

Applications of Argumentation Mining on News

Demystifying the Dissertation
Tariq Alhindi

A little about me

- 4th year PhD student in CS
Member of the Natural Language Processing (NLP) group
Advised by Smaranda Muresan
- BS in Computer Engineering
King Fahd University of Petroleum and Minerals (KFUPM)
- Dual MS degrees in Computer Science and Engineering Management
Syracuse University
- 5 years work experience (full-time, internships): Research, Software Eng.

Today's Talk

- Argument Mining
- Fact vs. Opinion in News Articles
- What is it like to be a PhD student?

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- **Argument Mining**
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Where is argumentation?

- Reviews (Trip Advisor)
- Online fora
- Legal texts
- Scientific papers
- Newspaper articles
- Political debates
- Persuasive essays

.....

Why mining arguments?

- Assess public opinion on political and social issues to foster public deliberation
- Understand common reasoning patterns
- Detect persuasive strategies
- Refine search and information retrieval
- Detect fake news

.....

slides from Smaranda Muresan

Examples

Man shot to death near Occupy Oakland camp

By Matthai Kuruvilla and Demian Bulwa Published 4:00 am, Friday, November 11, 2011



ADVERTISEMENT



Discussion Forum

User1: A shooting in Oakland? That NEVER happens.

User2: Shootings happen in Oakland all the time and

this shooting had nothing to do with the Occupy movement. [...]

Target

Disagree

Causal (*Reasoning Rule*)

Calling-Out

User3: This shooting does have something to do with the Occupy movement because many of the witnesses are the Occupiers and it happened only a few yards away from the encampment.

Claim; Premise

What are the issues discussed?

What are the standpoints towards the issue and their rationale?

What constitutes a persuasive argument?

What's an argument?

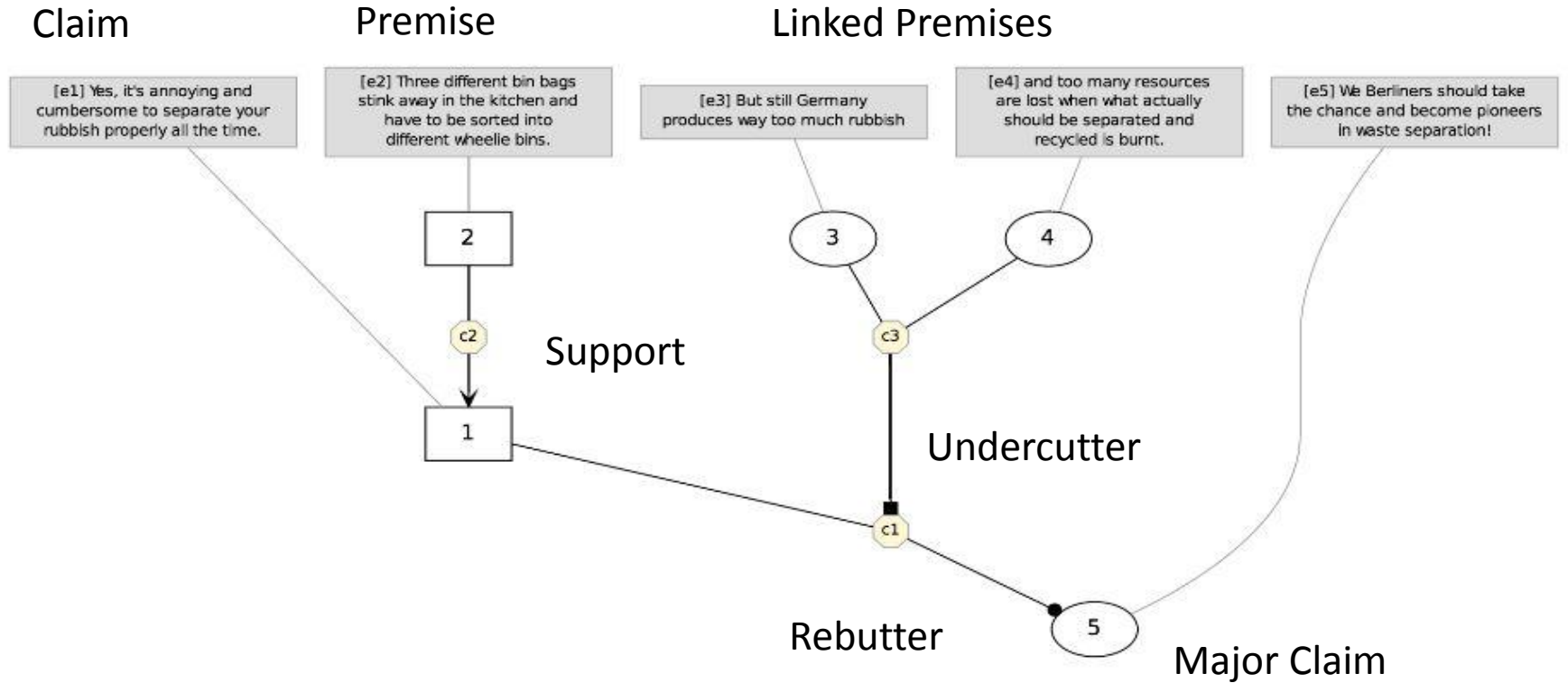
An argument is a /a set of proposition(s) that **supports** or **attacks** the truth of another proposition (standpoint/claim).

