Trusted Innovation – Junk Science, Fake News, and Public Understanding of Artificial Intelligence and Climate Change

Philip N. Howard, Principle Investigator, Oxford Internet Institute
Rasmus Nielsen, Co-Principle Investigator, Reuters Institute

Abstract
In some key domains of public life there appears to be coordinated efforts to ruin the reputation of science and innovation. Scientists now protest in the streets just to get policymakers to embrace evidence-based policy making. Long-held consensus on the causes and consequences of climate change, tobacco-induced cancers, and value of public health strategies increasingly seem open for debate. We have political leaders who claim to be unable to discern what expert consensus is—even when experts organize to make explicit statements about levels of confidence and certainty around particular areas of research. Social media platforms have become a powerful venue for those aiming to deflating public support for action based on reliable research, and previously trusted technological innovations come to have negligible impact. In this three-year project, we will examine the interplay between systematic misinformation campaigns, news, and increasingly important social media platforms for public understandings of science and innovation. We aim to increase our understanding of the role of "junk science" and fake news in influencing—or even undermining—public understanding of scientific issues and develop evidence-based recommendations for scientists, journalists, and policymakers interested in effective science communication in the 21st century.

Context for this Research Agenda

Technological innovations, market forces and political incentives have created dangerous opportunities to derail scientific advancement and evidence-based public policy conversations. The combination of political partisanship, social media, and private interests has increased public uncertainty around a wide range of public policy problems and solutions. Indeed, since well before the advent of social media there has been a professional class of strategists and lobbyists that specialized on promoting uncertainty around acid raid, tobacco-induced cancers, and climate change (Sachs 2010). Indeed, people with different political ideologies involve science in their thinking in different ways. In the United States, research suggests, Democrats refer to science in their appraisal of the harms of climate change, whereas Republicans do not (Cary 2017). Moreover, social media provides a platform for science conspiracies that cross domains. For instance, social media users who reject the link between HIV and AIDS generally also believe that AIDS was created by the U.S. Government to control the African American population (Bessi et al. 2015). Misinformation about basic issues in science and technology, from natural selection to algorithmic filtering, abounds. In some cases, important political figures contribute to the confusion and misinformation by making flawed or untrue public arguments. In other cases, more discrete coordinated campaigns use various forms of digital media to pursue their political and other goals and in the process undermine both evidence-based policy discussions and public understanding of science and technology. On some topics, like climate change, junk science in some countries seems to circulate farther than legitimate research findings.

This project has two aims. First, we will analyse public understanding of science and innovation with a specific focus on the interplay between misinformation campaigns and the various social media platforms that enable them. Second, we will help researchers, journalists, and policymakers find better ways of communicating about innovation in science and technology in the specific domains of AI and climate science. The project builds on our existing record of research in this area. The Reuters Institute has demonstrated that more than half of internet users across a sample of 26 countries rely on social media for news, underlining the importance of understanding how science and innovation is communicated in a changing media environment. The Oxford Internet

Institute (OII) is the premier centre for the study of computational propaganda and has shown how coordinated misinformation campaigns are enabled by the very social media platforms people increasingly turn to for news. It is increasingly clear that public understanding of science and innovation is not only shaped by education and by traditional forms of science communication through established news media, but also by the algorithms and machine learning behind the world's most regularly used social media platforms. But so far, our understanding of the interplay between the public, misinformation campaigns, and social media has been limited and most research carried out has focused on elections and candidates for public office rather than broader but equally important issues of science communication. This project will turn to the problem of junk science, fake news and public policy issues, focusing specifically on the two critical issues of (1) artificial intelligence (AI) and (2) climate change. We have selected these two issues (a) because they are both critically important examples of public discussions of technological innovation and science, (b) because they different in important ways, in terms of how established they are and how politicized they are. AI represents an example of cutting-edge research discussed more on the basis of potential and prejudice than established facts, and one that has till recent controversies surrounding fake news on Facebook and Google been less politicized. Climate change represents an established issue with an established research consensus on the causes and consequences of current developments, and an issue that has long been highly politicized. We will focus on three questions:

1. How does the public's understanding of the two issues of AI and climate change vary from country to country and how is this variation related to differences in media use?
2. How do misinformation campaigns on social media influence public learning about the two critical issues of AI innovation and climate science?
3. How can scientists, journalists, and policymakers be better at communicating about science and new innovations, so as to contribute to evidence-based policy making and respond to misinformation and junk science?

