Robust Text Classifier on Test-Time Budgets

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Motivation

Great location but the food is not

Five stars for getting what you pay for here. The food is good and the price is affordable. A great location right off Wilshire, very clean inside, and family friendly. The menu has more than burgers which is great. The steak sandwiches are delicious as well, I favor the teriyaki. The ahi is pretty good too and usually seared just perfectly. Also the salads aren't that bad as well. The soda fountain is the usual at places like this. This place has two signature drinks which are pretty refreshing, cucumber and strawberry.

Kai-Wei Chang (http://kwchang.net)
Motivation

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Kai-Wei Chang (http://kwchang.net)
intuition

A single text classifier for various test-time budgets
<table>
<thead>
<tr>
<th>Business</th>
<th>Telecom Austria taps the Bulgarian market. <strong>Telecom</strong> Austria, Austria's largest telecoms operator, obtained ..</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sci/Tech</td>
<td>.. Reuters - <strong>Software security</strong> companies and handset makers, including Finland’s Nokia (NOK1V.HE), are ..</td>
</tr>
</tbody>
</table>

**Document Classification**

Kai-Wei Chang (http://kwchang.net)
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Kai-Wei Chang (http://kwchang.net)
A Meta Selector-Classifier Framework

1. How to build an effective/efficient selector

Selector

Budget (selection rate)

Great location but the food is not

Text Classifier

Original input sentence

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2. How to train a robust classifier?

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End-to-End Training for WE Selector

- Selector has to be light-weight
- We consider a selector based on word-embedding
  - $P(\text{word } x \text{ is selected}) = \sigma(\theta^T \vec{x})$
- End-to-end training [Lei et al. (2016)]
- L1-regularizer to encourage sparsity

Key Challenges - Fractured Texts

- Text classifier is not trained to deal with fractured texts

![Diagram showing text classification accuracy and test time](image-url)
Training a Robust Classifier with Data Aggregation

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Selector A
Great location but food is not

Selector B
food is

Selector C
Great but the not

Aggregated corpus
Great but
but not
location is
food is
Great but
but the
is

Text Classifier
Train

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An Alternative Selector

- L1-regularized Bag-of-Words Model

\[ \theta^* = \arg\min_{\theta} \sum_{(x,y)} \log (1 + \exp(-y \theta^T \cdot \vec{x})) + \frac{1}{b} ||\theta||_1 \]

\( b \): selection rate

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Related Work

- Skip/Skim unimportant Text
  - Skip-RNN [Campos et al., 2017]
  - Skim-RNN [Seo et al., 2018]
- Our approach is agonistic to text classifier

- Model Compression [Bucila et al., 2006]
Experiment Setting

- Datasets: SST-2, IMDB, AGNews, and Yelp
- Classifiers: LSTM, BCN [McCann et al., 2017]
- Aggregate corpus from both selectors:
  - Selection rate = \{50\%, 60\%, 70\%, 80\%, 90\%, 100\%\}
Error Rate v.s. Test-Time

![Graphs showing error rate vs. test-time for IMDB and AGNews datasets.]

IMDB

AGNews

See our paper for more results

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Conclusion

- We present a selector-classifier meta framework for building efficient text classifier
- We propose efficient selectors and data aggregation scheme to train classifiers that are compatible with fractured text selected at any rate.

Source codes are available at:
https://github.com/uclanlp/Fast-and-Robust-Text-Classification

Thanks!!!!