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COMPUTER-BASED PERSONALITY JUDGMENTS FROM DIGITAL FOOTPRINTS: THEORETICAL CONSIDERATIONS AND PRACTICAL IMPLICATIONS IN POLITICS

Abstract

Accurately forming personality judgments is of vital importance in a wide range of social interactions. Although people are able to make fairly accurate personality judgments of others, recent technological advances in machine learning made computers better at predicting personality than humans. In this review, we will focus on computer-based personality judgments and their theoretical considerations and practical implications in politics. More precisely, we will discuss (i) the use of social platforms and digital devices in collecting so-called digital footprints, (ii) personality traits that are assessed based on digital footprints, (iii) advantages and disadvantages of using computer-based personality judgments, (iv) persuasive communication based on digital footprints of personality traits, and lastly, (v) the matters of privacy and informed consent. With this review, we aim to provide a guide how to use computer-based personality judgment in a way to serve the public interest.

Keywords: personality judgment, social media, digital footprint, persuasive communication.

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INTRODUCTION

Accurately forming personality judgments is of vital importance in a wide range of social interactions (Thielmann, Hilbig, and Zettler 2020, 175; Youyou, Kosinski, and Stillwell 2015, 1036). People use personality judgments for making decisions about who to trust, socialize with, employ, date, marry, elect as president, etc. (Funder 2012, 177; Hinds and Joinson 2019, 204; Youyou, Kosinski, and Stillwell 2015, 1036). Previous studies have demonstrated that people are able to make fairly accurate personality judgments of others, which help them navigate through daily social interactions (e.g., Beer and Watson 2008, 250; Connelly and Ones 2010, 1119; Funder 2012, 180; Hirschmüller et al. 2013, 351; Youyou, Kosinski, and Stillwell 2015, 1039).

However, when we compare the accuracy of human and computer personality judgments, studies suggest that computers are better at predicting personality than humans (Azucar, Marengo, and Settanni 2018, 150; Hinds and Joinson 2019, 205; Tskhay and Rule 2014, 25; Youyou, Kosinski, and Stillwell 2015, 1036). Computer personality judgments have higher external validity compared to human personality judgments when predicting relevant life outcomes such as political attitudes, substance use, physical health, etc. (Youyou, Kosinski, and Stillwell 2015, 1039). Therefore, in this review we will focus on computer-based personality judgments and their theoretical considerations and practical implications in the area of politics. In the next few paragraphs, we will discuss the use of social platforms and digital devices in collecting so-called digital footprints.

DIGITAL FOOTPRINTS

The increasing usage of digital social platforms such as Facebook, Twitter, Instagram, YouTube, etc., provide us with a relatively new source of user generated ecological data, which are automatically collected (Settanni, Azucar, and Marengo 2018, 217). This type of data is known as digital footprints,digital traces or digital records defined as data created by users which they leave behind on digital platforms (Hinds and Joinson 2019, 204; Koops 2011, 230; Settanni, Azucar, and Marengo 2018, 217). Digital footprints can be distinguished from data shadows, which are information about users generated by others (Koops 2011,

230). Everybody has their own unique digital footprint, and based on it, it is possible to create a complete digital entity of a certain person (Deeva 2019, 185). Digital footprints can be used for various research purposes in diverse disciplines and among them for personality judgment (Settanni, Azucar, and Marengo 2018, 217). A single piece of information that is a part of digital footprint is not enough to produce an accurate personality prediction, but when multiple pieces of information are combined, the resulting personality prediction can be accurate (Risso 2018, 77).

We can distinguish between different types of digital footprints found on social media such as user demographics (e.g., gender, age, level of education, etc.), likes (e.g., on Instagram, TikTok, Facebook, etc.), user activity statistics (e.g., number of received likes, number of posts, number of uploaded videos or photos, number of comments, number of friends or followers, number of user tags, etc.), linguistic features (e.g., tweets, status updates, comments, blog posts, etc.), audiovisual content (e.g., profile pictures, videos, etc.), and so on (Azucar, Marengo, and Settanni 2018, 152; Farnadi et al. 2016, 113).

Digital footprints can also be collected offline, through digital devices (Hinds and Joinson 2019, 204; Lambiotte and Kosinski 2014, 1937). For example, individuals leave digital footprints when they wear devices that track physical states such as walking, running, and sleeping, join a Wi-Fi network, connect with Bluetooth, use Global Positioning System (GPS), make phone calls, write text messages, spend their money, etc. (Gladstone, Matz, and Lemaire 2019, 1087; Hinds and Joinson 2019, 204; Lambiotte and Kosinski 2014, 1937). When people wear digital tracking movement devices, they leave behind accelerometer data; when they use Wi-Fi and GPS, they leave geolocation data; when they connect with Bluetooth, colocation with other devices can be detected; when they spend money, they leave transaction data; and with records of phone calls and text messages, levels of social interaction can be measured (Gladstone, Matz, and Lemaire 2019, 1087; Hinds and Joinson 2019, 204; Lambiotte and Kosinski 2014, 1937).

