

Assessing weight of opinion by aggregating coalitions of arguments

Pavithra Rajendran, Danushka Bollegala and Simon Parsons

16 Sep 2016



Aim

- Weighing opinions (arguments) in social media texts (online reviews).
- Propose methods to weigh coalitions of arguments and to aggregate them in different ways.
- Experiments performed on hotel reviews — investigate on coalition-support for overall sentiment prediction of reviews

Coalitions of arguments

Definition

A coalition of arguments ¹ is a set of arguments supporting each other directly or indirectly where conflicts occur among such coalitions. These coalitions of arguments satisfy the following properties:

- There is no direct attack among pairs of arguments belonging to the same coalition.
- Any pair of arguments in a coalition will have a direct or indirect support relation between them.
- If an argument in coalition A attacks an argument in coalition B, then A attacks B.

¹C. Cayrol and M.-C. Lagasque-Schiex. Coalitions of arguments: A tool for handling bipolar argumentation frameworks. Int. J. Intell. Syst., 25(1):83–109, 2010.

Coalition strength calculation

- Argument strength calculation performed using local gradual valuation method²
- We propose two ways of computing the coalition strength:
 - max - the weight of the strongest argument in a coalition represents the weight of the coalition.
 - agg - the aggregated sum of the weights of all the arguments in a coalition represents the weight of the coalition.

²C. Cayrol and M.C. Lagasquie-Schiex. Gradual valuation for bipolar argumentation frameworks. In ECSQARU'05, pages 366–377, 2005.

Coalition formation in reviews

- Arguments divided into two categories — *Low* and *High* based on the overall star ratings of reviews.
- *Low* - Arguments from reviews with star rating of 1.0 or 2.0
- *High* - Arguments from reviews with star rating of 4.0 or 5.0
- Coalitions are formed based on the properties of arguments — supporting argument or attacking argument. (not related to support and attack relations!)

Sentiment prediction function (online reviews)

- Aggregating different coalitions from *Low* and *High* (extracted from a set of reviews) to support arguments in a given review (for which the overall sentiment has to be predicted).

$$score = \frac{1}{1 + \beta ACV} - \frac{1}{1 + \alpha SCV} \quad (1)$$

where $\alpha + \beta = 1.0$

- ACV represents the strength of coalitions of attacking arguments and SCV represents the strength of coalitions of supporting arguments

continued ...

- Two ways to calculate the score — *max* and *agg*
- *max* - maximum value among SCV and maximum value among ACV chosen
- *agg* - aggregated sum value of SCV and aggregated sum value of ACV considered
- Example : ACV = 0.1, 0.5, 0.3 and SCV = 0.2, 0.4, 0.7
- For *max* ACV = 0.5 and SCV = 0.7
- For *agg* ACV = 0.9 and SCV = 1.3

Data

- ArguAna³ corpus of hotel reviews
- Each statement in a review is annotated with its sentiment (pos or neg) and aspect
- Aspect - Aspects are categorized into seven aspect categories — *room, service, location, value, business*
- Supporting argument - statement with positive sentiment in favour of an aspect or aspect category.
- Attacking argument - statement with negative sentiment against an aspect or aspect category.

³Henning Wachsmuth, Martin Trenkmann, Benno Stein, Gregor Engels, and Tsvetomira Palakarska. A Review Corpus for Argumentation Analysis. In Proceedings of the 15th International Conference on Intelligent Text Processing and Computational Linguistics, pages 115-127, 2014.

Experiments

- Support and attack relation automatically identified using Takelab STS system (Saric et al., 2012) by grouping statements with same sentiment (support relation) and opposite sentiment (attack relation) about the same aspect category with similarity score threshold >1.0 .
- Train data - coalitions aggregated, test data - support from coalitions used in prediction.
- 10 fold cross validation experiment performed on 14 different hotel data using different coalitions aggregation methods.

Examples

- **Support relation**

Attacking argument this is not a hotel i can recommend for any type of group.

Attacking argument i will never stay at this hotel!

- **Attack relation**

Attacking argument i really can't see how it gets away with claiming to be in any way a 'luxury hotel.

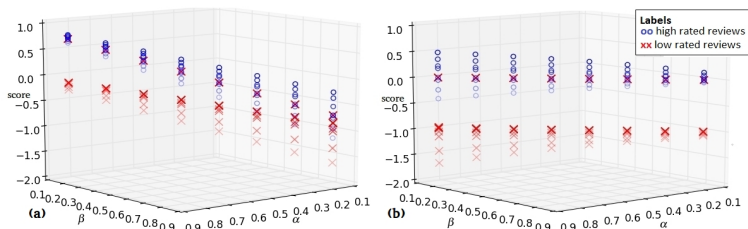
Supporting argument so again the hotel is nice..

Coalitions aggregation methods

- Different coalition aggregation methods tested.

Method	Description	Coalition strength
ArgAll	All arguments in <i>Low</i> and <i>High</i>	Argument strength is used.
AttSupCoal	<i>Low</i> = coalitions of attacking arguments, <i>High</i> = coalitions of supporting arguments	<i>agg</i>
AttSupArg	<i>Low</i> = strongest coalition of attacking arguments, <i>High</i> = strongest coalition of supporting arguments	<i>max</i>
AttSupBoth	Coalitions from AttSupCoal is filtered based on aspects and AttSupArg is performed.	<i>max</i>

Results



Scores of each review for a single hotel. A red cross denotes a review that belongs to Low and a blue circle denotes a review that belongs to High. (a) Scores vs α and β aggregating using ArgAll (b) Scores vs α and β aggregating using AttSupBoth. Max sentiment prediction function used.

Results

	Category	<i>AttSupBoth</i>		<i>AttSupArg</i>		<i>AttSupCoal</i>		<i>AllArg</i>	
		f_{agg}	f_{max}	f_{agg}	f_{max}	f_{agg}	f_{max}	f_{agg}	f_{max}
Majority Low reviews	Low	96	97	88	92	74	90	80	68
	High	37	50	22	35	31	22	16	16
Balanced reviews	Low	90	93	85	90	76	87	85	72
	High	35	35	33	45	54	26	23	23
Majority High reviews	Low	84	92	88	92	52	88	80	64
	High	23	40	38	38	76	25	28	28
Overall	Low	93	96	86	90	72	87	80	70
	High	36	46	31	39	54	24	20	20

The numbers are the percentage of reviews correctly predicted into category Low and High. The highest value on each line is highlighted. Test data was reviews from 14 different hotels. There were 217 Low reviews and 148 High reviews.

Results

	Category	Majority High	Balanced	Majority Low	Overall
<i>AttSupBoth, f_{max}</i>	Low	97	93	92	96
	High	50	35	40	46
ArguAna	Low	99	93	100	97
	High	29	21	30	28

Comparison of AttSupBoth (max) with ArguAna tool prediction results.

Conclusion and Future work

- We investigated on the usefulness of weighing coalitions of arguments and the different ways to aggregate them.

Coalition strength	Coalitions aggregation	Sentiment prediction
<i>max</i> <i>agg</i>	<i>ArgAll</i> <i>AttSupCoal</i> <i>AttSupArg</i> <i>AttSupBoth</i>	<i>max</i> <i>agg</i>

- **Future work**
- Investigate on better ways of extracting arguments and relations.
- We will also try improving the results for high rated reviews.

Thank you!