The Hirsch index for Twitter:
Influential proponents and opponents of Brexit

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We propose a measure of influence on Twitter, based on the well-known Hirsch index [6]. The influence of a Twitter user is defined as a combination of her/his productivity (the number of tweets posted) and citations (the number of retweets received). The retweets are a form of endorsement, and we already demonstrated that the retweet networks reflect well the actual relations between the Twitter users. In the case of the members of the European Parliament, we showed that the retweet communities closely match the political groups and nationalities of the members [2], and that their co-voting and retweeting behaviours are correlated [1].
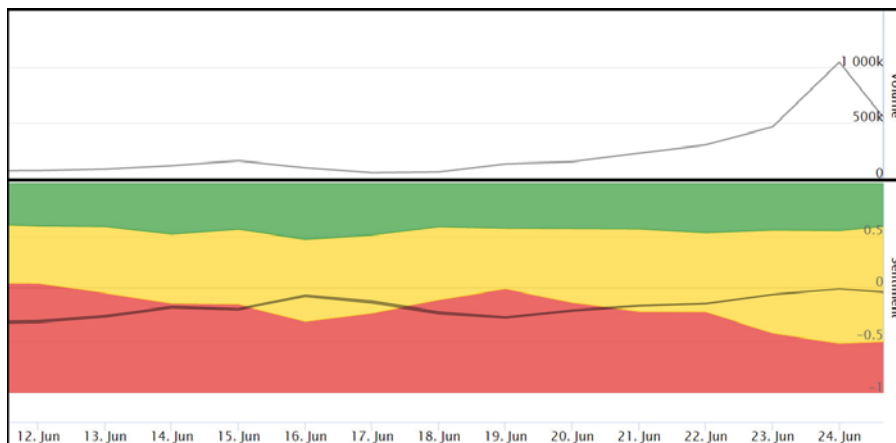

Fig. 1: A snapshot of the UK-based Twitter activities about Brexit before the referendum on June 23, 2016. Top: the daily volume of tweets, bottom: the proportion of Twitter users for Brexit (red), against Brexit (green), and neutral (yellow).

The political issue investigated in this work concerns the Brexit referendum, held in the UK on June 23, 2016. We focus on two aspects of Twitter activities: the leaning of the UK-based Twitter users for and against Brexit [5], and identification of the most influential users in both camps. In the weeks before the referendum, starting on May 12, we were continuously collecting the geo-coded, Brexit-related tweets. We collected around 4.5 mio tweets, from almost 400,000 users tweeting about Brexit. A large sample of the collected tweets (35,000) was manually labeled as "for Brexit", "against Brexit",

or "neutral". The labeled tweets were used to train an SVM classifier [7] which then automatically labels all the remaining Brexit tweets. A snapshot of the results is in Fig. 1. Once we can assign a label to each tweet, we can aggregate the tweets of each user to determine her/his prevailing stance towards Brexit.

The main question addressed here is how to formalize the notion of influence on Twitter. We propose to use the Hirsch index (*h-index*), an author-level metrics that combines the productivity and citation impact of tweets posted. Let *RT* be the function that corresponds to the number of retweets of each tweet. The values of *RT* are ordered in decreasing order, from the largest to the lowest value, and *i* corresponds to the position in the ordered list. The *h-index* [6] is then computed as follows:

$$h\text{-}index(RT) = \max_i \min(RT(i), i)$$

The results for both groups of Twitter users—for and against Brexit—are in Table 1. It seems that the automated Twitter classification of the users produced a reliable distinction (at least for the top users), since there is little doubt that they are correctly classified. Note, as a curiosity, that the Labour party has two Twitter accounts, one supporting Brexit (@labourleave), and the other one opposing it (@UKLabourIN).

Table 1: The top ten proponents and opponents of Brexit, ordered by the *h-index(RT)*.

Twitter user	No. of tweets	No. of retweets	*h-index*
for Brexit:			
@vote_leave (Vote Leave)	1,004	256,463	297
@theordinaryman2 (TheOrdinaryMan)	1,660	86,728	128
@Vote_LeaveMedia (Vote Leave Media)	891	40,379	100
@PrisonPlanet (Paul Joseph Watson)	107	33,960	89
@RedHotSquirrel (Robert Kimbell)	579	17,090	62
@davidicke (David Icke)	70	6,996	62
@DVATW (David Vance)	273	14,225	61
@labourleave (Labour Leave)	93	11,263	55
@ukleave_eu (#Brexit #Article50)	278	8,503	52
@EUVoteLeave23rd (SUPPORTING BREXIT)	1,439	18,492	52
against Brexit:			
@guardian (The Guardian)	356	19,304	70
@Independent (The Independent)	356	14,575	60
@TheGreenParty (Green Party)	83	8,894	51
@itvnews (ITV News)	248	8,783	45
@UK__News (UK News)	97	5,894	40
@BBCr4today (BBC Radio 4 Today)	119	6,399	39
@UKLabourIN (LabourInForBritain)	61	4,068	37
@The_TUC (TradesUnionCongress)	180	4,574	34
@wdjstraw (Will Straw)	85	3,805	33
@LibDems (Liberal Democrats)	66	3,765	33

It is interesting to observe that the proponents of Brexit were considerably more active on Twitter, and that their impact and influence on social media was much higher.

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We can only speculate how would a more active engagement of the "remain" camp influence the referendum outcome. We observed a similar phenomena in the case of the European Parliament [1], where the right-wing parties (lead by Nigel Farage and Marine Le Pen) exhibit much higher Twitter activities when promoting their eurosceptic agendas.

There is a lot of research on the question whether the analysis of social media can be used to predict political-related events. A survey of election predictions from Twitter, with mixed conclusions, is given by Gayo-Avello [4]. Our research indicates that in particular election cases, Twitter volume [3] and/or Twitter sentiment [8] are correlated with election results. In any case, we claim that there might be a valuable lesson for all the policy makers who want to promote their agendas: do not underestimate the role of social media, invest in a long-term effort in building communities of supporters, and actively and continuously engage in distributing your contents.

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