Arguments that attack a claim constitute counterarguments.

They can be of two types:

REBUTTERS: they challenge the acceptability of the claim

UNDERCUTTERS: they challenge the acceptability of the support relation between the argument and the claim



Andreas Peldszus, Manfred Stede. An annotated corpus of argumentative microtexts. First European Conference on Argumentation: Argumentation and Reasoned Action, Portugal, Lisbon, June 2015.

What is an argument made of ?

A: “I want brownies!!”

B: “We cannot make brownies: we run out of chocolate”

Claim: We cannot make brownies

Minor Premise: We run out of chocolate

Major Premise: Chocolate is a necessary ingredient for brownies



This **implicit** premise is called *enthymeme*

Is this enough?

Argumentation mining subtasks

Raw Text

It is likely that China is putting in infrastructure in order to [consolidate control of the area's natural resources. Satellite imagery of airfields and land buildup]a provides the strongest evidence for China's construction activities in the Spratly Islands]b. [A strategic intent describes long term goals and aims rather than detached actions]. Given this]a and [the evidence considered above, it is highly likely that [China's strategic intent for building up infrastructure is to control the oil gas and other resources in the Spratly Islands

Argument Components

It is likely that [China is putting in infrastructure]a in order to [consolidate control of the area's natural resources. Satellite imagery of airfields and land buildup]a provides the strongest evidence for China's construction activities in the Spratly Islands]b. [A strategic intent describes long term goals and aims rather than detached actions]. [Given this]a and [the evidence considered above]b, it is highly likely that [China's strategic intent for building up infrastructure is to control the oil gas and other resources in the Spratly Islands]c.

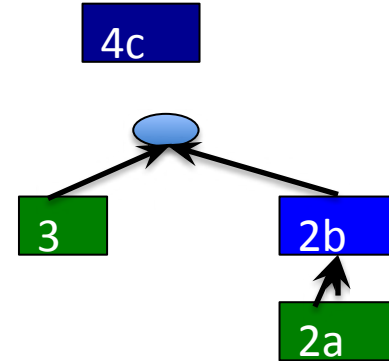
- Separate argumentative from non-argumentative text units
-
- Identification of argument component boundaries (A

Components Types

It is likely that [China is putting in infrastructure]a in order to [consolidate control of the area's natural resources]b. [Satellite imagery of airfields and land buildup]a provides the strongest evidence for [China's construction activities in the Spratly Islands]b. [A strategic intent describes long term goals and aims rather than detached actions].
[Given this]a and [the evidence considered above]b, it is highly likely that [China's strategic intent for building up infrastructure is to control the oil gas and other resources in the Spratly Islands]c.

- Identify argumentative role of argument components e.g. claims, premises, etc.