Methodologically, the project will combine the established social science methods of surveys, content analysis, and qualitative research with new computationally-intensive methods of auditing algorithms, scraping social media posts, and social network analysis of big data.

Aims and Objectives
This proposal is the result of new conversations between the OII and the Reuters Institute and our goal is to combine social science and computer science to address the damaging impact of computational propaganda and other forms of digitally-enabled misinformation campaigns on scientific innovation, policy making, and public life. The OII's studies of computational propaganda has already demonstrated that even simple levels of automation (i) effectively keep negative messages and fake news in circulation longer (ii) target journalists and civil society groups and (iii) operate with little oversight from social media firms (Howard and Kollanyi 2016; Kollanyi, Howard, and Woolley 2016a, 2016b, 2016c, 2016d; Forelle et al. 2015). Researchers at the Reuters Institute and elsewhere have also examined the increasing overlap between social media platforms like Facebook and Twitter and public communication more broadly (Nielsen and Ganter 2017, Nielsen 2016) and demonstrated that simple algorithms can manipulate public opinion over social media platforms, especially in research domains where researchers must communicate findings in terms of risk and uncertainty (Painter 2014; Sandvig et al. 2016; Hamilton et al. 2014; Karppi and Crawford 2015, Webb et al. 2016).

In this project, we will (a) investigate the degree to which misinformation campaigns can direct digital and social media advertising to citizens during sensitive moments when scientific expertise would normally be part of the process of evidence-based policy making, (b) research how bots or fake accounts on Twitter and Facebook amplify such messages to real communities of users

(c) examine how scientists, journalists, and policymakers engage with misinformation campaigns and (d) identify ways to overcome the problems they create.

For the last several months, we have been engaging through ad hoc workshops about the impact of social media, alternative facts, post-truth and a range of other issues facing civil discourse, but there is a real need to bring together and expand Oxford's various strands of relevant work in these areas to ensure a better understanding of the phenomena at hand as well as the ability to engage more effectively with decision makers trying to combat misinformation and misunderstandings. The Reuters Institute is one of the world's leading centres of research on change in the business and practice of journalism, including work on technological change broadly and on coverage of climate change and science specifically. The OII is the university's renowned department for social data science. The *Trusted Innovation Project* will allow the Martin School to catalyse a new collaboration within Oxford University, bringing OII's computer scientists together with Reuters Institutes' social scientists, and leveraging our combined networks across policymaking, the technology industry, and the news media sector. Indeed, we believe there is no better global institution for putting computer scientists together with experts in news production to study the very contemporary problems of fake news and junk science.

To answer the research questions above we will apply a variety of relevant social and data science methods, including research modes common to public opinion research, social data science, and comparative methods. To answer the first research question (around public understanding) we will apply (a) survey research by fielding and analysing data from a high quality public polling instrument and (b) social data science of Facebook and Twitter data use around key hashtags. To answer the second research question (around misinformation campaigns around AI and climate science) we will conduct (a) interviews with hackers and bot writers behind misinformation campaigns, (b) conduct audits of Facebook's advertising algorithms to understand the origins and placement of junk science in newsfeeds, and (c) track the spread of misinformation across sites like Twitter. To answer the third question (around the role of scientists, journalists, and policymakers) we will do (a) cross country comparative work to understand how and why junk science spreads in some countries and (b) interpretive policy analysis to explain what combination of scientific communication strategies, media regulation, and information policy may be most conducive to spreading trusted innovations in science and technology and which combinations may prevent such innovations from having an impact. In terms of case selection, we propose developing our models in the UK and then testing them on Australia, Canada and the US in the first phase of the project. We will then expand out to cover other countries in the second phase, the precise sampling depending on the country knowledge of our postdoctoral appointments. The initial four cases have been chosen because they have comparable scientific cultures and a shared language, and because the lead investigators have extensive experience studying the role of social media and news in public life in these countries. Over the two phases, we will first develop robust, multi-methods, and interdisciplinary approaches to studying the role of misinformation campaigns and social media in the public understanding of science and technology, using the two critical issues of AI and climate science, then second be able to use these to compare across countries how variations in for example politics and the media shape these new dynamics.

