

## **Ph.D. in Data Analytics and Decision Science:**

### **Thesis Defenses January 26th, 2022 Aula N. Schiavoni/online by Teams – at 17.00**

**Francesco Pierri – XXXIV Cycle**

Advisor: Prof. Stefano Ceri

PhD Thesis Title: **Characterization and Detection of Disinformation Spreading in Online Social Networks**

Abstract:

In the last decade, online Social Networking Sites have become a fundamental part of our everyday life. Billions of individuals worldwide participate in such virtual communities, sharing and discussing messages, photos, videos, and other user-generated content. News consumption habits have also changed, and more and more individuals consume online news on social platforms such as Facebook and Twitter rather than traditional media such as newspapers and TV.

However, online social media also expose us and make us vulnerable to a variety of false and misleading information which erodes public trust towards institutions, with severe backlashes in the real world. One example is the ongoing COVID-19 pandemic, which has been accompanied by waves of potentially unreliable information which undermine medical intervention and governmental efforts to circumvent the spread of the disease.

In this work, we leverage a network and computer science approach to tackle the problem of disinformation -- a term we use hereby as a shorthand to indicate all sorts of misleading, false and potentially harmful information -- spreading in online social networks.

Focusing on Twitter and Facebook, we study the mechanisms and the actors involved in the spread of false information and other malicious content during relevant events such as political elections and the ongoing COVID-19 pandemic, when the need of reliable information for the public is higher.

We carry out a systematic comparison of reliable information, published by mainstream and traditional news websites, versus unreliable information conveyed by websites that have been repetitively flagged for sharing disinformation, misinformation, hoaxes, fake news and hyper-partisan propaganda.

We provide evidence of superspreaders of disinformation, i.e., influential users which are responsible for most of the disinformation shared online, and we unveil links with far-right communities, which oftentimes exploit fabricated information to push their agenda. At the same time, we show that reliable information accounts for the majority of news stories circulating online and that disinformation has a small yet non-negligible online prevalence which can still influence individuals' opinions and feelings.

We further investigate the interplay between vaccine-related disinformation shared on Twitter and the vaccine hesitancy and uptake rates measured across U.S. regions, following the roll-out of the COVID-19 vaccination program. Building a regression model which takes into account demographics, socio-economic and political factors, we find a significant association between online disinformation and vaccine outcomes.

Finally, drawing on the results of aforementioned analyses, we deploy a methodology to accurately classify news articles based on the interactions between users that naturally take place on Twitter. Following the intuition that users shape different diffusion patterns depending on the content they share, we train and test off-the-shelf machine learning classifiers that can classify the veracity of a news article, without the need of looking at its content.

All in all, our results contribute to a better understanding of the issue of disinformation spreading in online social media, and highlight the need for intervention by platforms and governments to address this issue in a timely fashion.