Psychology Approach: Through AI, ML and DL

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Abstract: Human brain is more complex than any other known structure in the universe. Millions and trillions of information like the memories are stored, habits learned, and personalities are shaped in it. To know how all this work and to know how mind basically respond on certain events, Psychology came in action. Most of the work in this field is based upon the history and impressions while major treatment is done using guess work, even the best psychiatrists choose the correct treatment for a given patient only about 37% which we ultimately want to improve. So, this paper presents the major connection between computer science and psychology and how machine learning can change the overall approach and methods in the treatment of mental health and in the understanding of psychology.

Keywords: Psychology, Machine Learning, Predictive Approach, Big Data, AI.

I. INTRODUCTION

Psychology is the study of the characteristics and behavior of our brain, as indicated by the American Psychological Association. Psychology has different sub-field which includes study of variety of things like how human behave in particular event and how humans think in different situations like in danger, tension or anxiety or maybe in happiness.

Major objective of scientific psychology is to understand human nature [1]. Till date majority seek for explanatory approach in psychology to learn any kind of behavior or solve any mental problems regarding health. It is believed that 'Explanation is the key' which is true as it gave so many positive results from building huge buildings or walk to the moon but in the psychology case it is not as beneficial, it is like making formulae of your likings or your moods. There cannot be formulae for these things as they mainly depend upon various situations, behaviors, genetics and many more things. For a human mind, it is not completely possible to consider all these things and provide an explanation.

Instead, we should look for better predictions which is now possible via machine learning techniques and with the increase in machine learning theory and methodology—in which prediction of unobserved information is treated as the best quality level of progress, it is very more conceivable and with more prominent precision. For all these predictions we need many computer sciences concepts, and this paper is focused in all that. How we can use machine learning, big data, AI, statistical modelling, and prediction modelling. This paper presents some major concepts of the computer science and how we can effectively relate them and use them in psychology.

II. ROLE OF COMPUTER SCIENCE IN PSCHYLOGY

The first thing that should be taken in consideration is data collection [2], which is now easily possible with internet, people use many social media platforms which mainly offer a compelling wellspring of

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rich and personal advanced data. Everything from their own pictures, how old are they, sex, status of marriage, spot of root, work, and schooling past to inclinations and all those things that they perform in their day-to-day life [2]. Moreover, everything is coming from the user directly like the messages, post and all other updates. Also, online studies or surveys are coordinated inside a web-based media stage and would then be able to be effortlessly associated with the data from clients' web-based media profiles [3]. AI scientists can gather more conventional psychological evaluation information, for example, scores on character polls [6]. Figure 1 shows major methods which are described in the paper.

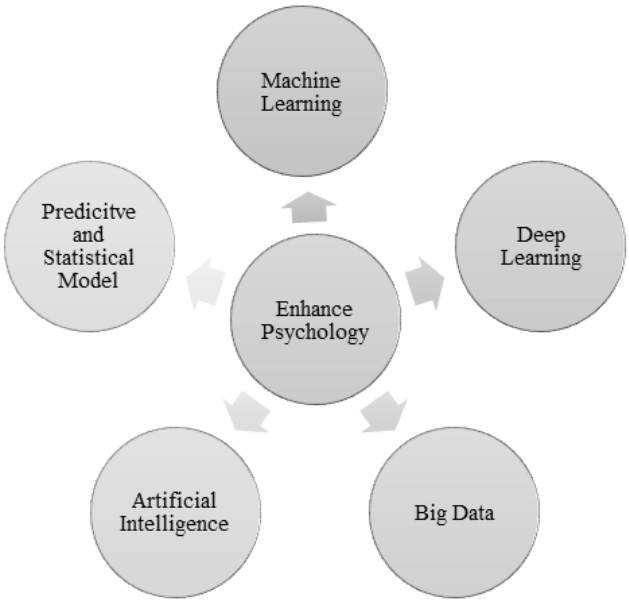

Figure 1. Concepts to enhance psychology

*A. **Big Data***

Big data operates on the information or data that is way too big to handle by conventional means [7]. From a long time, the problem to operate huge data sets has been there, big data helps to solve this now-a-days. The "information" of Big Data is separated into information that is not structured: crude, advanced data, for example, text or pictures. A common illustration of not structured information could be an assortment of messages from social handles. Raw messages data from Twitter incorporates numerous snippets of data, for example, the content of the messages, number of devotees of the social handle, and whether it was a re-message [7]. Here, we can take example of ‘twitter’.