Argument Structures



- Identification of relations between argument components e.g. support / attack relations ; argument schemes

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Conference on Computational
Linguistics

FACT VS. OPINION: THE ROLE OF ARGUMENTATION FEATURES IN NEWS CLASSIFICATION

Tariq Alhindi, Smaranda Muresan and Daniel Preoțiuc-Pietro



COLUMBIA UNIVERSITY
IN THE CITY OF NEW YORK

Bloomberg

Engineering

PROBLEM & MOTIVATION

- Only 41% of publishers label their type of articles
 - Types include: editorial, review, analysis
 - Lack of consistency and clarity (Harris, 2017).
- Two Types of News Articles:
 - 1) Opinion articles: persuade the readers with respect to a particular point of view
e.g. editorial, op-ed, letters to the editor
 - 2) News stories: report factual news or events.
- A clear marking is essential for gaining public trust (The Media Insight Project, 2018)
 - Especially between the above categories

Hypothesis

A key difference between the two types is the discourse structure and, in particular, the argumentative and persuasive aspects

EXAMPLE

Title: Massachusetts Law Requires Insurance for Infertility Care

Massachusetts will become the first state to require insurance companies to pay for all medical treatment of infertility.

A new law, signed Thursday by Gov. Michael S. Dukakis, is expected to help hundreds of couples who have been unable to afford infertility treatment, including the expensive procedure of fertilizing human embryos outside the womb. The law takes effect Jan. 6.

"Insurance companies have tended to regard infertility as a cosmetic problem, like a nose job," said Karen Sweet, a lobbyist for Resolve of the Bay State, a group that offers support and counseling to infertile people. "In practice, most people were getting most things paid for," she said. "But the coverage was inconsistent and inequitable in many cases. Usually, if a doctor used a medical term to describe it, it got covered."

Many couples in Massachusetts have found that initial treatments for infertility were covered by insurance, but subsequent ones were not, Ms. Sweet said. The bill passed easily despite opposition from Blue Cross and Blue Shield of Massachusetts and the Roman Catholic Church.

(a) News Story

Antibiotics in the Poultry Industry

It was a pleasant surprise to learn this week that three large poultry companies had greatly reduced their use of antibiotics in healthy chickens, a move that could help slow the emergence of antibiotic resistance in bacteria that cause diseases in humans. Other companies ought to follow the lead of these pioneers, and Congress ought to ban the use of medically important antibiotics in animal husbandry except to cure sick animals.

Strong action is needed because many germs that infect humans are growing resistant to treatment with antibiotics. Such resistance occurs inevitably over time as an antibiotic kills off susceptible strains of a germ and leaves only the more resistant strains to proliferate. But in recent decades the growth of resistance has been increased by overuse of antibiotics in agriculture, where companies routinely use the drugs to promote growth on less feed and to prevent disease in healthy animals. As a result, some germs that infect both animals and humans have become resistant to antibiotics, and even germs that do not infect humans are capable of transferring their antibiotic-resistance genes to germs that do.

That is why the report in Sunday's Times by Marian Burros was so encouraging. She found that three poultry companies that produce a third of the chickens consumed by Americans each year -- Foster Farms, Perdue Farms and Tyson Foods -- had greatly reduced the use of antibiotics in healthy chickens and were using them primarily to treat sick chickens.

There is no reason that other poultry producers could not do the same, and probably the pork and beef industries as well. It is unacceptable that any industry should use medically important antibiotics for the economic purpose of fostering growth. Congress and the Food and Drug Administration need to curtail the use of animal antibiotics that are related to human medicines.

(b) Opinion Article

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Claim

Premise

(a) News Story

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(b) Opinion Article

RESEARCH QUESTIONS

Can sentence-level argumentation features derived from predictive models help in the downstream task of document-level news vs. opinion classification?

Do argumentation features transfer well to articles from unseen publishers or domains, when trained on a single- or multiple-publishers?

