Predicting Users' Personality Based on Their 'Liked' Images on Instagram

Alixe Lay
University College London
London
United Kingdom
alixe.lay.17@ucl.ac.uk

Bruce Ferwerda
Jönköping University
Jönköping
Sweden
bruce.ferwerda@ju.se

ABSTRACT

With the development in technology and the increasing ubiquity of social media services, it has created new opportunities to study personality from the digital traces individuals leave behind. The large number of user-generated images on social media has prompted renewed interests in understanding the psychological factors driving production and consumption behaviours of visual content. Instagram is currently the fastest growing photo-sharing social media platform, with more than 400 million active users and nearly 100 million photos shared on the platform daily [1], and generates 1.2 billion likes each day [2]. The understanding of the appeal of visual content at an individual level is highly relevant to psychometric assessment, social media marketing and interface personalisation. In this position paper, we address the need to explore the avenue of automatic personality assessment using 'liked' images on Instagram.

KEYWORDS

Personality, automatic personality recognition, Instagram, image features

1 INTRODUCTION

Recent advancements in technology and the increase in ubiquity of digital services observing and recording human activities have opened up new opportunities for research into human behaviours [3]. With statistics showing that people are spending more of their time on the Internet on, or through, social networking services (SNS) [4], it is apparent that SNSs are data-rich avenues to study personality and human behaviours. This allows researchers to base their predictions of individuals' personality on digital records of human behaviour [5].

Personality traits are the descriptions of people in terms of their relatively stable patterns of behaviour, thoughts and emotions [6]. Personality influences human decision making process and reveals a person's preferences to different entertainment domains such as TV, music and books [7-8]. They can be assessed explicitly via psychometric questionnaire [6], or implicitly, via observation of behavioural patterns [9]. Previous process and reveals a person's preferences to different entertainment domains such as TV, music and books [7-8]. They can be assessed explicitly via psychometric questionnaire [6], or implicitly, via observation of behavioural patterns [9]. Previous studies have demonstrated that personality can be inferred from individuals' behaviours and user-generated content in digital environments, such as Facebook Likes [4], Twitter profiles [10], the contents of personal websites [11], language used on Facebook [12] and Twitter [13]. Although explicit questionnaires yield higher accuracy than methodologies inferring personality from user-generated content, they require more effort on participants' part to complete [14]. Further, automatic personality assessment from social media traces has the potential to allow more efficient inquiry into personality at an unprecedented scale.

This position paper will outline a proposal for a study aimed at predicting users' personality based on their liked images on Instagram. As automatic personality assessment within the domain of social media images is scarce, this research will be necessary to further our understanding of this field. The following section will outline related work predicting personality using social media images, as well as the reason for choosing Instagram as the SNS of interest.

2 RELATED WORK

2.1 Personality and Social Media Images

On SNSs, we are exposed to various images and videos on a daily basis. With the recent rise of photo-sharing SNS platforms (e.g., Instagram, Pinterest), photo-posting and sharing activities on SNSs have increased vastly in popularity, making them a distinctive and fast-emerging phenomenon in digital environments [15]. Photographic data on social media are often connected with well-defined agents: the producers who create them, and the consumers who consume them [16]. So, the creation of an image is traceable from the first authorised post and the consumption of the same image can be inferred from various activities, one of them being to 'like' it [16].

More recently, researchers have started to explore the links between personality and posted images on social media. Prior

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studies have been conducted to predict users' personality using their Facebook profile images [17-18]. [18] analysed four families of visual features and found interpretable patterns associated with the personality traits of the individuals who posted these images. For instance, extraverted and agreeable individuals were found to have pictures with warm colours and many faces in their portraits, reflective of their tendency to socialise; whereas the images of those high on *Neuroticism* tended to be set indoor. When the performance of the classification approach was compared to the one obtained by human raters, this study showed that the former produced more accurate classifications than the latter for *Extraversion* and *Neuroticism*. Echoing previous psychological research [19-20], this study has demonstrated that Facebook profile pictures carry relevant information for classifying the personality traits of the individuals who post them.