Big data applications give us many new options in the field of psychology. Huge sets of data and the huge type of application caught in these information give analysts of brain science the chance to direct an effective research. Re-searchers may test hypotheses on gigantic information that depend on genuine person conduct [7].

Also, big data also additionally presents difficulties to current and future psychologists. With the SAM approach which is a split/analyze/meta-analyze, we expected to bring down the limit for taking part in enormous information re-search [4] It likewise speaks to an important commitment to psychometrics by giving a lot of information for examination. One illustration of this is the treatment of human versatile lead and conduct that underlie examples of social advancement. It likewise eliminates the cut off to by member test size, especially on account of examination on non-clinical populaces or managing social wonders in regular settings or explicit societies [7].

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There are mainly four steps for any assignment regarding big data: data management planning, data acquisition, data processing, and data analytics. Further this data is analyzed which is basically data mining that includes search of patterns and associations in given data so that prediction can be done [7]. Also, it continues from a fine-grained, base up investigation of the information that in-tends to consider whatever number highlights of the information as could be al-lowed. These investigations can be utilized by analysts in psychology on both information from customary examinations and information gained from huge information sources. The attention can be on the data part of Big Data [7]. Figure 2 shows how big data in psychology is inter-related with safety science and all these play an important part in why we should use big data.

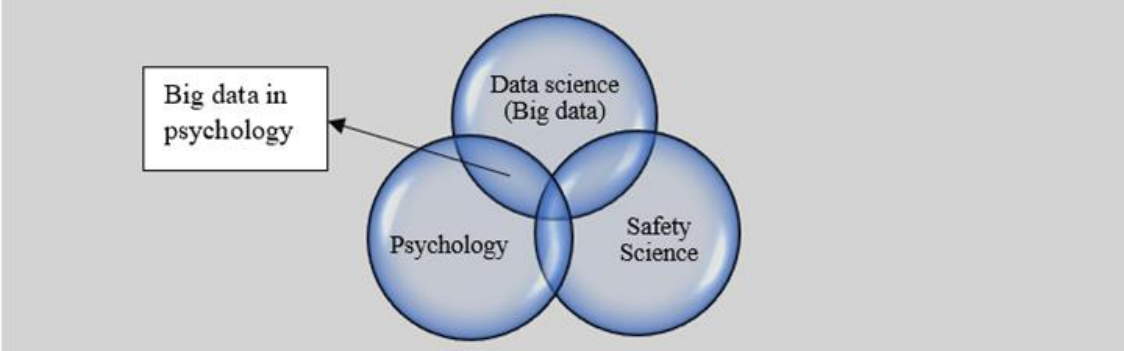

Figure 2. Interrelation among data science, psychology and data science

B. Psychology using Machine learning

Psychology using Machine learning can have a deep impact on psychology, especially in understanding the deep patterns hidden behind the things we do and why we do them. In general, machine learning can be used to figure out patterns in any form of structured or unstructured data. Now the observations from psychological experiments would fall in any of these two categories.

Yes, ML could help answer so many questions about not only the neural or materialistic aspects of the human brain (by analyzing the signals gathered using various devices) but also some higher-level aspects like mindfulness, happiness, other emotions, and the absence of the same [5].

It should be used as an instrument to read data and interpret it accordingly. Now thinking about how the machine learning should be used in under-standing human behavior and personality characteristics [7].

Some AI frameworks endeavor to kill the requirement for human instinct in the investigation of the information, while others embrace a community-oriented methodology among human and machine. Human instinct cannot be altogether killed since the planner of the framework should indicate how the information are to be spoken to and what instruments will be utilized to look for a portrayal of the information [5]. AI can be seen as an endeavor to robotize parts of the logical technique [9]. It is used in changing the overall approach of the psychology i.e., going from explanatory to predictive and now-a-days prediction is all about machine learning.

Also, application of ML in psychometrics, whose recent example is when a large amount of social media information (on over 50.000 participants) for predicting the characteristics of social media (FB) profile owners based on their day to day. This research yielded a profoundly persuasive publication were the authors indicated how FB-based practices (i.e., likes) could be utilized to distinguish private attributes with high exactness [9].

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Another application can be a psychometric Credit Score is a predictive model based on a microcredit applicant's psychological and behavioral profile which is a substitute of the FICO score used for banked applicants, which, in turn, is mainly based on bureau data and credit cards historical records [9].