Additionally, we can differentiate between users that post their content frequently and those who rarely post their own content. We can infer the personality traits of the second type of users when using computer-based personality judgment through things they like and share. We can also gain insights about the personality traits of the users we are interested in analyzing through indirect sources, such as comments that are directed at them, texts from web pages that they share link to, etc. (Yamada, Sasano, and Takeda 2019, 177–182).

Multidisciplinary collaborations are needed to make the best use and interpretation of digital footprints available on social media and digital devices for personality judgment (Lambiotte and Kosinski 2014, 1938; Schwartz et al. 2013). Multidisciplinary collaborations could happen between psychology, computer science, social sciences, linguistics, and applied mathematics (Lambiotte and Kosinski 2014, 1938). These diverse fields could be unified in the field of computational social psychology (Lambiotte and Kosinski 2014, 1938). In the section to follow, personality traits, that are assessed based on digital footprints, will be described.

PREDICTING PERSONALITY TRAITS FROM DIGITAL FOOTPRINTS

Models have mostly been used to predict individuals' Big Five personality traits from digital footprints (Stachl et al. 2020a, 614). The Big Five model of personality (also known as the Five-Factor or OCEAN model) is regarded as the most widely used theoretical framework and most empirically supported model of normal personality traits (Chmielewski and Morgan 2013). The Big Five model consists of five broad personality dimensions – Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism (Chmielewski and Morgan 2013). These broad trait dimensions are used to describe individual differences in thoughts, feelings, and behaviors (Chmielewski and Morgan 2013).

It has been shown on a meta-analytical level that the predictive power of digital footprints in the case of Big Five traits is in line with the correlations obtained between behavior and personality in other studies of individual differences that use questionnaires (Azucar, Marengo, and Settanni 2018, 150). Correlations between digital footprints and personality traits range from .29 (in the case of Agreeableness) to .40 (in the case of Extraversion)(Azucar, Marengo, and Settanni 2018, 150). Accuracy is quite consistent across all Big Five traits and it can additionally improve when multiple types of digital footprints and accounts from multiple social media sites are used (Azucar, Marengo, and Settanni 2018, 150; Skowron et al. 2016, 108).

One more widely used model that has been used for personality prediction is the Myers-Briggs Type Indicator (MBTI; Yamada, Sasano, and Takeda 2019, 178). MBTI describes the preferences of an individual on four dimensions – Introversion-Extraversion, Sensing-Intuition, Thinking-Feeling, and Judging-Perceiving, and these basic dimensions

combine into 16 personality types (Yamada, Sasano, and Takeda 2019, 178). Previous studies have shown that these basic dimensions can also be accurately predicted from digital footprints (Amirhosseini Hossein and Kazemian 2020; Yamada, Sasano, and Takeda 2019, 181). Other related psychological traits that have been successfully predicted from digital footprints are sensation seeking (Schoedel et al. 2019, 232), materialism (Gladstone, Matz, and Lemaire 2019, 1091), self-control (Gladstone, Matz, and Lemaire 2019, 1091), depression (Eichstaedt et al. 2018, 11203), traits from the Dark Triad model (i.e., Machiavellianism, narcissism, and psychopathy; Garcia and Sikström 2014, 92), etc. In the following paragraphs, advantages and disadvantages of using computer-based personality judgments will be discussed.

ADVANTAGES AND DISADVANTAGES OF USING COMPUTER-BASED PERSONALITY JUDGMENTS

Advantages of using computer-based personality assessment compared to traditional personality assessment are the possibility to noninvasively collect personality-related data from large numbers of people and the possibility to collect data over extended periods of time (Mõttus et al. 2020, 1181). Data collection over extended periods of time allows to track short-term and long-term changes in personality (Mõttus et al. 2020, 1181). Computer-based personality assessment can also be cheaper than traditional personality assessment, and it is an automated process that doesn't require human social-cognitive skills (Matz and Netzer 2017, 7; Youyou, Kosinski, and Stillwell 2015, 1036). Additionally, computer-based personality assessment is not only more accurate, but also less prone to cheating and misrepresentation (Kosinski, Stillwell, and Graepel 2013, 5805). Furthermore, unlike questionnaires and surveys, using language data from social media allows researchers to observe individuals when they express themselves in their own words (Schwartz et al. 2013).

