

Inferring Political Opinion From Social Media Data

Angus Scott

4th Year Project Report
Artificial Intelligence and Computer Science
School of Informatics
University of Edinburgh
2015

Abstract

This is an example of `infthesis` style. The file `skeleton.tex` generates this document and can be used to get a “skeleton” for your thesis. The abstract should summarise your report and fit in the space on the first page. You may, of course, use any other software to write your report, as long as you follow the same style. That means: producing a title page as given here, and including a table of contents and bibliography.

Acknowledgements

Insert Acknowledgements here.

Table of Contents

1	Introduction	3
2	Interim Report Only	4
3	Related Work	5
3.1	Network Structure	5
3.2	User Communication	6
4	Data and Methodolgy	7
4.1	Scotland Independence Referendum Background	7
4.2	The Twitter Platform	7
4.3	Dataset	8
4.4	General approach to user profiling	9
4.5	Models	9
4.5.1	Naive Bayes	9
4.5.2	Topic Modelling	9
4.5.3	SVM	9
4.5.4	Gradient Boosted Decision Trees	9
5	Evaluation	10
6	Conclusions and Further Work	11
	Bibliography	12

Chapter 1

Introduction



Chapter 2

Interim Report Only

Included todo notes for sections as I have ideas.

Covered sections: Completed sections on introduction to Twitter Platform, and Dataset. Plan to work on Related Work section: Need to outline more detail, and plan to include some heavy detail on Topic Modelling, as I'll be covering these in detail in other courses.

Plan to build models over the next couple of weeks, current schedule: By week 4 Finish annotation and build SVM and NB models for greater set of features than hashtags. Plan to use hashtags model as baseline. week 5/6 Get cross annotator scores, and get Topic Models done

Chapter 3

Related Work

The inference of user attributes from different sources of media has been well considered both in the context of traditional media and new media.

A natural extension to this task has been to apply similar methods to the microblogging service Twitter. Previous work includes detection of *gender*, *ethnicity*, *brand loyalty*, *regional origin* and *age*. [9] [10]

The detection of *Political Affiliation* has also been considered. Most of the research in this area has been focused on one of two political systems. First is the American system, with the 2010 Congressional Midterms [2] [3] [9] or the 2012 Presidential Elections [13]. Second is the German system, with the 2009 federal election to the national parliament [12] [5].

Approaches to the task of inference of latent attributes from twitter can be broadly split into two categories:

1. Use of the networked structure of the data
2. Analysis of user communication streams

3.1 Network Structure

It has long been known that individuals form information networks corresponding to their own political preferences [7], and this has continued into online social networks [6]. This demonstrates that people who participate in particular networks, are likely to share similar political values or opinions, which could be used to infer someones political beliefs.

There are four main types of networks that have previously been exploited to infer political persuasion:

- *Follower* -
- *Mention* -

include
links
to
pa-
pers
that
have
per-
formed
tasks
in
dif-
fer-
ent
me-
dia

- *Retweet* -
- *Hyperlink* -

3.2 User Communication

Sentiment Analysis Topic Modelling Support Vector Machines Decision Trees

Chapter 4

Data and Methodology

4.1 Scotland Independence Referendum Background

The Scottish Referendum on Independence was a referendum on Scottish Independence with the intention of establishing Scotland as an independent sovereign state, independent of the rest of the United Kingdom. The election took place on the 18th September 2014, with record turnout of 84.59% and an electorate of 4,283,392. The referendum concluded with a “No” side victory of 55.3%, over the “Yes” side with 44.7%.

Yes Scotland was the primary campaigning group behind independence, whilst Better Together were campaigning to maintain the union with the rest of the United Kingdom. Many other campaigning groups, including: political parties, businesses, newspapers and famous individuals, were also involved in the campaign. The campaign was widely discussed on social media, with estimates by YouGov stating that 54% of the electorate got information, regarding the campaign, from social media and other websites. There was much debate during the campaign, on issues including: currencies and monetary policy, public expenditure, EU membership and north sea oil revenues.

There was also considered to be several key events on the run-up to the campaign, including The Commonwealth Games that were hosted in Glasgow Glasgow

4.2 The Twitter Platform

Twitter is a popular microblogging and social network site that allows users to send and read short 140 character messages commonly known as *tweets*. Tweets as used in this report include the 140 character message, along with the associated metadata. This includes features such as: creation dates, user follower counts, coordinates and language.

As well as tweeting¹ to an audience of *followers*, Twitter users can interact publicly

¹Tweeting - The act of broadcasting a tweet

through two main approaches: *retweets* and *mentions*. Retweets often indicate agreement [8], allowing users to rebroadcast content from other users, having the effect of spreading tweets to a larger audience [4]. Alternatively, mentions work by allowing someone to refer to a particular Twitter user by including their @username in a tweet, creating a public dialogue between the referrer and referee.

Hashtags are another important feature of Twitter, allowing users to tag tweets according to topic and their intended audience. For example #IndyRef was often used to reference the topic of the Independence Referendum, or #bettertogether which generally indicated that someone was No Voter or was addressing No Voters.

Twitter has several benefits over other social networking sites [11] [13] including:

1. Twitter users retweet notable events and participate in the spread of realtime news.
2. The 140 character constraint forces tweets to be concise and to the point.
3. Users are highly reactionary and discussed events tend to have happened in the recent past.
4. Tweets are media rich, and include content like video, image and hyperlinks along with text.

4.3 Dataset

The dataset was collected following the referendum, and is composed of X tweets from Y users, spanning from the 1st February 2014, to 17th September 2014, the day prior to the Independence Referendum. The corpus also includes set of user classifications obtained through annotation of users tweets from the 18th of September.