Also, machine learning to try and find specific brain regions and/or changes in specific imaging biomarkers, like amyloid levels, volume of different regions, etc., that might be related to specific cognitive processes/measurements and then track how those change over time [10].

Overall, since neuroimaging studies tend to produce very large datasets that contain data from several sources, machine learning techniques are of great use in analyzing such data [12]. Figure 3 shows basic idea behind machine learning.

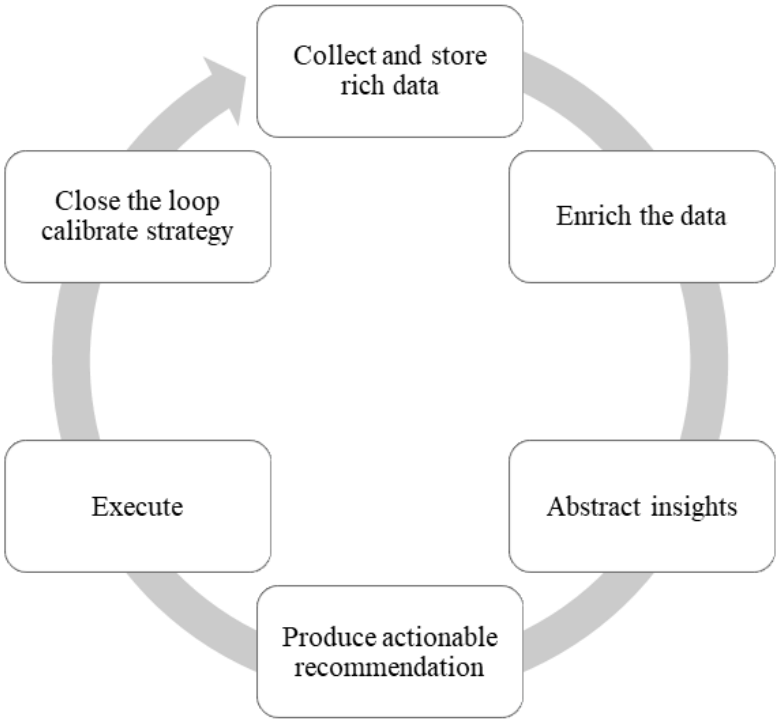

Figure 3. Basic idea behind Machine Learning.

C. *Deep Learning*

Deep learning has revolutionized predictive modelling in topics such as computer vision and natural language processing several benefits of the deep learning approach to predictive modelling. There can be three basic deep learning models that generalize linear regression: The feed forward neural network (FNN), the recurrent neural network (RNN), and the convolutional neural network (CNN) [6].

It can leverage big data sets to obtain highly accurate predictions as society becomes increasingly digitized, psychologists will have greater access to large data sets that will be difficult to effectively analyze without using deep learning. Deep learning algorithms may be able to capitalize on huge data sets such as observations from internet sources (e.g., websites, blogs, and social media), cell phone behaviors, and genomic data sets to predict psychological out-comes with unprecedented accuracy [18].

It leverages small correlations for accurate predictions. Deep learning algorithms excel at discovering intricate relationships between large numbers of variables. Many phenomena studied by psychologists

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are likely influenced by many weak causal factors that interact in complicated ways – that is, "every-thing correlates with everything else" [21].

It reduces the need for feature engineering. Psychologists usually need to think carefully about including meaningful, theoretically-relevant variables in models to obtain accurate, generalizable predictions – that is, predictive modelling in psychology often requires careful feature engineering [22].

Its algorithms often obtain higher predictive accuracy than other machine learning algorithms when the observations are sequences or images.

D. Artificial Intelligence

Artificial Intelligence has increased clinical application in psychological benefit administration. With improvements going in 'online psychotherapists and online robots in mental disorder and imbalance improvement and for sexual problems also, dishonestly adroit virtual and computerized experts are dynamically taking on raised level therapeutic intercessions, skilled prosperity specialists. To engage careful clinical use, good and social consequences of the growing use of epitomized AI in emotional wellness ought to be recognized and tended to [23].

Artificial intelligence uses into emotional well-being care across the fields of Psychiatry, Psychology and Psychotherapy. Developing this examination, it develops a lot of preliminary recommendations on the most capable technique to address good and social challenges in current and future uses of epitomized AI. AI robots additionally give opportunities to various types of commitment with kids experiencing autism spectrum disorders (ASDs) [24]. Youngsters with autism have been found to respond emphatically to robots, even in situations where they have trouble connecting with others [17]. Artificial intelligence empowered robots are additionally being investigated across an assortment of other psychological wellness zones including state of mind and tension issues, kids with problematic conduct, and patients who might not have a particular analysis however who might profit by help with emotional well-being concerns [16].