References

Bessi, Alessandro, Mauro Coletto, George Alexandru Davidescu, Antonio Scala, Guido Caldarelli, and Walter Quattrociocchi. 2015. "Science vs Conspiracy: Collective Narratives in the Age of Misinformation." *PLOS ONE* 10 (2): e0118093. doi:10.1371/journal.pone.0118093.

Cary, Funk. 2017. "How Much Does Science Knowledge Influence People's Views on Climate Change and Energy Issues?" *Pew Research Center*. March 22. http://www.pewresearch.org/fact-tank/2017/03/22/how-much-does-science-knowledge-influence-peoples-views-on-climate-change-and-energy-issues/.

Forelle, Michelle C., Philip N. Howard, Andres Monroy-Hernandez, and Saiph Savage. 2015. "Political Bots and the Manipulation of Public Opinion in Venezuela." SSRN Scholarly Paper ID 2635800. Rochester, NY: Social Science Research Network. http://papers.ssrn.com/abstract=2635800.

Hamilton, Kevin, Karrie Karahalios, Christian Sandvig, and Motahhare Eslami. 2014. "A Path to Understanding the Effects of Algorithm Awareness." In *CHI '14 Extended Abstracts on Human Factors in Computing Systems*, 631–642. CHI EA '14. New York, NY: ACM. doi:10.1145/2559206.2578883.

Howard, Philip N., and Bence Kollanyi. 2016. "Bots, #Strongerin, and #Brexit: Computational Propaganda during the UK-EU Referendum." Working Paper 2016.1. Oxford, UK: Project on Computational Propaganda. www.politicalbots.org. http://dx.doi.org/10.2139/ssrn.2798311.

Karppi, Tero, and Kate Crawford. 2015. "Social Media, Financial Algorithms and the Hack Crash." *Theory, Culture & Society* 33 (1): 73–92. doi:10.1177/0263276415583139.

Kollanyi, Bence, Philip N. Howard, and Samuel C. Woolley. 2016a. "Bots and Automation over Twitter during the First U.S. Presidential Debate." Data Memo 2016.1. Oxford, UK: Project on Computational Propaganda. http://www.politicalbots.org.

———. 2016b. "Bots and Automation over Twitter during the Second U.S. Presidential Debate." Data Memo 2016.2. Oxford, UK: Project on Computational Propaganda. http://www.politicalbots.org.

———. 2016c. "Bots and Automation over Twitter during the Third U.S. Presidential Debate." Data Memo 2016.3. Oxford, UK: Project on Computational Propaganda. http://www.politicalbots.org.

———. 2016d. "Bots and Automation over Twitter during the U.S. Election." Data Memo 2016.4. Oxford, UK: Project on Computational Propaganda. http://www.politicalbots.org.

Painter, James. 2014. "Climate Change in the Media: Reporting Risk and Uncertainty." Oxford, UK: The Reuters Institute. https://reutersinstitute.politics.ox.ac.uk/.

Sachs, Jeffrey. 2010. "Climate Sceptics Are Recycled Critics of Controls on Tobacco and Acid Rain." *The Guardian*, February 19, sec. Environment. https://www.theguardian.com/environment/cif-green/2010/feb/19/climate-change-sceptics-science.

Sandvig, Christian, Kevin Hamilton, Karrie Karahalios, and Cedric Langbort. 2016. "Automation, Algorithms, and Politics | When the Algorithm Itself Is a Racist: Diagnosing Ethical Harm in the Basic Components of Software." *International Journal of Communication* 10 (0): 19.

Webb, Helena, Pete Burnap, Rob Procter, Omer Rana, Bernd Carsten Stahl, Matthew Williams, William Housley, Adam Edwards, and Marina Jirotka. 2016. "Digital Wildfires: Propagation, Verification, Regulation, and Responsible Innovation." ACM Transactions on Information Systems (TOIS) 34 (3): 15.