2.2 Instagram

Instagram is an online, mobile phone photo-sharing, video-sharing and social network service (SNS) that enables its users to take pictures and videos, and then share them on its own platform as well as other social media platforms [21]. By recently outpacing Twitter, YouTube, LinkedIn and Facebook in growth [22], Instagram is currently the fastest growing social network site globally, with more than 400 million active users, nearly 100 million photos shared on the platform daily [1], and generates 1.2 billion likes each day [2]. Despite the rapid rise of Instagram as one of the most popular social media platforms, there is limited academic research on this SNS compared to others, such as Facebook and Twitter.

There have been two studies that have predicted personality from posted images on Instagram. [23] found distinct features within Instagram photos (e.g., hues, brightness, saturation) that are related to personality traits, indicating that users with different personalities make their pictures look different. For instance, *Openness to Experience* was positively associated with the colour green, low brightness, high saturation, cold colours and few faces; individuals high on *Conscientiousness* tended to post images with saturated and unsaturated colours; agreeable individuals were more likely to post images with few dark and bright areas; *Neuroticism* was related to images with high brightness; *Extraversion* was linked with images of green and blue tones, low brightness, saturated and unsaturated colours [23]. In line with previous research showing consistent links between *Openness to Experience* and aesthetic preferences [24], [23] also found *Openness to Experience* to be the trait with the most strongly significant correlations with image characteristics, followed by *Agreeableness* and *Conscientiousness*.

Another study investigated markers of depression within Instagram photos posted by users [25]. The findings of the study show that photos posted to Instagram by depressed individuals were more likely to contain the colours blue and gray, to appear darker, and to receive fewer likes. Instagram users who were depressed also demonstrated a stronger preference to filter out all colours from their photos, and an aversion to artificially lightening photos, relative to their non-depressed counterparts. Importantly, these depressive signals are detectable in images posted on Instagram even before the date of first diagnosis. Moreover, the prediction model was more accurate than general practitioners at correctly diagnosing depression, indicating that major psychological changes within individuals are transmitted in social media use, and can be identified using computational methods.

2.3 Liked Images

As individuals engage in more 'liking' behaviours than posting behaviours [1-2], this warrants an investigation into personality detection using 'liked' images. However, despite the contrast in both activities and the ubiquity of the 'like' or virtual endorsement function on various social media platforms [26], there has been substantially less research attempting to infer personality from virtually endorsed images on social media. [27] found that the features of images tagged as favourite on Flickr could be used to predict both self-assessed and attributed personality traits. However, they found covariation was high in attributed traits, but not in self-reported traits. The authors explained that it is possible that when assessing their own traits, the participants used information such as their personal history and life experiences [28], which is different or absent from their favourited pictures [27]. It would be interesting to investigate whether the same findings will emerge on a different social media platform, Instagram.

As mentioned, posting an image is akin to production, while liking an image can be considered as consumption of social media content, and hence both activities are fundamentally different in terms of purpose [16, 29]. [29] posits that the different uses are driven by different motivations: people produce their own content for self-expression and self-actualisation; consume the content for information and entertainment; and participate (by directly or indirectly engaging with the content) for social interaction and community development. Previous psychological research has found that personality differences in posting behaviours [19-20], as well as virtual endorsement behaviours [30]. Within the personality computing literature, [31] looked at posted and preferred images on Twitter and found that image posting and liking preferences using interpretable aesthetic and semantic features were associated with differences in personality. Further, combining the information from both posted and liked images leads to significant performance gain compared to individual interactions, indicating that both posting and liking images allow for more complete understanding of users' personality. However, there has been no attempt to date comparing the predictive accuracy of posted and liked images on individuals' personality on Instagram. With the growth of Instagram overtaking all the other SNSs [22], and the low generalisability of findings across different social media platforms [26], it is necessary to study the links between personality traits and the images that users like and

post on Instagram for the findings to be useful for designing effective advertising or personalisation strategies which are based specifically on Instagram activities.

3 RESEARCH PROPOSAL

There has been no study to date which has attempted to predict users' personality based on their 'liked' images on Instagram. Further, it would also be interesting to look at the predictive accuracy of posted and liked images on Instagram on users' personality, as they are considered as qualitatively different activities [16, 29]. With studies showing predominantly better accuracy of personality prediction using online behaviours [27; 40], we are also interested in comparing the accuracy of human-based and computer-based personality assessments using liked images. In this position paper, we propose a research project which aims to predict users' personality based on the images that they 'like' on Instagram.

