

Exploiting off-topic Sentences for Review Sentiment Analysis

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Overview

- Introduction
 - Off topic sentences in review sentiment analysis
 - Comparative demonstrations in off topic sentences
- Proposed Model
- Experiments
- Conclusions

Review sentiment analysis

- Review sentiment analysis (*Pang and Lee, 2005; Lerman et al., 2009; Hu and Liu, 2004; Titov and McDonald, 2008*)



- Task: predicting users' sentiment using their review texts.
- Approach: use words in review texts as sentiment indicators (*Pang and Lee 2005*)
 - E.g. "good" is an indicator of positive sentiment
 - E.g. "bad" is an indicator of negative sentiment

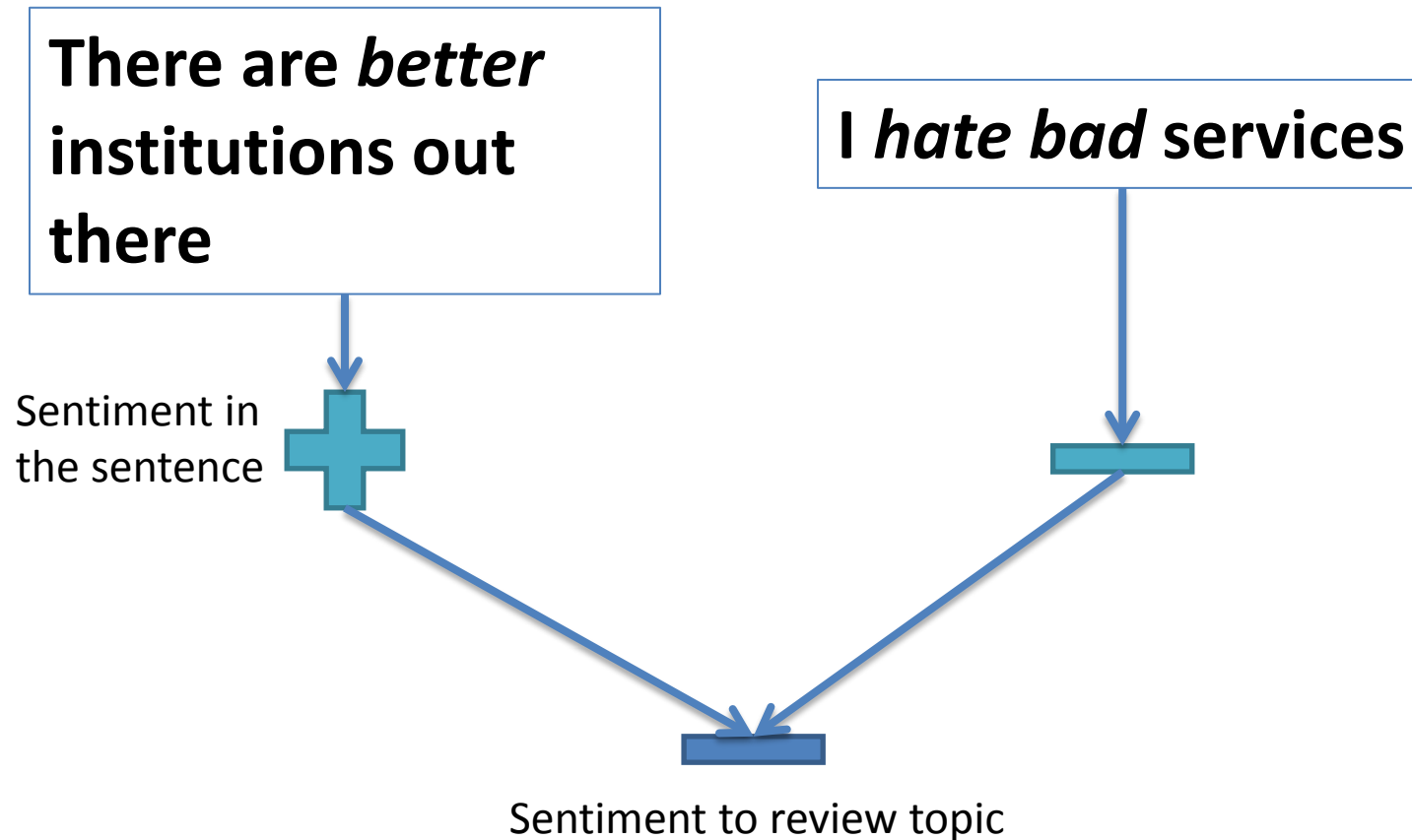
Off-topic sentences in review sentiment analysis

