

Yuren Ji

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Prof. Reid

Final Project

The Relationship of Psychology and Machine Learning

A newly developed machine that has yet been exposed to any information is just like a new born baby that has no knowledge of our world. Just like how humans are to absorb informations from others and combine them, later coming up with their own understanding based upon the original materials. Artificial intelligence are programed to do something similar— receive informations and learn how to calculate an outcome in the future. The differences are, as human, our understanding, focuses, along with various cultural backgrounds could lead to different perception about the same thing, which may have caused us to see and solve the problem very differently. Yet, as for machine learning, the AIs will only process the information they have learnt and were asked to calculate, with no other various effecting the outcome, we are more likely to get a none-biased result when it comes to diagnose.

When it comes to machine learning and psychology, is there any connections between the two that has such similarity yet are profoundly different from one to another? If so, how many of the developments we have seen are based upon their interactions and how far it could go? This project will provide a literature review-based discussion on how do Artificial Intelligence and Psychology cooperate, the current use of AI in Psychology and use of Psychology in Machine Learning, and some discussion based upon the development human now have on information technology and machine learning.

Generally speaking, reading any textbooks of psychology and artificial intelligence at will, it is difficult to peek through the content of the subject and if there is a connection. But in fact, when it comes to the impact on artificial intelligence research, there is probably no discipline that can be related to it more than psychology. From the beginning of artificial intelligence to the recent, many artificial intelligence experts, are either psychologists or have a background in psychology. In the process of promoting the progress of artificial intelligence, psychology is playing an important role directly or indirectly.

One of the example is during the Apple recruits a few years ago, they have required job applicants to have some knowledge in psychology in addition to computers. The reason is that when people communicate with Siri, they unconsciously confide in her, yet Siri is not smart enough to be a counselor. This requirement shows reveals even more of the connections between AIs and psychology, and how inseparable they are in many ways.

Another interesting example is that MIT has a laboratory that is doing psychology-related research projects (MIT Media Lab: Affective Computing). A detection system composed of wearable biosensors, smart phones, sample analysis, and artificial intelligence algorithms can detect people's emotional state, assist in the treatment of chronic diseases such as neurological disorders, and the withdrawal of various addictive habits.

On the other hand, the main concern of psychologists is how the human mind works. From the earliest, philosophical and introspective ways of exploring the mind, gradually turned to scientific empirical research methods to collect behavioral evidence. However, these experiments still cannot describe the operating mechanism of the human mind. Although technologies such as brain waves and brain tomography have allowed scholars to explore the operation of the brain since the end of the last century, these methods still cannot clearly capture

the details of the mental calculation mechanism. For this reason, psychologists try to describe the process of mental operations with machine learning and its ability to calculate.

Due to the rapid development of artificial intelligence, algorithms are becoming newer and newer, and the speed of computer operations is getting faster and faster. These achievements directly or indirectly assist psychologists in developing more complex mathematical models, which can more comprehensively explain the human mind.

An article titled *Computer-based personality judgments are more accurate than those made by humans* published on PNAS explores whether machine-based personality judgments are more accurate than those made by humans. The research can be judged from the affirmative sentence pattern of the title. The conclusion is yes. The study used the IPIP five-factor model (commonly known as O.C.E.A.N. as for the five personalities) personality scale to measure the personality of 70520 users, then it collects the themes these users “Liked” on Facebook. With the increase of the LIKES data obtained, the accuracy of the prediction gradually rises. The accuracy of “Openness” is higher than the other four personality traits. The study collected the personality assessments of users' colleagues, friends, cohabitants, spouses, and family members. The average accuracy of humans is 0.49, and the average accuracy of machines is 0.56. “The primary criterion of judgmental accuracy is self-other agreement: the extent to which an external judgment agrees with the target’s self-rating, usually operationalized as a Pearson product-moment correlation”(Wu Youyou, Michal Kosinski, & David Stillwell. 2015). Machine evaluation is significantly better than human evaluation. After obtaining 300 LIKES themes from users, the machine's prediction accuracy will surpass that of all humans (the users' colleagues, friends, cohabitants, family members, and spouses).