The first steps in building the corpus, was to obtain tweets from the 18th of September 2014. This first set of tweets were obtained from a Twitter Mining system developed by Sasa Petrovic and Miles Osborne as part of their efforts to create the Edinburgh Twitter Corpus. From this I was given a collection of tweets that matched a set of hashtags commonly used by users involved in the Yes and No campaigns.

Hashtags, and their associated campaign are given in Table 4.1, which were obtained using the hashtagify.me tool. It is worth noting that this is a set of non-event specific hashtags. Whilst hashtags such as #PatronisingBTlady [1] are politically divisive, they have been excluded as they have a short lifespan as discussed in Section 4.2, and are therefore unlikely to be used on the final day of the referendum.

These tweets are then used as evidence for the annotators to classify a user as Y (Voted Yes in the referendum), N (Voted No in the referendum) or U (Unknown or Undeterminable). We make the assumption that tweets on the final day are the most emblematic of how a user voted, as the opportunity to flip their opinion is minimised and Twitter activity surrounding the event was at it's peak. This is done as there are both technical and ethical issues about obtaining classifications more directly.

Add
num-
ber
of
users
here

Include
graph
show-
ing
strength
of
hash-
tag,
and
how
many
tweets
it
ap-

Topic Indicators:	#indyref, #scotland, #scotdecides, #scotlanddecides, #independence
Yes Campaign:	#voteeyes, #yesscotland, #yesscot, #youyesyet
No Campaign:	#voteno, #nothanks, #bettertogether, #letsstaytogether
Political Parties/Politicians:	#snp, #labour, #conservative, #tory, #libdem, #salmond, #alexsalmond, #davidcameron, #gordonbrown, #alistairdarling

Table 4.1: Set of hashtags related to the campaign

After providing a class for each user, we then collect all their publicly available tweets, available from 1st February to 17th September, and their associated meta data using the Twitter API ².

4.4 General approach to user profiling

4.5 Models

4.5.1 Naive Bayes

4.5.2 Topic Modelling

4.5.3 SVM

4.5.3.1 One class SVMs

4.5.3.2 Alternative SVMs, standard?

4.5.4 Gradient Boosted Decision Trees

²Due to a limitation of the Twitter API, you can only collect from the last 3200 published tweets.

Detail
what
can
be
mea-
sured
in
Twit-
ter
and
how
we
could
use
it

Models
I
plan
on
im-
ple-
ment-
ing,
may
be
moved
to
eval
sec-
tion

Chapter 5

Evaluation

Chapter 6

Conclusions and Further Work

Bibliography

- [1] Libby Brooks. Scottish independence: no campaign’s new ad convinces some to vote yes, August 2014. [Online; posted 27-August-2014].
- [2] M Conover, B Gonçalves, J Ratkiewicz, A Flammini, and F Menczer. Predicting the political alignment of twitter users. In *Proceedings of 3rd IEEE Conference on Social Computing (SocialCom)*, 2011.
- [3] Michael Conover, Jacob Ratkiewicz, Matthew Francisco, Bruno Gonçalves, Alessandro Flammini, and Filippo Menczer. Political polarization on twitter. In *Proc. 5th International AAAI Conference on Weblogs and Social Media (ICWSM)*, 2011.
- [4] Scott Golder Danah Boyd and Gilad Lotan. Tweet, tweet, retweet: Conversational aspects of retweeting on twitter. *HICSS-43, IEEE:Kauai, HI, January 6*, 2010.
- [5] Albert Feller, Matthias Kuhnert, Timm Oliver Sprenger, and Isabell M. Welpe. Divided they tweet: The network structure of political microbloggers and discussion topics. In Lada A. Adamic, Ricardo A. Baeza-Yates, and Scott Counts, editors, *ICWSM*. The AAAI Press, 2011.
- [6] Itai Himelboim, Stephen McCreery, and Marc A. Smith. Birds of a feather tweet together: Integrating network and content analyses to examine cross-ideology exposure on twitter. *J. Computer-Mediated Communication*, 18(2):40–60, 2013.
- [7] Robert Huckfeldt and John Sprague. Networks in context: The social flow of political information. *American Political Science Review*, 81:1197–1216, 12 1987.
- [8] Panagiotis Takis Metaxas, Eni Mustafaraj, Kily Wong, Laura Zeng, Megan O’Keefe, and Samantha Finn. Do retweets indicate interest, trust, agreement? (extended abstract). *CoRR*, abs/1411.3555, 2014.
- [9] Marco Pennacchiotti and Ana-Maria Popescu. A machine learning approach to twitter user classification, 2011.
- [10] Delip Rao, David Yarowsky, Abhishek Shreevats, and Manaswi Gupta. Classifying latent user attributes in twitter. In *Proceedings of the 2Nd International Workshop on Search and Mining User-generated Contents, SMUC ’10*, pages 37–44, New York, NY, USA, 2010. ACM.

- [11] Claire Warwick Shirley Ann Williams, Melissa Terras. what people study when they study twitter: Classifying twitter related academic papers. *Journal of Documentation*, 69, 2013.
- [12] A. Tumasjan, T.O. Sprenger, P.G. Sandner, and I.M. Welp. Predicting elections with twitter: What 140 characters reveal about political sentiment. In *Proceedings of the Fourth International AAAI Conference on Weblogs and Social Media*, pages 178–185, 2010.
- [13] Felix Ming Fai Wong, Chee Wei Tan, Soumya Sen, and Mung Chiang. Quantifying political leaning from tweets and retweets. In *Proceedings of the Seventh International Conference on Weblogs and Social Media, ICWSM 2013, Cambridge, Massachusetts, USA, July 8-11, 2013.*, 2013.