To assess participants' self-reported personality, we choose to focus on the Five-Factor Model (FFM), or "Big Five" as it is the most widely-accepted trait framework in the history of personality psychology [32]. The FFM describes personality in terms of *Extraversion*, *Agreeableness*, *Conscientiousness*, *Neuroticism* and *Openness to Experience* [33]. In terms of the image features which will be used to predict personality, we will incorporate not only the standard colour- and content-based features, but also visual sentiment-based features. As suggested by [34], the standard methods used in studies of photographic data focus on identifying faces and features in the images, and is incapable to actually recognise the intention of the uploader, hence the social value of the image. Hence, to bridge this affective gap, we will use visual sentiment-based features to form part of the features in the prediction model. A series of studies will be run, which will answer five research questions using the outlined approaches.

RQ1 Can we predict users' big five personality from the characteristics of their 'liked' images?

We will use computational methods to extract colour-based, content-based and visual sentiment-based features from the collected photographic data via an Instagram API. We will then devise a prediction model which can predict self-reported personality scores from the characteristics of the images participants have 'liked'.

RQ2 Which, if any, of the image features are indicative of liker's personality?

Correlational analyses will be used to identify the image features which are significantly correlated with liker's personality traits.

RQ3 Do the images a user posted or liked yield a higher predictive accuracy over their personality?

We will devise a model to predict personality traits using features of participants' posted images, and compare this model to the one obtained from the analyses for RQ1 to determine whether the posted or liked images are more predictive of users' personality traits.

RQ4 How do the images a user posts or likes differ?

The correlations between personality traits and posted images will be compared against those obtained from previous analyses of liked images in RQ2.

RQ5 Is the computer-based or human-based personality assessment using liked images of an individual more accurate?

Human raters will be selected and asked to judge the liker's Big Five personality traits on a 5-point Likert scale based on a random sample of 20 liked images from the collected data. They will first be presented with the descriptions of each Big Five traits, and then asked to rate the images accordingly. As this is a labour intensive task, only 20 images will be used for each human rater. The accuracy results of human raters will then be compared to the computer-based predictive model obtained in earlier analyses.

4 IMPLICATIONS

Automatic personality assessment from liked images have important implications for the field of personality and differential psychology, as they can be used to measure psychological traits in a cheap, convenient and reliable manner. As this study will only examine the prediction of personality from images, it may be a worthwhile avenue for future studies to explore the use of other behavioural parameters within Instagram to assess personality, such as written captions, comments, follower and following lists, and profile descriptions.

The results of this study may contribute to the body of work concerning personality-based personalisation [35]. For instance, personality-based recommendation systems have been found to increase users' loyalty towards a system and lower their cognitive effort in a more effective way, compared to systems without personality information [36]. The adoption of personality information into recommender systems may also have the potential to lessen the cold start problem [37].

Further, the findings may also be of high relevance to social media marketing, particularly on Instagram. According to [38], marketers are increasing their budget for social media marketing every year. With more brands competing for audience's attention on social media, there is pressing need for more effective microtargeting strategies to increase the persuasive appeal to marketing content. Importantly, a recent study found that when the content of persuasive appeals was matched to individuals' psychological characteristics inferred from their Facebook Likes,

it resulted in up to 40% increase in clicks and up to 50% more purchases than when the content were mismatched or unpersonalised [39]. It is possible that by understanding the links between characteristics of images individuals are consuming on Instagram and their personality, we may be able to further finetune the content of marketing content to increase its ability to persuade.

As discussed, automatic personality assessment may open up new avenues for developing or elevating products and services. At the same time, ethical challenges and privacy concerns may also arise from the capacity to identify individuals' private psychological traits from their liked images. As the amount of digital traces people leave behind grows in abundance, it becomes increasingly difficult for individuals to control which of their intimate attributes are being uncovered [4]. With exponential accumulation of digital behavioural records, continuous increase in pervasiveness and robustness of personality predictions, it is imperative that policymakers implement regulations on the uses as well as potential abuses of this kind of technology, in order to ensure that the public is safeguarded from any potential harm that may incur.

