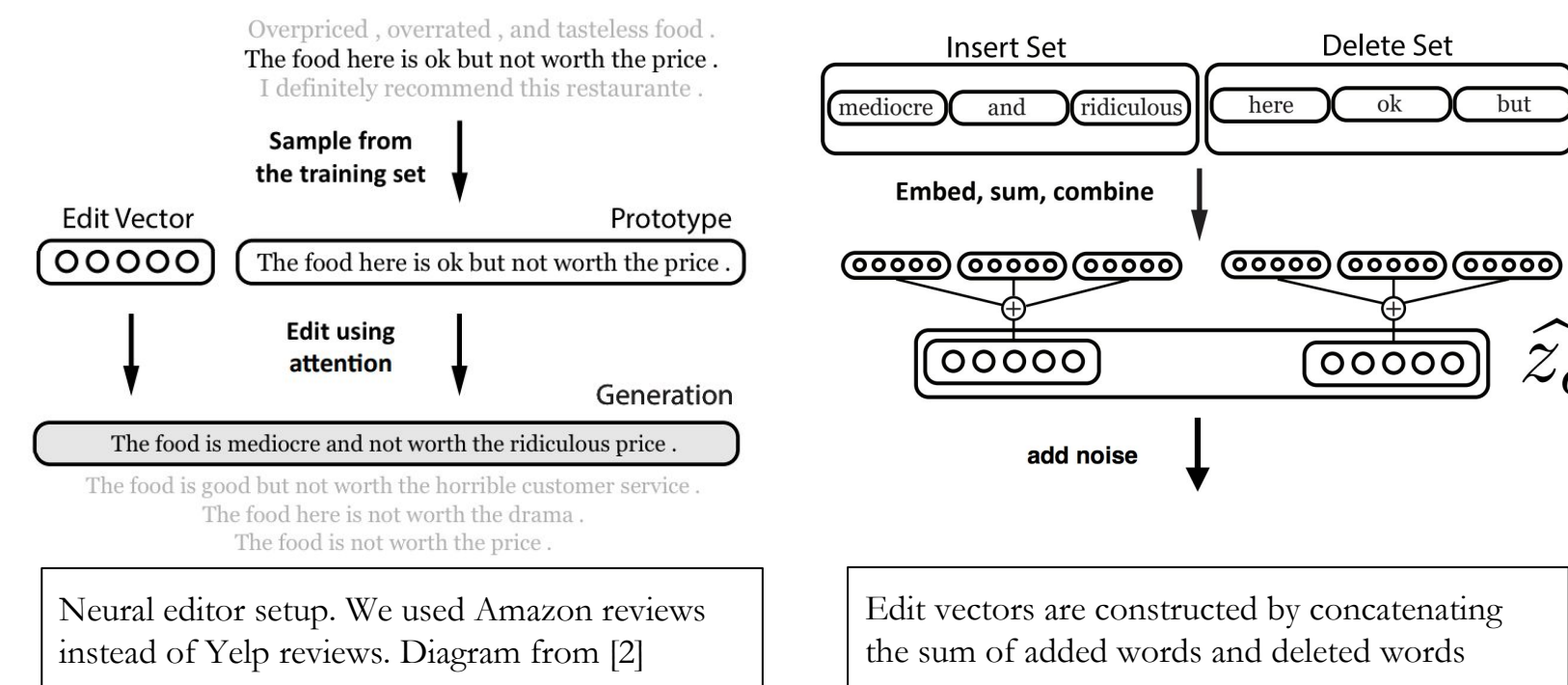- "holiday quotes"

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.

Neural editor setup. We used Amazon reviews instead of Yelp reviews. Diagram from [2]

Edit vectors are constructed by concatenating the sum of added words and deleted words

Model
Seq2Seq architecture. 3-layer BiLSTM encoder. 3-layer LSTM decoder with source attention, conditioned on edit vector
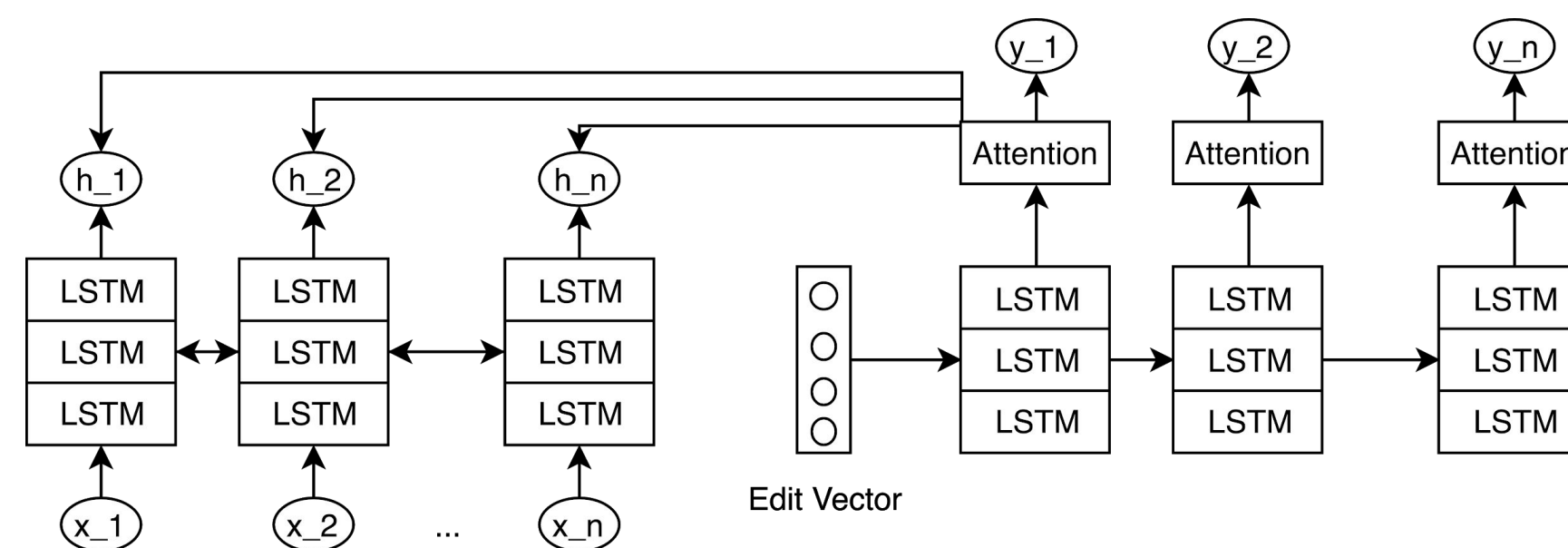
Training
Pairs of Amazon reviews with Jaccard similarity of >= 0.4