- Off-topic sentences introduces complications:
 - Off-topic sentences: sentences not directly talking about the main topic (e.g. product).
 - Sentiments in off-topic sentences don't have consistent contributions to review sentiments:
 - Sometimes the sentiment is consistent with the topic
 - E.g. I **hate bad** services.
 - Sometimes the sentiment is the opposite:
 - E.g. There are **better** institutions out there .
 - Around 40% of review sentences are off-topic (*Toprak et al. 2010*)

Off-topic sentences in review sentiment analysis (cont.)

- How do we use off-topic sentences for sentiment?
 - Discard them (*Hurst et al. 2004, Zhai et al. 2011*)
 - Lose valuable sentiment information (40% sentences)
 - Use them
 - Treat them the same as on-topic sentences (*Titov et al. 2008*)
 - Problem: Off-topic sentences may contain both the same or opposite sentiment of the overall review sentiment
 - Treat them differently
 - How?

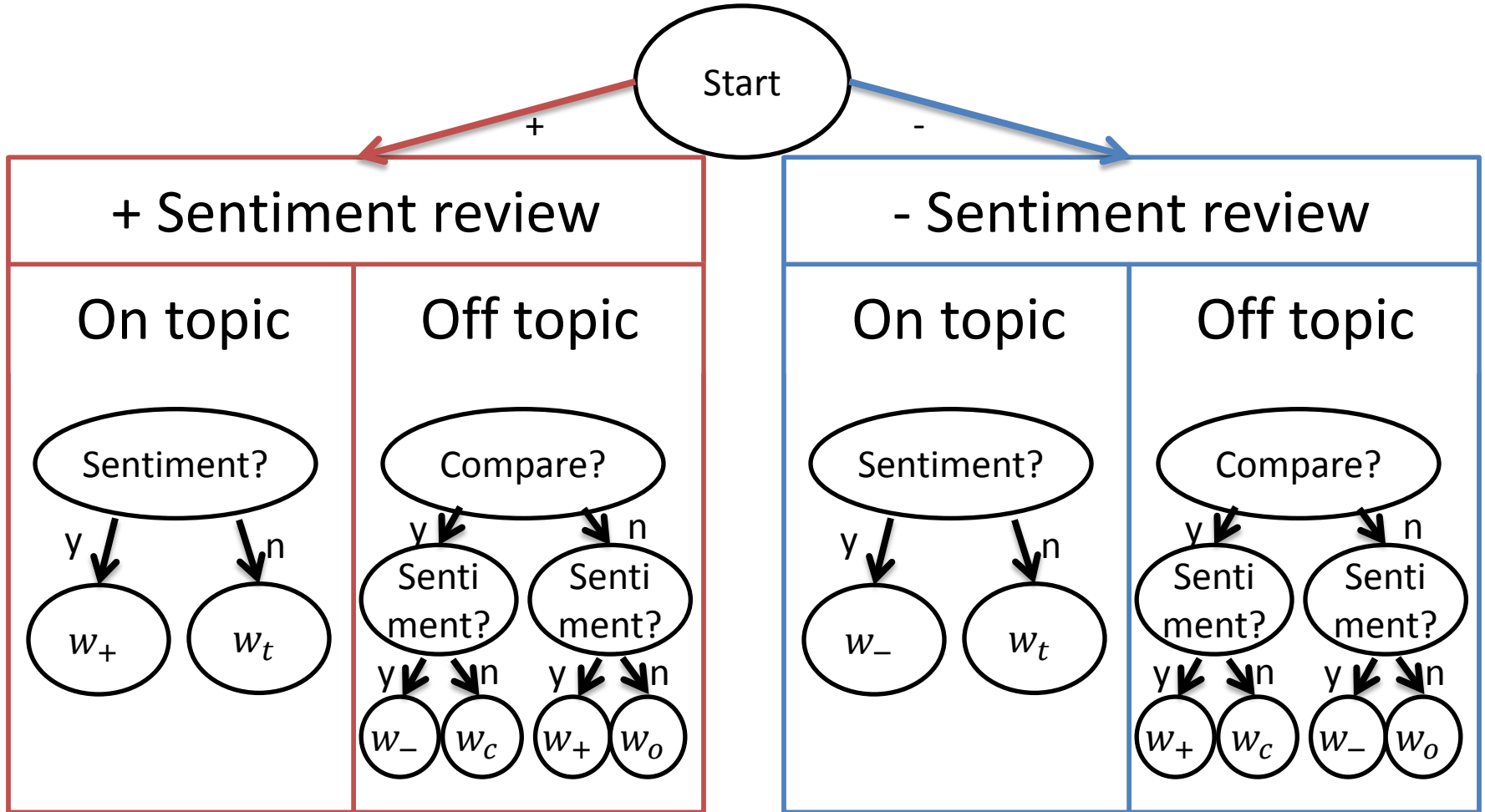
Problem of Treating Off-topic Sentence Sentiments Equally in all Contexts