REFERENCES

[1] Instagram. 2016. *Instagram statistics*. https://instagram.com/press/

[2] Sciberras, E. 2015. *Social media statistics 2014. The latest overview of the social media world.* http://socialmediabuzz.com/socialmedia-statistics-2014-latest-overview-social-media-world/.

[3] Kosinski, M. 2014. *Measurement and prediction of individual and group differences in the digital environment.* Department of Psychology University of Cambridge.

[4] Alexa.com. 2017. *Top Sites*. https://www.alexa.com/topsites

[5] Kosinski, M., Stillwell, D., & Graepel, T. 2013. Private traits and attributes are predictable from digital records of human behavior. *Proceedings of the National Academy of Sciences, 110*(15), 5802-5805.

[6] McCrae, R. R., & Costa, P. T. 2003. *Personality in adulthood: A five-factor theory perspective.* Guilford Press.

[7] Cantador, I., Fernández-Tobías, I., & Bellogín, A. 2013. Relating personality types with user preferences in multiple entertainment domains. In *CEUR Workshop Proceedings*. Shlomo Berkovsky.

[8] Rentfrow, P. J., & Gosling, S. D. 2003. The do re mi's of everyday life: the structure and personality correlates of music preferences. *Journal of personality and social psychology, 84*(6), 1236.

[9] Fast, L. A., & Funder, D. C. 2008. Personality as manifest in word use: correlations with self-report, acquaintance report, and behavior. *Journal of personality and social psychology, 94*(2), 334.

[10] Quercia, D., Kosinski, M., Stillwell, D., & Crowcroft, J. 2011. Our twitter profiles, our selves: Predicting personality with twitter. In *Privacy, Security, Risk and Trust (PASSAT) and 2011 IEEE Third Inernational Conference on Social Computing (SocialCom), 2011 IEEE Third International Conference on* (pp. 180-185). IEEE.

[11] Marcus, B., Machilek, F., & Schütz, A. 2006. Personality in cyberspace: personal Web sites as media for personality expressions and impressions. *Journal of personality and social psychology, 90*(6), 1014.

[12] Farnadi, G., Zoghbi, S., Moens, M. F., & De Cock, M. 2013. Recognising personality traits using Facebook status updates. In *Proceedings of the workshop on computational personality recognition (WCPR13) at the 7th international AAAI conference on weblogs and social media (ICWSM13)*. AAAI.

[13] Sumner, C., Byers, A., Boochever, R., & Park, G. J. 2012. Predicting dark triad personality traits from twitter usage and a linguistic analysis of tweets. In *Machine learning and applications (icmla), 2012 11th international conference on* (Vol. 2, pp. 386-393). IEEE.

[14] Cantador, I., & Fernández-Tobías, I. 2014. On the exploitation of user personality in recommender systems. In *CEUR Workshop Proceedings*. Mouzhi Ge.

[15] Kim, E., Lee, J. A., Sung, Y., & Choi, S. M. 2016. Predicting selfie-posting behavior on social networking sites: An extension of theory of planned behavior. Computers in Human Behavior, 62, 116-123.

[16] Segalin, C. 2015. Social Signal Processing for Computational Aesthetics.

[17] Celli, F., Bruni, E., & Lepri, B. (2014, November). Automatic personality and interaction style recognition from facebook profile pictures. In Proceedings of the 22nd ACM international conference on Multimedia (pp. 1101-1104). ACM.

[18] Segalin, C., Celli, F., Polonio, L., Kosinski, M., Stillwell, D., Sebe, N., ... & Lepri, B. 2017. What your Facebook Profile Picture Reveals about your Personality. *Proceedings of the 25st ACM international conference on Multimedia*.

[19] McCain, J. L., Borg, Z. G., Rothenberg, A. H., Churillo, K. M., Weiler, P., & Campbell, W. K. 2016. Personality and selfies: Narcissism and the Dark Triad. *Computers in Human Behavior, 64*, 126-133.

