

Discussion about the engagement and trust in science on the subject of communication of space science on Social Media like Whatsapp, Facebook, etc

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ABSTRACT

There is situation that a disaster of believe might also be looming between society and scientists, as evidenced through the show of great public mistrust in essential troubles such as local weather alternate and childhood vaccinations. This perceived erosion of public self belief in science is one of the impetuses at the back of the public engagement with science movement, whereby scientists are referred to as upon to interact in dialogues with public audiences to assist enhance believe in science and scientists. This find out about ambitions to fill this gap. In particular, two overarching questions had been addressed: (1) does speaking with house scientists on social media have any results on public have confidence in science and scientists? and (2) what are the elements that have an effect on target market engagement and have faith in science amongst area science audiences?

A aggregate of guide and automatic content material evaluation techniques used to be used. More than 500,000 social media messages had been collected. The research published three necessary findings. First, outcomes point out that speaking to house scientists on social media motives a raise in have faith in science and scientists. Second, the elements related with target audience engagement and have faith in science are very different: visible factors stimulate target audience engagement, whilst similarity is the largest determinant of trust. Third, authenticity is the solely characteristic that influences each engagement and trust. This suggests that science audiences like and have confidence messages that are personal, honest, and genuine.

The world more and more wants scientists to additionally be advocates of science. The findings of this thesis symbolize concrete proof that ought to assist information social media science conversation efforts. Further, the world in which surveys worked properly has been modified by means of the digital revolution and this thesis demonstrates the attainable of the usage of superior computational strategies such as desktop getting to know for science verbal exchange research.

Key Words: local weather, social media, space Science, whatsapp, house scientists

INTRODUCTION

The confidence that public audiences location in science in phase approves scientists to undertake scientific endeavors that have resulted in high-quality accomplishments for humanity. We landed guys on the moon, eradicated lethal diseases, and sequenced the human genome, amongst different achievements. In turn, society trusts that scientists will habits their lookup with honesty and integrity (National Academies of Sciences, Engineering, and Medicine, 2009), that their lookup will inform public coverage in methods that are really useful to public audiences (Obama, 2009; Resnik, 2009), and that they will use public money and sources in a accountable and honourable manner (Schroeder, Zones, & Showstack, 1989; Shrader-Frechette, 1994).

However, public have faith is fragile and at instances unstable (Hilgard & Jamieson, 2017; Yarborough, 2014). In latest times, information of scientific misconduct (Grundmann, 2013; Hvistendahl, 2013; Jaafar & Maweni, 2016; Wise, 2013) and the mishandling of public fitness crises with the aid of lookup establishments (Dutton, De Pinto, Salvanto, & Backus, 2014; Kamradt- Scott, 2016), A file with the aid of the Pew Research Center published principal opinion variations between American scientists and public audiences on key problems such as evolution, obligatory childhood vaccinations, local weather change, and genetically modified meals (Funk & Rainie, 2015).

The perceived disaster of have confidence between science and public audiences is one of the impetuses at the back of the public engagement with science and science movement, signaling a shift from a deficit to a talk mannequin of science verbal exchange (House of Lords, 2000). Bi-directional conversation is the ethos of public engagement. By explicitly and actively enticing science audiences in two-way conversations about science and its applications, it is hoped that public attitudes toward science can be improved. Public audiences recognize scientists, however do now not always have faith them (Fiske & Dupree, 2014). To treatment this scientists are known as upon to take up public engagement things to do to talk with public audiences and interact them in dialogues.

The tertiary intention of this thesis is to discover the feasibility of computerized techniques in social media science conversation research. Traditional lookup strategies such as surveys are nevertheless the dominant strategy in science verbal exchange research (e.g., Hendriks, Kienhues, & Bromme, 2015; Nadelson et al., 2014; National Science Board, 2018). However, the availability of digital facts harvested from social media systems skill computational strategies are

turning into an increasing number of vital in social media lookup to allow deeper analyses of the data. This thesis pursuits to have a look at the viability of automatic strategies in the lookup of social media area science verbal exchange and supply hints on the terrific strategies that can be used to handle a range of lookup questions.

