

# Tweeties squabbling: Positive and Negative Results in Applying Argument Mining on Social Media

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# How to extract the arguments and predict the relations among them on Twitter data?

- How to distinguish from a stream of tweets those textual exchanges that are arguments and those that are not?
- How to identify the relationship, i.e., attack or support, among two (or more) tweets to study the evolution of a certain discussion?

# DART - Dataset of Arguments and their Relations on Twitter

## Step 1: arguments annotation

- an **argument** gives a reason to support a claim that is questionable or open to doubt
- **three components**: premises (the reasons), conclusion (the supported claim), relation
- **Twitter issue**: 140 characters  $\Rightarrow$  no complete structure
- **Arguments in Twitter**: opinions (claims), data (Toulmin model), persuasive claims, ...

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- tweets containing an opinion

*RT mariofraioli: What will #AppleWatch mean for runners? I can't speak for everyone, but I won't be running out to get one. Will you? <http://t.coxBpj0HWKPW>*

- claims expressed as questions

*RT GrnEyedMandy: What next Republicans? You going to send North Korea a love letter too? #47Traitors*

- tweets containing factual information

*RT HeathWallace: You can already buy a fake #AppleWatch in China <http://t.coWpHEDqYuUC> via cnnnews mr gadget <http://t.coWhcMKuMWcd>*

[Bosc, Cabrio, Villata, LREC 2016]

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- amount of world knowledge?

*RT SaysSheToday: The Dixie Chicks were attacked just for using 1A right to say they were ashamed of GWB. They didn't commit treason like the #47Senators*

- tweets containing pronouns only? Not arguments.

*FakeGhostPirate GameOfThrones He is the one true King after all ;)*

- tweets containing an advertisement? Arguments if providing opinions/factual information

*RT NewAppleDevice: Apple's smartwatch can be a games platform and here's why  
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## Step 2: pairs creation

- identical or almost identical tweet-arguments are pruned to avoid redundancy
- arguments discussing about the same topic (or the same aspect of it) are grouped together
- pairs are created within such groups
- manual creation of categories for each topic

# DART - Dataset of Arguments and their Relations on Twitter

## Step 3: argument linking

- **positive relation:** i.e., a support relation in abstract bipolar argumentation (Cayrol and Lagasque-Schiex, 2005)

*Tweet-A: The letter #47Traitors sent to Iran is one of the most plainly stupid things a group of senators has ever done. <http://t.co/oEJFIJeXjy>*

*Tweet-B: Republicans Admit: That Iran Letter Was a Dumb Idea <http://t.co/Edj57f4nE8>. You think?? #47Traitors*

- **negative relation:** i.e., an attack relation in abstract argumentation (Dung, 1995)

*Tweet-C: #47Traitors is a joke. Given the definition of treason, it would be on the Obama administration if Iran developed a nuclear bomb.*

- **unrelated**

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# Data:

- **(politics)** the letter to Iran written by 47 senators on 10/03/2015 (e.g., #47Traitors, #IranLetter)
- **(politics)** the referendum in Greece for or against Greece leaving European Union on 10/07/2015 (e.g., #Grexit, #GreeceCrisis)
- **(product release)** the release of Apple iWatch on 10/03/2015 (e.g., #AppleWatch, #iWatch)
- **(product release)** the airing of Episode 4 (Season 5) of the series Game of Thrones on 4/05/2015 (e.g., #GameOfThrones, #GoT)

# Step 1: arguments annotation

- **annotators**: three European students (from Luxembourg, Italy and Germany)
- **reconciliation phase**: the label annotated by at least 2 annotators out of 3 (majority voting mechanism) was chosen
- **IAA**: between the expert annotators and the reconciled student annotations on 250 tweets ( $\alpha_{47\text{traitors}} = 0.81$ )

Topic	# arg	# not arg	# tot
47 Traitors	768	214	982
Grexit	746	241	987
Apple Watch	623	352	975
Games of Thrones	565	374	939
TOTAL	2702	1181	3883

## Step 2: pairs creation

- + 2200 argument-tweets on Apple watch (on 9/03/2016)
- **categories:** features (F), price (P), look (L), buying announcements (B), advertisement (A), predictions on the future of the product (S), news (N), and others (O).
- category *features* divided into: health, innovation, and battery.
- tweets could be annotated with more than one category

	O	A	B	F	L	N	P	S
#	720	175	370	619	205	65	189	112



## Step 3: arguments linking

- Two expert annotators annotated  $\sim 600$  pairs of tweet-arguments in each categories look, price, health, and 100 pairs of category prediction
- IAA: 99 pairs (33 pairs from each topic), Krippendorff  $\alpha = 0.67$ .

