448.025 - Toward a Digital Phenotype of Autism: An Exploratory Study Using Twitter Data

Background: As social communication deficits are a core feature of autism, patterns of language use are a useful tool in characterizing the disorder. However, even though online services have become increasingly popular in recent years, no study of autism to date has analyzed language use in the context of social media. Such an analysis could contribute to understanding whether autism has a robust “digital phenotype” of online behavior. Twitter in particular is a useful source of data. It has a large number of frequent users (126 million people use the services at least daily), is largely public-facing (87 percent of Twitter users make all their tweets publicly-available), and is used by a significant segment of the autistic community, with many users who self-identify using the hashtag “#actuallyautistic.”

Objectives: We sought to train a machine-learning model to predict whether an individual autism-related tweet came from a user who self-identified as autistic using the #actuallyautistic hashtag.

Methods: We used Twitter search to download all unique English-language tweets made over a one-month period (7/28/2019 - 8/28/2019) that contained either the word “autism” or “autistic.” We labeled all tweets as “self-identified autistic” or “not self-identified autistic” based on whether they contained the hashtag “#actuallyautistic.” We then processed tweets for analysis by removing “autism,” “autistic,” any hashtags, any URLs, and any usernames from the text, and by converting all text to lowercase. We created a modeling dataset from all “self-identified autistic” tweets and a random matching subset of “not self-identified autistic” tweets. Using the open-source fastText algorithm, we transformed tweets into bigram vector representations and trained a model using 75% of the data for 50 epochs. We then evaluated model performance on the remaining 25%.

Results: Of 100,356 unique tweets containing “autism” or “autistic,” 992 contained the hashtag “#actuallyautistic” and were given the “self-identified autistic” label. Our trained algorithm was able to identify “self-identified autistic” tweets in the test set with reasonable (73.80%) accuracy.

Conclusions: These exploratory results at minimum sugggest that the semantic content of tweets about autism made by users who self-identify as autistic may differ systematically from those made by users who do not. However, we also consider them a promising proof-of-concept for future work using Twitter data. A logical next step would be to obtain non-autism-related tweets from the profiles of self-identified autistic users and compare them to a control group from non-autistic users. It is possible that this could improve the accuracy of our classifier, as our ascertainment of tweets based on search terms may have inherently reduced the differences between them. An eventual goal would be to determine whether a classifier trained on Twitter data can generalize to other online prose, such as Facebook comments, text messages, or emails. If so, this would represent a meaningful step towards characterizing a digital phenotype of autism.

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