However, there are some possible downsides to using computer-based personality assessment. Firstly, test samples for personality assessment are collected usually only for a recent time period (Zhong et al. 2018, 269). Secondly, sometimes information used for algorithms for personality assessment is incorrect, i.e., users may give unreal answers about their personality traits on personality questionnaires. Thirdly, some people may hide their true thoughts and feelings when using social media, and generally people behave differently

online and in real life (Al Marouf, Hasan, and Mahmud 2020, 587; Zhong et al. 2018, 269). With that being said, previous studies have shown that at least in the case of Facebook, users' information reflect their real personality, not their idealized version of personality (Wan et al. 2014, 220). Fourthly, indicators such as likes are limited, because peoples' preferences change over time (Hinds, Williams, and Joinson 2020). Finally, some people have accounts on social media, but don't use them very often, i.e., their digital footprint is small (Hinds, Williams, and Joinson 2020). In the paragraphs to follow, persuasive communication based on digital footprints of personality traits will be described.

PSYCHOLOGICAL PERSUASION BASED ON DIGITAL FOOTPRINTS OF PERSONALITY TRAITS

Recent technological advances that allow us to assess personality traits can be used for persuasive communication in different contexts (Matz et al. 2017a, 12714). Persuasive communication is used in politics to mobilize the voting population to vote for a specific political candidate (Matz et al. 2017a, 12714). An approach where persuasive communication is tailored to people's unique psychological characteristics and motivations is referred to as psychological persuasion (Matz et al. 2017a, 12714). This includes persuasion based on individuals' personality traits (Matz et al. 2017a, 12714). Psychological persuasion can be on an individual and on a group level (Hirsh, Kang, and Bodenhausen 2012, 578; Matz et al. 2017a, 12717). The benefit of personalized psychological persuasion is that it provides a way to alleviate the problem of choice overload, by prioritizing content that individual users will prefer the most (Matz et al. 2017b, 279). By alleviating the problem of choice overload, this type of persuasion helps people to make better decisions, and also lead happier and healthier lives (Matz et al. 2017a, 12714). The main drawback of personalized psychological persuasion is that it can be used to exploit weaknesses in people, and to persuade them to make decisions that aren't in their best interest (Matz et al. 2017a, 12717).

One specific type of psychological persuasion that is used, among other things, in politics is called micro-targeting (Heawood 2018, 429). The term micro-targeting is defined as targeted messaging for specific groups (Heawood 2018, 429). Data that is used for micro-targeting is collected through traditional market research techniques such as surveys and focus groups, but also through tracking individuals' online behavior (Krotzek 2019, 3611).

Effectiveness of political micro-targeting based on personality traits has been questioned (Zarouali et al. 2020). Nevertheless, it has been shown that individuals prefer advertisements that are tailored to their personality traits (Zarouali et al. 2020). The use of political micro-targeting has both good and bad sides (Zarouali et al. 2020). The good side is that individuals can get relevant information about issues they are really interested in (Zarouali et al. 2020). The bad side is that electoral candidates and political parties can use this technique to influence how individuals intend to vote, and in that way undermine democratic values and informed self-determination (Boyd, Pasca, and Lanning 2020, 605; Zarouali et al. 2020).

The best-known case of an ethically wrong way of political micro-targeting based on personality profiling is the Facebook-Cambridge Analytica data scandal (Hinds, Williams, and Joinson 2020). The company Cambridge Analytica inappropriately used data from approximately 87 million Facebook users to make psychologically tailored advertisements which aimed to influence the outcome of the 2016 U.S. presidential election (Hinds, Williams, and Joinson 2020). In the case of the company Cambridge Analytica, data about personality characteristics were combined with other kinds of useful data from Facebook (such as Facebook 'Likes') and used for the purposes of political micro-targeting (Prichard 2021).