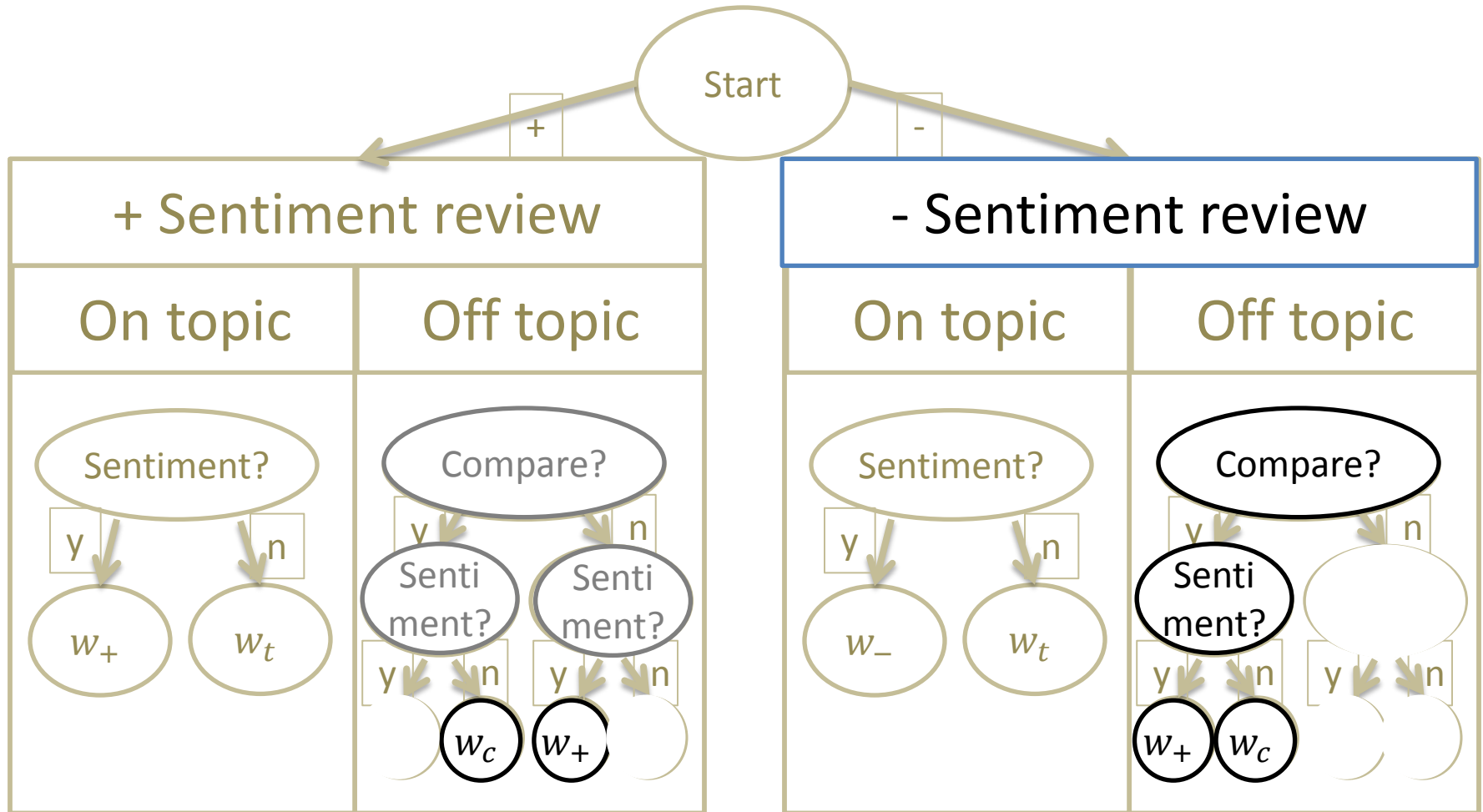
Comparative demonstrations in sentiment off-topic sentence

