

## **Towards Visual Personality Questionnaires Based on Deep Learning and Social Media**

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**Abstract :** Image sharing in social networks has increased exponentially in the past years. Officially, there are 600 million Instagrammers uploading around 100 million photos and videos per day. Consequently, there is a need for developing new tools to understand the content expressed in shared images, which will greatly benefit social media communication and will enable broad and promising applications in education, advertisement, entertainment, and also psychology. Following these trends, our work aims to take advantage of the existing relationship between text and personality, already demonstrated by multiple researchers, so that we can prove that there exists a relationship between images and personality as well. To achieve this goal, we consider that images posted on social networks are typically conditioned on specific words, or hashtags, therefore any relationship between text and personality can also be observed with those posted images. Our proposal makes use of the most recent image understanding models based on neural networks to process the vast amount of data generated by social users to determine those images most correlated with personality traits. The final aim is to train a weakly-supervised image-based model for personality assessment that can be used even when textual data is not available, which is an increasing trend. The procedure is described next: we explore the images directly publicly shared by users based on those accompanying texts or hashtags most strongly related to personality traits as described by the OCEAN model. These images will be used for personality prediction since they have the potential to convey more complex ideas, concepts, and emotions. As a result, the use of images in personality questionnaires will provide a deeper understanding of respondents than through words alone. In other words, from the images posted with specific tags, we train a deep learning model based on neural networks, that learns to extract a personality representation from a picture and use it to automatically find the personality that best explains such a picture. Subsequently, a deep neural network model is learned from thousands of images associated with hashtags correlated to OCEAN traits. We then analyze the network activations to identify those pictures that maximally activate the neurons: the most characteristic visual features per personality trait will thus emerge since the filters of the convolutional layers of the neural model are learned to be optimally activated depending on each personality trait. For example, among the pictures that maximally activate the high Openness trait, we can see pictures of books, the moon, and the sky. For high Conscientiousness, most of the images are photographs of food, especially healthy food. The high Extraversion output is mostly activated by pictures of a lot of people. In high Agreeableness images, we mostly see flower pictures. Lastly, in the Neuroticism trait, we observe that the high score is maximally activated by animal pets like cats or dogs. In summary, despite the huge intra-class and inter-class variabilities of the images associated to each OCEAN traits, we found that there are consistencies between visual patterns of those images whose hashtags are most correlated to each trait.

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