The best advantage of AI applications is primary, to be specific the possibility to arrive at populaces that are hard to treat through customary courses of arrangement [24]. The arrangement of some psychological wellness administrations, for instance, through low-limit, advantageous remedial mediations by means of chat bots or symbols might be especially gainful for populaces living in asset helpless settings. For those living in far off or provincial areas or in settings where on location emotional wellness administrations are scant, savvy applications can increment geological access and give some negligible psychological well-being care administrations where they are generally missing [25]. The equivalent may likewise be valid for people living in higher pay nations who don't have protection or whose protection doesn't cover treatment [23]. Figure 4 shows AI relationship.

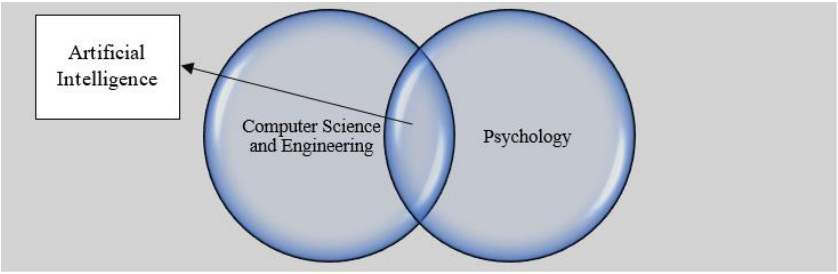

Figure 4. Shows AI relationship.

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E. Predictive Modeling

Predictive modelling is basically a method that uses data to form models so that analysis and prediction can be done effectively. In predictive modelling f^ is used to make predictions from new information. Also creating expectations from f^ leads to have difficulty of different elevation, contingent upon the unpredictability of f^ and on the kind of forecast produced. The ideas of over-fitting, cross-approval, and regularization, and the issue of sample [10]. We can contend that short-term focus on prediction can eventually improve our capacity to clarify the reasons for conduct in the long haul. Accordingly, an emphasis on prediction can be seen not as a rival of clarification, but instead as a complementary objective that can at last increment theoretical understanding [1]. Table 1 summarizes the key concepts of computer science and their application in psychology.

Table 1. Key concepts of computer science and their application in psychology.

Concept	Definition	Application in Psychology
Deep Learning [6]	Deep learning is ambit of machine learning. It puts emphasis on study successive layers of increasingly meaningful representation	Predictive modelling in topics such as Vision of computer and NLP.[27]
Big Data [7]	Enormous and complex informational indexes that might be dissected with AI and other progressed information insightful strategies to find pattern, identify gesture, and form question which are hard to think with more modest informational indexes.[28]	Reading data for psychological research to analyze and systematically extract information about human behavior.[28]
Artificial Intelligence [8]	Artificial intelligence (AI), is maturity that is shown by machines, dislike the common mindfulness shown by people or creatures. It is defined as the field of the investigation of "smart specialists":	Support for specific tasks in Computation as an extra ability for therapeutic purposes, also things that are as of now exist and furthermore investigating the ideas and components that triggers the standards of conduct of a person.
Prediction Models [1]	Models that use statistics and analysis to predict outcomes and they can be used at any type of anonymous situations	Use to enhance the predictive approach in Psychology.
Statistical Model	A statistical model is numerical exemplary which encapsulates a bunch of graphical suspicions taking the age of test information (and comparative information from a bigger populace) and making it more understandable	For Statistical graphs, data and model Visualization as well as exploring and Understanding model diagnostics.
Machine Learning [9]	Machine learning (ML) is basically a subject about computer data and model that improves on its own through experience] Its methods form pattern or rules from initial info called as "training data", for basically making accurate predictions or decisions without being especially programmed to do so. Its algorithms have so many types of applications, such as to filter emails and computer vision, is used immensely.	Everything starts from here like psychometrics application and every prediction model use machine learning for better results. Interpreting brain images or calculating psychometric credit score.

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III. RELATED WORK

In [1], authors discussed about the approach in learning human behavior and how predictive approach plays an important role in understanding psychology where-as it is more effective now-a-days using machine learning concepts. Also, author emphasis on how prediction is the key factor in psychology as we cannot rely on finding reason in every field. Now we just must find more and more ways to improve our prediction where Computer science comes in action.