This shift in focal point to favour bi-directional varieties of science conversation makes social media appropriate equipment for science communication. Indeed, the interactive, mobile, speedy, human, and egalitarian nature of social media seems to suit nicely with the concepts of public engagement. Despite encouragements from proponents of social media science communication, most scientists are nevertheless reluctant to choose up these digital equipment for public engagement. One of the motives underlying this resistance is the lack of proof for the effectiveness of social media in affecting public attitudes closer to science.

RESULTS

The following file on the consequences of Study, which centered on the investigation of the engagement element of social media house science communication. The hypotheses that have been examined are:

1. The engagement attainable of house science-related social media messages can be envisioned the use of elements contained in the messages.
2. Engaging house science-related social media messages include positive facets that are special to area science.

Psycholinguistic facets of social media messages

This part affords the outcomes of the strategies described in Section 5.3.1.2 (p. 169) to analyse the psycholinguistic elements of the social media messages from 4 fields: area science, politics, business, and nonprofit.

Apart from a few exceptions, the LIWC rankings computed for social media messages from all 4 fields normally did now not exhibit large variations to the baseline scores. The whole effects are introduced in Appendix H. A few of noteworthy observations are listed below. Scores for Facebook and Twitter had been similar; for illustrative functions solely the rankings for Facebook are listed:

- Space science scored the best for the “analytic” ($M = 90.36$, $SD = 16.91$) and “authentic” ($M = 41.65$, $SD = 33.65$) categories.
- Space science scored the lowest for the “clout” ($M = 63.52$, $SD = 19.64$) and “tone” ($M = 49.35$, $SD = 43.20$) categories.
- Space science scored the absolute best for the “see” class ($M = 2.74$, $SD = 3.94$).
- Space science exhibited the lowest imply rating for the “certainty” class ($M = 0.58$, $SD = 1.82$), which was once additionally substantially decrease than the baseline rating ($M = 1.43$, $SD = 0.70$).

Predicting enticing social media messages

The supervised getting to know fashions that have been developed to predict the engagement workable of house science-related social media messages received right performances. High prediction accuracies have been executed for each Facebook and Twitter (H1), i.e. the predictive fashions have been in a position to predict particularly attractive area science-related Facebook posts and tweets with very little error. For Facebook, the best-performing mannequin (linear mannequin with SGD training) performed prediction accuracy of 84% on the check facts when all three function sets (psycholinguistic, grammatical, and social media) have been used. To put this rating into perspective, accuracies of round 50% would be predicted if the labels had been assigned randomly, given that there have been two labels to be expected (HER and LER). Performance for Twitter used to be barely better, with the best-performing fashions (linear mannequin with SGD education and Extra Tree classifier) attaining prediction accuracy of 88% on the take a look at records when all three function units have been used. For each Facebook and Twitter, precision, recall, and F1-scores in vary of 78% to 93% had been achieved.

To confirm the significance of the features, the pinnacle ten area science aspects for each systems have been excluded additively from mannequin training. Results exhibit that the drop in mannequin overall performance was once typically better for the higher-ranking features, and smaller for the lower- rating features, indicating the greater significance of the higher-ranking features. This is illustrated in following Figure, which suggests the drop in mannequin overall performance for the Naïve Bayes classifier when the ten most necessary points have been removed. The horizontal axis indicates the variety of aspects excluded: zero suggests no aspects had been excluded, 1 suggests the function ranked 1 (from Table 15) used to be excluded, 2 suggests the facets ranked 1 and two had been excluded, and so on. Excluding the 1st most essential function (“type_photo”) for Facebook led to a 3.2% drop in mannequin performance, whilst for Twitter,

getting rid of the pinnacle characteristic (“has photo”) led to a 11.1% drop in performance. Excluding all pinnacle ten points led to an typical drop in overall performance of 7.5% for Facebook and 24.9% for Twitter.