[20] Qiu, L., Lu, J., Yang, S., Qu, W., & Zhu, T. 2015. What does your selfie say about you?. *Computers in Human Behavior, 52*, 443-449.

[21] Frommer, D. 2010. Here's how to use Instagram. *Business Insider*, 11.

[22] Chaffey, D. 2016. Global social media research summary 2016. *Smart Insights*, 8.

[23] Ferwerda, B., Schedl, M., & Tkalcic, M. 2016. Using Instagram picture features to predict users' personality. In *International Conference on Multimedia Modeling* (pp. 850-861). Springer, Cham.

[24] McManus, I. C., & Furnham, A. 2006. Aesthetic activities and aesthetic attitudes: Influences of education, background and personality on interest and involvement in the arts. *British Journal of Psychology, 97*(4), 555-587.

[25] Reece, A. G., & Danforth, C. M. 2017. Instagram photos reveal predictive markers of depression. *EPJ Data Science, 6*(1), 15.

[26] Hayes, R. A., Carr, C. T., & Wohn, D. Y. 2016. One click, many meanings: Interpreting paralinguistic digital affordances in social media. *Journal of Broadcasting & Electronic Media, 60*(1), 171-187.

[27] Segalin, C., Perina, A., Cristani, M., & Vinciarelli, A. 2017. The pictures we like are our image: continuous mapping of favorite pictures into self-assessed and attributed personality traits. *IEEE Transactions on Affective Computing, 8*(2), 268-285.

[28] Wright, A. G. 2014. Current directions in personality science and the potential for advances through computing. *IEEE Transactions on Affective Computing, 5*(3), 292-296.

[29] Shao, G. 2009. Understanding the appeal of user-generated media: a uses and gratification perspective. *Internet Research, 19*(1), 7-25.

[30] Lee, S. Y., Hansen, S. S., & Lee, J. K. 2016. What makes us click "like" on Facebook? Examining psychological, technological, and motivational factors on virtual endorsement. *Computer Communications, 73,* 332-341.

[31] Guntuku, S. C., Lin, W., Carpenter, J., Ng, W. K., Ungar, L. H., & Preoţiuc-Pietro, D. 2017. Studying personality through the content of posted and liked images on Twitter. In *Proceedings of the 2017 ACM on Web Science Conference* (pp. 223-227). ACM.

[32] Funder, D. C. 2001. Accuracy in personality judgment: Research and theory concerning an obvious question. In *B. W. Roberts & R. Hogan (Eds.), Decade of behavior. Personality psychology in the workplace* (pp. 121-140).

[33] Costa, P. T., & McCrae, R. R. 1992. Four ways five factors are basic. *Personality and individual differences, 13*(6), 653-665.

[34] Bechmann, A. 2017. Keeping it Real: From Faces and Features to Social Values in Deep Learning Algorithms on Social Media Images. In *Proceedings of the 50th Hawaii International Conference on System Sciences*.

[35] Nunes, M.A.S. and Hu, R. 2012. Personality-based recommender systems: an overview. In *Proceedings of the sixth ACM conference on Recommender systems* (pp. 5-6). ACM.

[36] Hu, R., & Pu, P. 2011. Enhancing collaborative filtering systems with personality information. In *Proceedings of the fifth ACM conference on Recommender systems* (pp. 197-204). ACM.

[37] Tkalcic, M., Kunaver, M., Košir, A., & Tasic, J. 2011. Addressing the new user problem with a personality based user similarity measure. In *First International Workshop on Decision Making and Recommendation Acceptance Issues in Recommender Systems (DEMRA 2011)* (p. 106).

[38] 4C. 2017. *The State of Social Advertising*. http://www.4cinsights.com/wp-content/uploads/2017/04/4C_TheStateOfSocialAdvertising_2017Q1.pdf

[39] Matz, S. C., Kosinski, M., Nave, G., & Stillwell, D. J. 2017. Psychological targeting as an effective approach to digital mass persuasion. *Proceedings of the National Academy of Sciences*, 201710966.

[40] Youyou, W., Kosinski, M., & Stillwell, D. 2015. Computer-based personality judgments are more accurate than those made by humans. *Proceedings of the National Academy of Sciences*, *112*(4), 1036-1040.