Research Paper

AI-based Model for Physio-Psycho Behavior of University Students

Shubham Chahar[1*] iD, J.K. Arora[2] iD, Utkarsh Kumar[3] iD

[1,2]Technical College, Dayalbagh Educational Institute (Deemed University), Agra, India
[3]Dept. of General Surgery, Kalpana Chawla Government Medical College, Karnal, India

Corresponding Author: shubham17chahar@gmail.com

Abstract: Artificial Intelligence (AI) has emerged as a powerful tool for measuring the psychophysiological behavior of students, enabling a deeper understanding of their cognitive and emotional states. By leveraging AI algorithms and data analytics, researchers can analyze various data sources such as facial expressions, voice tone, eye movements, and physiological signals to infer students' engagement levels, attention spans, stress levels, and overall emotional well-being. This technology has applications in educational settings, where AI can be utilized to develop intelligent tutoring systems that adapt to students' individual needs, providing personalized feedback and interventions. Yoga and have gained significant popularity in recent years due to their potential positive effects on physical, mental, and emotional well-being. This research paper explores the effects of yoga on the psychological and physiological well-being of university students, using an Artificial Neural Network (ANN) model. The study aims to analyze the relationship between regular yoga practice and various indicators of well-being among students. The ANN model is employed to uncover complex patterns and interactions within the dataset, providing insights into the potential benefits of these practices. The findings of this research have implications for promoting holistic well-being among university students. A sigmoid axon was used as a transfer function for input and output layers.

Keywords: Artificial Intelligence (AI), Machine Learning, Artificial Neural Network, Physiological Parameters, Psychological Parameters, Yoga.

1. Introduction

In recent years, the field of artificial intelligence (AI) has made significant advancements in understanding and interpreting human behavior. Stress, anxiety, and mental health issues are prevalent among this population, highlighting the need for effective interventions. One notable application of AI lies in its ability to measure the psychophysiological behavior of students, offering valuable insights into their cognitive and emotional states. By analyzing data from various sources such as facial expressions, voice tone, eye movements, and physiological signals, AI algorithms can provide a deeper understanding of students' engagement levels, attention spans, stress levels, and overall emotional well-being. This innovative approach has the potential to revolutionize education by enabling personalized learning experiences and facilitating early intervention for mental health issues. The well-being of university students is of paramount importance as they navigate the challenges of academic life, personal growth, and transition into adulthood.

In this paper, we explore the applications of AI in measuring the psychophysiological behavior of students, highlighting its significance in promoting holistic well-being and enhancing educational outcomes using artificial neural network (ANN) model. By harnessing the power of AI, educators can gain valuable insights into students' behaviors and emotions, ultimately fostering a more supportive and tailored learning environment.

2. Background

The mental health of students is a serious public health issue that is in need of scalable, effective, and attractive interventions. Universities in the whole world among their students, are facing an increasing prevalence of mental health problems. Yoga is an ancient practice that combines physical postures, breathing exercises which promote holistic well-being. It originated in ancient India and has been adopted by various cultures worldwide. Yoga have been associated with a range of potential benefits, including stress reduction, improved mental focus, emotional regulation, increased self-awareness, and enhanced physical fitness.

Due to mental health problems like stress, anxiety, and other mental issues, students are compelled for going to allopathic doctors for their treatment and getting relief a little faster, which might be giving relief to them but the allopathic treatment also arises many side effects on the long run whose effects could be seen after some years.

Reason for using ANN Model

Artificial Neural Networks are excellent at recognizing patterns and extracting meaningful information from complex datasets. It helps in understanding the relationships between various physiological and psychological factors in student behavior.

Human behavior is often influenced by non-linear relationships between various factors. Artificial neural networks are capable of modeling and capturing these non-linear relationships, allowing for a more accurate representation of the complex interactions between physiological and psychological variables. This enables a deeper understanding of the factors that influence student behavior.

Artificial neural networks are adaptive models that can learn from data and generalize their learning to new, unseen situations. This makes them well-suited for studying student behavior, which can vary widely across individuals and over time. Artificial neural networks can automatically extract relevant features from raw input data.

Overall, artificial neural networks provide a powerful tool for modeling and understanding the complex physio-psycho behavior of university students. They can capture non-linear relationships, extract meaningful features, generalize their understanding, and make predictions based on new data, enabling researchers and educators to gain valuable insights into student well-being and academic performance.

3. LITERATURE REVIEW

Numerous populations, including teenagers, children, and clinical populations, have participated in substantial research on the impact of yoga on psychological and physical health using artificial intelligence. Here, we examine pertinent research on the study of yoga using AI.