- Observation: comparative demonstrations is one major cause of opposite sentiments:
 - Comparative demonstrations: showing opposite sentiments toward other comparable topics
 - E.g. There are better institutions out there .
 - E.g. However , I can answer all of his computer related questions correctly .
- We propose:
 - Consider if an off-topic sentence does comparative demonstration
 - If yes: invert the sentiment
 - If no: keep the sentiment
 - We infer whether it is a comparative demonstrations from the text: review texts contain indicators
 - E.g. “other”, “friend”, “past”, “however”...

The Proposed Model

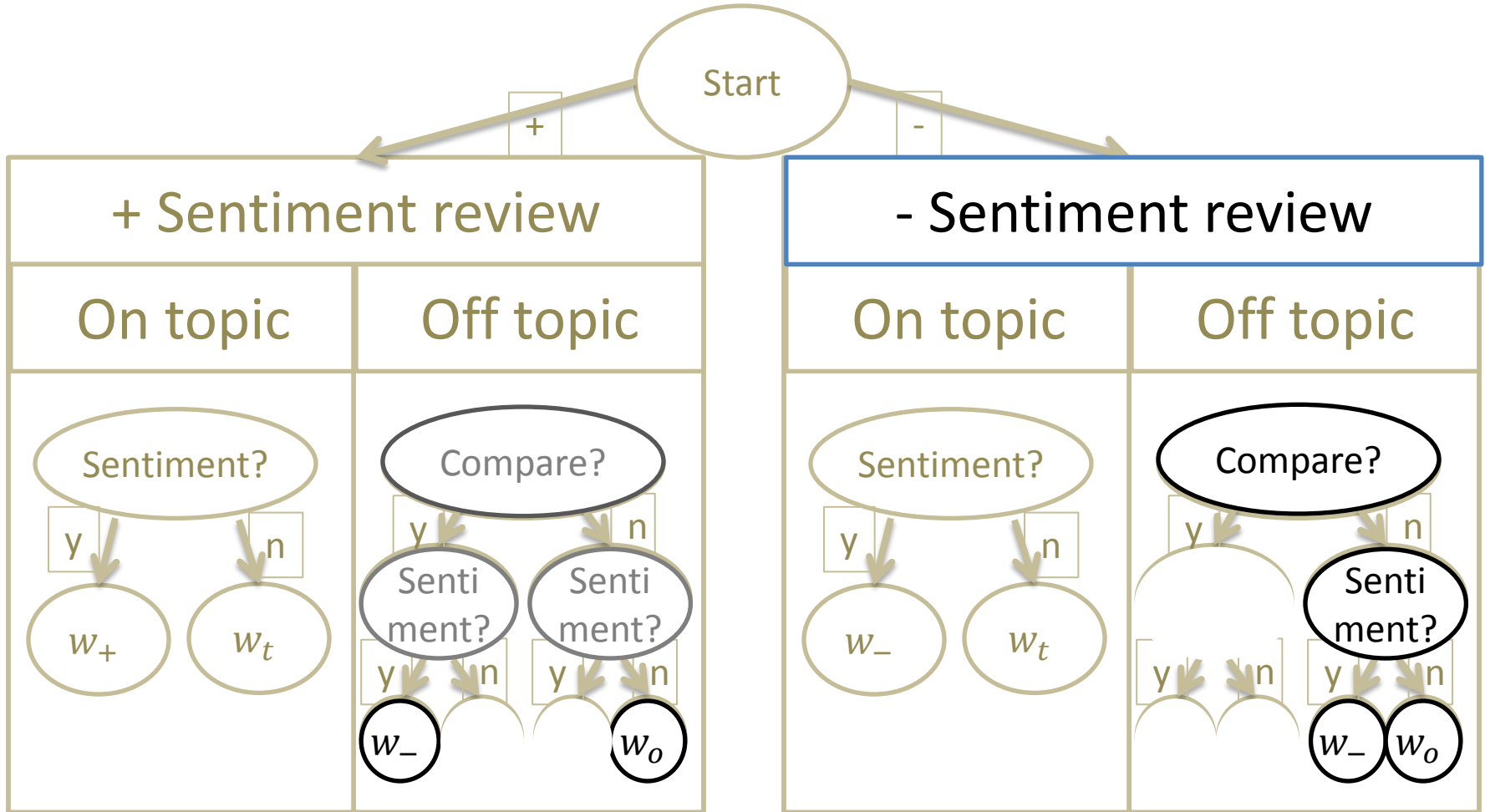


Handling Comparative Demonstrations



Off topic: There are better institutions out there

Handling irrelevant claims



Off topic: I hate bad services

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- **Experiments**
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Questions we hope to answer

- Can off-topic sentences help sentiment analysis?
- Does it help if we use off-topic sentences as if they are on-topic sentences?
- Does it help to firstly guess if we should treat the sentiment differently?

Experimental Setup

- Dataset
 - From Toprak et al. 2010
 - Has on/off topic annotations.
 - Containing