The team published another article *Birds of a Feather Do Flock Together: Behavior-Based Personality-Assessment Method Reveals Personality Similarity Among Couples and Friends* 2 years later to explore the personality similarities between partners, friends and themselves. In the past, it was thought that choosing a spouse or friend was random, and self-reported personality tests showed that the relationship with personality of the spouse or friend was very low, but the author did not agree with this conclusion. It is believed that this may be caused by the reference-group effect (when responses to self-report items are based not on respondents' absolute level of a construct but rather on their level relative to a salient comparison group).

There isn't no improvements made before, Botwin et al. (1997) measured personality using independent interviewers' ratings and found similarity among spouses. Admittedly, this type of measure is still subject to the reference-group effect because the interviewer has his or her own reference group, but it affects both dyad members equally and therefore does not obscure the similarity between them. Introversion, for example, was assessed by asking participants to judge whether in the last 3 months they "watched the soap opera on TV" or "went for a long walk alone".

Although previous efforts have made improvements, the group reference effect cannot be avoided. The method used in this article is to collect two types of data on Facebook users: Facebook Likes language use (Facebook status updates) Extraverts, for example, tend to use more words describing positive emotions (eg, "great," "happy," or "amazing") than introverts do. The first type of data was introduced in the previous article, and language use is the language used to collect the user's post status. For example, compared to introverts, extroverts use the words great, happy or amazing more often. Main process includes: "(1) We obtained a sample of

participants with both self-reports of personality and Facebook data. (2) Next, we built a series of predictive models to link self-reports of personality with Likes or language use, respectively. (3) The resulting models were then applied to a separate sample of romantic partners and friends to generate personality scores for these participants.” (Youyou, W. et al. 2017)

It can be seen that regardless of whether it is LIKES or the language used by the user to post status, the obtained personality similarity between lovers and friends is higher than the self-reported personality similarity. Among them, the similarity obtained by language data is higher. The regression methods used in the above two articles are not uncommon, but the idea of splitting data into training and prediction sets is not common in psychology research.

Another important use of artificial intelligence that is tightly connected with our world right now ,and seems very much likely to be put in wilder use in the future days is its ability of detecting depression and tendency of suicidal behavior on social media. Every year around the world, 80 people die by suicide, and behind each suicide there are more than 20 suicide attempts. Early detection and treatment are considered to be the most effective way to prevent suicidal thoughts and potential suicide attempts. Suicides will show strong negative emotions, worry and despair. Suicidal thoughts may involve family and friends, and the topics discussed cover personal and social issues.

Facebook can use instant messages on the site to communicate emotions with users, provide insights into user behavior patterns and provide personalized recommendations. These programs can be accessed at any time and may include features such as emotion tracking, daily check-in, and psychological education. These machine learning-based Facebook applications will learn more about the user in every conversation with the user, and can even study the user’s language patterns, facial and body language, and eye movements to assess the level of mental

disorders. If a suicide threat is detected, the app can signal a request for human assistance. AI dialogue programs have high usability and are widely praised for their user-adapted content and emotional responses. (Hollander, M., et al. 2017).

Psychological research aims at the prediction and study the pattern of human behavior, and describes and explains the general laws of psychological phenomena through the exploration of the apparent behavior of the research object. As an important auxiliary method, artificial intelligence has played an important role in the measurement and prediction of psychological variables, and can assist in the identification, diagnosis and psychological intervention of some psychological symptoms. With the development of artificial intelligence, psychologists and computer scientists who are actively researching it will help develop more efficient and more machines. At the same time, the development in the psychology field will also be further benefits by the artificial intelligence. Their features will make these machines more useful to the public because they are more likely to interact and find it more beneficial with such artificial intelligence.

To sum up, the development of artificial intelligence and related technologies has provided breakthrough research methods and tools for psychological research; the application of psychological research results on brain mechanisms in the field of artificial intelligence has also promoted the progress of artificial intelligence research. By combining the latest research results in artificial intelligence and psychology to carry out cross-research, we can better solve the scientific problems of the two fields. These two fields will also promote each other's development through mutual integration and enhance their respective value to the society.

Reference

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