Kora et al. (2021) interpreted that, Yoga practice could be a useful supplemental treatment for a sick and elderly population. Advanced research can look into the effects of different types of yoga on a certain clinical grouping. Yoga and meditation improved total brain function[1]. Toshev et al. (2014) proposed a method for human pose estimation based on Deep Neural Networks (DNNs) and also presented a complete empirical analysis with state-of-the-art or higher performance on four academic benchmarks of various real-world photos was presented[2]. Luu et al. (2017) examined that, in terms of mood outcomes, both hatha yoga and meditation significantly increased POMS total mood scores. Hatha yoga and meditation had no significant differences in POMS total mood, but hatha yoga had significantly better benefits on the vigor-activity subscale. Overall, the data indicate that acute sessions of hatha yoga and mindfulness meditation boost executive function and mood in the same way[3]. Ng et al. (2019) reviewed that, the impact of augmented and virtual reality-enhanced exercise on physical activity, psychological consequences, and physical performance[4]. Chiddarwar et al. (2020) conducted surveys and listed the numerous technologies that can be used for pose estimation before deciding on the optimal way based on the usability of an Android application[5]. Agrawal et al. (2020) experimented with implementing machine-learning algorithms for identifying yoga poses[6]. Moraes Lopes et al. (2020) provide a discussion about the significance of diet and fitness in terms of health and well-being; What is precision medicine, artificial intelligence, precision nutrition, and precision fitness? how AI can help with precision nutrition and fitness; nutritious meal planning/dietary menu planning decision-making algorithms Diet and supplements based on artificial intelligence; AI is being employed in genetic tests to improve precision diet and fitness. AI-based nutritious meal planning for cancer, cardiovascular disease, obesity, and type 2 diabetes patients AI-powered diet and exercise coaching systems[7]. Garbett et al. (2021) examined individuals' experiences with AI computer vision fitness instructor applications[8]. Kalpan-Rakowski et al. (2021) showed that students stated that meditation techniques supplied via either medium were beneficial in reducing their pre-exam anxiety, also demonstrated practical ramifications, and provides evidence of the favorable influence of VR meditation on students' exam performance and anxiety levels[9]. Kishore et al. (2022) explained that yoga is a traditional Indian practice that involves physical postures (asanas), voluntarily regulated breathing (pranayama), meditation, and relaxation techniques. It was also suggested that this study's implementation of deep learning-based methods, which can estimate the precise pose performed by a practitioner, would make the work of such practitioners easier. The study used EpipolarPose, OpenPose, PoseNet, and MediaPipe as four different deep-learning architectures to accomplish this strategy[10]. Agarwal et al. (2022) introduced various artificial intelligence (AI)-based yoga mobile applications that encourage users with a tailored experience and positive feedback. It also introduces the idea of an AI-based yoga trainer who reminds, teaches, guides, and motivates a user to practice yoga or while doing yoga[11]. Dutta et al. (2022) stated that in the year 2020, yoga has been examined under a wide variety of clinicopathological disorders, and also hopes to provide an idea of the role of yoga in diverse clinical situations and its future therapeutic implications[12]. Yao (2022) indicated that COVID-19's influence should focus on enhancing university students' professional quality, physical quality, humanistic quality, and moral character in order to promote college and university stability in the event of public health catastrophes[13]. Li et al. (2022) determined college students' psychological health standards, selected measurement tools for college students' psychological state, elaborated the principles of psychological assessment based on text information, performed sample set data establishment and data processing of assessment and analysis model of psychological health, conducted network establishment, training, and simulation, conducted case experiment and its result analysis, explored the cause analgesia[14]. Solas-Martinez et al. (2023) discussed present AI devices for PA monitoring and the most relevant AR software focusing on movement, as well as reviewed Artificial Intelligence and Augmented Reality in Physical Activity[15]. Bhari et al. (2019) compared and analyzed an artificial intelligence-based

educational environment and a traditional educational environment using some common concerns of teaching and learning[16]. Sharma et al. (2022) reviewed Artificial intelligence applications in the healthcare business are covered, including Oral Pre-Cancerous Lesions and Oral Cancer Detection, Neurodegenerative Disorders, Medical Disorders, and Drug Discovery[17].