Author in [3] tells how computed decisions in clinics helps to cure adult mental problems, also some major benefits regarding this approach and how widely it can be used. Majorly works brilliantly in problems like smoking, phobia, and panic attacks.

In [4], authors represent the uses and application of Big data in psychology and how it can used to test theories based on huge datasets, he describes SAM approach to analyze big data. He intended to bring down the limit for taking part in large information research. Things Psychologists seek can't be concluded by some low number of people survey or with small data, we need huge data and information so that accuracy of over prediction can be increased and to handle this huge data we need big data. There are two examples in the paper i.e., world values data and airlines data which are handled via SAM approach.

Authors in [6] gave the application of deep learning majorly in predictive modeling in topics such as computer vision aid natural language processing. He also elaborated that it is not commonly applied to psychological data. Then author discusses three basic deep learning models that generalize regression: FNN, RNN and CNN. At last, he emphasis on how machine learning and deep learning can combine with research and help psychologist to predict human nature and behavior more accurately and reliably.

Authors in [7], give information about how researchers can do their own re-search using massive data as an option. Authors introduce big data addition and problem-solving concepts so that behavioral science project idea can be introduced, Paper introduces four major steps for research: data acquisition, data processing and data analytics. We can easily access essential information from vast data and compliment traditional research.

In [8], author discuss about the basic AI Vs human's conspiracy. As major scientist and intelligent people are taking about how after some time AI filled machine will overcome the humans. Author mentions on how everything has its boon and bane while with AI, it has so many benefits which we stated above and some bad effects among humans like AI can take over some human functions.

In [9], authors first emphasize on the concepts of machine learning like big da-ta, AI and statistical modelling. They form three generation to do personality assessment through machine learning research which they considered as an important part in understanding behavior and personality traits. Mainly three major steps were there to judge personality: data collection, data extraction, and prediction of personality characteristics. Also discussed about some major applications of machine learning in judging personality and bringing ML in highlights of the progression which can be obtained by using it.

In [10], author gave a approach to detect depression. Major steps were data pre-processing - word embedding which include Skip-gram, CBOW, Optimized and random and at last data is sent to neural network. It is achieved using CNNs and RNNs that are most functional deep neural architecture and an important approach in natural language processing.

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In [13], authors emphasis on how both predictive accuracy and explanatory power differ from each other and how they play different role. While scientific work also become of low quality and its progress also becomes slow if we ignore the prediction involved in it. Also, we can conclude that things only using predictive approach also must search for not using any explanatory approach. Important thing to note was that neither of the approach is fundamental and both have different benefits and approach. Also, statistical model should be considered as they can be very useful.

In [14], HCI is majorly discussed and how it relates computer science and psychology. It basically provides a test domain for using psychological theory in computer and technology.

In [18], it is all about the challenges that are there for using ML techniques as well as the points that can be covered for overcoming mental health issues. Author also discussed how ML showed a scope of advantages across the zones of finding, treatment and support, research, and clinical organization.

IV. CONCLUSION

As of now we are suffering from a world pandemic. The disease is not all about therapeutic treatment, it also has a major psychological side. Research expresses that the greater part of novel covid-19 recovered patients showed manifestations of confusion, tension, hallucination, PTSD, sleep deprivation and make them inclined to encounter depression and habitual problem. This problem is not only for a specific disease whereas psychology problems are very common among people of different age groups suffering from any disease. Whereas the rate of problems or disease in psychology area is much more than the rate at which we can solve these problems so this article presents a review on different computer science approaches or technologies so that we can boost the treatment in psychology and able to understand the human behavior or nature more accurately so that any pitfall can be cured.

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Ethical statement: The authors declare that they have followed ethical responsibilities.

REFERENCES

[1] Yarkoni, T., & Westfall, J. (2017). Choosing prediction over explanation in psychology: Lessons from machine learning. Perspectives on Psychological Science, 12(6), 1100-1122.

[2] Anderson, Ross, and Tyler Moore. "Information security: where computer science, eco-nomics and psychology meet." Philosophical Transactions of the Royal Society A: Math-ematical, Physical and Engineering Sciences 367.1898 (2009): 2717-2727.

[3] Marks, Isaac, Susan Shaw, and Richard Parkin. "Computer-aided treatments of mental health problems." Clinical Psychology: Science and Practice 5.2 (1998): 151-170.-

[4] Bleidorn, W., & Hopwood, C. J. (2019). Using machine learning to advance personality assessment and theory. Personality and Social Psychology Review, 23(2), 190-203.