OUTLINE

- **Related Work**
- Data
- Features
- Models and Results
- Conclusion

RELATED WORK

- Linguistic Features for News vs. Opinion Articles
(Kruger et al., 2017)
- Argumentation Features have been used for other tasks
e.g. Sentiment Analysis (Wachsmuth et al., 2014)

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DATA

- **Single-Publisher Training**
(Kruger et al., 2017)
 - Train and test: WSJ
BLIIP Wall Street Journal (Charniak et al., 2000)
 - Test: NYT (Topics: Defense; Medicine)
New York Times Annotated Corpus of the
Linguistic Data Consortium (Sandhaus, 2008)
- **Multi-Publisher Training**
2018 - 2019
 - Train and test: New York Times, Washington Post, Washington Observer Report, Digital Journal, Enid News, Californian, Press Democrat, NW Florida Daily, Gazette-Mail and NJ Spotlight
 - Test (Unseen Publisher): The Metro - Winnipeg

Data Collection	Type	Publisher	News	Opinion	Total
WSJ-NYT	train	WSJ	1751	1751	3502
	test	WSJ	500	500	1000
	test	NYT-Defense	1000	1000	2000
	test	NYT-Medicine	1000	1000	2000
Multi-Publisher	train	10 publishers	3193	3193	6386
	test	10 publishers	353	353	706
	test	The Metro - Winnipeg	418	418	836

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FEATURES

- Linguistic Features

Structural, Quotes, Modal Verbs, Sentiment (Kruger et al., 2017)

- Embeddings

Fine-tuned BERT (Devlin et al., 2019): *bert-base-cased*
using the top layer of the [CLS] token to represent the article

- Argumentation Features

Argumentative types of sentences (Claim; Premise) in the articles

1. Aggregate features (percentages) SVM
2. Type sequence* RNN

* First 100 sentences

ARGUMENTATION FEATURES

- A corpus of 300 editorials annotated with six argumentative types (Al Khatib et al., 2016)

Assumption

Claim

Common-Ground, Testimony, Statistics, Anecdote

Premise

Other

Other

- Fine-tuning BERT to perform a three-way sentence classification

Claim, Premise, or Other

Macro F1 on the labeled test set: 0.76

- Use the BERT model to predict the argumentative types of sentences in our target datasets, and use those to generate features for the document-level task

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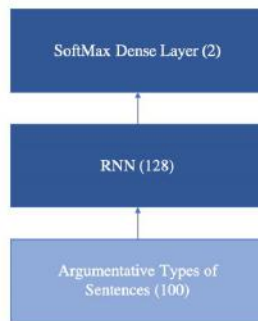
MODELS

- SVM with a linear kernel
Linguistic, Embeddings, and Argumentation Features

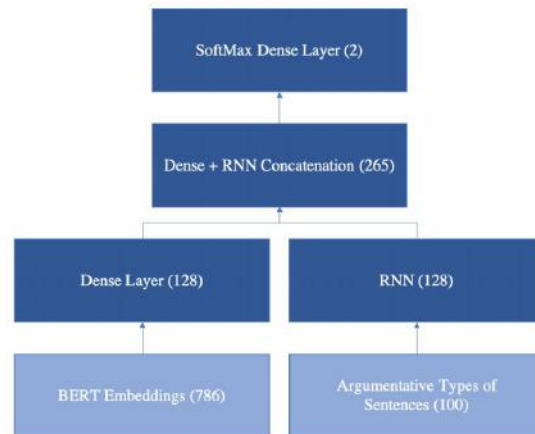
- BERT Fine-tuned

- RNN
Argumentation Features

- RNN+BERT
Argumentation Features+ Embeddings



(a) RNN



(b) RNN+BERT

RESULTS

- Single-Publisher (WSJ-NYT)

Model	Features	WSJ	NYT-Def	NYT-Med
SVM	Ling.	0.84	0.75	0.70
	Emb.	0.99	0.79	0.78
	Arg.	0.89	<u>0.88</u>	<u>0.87</u>
	Ling. + Emb.	0.99	0.79	0.78
	Ling. + Arg.	0.91	<u>0.88</u>	<u>0.87</u>
	Emb. + Arg.	0.99	<u>0.79</u>	<u>0.78</u>
	ALL	0.99	0.79	0.78
SVM Ensemble	SVM Emb.	0.99	0.83	0.80
	SVM Arg			
BERT	-	0.99	0.79	0.76
RNN	Arg.	0.94	<u>0.91</u>	<u>0.88</u>
RNN+BERT	Emb. + Arg.	0.99	0.79	0.78