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> **carafe** 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 **keyboard** 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
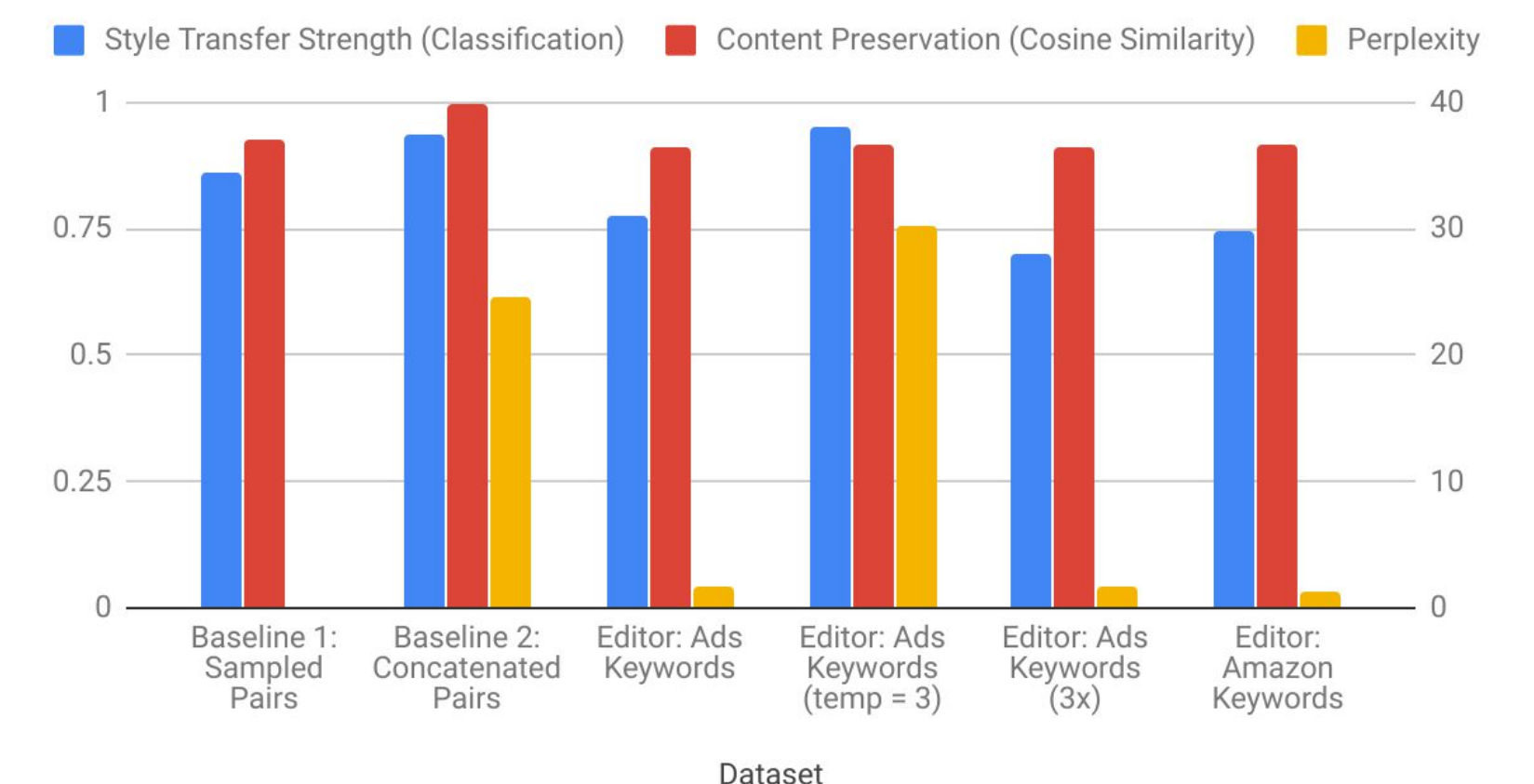
Quote: ***"when it didn't help, it didn't help, stop, it just didn't help"***