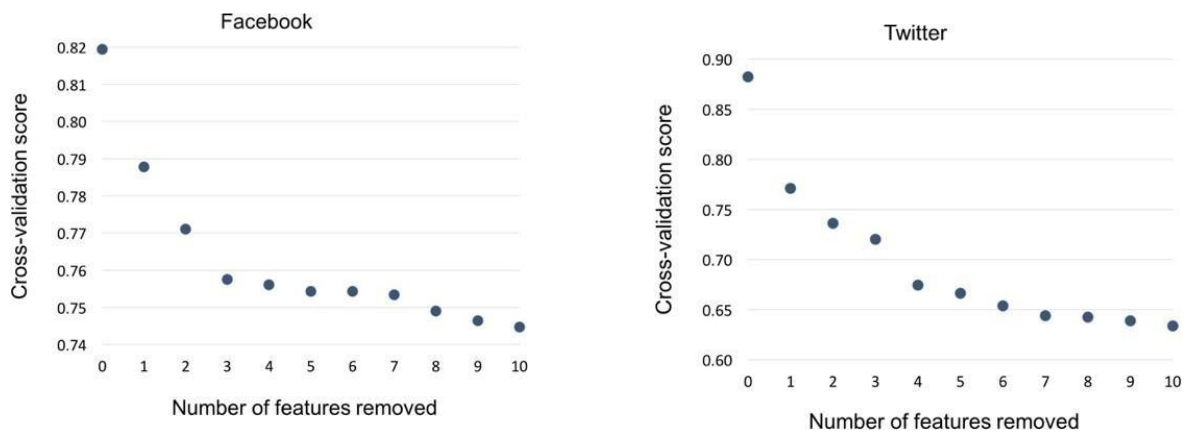


Figure: Drop in model performance following cumulative feature exclusion

A few examples of the house science-related Facebook posts and tweets and the points they contained are proven in Table 16.

Feature evaluation between house science and different fields

This part gives the effects of the strategies described, the place the vital points of engagement of area science-related messages have been in contrast with the points of engagement of the messages from the three different fields studied here.

For each Facebook and Twitter, numerous points have been discovered to be special to the area of house science. For Facebook, the rankings of 4 house science facets have been observed to be appreciably distinct (higher) than the three different fields: “type_photo”, “anger”, “see”, and “authentic_high”. For Twitter, 4 unique aspects have been found: “has_photo”, “has_hashtag”, “see”, and “nonfluencies”. The ANOVA distinction take a look at outcomes exhibit that the variations have been large adequate to advise that these aspects are attribute of attractive social media messages in, and solely in, the discipline of house science ($p < 0.01$ for all these features).

Topics of dialogue in house science

For the Facebook posts by using area science professionals, the ten subjects of

discussions were: house telescopes, area missions, rocket launches, local weather science, photo voltaic observations, area agencies, global area station, rosetta mission, observations and imaging, and science communication. For the equal time period, the ten subjects embedded in the audiences' Facebook feedback were: house objects and concepts, area exploration, house missions, authorities funding, local weather science, house visuals, astronauts, faith versus science, scientific inquiries, and promotional materials. There had been a few overlaps between the area science professionals' and audiences' topics. Figure 28 and Figure 29 exhibit the Gephi graphs for the subjects and their related key phrases for area science experts and audiences respectively.