[5] Bone, Daniel, et al. "Signal processing and machine learning for mental health research and clinicalapplications [perspectives]." IEEE Signal Processing Magazine 34.5 (2017):196-195.

[6] Cheung, M. W. L., & Jak, S. (2016). Analyzing big data in psychology: A split/analyze/meta-analyze approach. Frontiers in psychology, 7, 738.

[7] Jain, D., & Singh, V. (2021), "A Fast Parallel Classification Model for the Diagnosis of Cancer", Recent Advances in Computer Science and Communications (2021) 14: 291

[8] Orabi, Ahmed Husseini, et al. "Deep learning for depression detection of twitter users." Proceedings of the Fifth Workshop on Computational Linguistics and Clinical Psychology: From Keyboard to Clinic. 2018.

[9] Fuchs, Alfred H., and Rand B. Evans. "Psychology as a science." Handbook of Psychol-ogy, Second Edition 1 (2012).

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[10] Cheung, M. W. L., & Jak, S. (2016). Analyzing big data in psychology: A split/analyze/meta-analyze approach. Frontiers in psychology, 7, 738.
[11] Jain, D., & Singh, V. (2021), "A Fast Parallel Classification Model for the Diagnosis of Cancer", Recent Advances in Computer Science and Communications (2021) 14: 291.
[12] Chen, Eric Evan, and Sean P. Wojcik. "A practical guide to big data research in psychol-ogy." Psychological methods 21.4 (2016): 458.
[13] Crowder, James, and Shelli Friess. "Artificial psychology: The psychology of AI." Pro-ceedings of the 3rd Annual International Multi-Conference on Informatics and Cybernet-ics. Orlando, FL. 2012.
[14] Jain, D., & Singh, V. (2016). Utilization of Data Mining Classification Approach for Dis-ease Prediction: A Survey. International Journal Education and Management Engineering, 6, 45-52.
[15] Shmueli, G. (2010). To explain or to predict?. Statistical science, 25(3), 289-310.
[16] Dhull, A., Khanna, K., Singh, A., & Gupta, G. (2019). ACO Inspired Computer-aided Detection/Diagnosis (CADe/CADx) Model for Medical Data Classification. Recent Pa-tents on Computer Science, 12(4), 250-259.
[17] Bleidorn, W., & Hopwood, C. J. (2019). Using machine learning to advance personality assessment and theory. Personality and Social Psychology Review, 23(2), 190-203. D'Alfonso, Simon. "AI in mental health." Current Opinion in Psychology (2020).
[18] Shatte, Adrian BR, Delyse M. Hutchinson, and Samantha J. Teague. "Machine learning in mental health: a scoping review of methods and applications." Psychological medicine 49.9 (2019): 1426-1448.
[19] Mohr, David C., Mi Zhang, and Stephen M. Schueller. "Personal sensing: understanding mental health using ubiquitous sensors and machine learning." Annual review of clinical psychology 13 (2017): 23-47.
[20] Urban, Christopher, and Kathleen Gates. "Deep Learning: A Primer for Psychologists." (2019).
[21] Gkotsis, George, et al. "Characterisation of mental health conditions in social media us-ing Informed Deep Learning." Scientific reports 7.1 (2017): 1-11.
[22] Miotto, Riccardo, et al. "Deep learning for healthcare: review, opportunities and chal-lenges." Briefings in bioinformatics 19.6 (2018): 1236-1246.
[23] Graham, Sarah, et al. "Artificial intelligence for mental health and mental illnesses: an overview." Current psychiatry reports 21.11 (2019): 1-18.
[24] Luxton, David D. "An introduction to artificial intelligence in behavioral and mental health care." Artificial intelligence in behavioral and mental health care. Academic Press, 2016. 1-26.
[25] D'alfonso, Simon, et al. "Artificial intelligence-assisted online social therapy for youth mental health." Frontiers in psychology 8 (2017): 796.
[26] Conway, Mike, and Daniel O'Connor. "Social media, big data, and mental health: current advances and ethical implications." Current opinion in psychology 9 (2016): 77-82.
[27] Pundir, P., Gomanse, V., & Krishnamacharya, N. (2013). Classification and prediction techniques using machine learning for anomaly detection. *J. Eng. Res. Appl*, *1*, 1716-1722.
[28] RampelliI, S., Vadlamani, S. K., & Nukala, S. P. K. (2014). Big Data and data analytics: An action platform for the science of prediction. Journal of Engineering Research and Applications, 4, 24-27.

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