Machine learning-based public opinion mining on air pollution alarm policies in social media: A case study of fine dust alarm policies in Stuttgart,Germany

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With the progress of industrialization and urbanization, air pollution in Europe has regained the public's attention in recent decades. Compared to previous air pollution events such as London Great Smog and the smog crisis in Germany Ruhr area in the last century, the current air pollution problems in the new millennium, accompanied by the fast growing social networks, multi-media applications and the new forms of politics participation, pose unprecedented challenges. In recent years, many European cities have adopted their own air pollution alarm systems. Corresponding policies are implemented to reduce air pollution with the actions from both sides of authorities and the public. Due to the strong impact of public opinion on air pollution alarm policies implementation, the measurements of how these policies are viewed by the public is crucial for a better public participation in air quality improvement.

By applying data mining techniques in social media, this research aims to investigate the public opinion and concern towards the implemented policies of Germany's first fine dust alarm during 2016 and 2017 in city Stuttgart. Based on the data collected from social media Twitter, we performed machine learning-based sentiment analysis for revealing the public attitude towards fine dust alarm policies. A comparison of naive Bayes algorithm and the Perceptron function as classifier is carried out to seek better sentiment classification performance. The analysed public attitude includes the overall policies and different aspects of policy content, such as advocating for public transportation, promoting clean energy vehicles, prohibiting private fireplace, etc.

Meanwhile, epidemiological model for information diffusion on social media is applied to simulate the dissemination process of fine dust alarm topic among Twitter users. This analysis presents the trend of social influence of the topic and the level of public attention brought to this topic.

Our research is an exploration of how social media could be exploited to mine the public opinion towards environment hazard topics. It might help the authorities to have a better understanding of public's satisfaction level with the policies and to improve their policy making decisions.