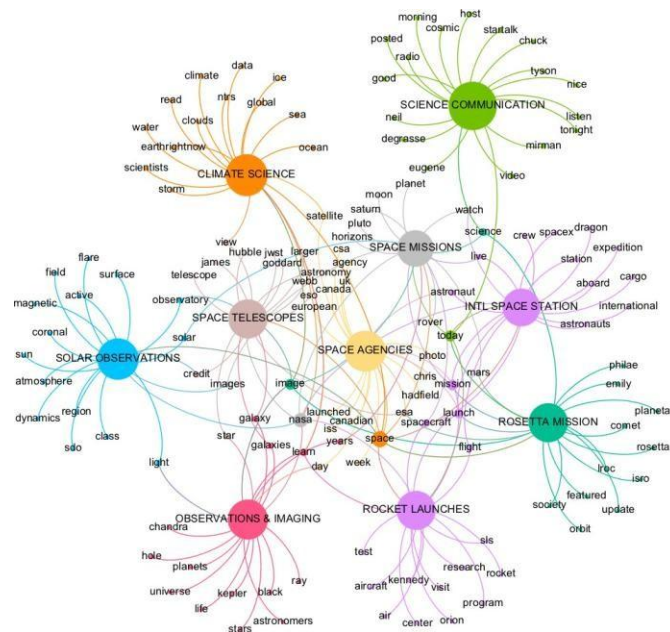


Figure. The discussion of Facebook posts by space science professionals for the February to March 2017

DISCUSSION

The overarching reason of this thesis was once to learn about the affect and points of social media engagement in phrases of its effectiveness in enhancing public believe in science and scientists amongst area science audiences. An extra purpose used to be to discover the feasibility of making use of automatic techniques such as laptop mastering in the lookup of social media area science communication. Three research have been performed to probe the engagement, trust, and have an impact on elements of social media area science communications, respectively.

Results show that the engagement plausible of area science-related social media messages ought

to be estimated with excessive accuracies, and that especially attractive messages contained sure facets that had been special to the discipline of area science (Study 1). The house science target audience participants who engaged with area scientists on Twitter had been extra probable to have faith science in contrast with the target audience individuals who solely engaged among themselves on Twitter (Study 2). The have faith doable of area science-related tweets should be estimated with excessive accuracies, and the facets of trust-inspiring tweets had been very one of a kind from the facets of attractive social media messages (Study 2). Engagement with astrobiologists on Reddit led to an enchancement of have faith in science and scientists, and the tone of the astrobiologists' messages used to be positive, reward-focused, tentative, and greater analytical than proper (Study 3). Lastly, findings exhibit that the matters of dialogue amongst area science audiences had been wide-ranging and regularly worried troubles associated to the dangers and implications of science (Study 1 and 3).

This area discusses the effects of Study 1 to take a look at H1, which proposed that the engagement viable of house science-related social media messages can be anticipated the usage of facets contained in the messages. The dialogue centres round two associated lookup questions: are there any aspects in noticeably attractive area science-related social media messages that set them aside from much less enticing messages (RQ1a)?, and can the engagement degree (i.e. excessive or low) of a house science-related social media message be estimated (RQ1b)? To recall, social media engagement was once described usually as “a connective and interactive phenomenon the place customers attend to others in methods that communicate to collective perception of the world and time” (Section 1.6.1, p. 14). Social media engagement in Study 1 used to be calculated with an equation (Equation 6) that took into account each informal and deliberate engagements and assigned various weights to distinct acts of engagement, such as likes, shares, and comments.

The predictive fashions developed in Study 1 executed excessive prediction accuracies (84% for Facebook and 88% for Twitter, Table 12, p. 210), helping the speculation that it is viable to forecast the engagement attainable of area science-related social media messages (H1, RQ1b). Best mannequin overall performance was once performed the usage of the linear mannequin with Stochastic Gradient Descent (SGD) training. Further, the excessive cross-validation (CV) rankings exhibit that the fashions have been generalisable to unseen data, which is an necessary consideration in supervised studying (discussed in Section 4.3.1.5, p. 131). This suggests that the predictive fashions developed in Study 1 have been capable to predict target audience engagement on social media with very little error, i.e. when fed with a random house science-related social media message, the model can forecast with excessive

likelihood if the publish would obtain a excessive or a low engagement rate.