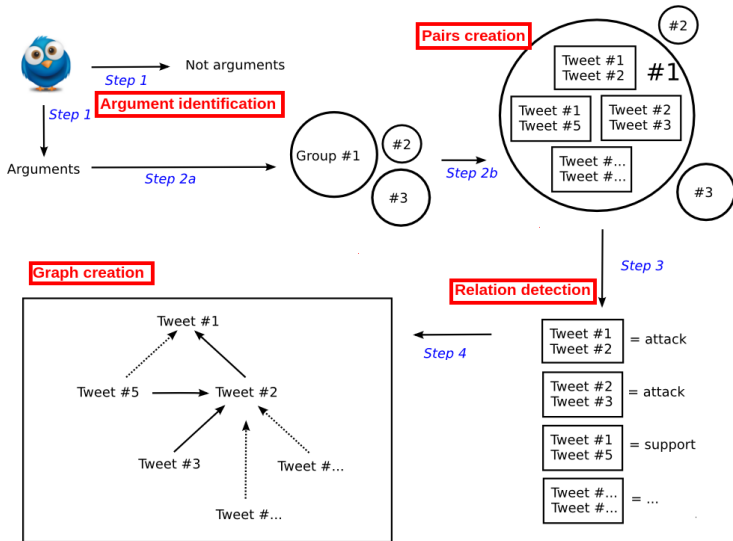
	Support	Attack	Unknown	Total
# in look	72	30	498	600
# in price	134	44	412	590
# in health	222	31	348	601
# in predictions	18	17	65	100
# TOTAL	446	122	1323	1891

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**Back to our research question:**  
**How to extract the arguments and  
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Twitter data?**

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# Argument mining pipeline



# Step 1: Argument identification

- classification task: **argument vs non argument** tweets
- train and validate on the first three topics (3-fold cross validation with randomized hyperparameter search (Bergstra and Bengio, 2012)), test on the Apple Watch dataset
- tweets tokenized with Ttokenize and PoS annotated
- baseline model: logistic regression trained on PoS tags and bigrams as features

Approach	Average F1
baseline	0.64
baseline + tokens	0.66
baseline + tokens + bigrams tokens	0.67

- **best model:** Logistic regression, L2-penalized with  $\lambda = 100$ , all the features and re-training on the 3 folds: F1-score = 0.78

## Step 2: Pairs creation

- clustering the tweets into sub-topics, and then create pairs from these sub-topics → a failure
- decision to focus on one topic only: Apple Watch
- clustering problem → **multi-class classification problem**
- focus on categories F (features), L (look), P (price), S (prediction)
- same features and same hyperparameters selection scheme as Step 1

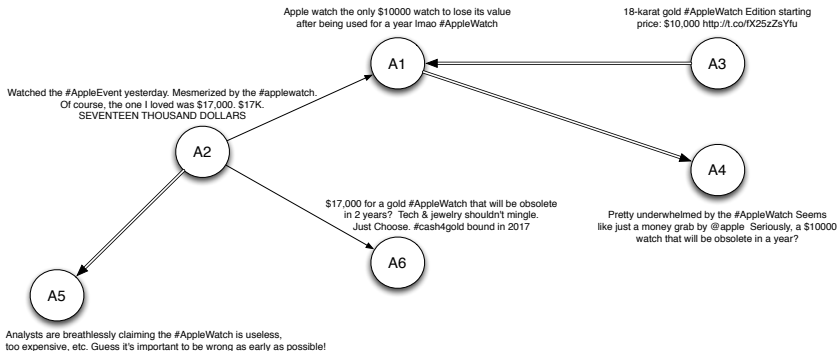
	F	L	P	S
F1-score (test set)	0.56	0.58	0.60	0.00

## Step 3: Arguments linking

- **predicting the relation holding between the tweets in a pair**
- ~600 tweets each for look, health (training), prediction (validation) and price (test) categories of the Apple Watch
- **Model 1:** Excitement Open Platform (EOP) for recognizing textual entailment
- **Model 2:** neural sequence classifier inspired by [Rocktaschel et al., 2016], two distinct Long Short-Term Memory networks (LSTM) [Hochreiter and Schmidhuber, 1997]

Model	EOP (MaxEnt)	Neural model
F1-score Support	0.17	0.20
F1-score Attack	0.0	0.16

## Step 4: Graph building



# Conclusions

- ongoing work to apply the argument mining pipeline on Twitter data
- **three sub-tasks:**
  - the identification of tweet-arguments from non argumentative tweets
  - the composition of tweet-arguments into meaningful pairs where pairs of completely unrelated tweet-arguments are discarded
  - the prediction of the relation, i.e., support or attack, between the tweet-arguments in a pair.





## Current/future work

- **topic**: more argumentative-like topics as in politics
- new dataset: Brexit (2988 tweets) and Turkey coup (2390 tweets)
- **task 1**: classification factual arguments vs. opinions (F1 0.79)
- **task 2**: source association via NER (ongoing work)

*BBC says re #Brexit - "the ball is in everyone's court"*



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# Thanks for your attention!

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