- Multi-Publisher

Model	Features	Multi Publisher	Unseen Publisher
SVM	Emb	0.93	0.89
	Arg	<u>0.84</u>	0.89
	Emb+Arg	0.93	0.89
BERT	-	0.93	0.90
RNN	Arg	<u>0.85</u>	0.86
RNN+BERT	Arg+Emb	0.93	<u>0.91</u>

RESULTS (SUB-TYPES OF OPINION)

NEWS VS. EDITORIAL

NEWS VS. LETTERS

- Single-Publisher (WSJ-NYT)

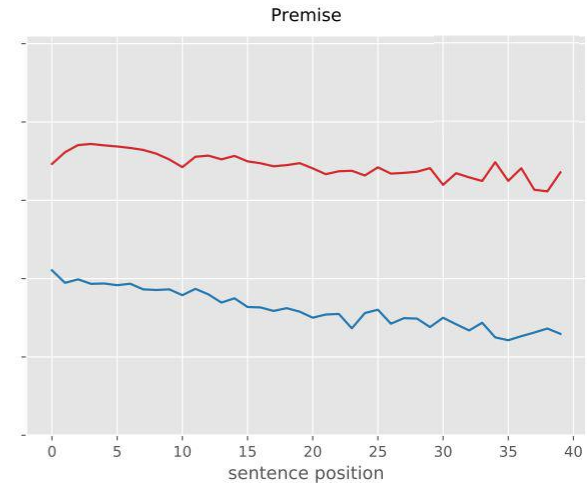
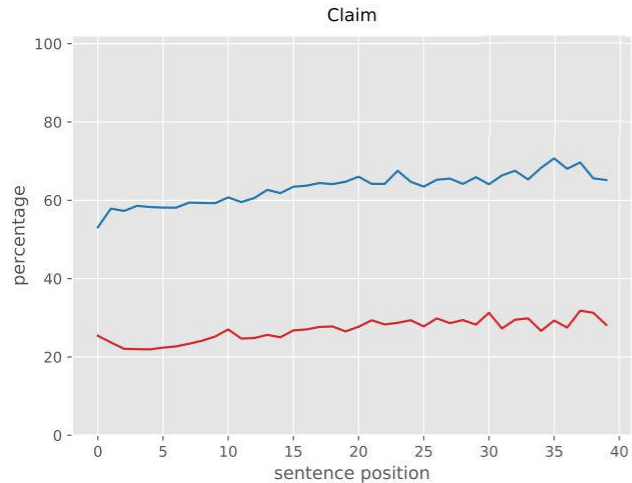
Opinion Class	Data set	SVM (Arg. features)	BERT	RNN
Editorial	NYT-Def	0.90	0.63	0.90
	NYT-Med	0.88	0.62	0.91
Letters	NYT-Def	0.89	0.98	0.87
	NYT-Med	0.88	0.85	0.87

- Multi-Publisher

Opinion Class	Dataset	SVM			BERT	RNN	RNN+BERT
		Emb	Arg	Emb+Arg	-	Arg	Arg+Emb
Editorial	Multi Publisher	0.93	0.90	0.93	0.94	0.89	0.91
	Unseen Publisher	0.89	0.88	0.88	0.89	0.87	0.90
Letters	Multi Publisher	0.98	0.86	0.98	0.99	0.89	0.95
	Unseen Publisher	0.91	0.88	0.91	0.91	0.87	0.87

FREQUENCY OF CLAIMS AND PREMISES AT EACH SENTENCE POSITION

News
Opinion



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CONCLUSION

- Argumentation features **transfer well**
 - Particularly when the training data is from a single publisher
- Argumentation features are able **to further improve** upon rich contextualized models trained on more data from multiple publishers
- There are **distinctive discourse patterns** related to claims and premises that are able to generalize well across publishers and topics

Future Work

- Finer-grained argumentative styles and discourse categories
e.g. **explanations, background, context, reactions and evidence**
- Expand the types of articles beyond the two types and two subtypes

What is it like to be a PhD student?

Thank you

<https://www.cs.columbia.edu/~tariq/>