The findings of this thesis cowl three essential dimensions of social media area science communication. First, it used to be proven that social media engagement with astrobiologists led to an make bigger of each specific and implicit have confidence in science and scientists. Second, function analyses exhibit that there used to be very little overlap between the facets of especially attractive area science-related social media messages and trust-inspiring ones. The most essential points of engagement for house science social media conversation have been visible factors (photos, videos, and “see” words), hashtags, anger, nonfluencies, and authenticity.

By contrast, the residences of trust-inspiring area science-related tweets have been basically similarity and network-related features, as properly as an real and analytical tone in the guardian tweet. Authenticity was once the solely frequent characteristic of target market engagement and have confidence in science, indicating that what works to promote target market engagement does no longer always encourage believe in science amongst area science audiences. Findings of this thesis advise that it is vital to use a aggregate of records (analytical tone) and feelings (authenticity) in social media area science communication. Lastly, the three research display the feasibility of the use of automatic techniques to increase guide competencies in the lookup of social media science communication. This thesis has countless limitations, inclusive of the restrained generalisability of the outcomes due to the precise subject of learn about and information sources chosen for the studies. The use of computational strategies was once additionally now not except flaws. In the following chapter, the conclusions drawn from the fundamental findings of this thesis are presented.

CONCLUSIONS

One of the essential findings of this thesis is the high quality have an impact on of social media engagement with house scientists on have faith in science and scientists. After speaking with astrobiologists in a Reddit AMA session, the participants’ have confidence in science and scientists was once boosted. As mentioned in Chapter 3, have confidence in science and scientists is significantly important, as it influences public audiences’ appreciation of necessary science issues, and offers scientists with the legitimacy to work on lookup that enriches human understanding and may want to doubtlessly clear up the most urgent troubles of our time. Hence, the nice results of social media engagement with house scientists in phrases of have confidence in science is a large discovery. At a time when net use is on the upward jab amongst sincerely all segments of public audiences, and social media is turning into increasingly more ubiquitous, it has been located that scientists are incredibly sluggish in

choosing up these digital equipment for public engagement purposes. Previous research have proven that one of the predominant motives underlying scientists' reluctance is the shortage of proof for the effectiveness of social media in altering public attitudes.

The obstacles of surveys are well-known. In particular, surveys on my own are insufficient equipment for the size of a complicated assemblies such as trust. This thesis advances the grasp of have faith in science by way of combining each survey and a customized Implicit Association Test (IAT) to investigate public believe in science and scientists. Little correlation used to be determined between the express and implicit measures, suggesting that the two comparison techniques would possibly be assessing distinct dimensions of trust. Nevertheless, the truth that each measures confirmed an amplify in believe strengthens the proof for the superb have an effect on of social media engagement with area scientists on have confidence in science and scientists.

The intention used to be to reply the query of whether or not area science target market participants who interact with area scientists on Twitter have been greater probably to have confidence science in contrast with target market contributors who solely have interaction with different target audience individuals on Twitter. Results exhibit that though the standard stage of have faith in science located amongst house science audiences on Twitter was once high (86.1%), this have faith seems to be divided. Space science target audience participants who engaged with house scientists on Twitter had been considerably extra possibly to have faith science in contrast with target market participants who solely communicated amongst themselves.

That is no longer to say scientists and science communicators have nothing to fear about. If anything, this thesis highlights the want for higher methodologies than countrywide surveys to measure have faith in science, a complicated and multifaceted concept. Attempts to describe "trust" and "science" in one vast stroke are problematic, as they hazard protecting the actual problems underpinning public mistrust in unique science issues. This thesis underscores the significance of perception the worldviews of science audiences, the intricacies of believe as each an emotional and rational construct, and the elements underlying science scepticism.

Visual facets and authenticity had been located via each supervised getting to know and normal statistical evaluation technique as essential homes of target audience engagement in social media house science communication. Topic modelling confirmed that "space visuals" was once a distinguished subject matter of dialogue amongst house science audiences, lending similarly guide to the significance

of visible aspects in stimulating engagement.

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