This was done, as follows – around 200 000 users voluntarily took a personality test on Facebook, but they hadn't been aware that the personal data from their family, friends, and acquaintances would also be collected, which increased the number of made psychological profiles to 87 million (Heawood 2018, 429). In addition, they hadn't been aware that their personality data was going to be used for a mass influence campaign i.e., they didn't give explicit consent (Prichard 2021). As we can notice, users' friends didn't give their informed consent either (Cadwalladr 2017). This was made possible by Facebook policies at the time (Cadwalladr 2017). Cambridge Analytica combined personality data with other data from Facebook in order to construct an algorithm that could analyze Facebook profiles and determine the personality traits of users that are linked to voting behavior (Cadwalladr and Graham-Harrison 2018). It was already previously shown in academic research that computer personality judgments can successfully predict political orientation (Youyou, Kosinski, and Stillwell 2015, 1039). The collected data could also be used as a search engine to find specific personality types such as undecided Democrats, which could more easily be swayed to vote for the Republican party (González 2017, 10). The personality data enabled Cambridge Analytica to craft individualized messages which would act as emotional triggers (Cadwalladr 2017). These individualized messages aim to trigger inner fears, concerns, and

exploit deep-rooted bias (Risso 2018, 78). This is based on the previously well-established fact that in political campaigns emotions play a more prominent role than facts (Risso 2018, 78).

Totalitarian institutions could utilize this type of personal data in the future to create psychologically tailored messages that could negatively influence the ideas, attitudes, and behaviors of the public (González 2017, 12). There is real danger that these psychologically tailored messages will be used for promoting extremist propaganda and certain political agendas (Hinds and Joinson 2019, 209). As an illustration, extremist groups might use highly personalized advertisements based on personality traits to promote violent messages. Another illustration would be the use of psychologically tailored political advertisements to show graphically disturbing content that portrays an opposing political candidate in a negative light. These are illustrations of ethically questionable marketing practices that prey on voters' emotions and bias (Risso 2018, 82).

Psychologically tailored messages might also be used to create voter disengagement i.e., to persuade voters of the opposition party to stay at home (Cadwalladr 2017). Additionally, psychologically tailored messages can be used to sway swing voters or undecided voters (Cadwalladr and Graham-Harrison 2018). Psychologically tailored political advertisements may contain misinformation, disinformation, false claims, incompatible promises, and false promises as well (Heawood 2018, 429-434). Since these political claims are made privately, they cannot be fact checked and potentially corrected (Heawood 2018, 429-434). When using psychologically tailored messages, it is impossible for individuals to notice that the messages are tailored to match their personality (Zarouali et al. 2020). Therefore, they cannot defend themselves from the psychologically tailored political advertisements as they would from traditional political advertisements (Zarouali et al. 2020). This is a clear form of 'online manipulation' that is done in such a way that uses individuals' personalities against themselves (Zarouali et al. 2020). In addition, this can be seen as an 'online manipulation', because this type of psychologically tailored advertisements might conceal they are political advertisements (Heawood 2018, 429-434).

On the other hand, computer-based personality prediction can be used for the public, to predict personality traits of political figures (Usher and Dondio 2020, 178). Politicians usually have their official accounts on Twitter, Facebook, and even Instagram. It has been shown, at least in the case of using tweets as material for personality prediction, that personality traits of politicians can be successfully predicted (Apriyanto and Anum 2020; Usher and Dondio 2020, 182). It should be noted, however, that this type of prediction can at

most reveal a political representation of a certain character, not their true personality (Usher and Dondio 2020, 182). This is because politicians don't usually give their statements privatly on social media and their social media content is almost exclusively politically related. However, this can be a useful way in the future for the general public to assess the personality of political candidates and to help them make important decision which political candidate to vote for (Apriyanto and Anum 2020). It should also be considered that politicians can also use personality prediction to predict personality traits of their political opponents and in that way gain an advantage in the political race (Usher and Dondio 2020, 178). In the last paragraphs, we will discuss the matters of privacy and informed consent, companies that buy and sell third-party personal data for financial gain, and how to prevent situations like the Facebook–Cambridge Analytica data scandal from happening again.

DISCUSSION AND CONCLUSIONS

A big concern when using personality prediction is the matter of privacy and the concept of informed consent (Alexander III, Mulfinger, and Oswald 2020, 643). There is a risk that political parties, commercial companies, governmental institutions, and other people in general could use social data to infer an individuals' personality, which he or she may have not intended to share, and thereby invade their privacy, as we have seen from the example of Facebook–Cambridge Analytica data scandal (Lambiotte and Kosinski 2014, 1938). The ever-growing amount of social data will make it difficult in the future for individuals to hide their personality traits and other personal attributes (Kosinski, Stillwell, and Graepel 2013, 5805). As research psychologist Kosinski best describes it: "Our smartphone is a vast psychological questionnaire that we are constantly filling out, both consciously and unconsciously" (Grassegger and Krogerus 2017).