 - Online university reviews (182):
 - » Capella University, Pheonix, University of Maryland College etc.
 - Online service reviews (209):
 - » PayPal, egroups, eTrade, eCircles etc.
- Task
 - Predict high(4-5)/low(1-3) star-rating
- Metric
 - Average prediction accuracy in 10-fold cross-validation

Models We Compare

- **Majority**: the majority baseline
- **NB on**: Naïve Bayesian (NB) classifier, with only on-topic sentences
- **NB on+off**: NB treating on/off topic sentences equally
- **NB on*off**: NB using separate features for on-topic and off-topic sentences
- **Comp demo**: proposed model, distinguishing if off-topic sentences contain comparative demonstrations.

Experimental Result

Model Name	Universities	Services
Majority	56.84%	62.14%
NB on	66.23%	78.05%
NB on+off	66.26%	77.60%
NB on*off	59.06%	77.12%
Comp-demo	68.54%	79.45%

- Do off-topic sentences help sentiment analysis? **YES**
- Does it help if we use off-topic sentences as if they are on-topic sentences? **NO**
- Does it help to firstly guess if we should treat the sentiment differently? **YES**

Conclusions

- Off-topic sentences are useful for sentiment analysis
- Off-topic sentences play a different role than on-topic sentences
- Taking into account comparative demonstrations help predicting sentiment