This enormous amount of personal online data (e.g., personality data) is seen as a source of income in a whole industry. This is a reason that personal online data is frequently called 'oil' of the new media economy (Heawood 2018, 429-434). In the US for example, almost all personal data is for sale (Grassegger and Krogerus 2017). Companies such as Google, Facebook, and Twitter can buy and sell personal online data, but after Trump's influence on privacy regulations internet service providers such as Comcast, Verizon, and AT&T can also sell personal online data to third parties (González 2017, 10). All other

personal data can be bought from specialized data broker companies like Acxiom and Experian (Grassegger and Krogerus 2017). There is a potential risk that personal data will be sold to the highest bidder and utilized in a way to undermine democracy in democratic regimes.

Social data should be collected and analyzed only when individuals give informed consent (Stachl et al. 2020b, 17680). It should be clearly stated in terms of use, the way data from social media and smartphones will be used (Stachl et al. 2020b, 17685). When conducting academic research with social data, researchers should inform participants about what social data are collected and that it would be used only for research purposes (Hinds and Joinson 2019, 209). Individuals might distrust or completely reject digital technologies if their data is not transparently used (Kosinski, Stillwell, and Graepel 2013, 5805). People should also be nudged to read carefully the parts with terms of use and not just skip it, in order to take better care of their private information. There is a need for raising awareness among users about online privacy risks (Hinds, Williams, and Joinson 2020; Sumner, Byers, and Shearing 2011, 211). They should be educated how to protect their online privacy in a way that doesn't overload them with too many information they may find too difficult to understand (Hinds, Williams, and Joinson 2020). They can also better protect their private information through adjustment of privacy settings on social media sites, and on the internet in general. Default privacy settings differ between social media platforms (Settanni, Azucar, and Marengo 2018, 218-219). On the one hand, there are social media platforms that make posts and updates public by default such as Twitter, Instagram, Reddit, Sina Weibo, etc. (Settanni, Azucar, and Marengo 2018, 218-219). On the other hand, there are social media platforms that make posts and updates visible only to users' friends, followers or connections by default, such as Facebook (Settanni, Azucar, and Marengo 2018, 218-219).

Digital literacy education programs and well-made regulatory controls are also needed, besides individual responsibility, in preventing the misuse of information derived from social media and smartphones (Sumner, Byers, and Shearing 2011, 211). Legal frameworks that exist for regulation of data protection are the General Data Protection Regulation (GDPR) by the European Union, while in the United States there are Family Educational Rights and Privacy Act (FERPA), Fair Credit Reporting Act (FCRA), and state laws (Alexander III, Mulfinger, and Oswald 2020, 642). These legal frameworks that exist in Europe and the United States have their focus on increasing the transparency in the way data is collected and making sure there are mechanisms for users to opt out of advertisements and data-processing activities (Matz et al. 2017a, 12717). Legal frameworks should be formulated

in such a way to prevent ‘online manipulation’ in the domain of political campaigning. For example, receiving informed consent from users is not a security barrier strong enough for data broker companies to prevent them from making data breaches (Zarouali et al. 2020). A balance is needed between collection of vast social data and protection of individual privacy rights (Stachl et al. 2020b, 17685).

With all that being said, computer-based personality judgments are indeed a useful tool, they just need to be used wisely, and in accordance with different laws and regulations regarding data protection and privacy. With this review, we aim to provide a guide how to use computer-based personality judgments in a way to serve the public interest, especially in politics, where there needs to be more transparency in how personality data is used for psychologically tailored political advertisements.

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РАЧУНАРСКЕ ПРОЦЕНЕ ЛИЧНОСТИ НА ОСНОВУ ДИГИТАЛНИХ ОТИСАКА: ТЕОРИЈСКА РАЗМАТРАЊА И ПРАКТИЧНЕ ИМПЛИКАЦИЈЕ У ПОЛИТИЦИ

Резиме

Тачно формирање процена личности је од виталног значаја у широком спектру друштвених интеракција. Иако су људи у стању да направе прилично тачно процене личности других, недавни технолошки напредак у машинском учењу учинио је рачунаре бољим у предвиђању личности од људи. У овом прегледу, фокусираћемо се на рачунарске процене личности и на њихово теоријско разматрање и практичне импликације у области политике. Тачније, дискутоваћемо о (i) употреби друштвених платформи и дигиталних уређаја у прикупљању такозваних дигиталних отисака, (ii) цртама личности које се процењују на основу дигиталних отисака, (iii) предностима и недостацима употребе рачунарске процене личности, (iv) персуазивној комуникацији заснованој на дигиталним отисцима црта личности, и на крају, (v) питањима приватности и информисане сагласности. Овим прегледом желимо да пружимо водич како користити рачунарску процену личности на начин који служи јавном интересу.

Кључне речи: процена личности, друштвени медији, дигитални отисак, персуазивна комуникација