4. Artificial Neural Network Model

A computer model known as an Artificial Neural Network (ANN) is made up of interconnected processing units, or neurons, that process and send data simultaneously. The structure and operation of the human brain serve as inspiration for ANN design. An ANN's neurons take in input signals, process them, and then produce output signals. The strength and influence of the information flow inside the network are determined by the connections between neurons, which are represented by weighted values. The ANN model was created using the mathematical software Neural Network Toolbox Neuro Solution 6.0® in the context of the particular application described.
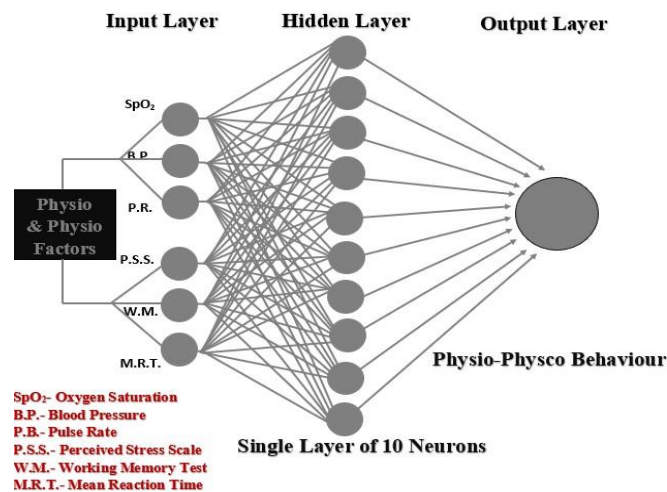

Figure 1. ANN Model

This study's ANN model has a single-layer design with sigmoid activation functions applied to the input and output layers. The collected data was separated into an input matrix and a desired matrix, which served as training data for the model. The functional relationship between the inputs and outputs is represented by a single-layer sigmoid network, given that the sigmoid layer has a suitable number of neurons to reflect the intricacy of the relationship. The Levenberg-Marquardt algorithm was used to train the ANN model. This technique is well-known for its efficiency in training networks of intermediate size, allowing for rapid convergence to a solution. It iteratively changed the network's weights and biases to minimize the discrepancy between expected and actual outputs.

5. METHODS

Twenty healthy male volunteers between the ages of 16 and 22 who attended Technical College Dayalbagh Educational Institute participated in the study. The participants were chosen based on their excitement and readiness to regularly practice yoga for personal growth. Tests including the Advanced ESP test, Precognition test, and Psi-Q test were used to record various psychological factors, and the power lab system software was used to monitor stress levels.

The yoga practice began with a 5-minute warm-up mild exercise, followed by 20 minutes of yogic asanas (postures) such as Anulom-Vilom, KapalBhati, Vajrasana, Siddhasana, and Shavasana. For one month, after performing four asanas in this sequence, Shavasana was practiced intermittently for around 2 minutes under the guidance of a trained instructor. At the halfway point of this one-month period, psychological characteristics were measured.

After a month, the participants continued to practice the same set of yoga asanas in the morning, as well as the occasional Savasana. They were then instructed to relax their toes, feet, ankles, calves, heart, lungs, neck, and hands, as well as their head and mind, by concentrating on their breath. They were subsequently taught Transcendental Meditation (TM), which they practiced for 30 minutes every day. During TM, participants could close their eyes and focus on God, Guru, Sound, =Name, or any specific object based on their religious views. This month-long yoga practice lasted.

Hard copies of questionnaires and an online survey were used to collect data for the study. A sensitivity analysis was performed to examine the effectiveness of variables such as ESP, stress, PSI-Q, and working memory during yoga practice. The created model's capacity to predict the performance of experimental data not included in the training program was tested.

6. RESULTS & DISCUSSION

The paper focuses on using physio-psycho correlations to assess the level of consciousness in university students. The study's major objective and theme revolve around investigating the impact of ethical lifestyle elements on awareness levels, which is supported by scientific arguments based on psycho-physiological measures.

The current study looks on how yoga effect the improvement of psychological patterns in university students. The pilot study included twenty participants, and the results indicated that yoga practices are especially useful for people who had never undergone yoga training.
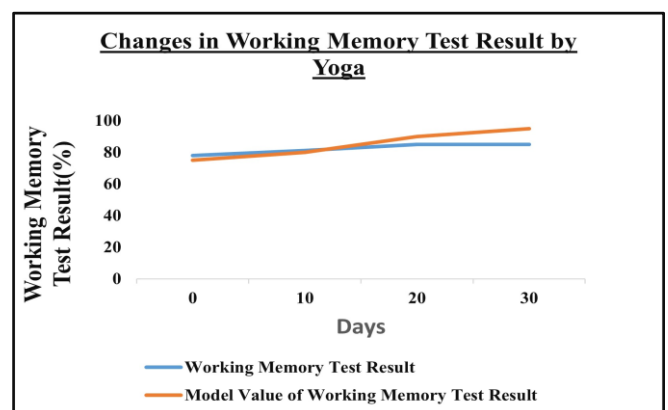

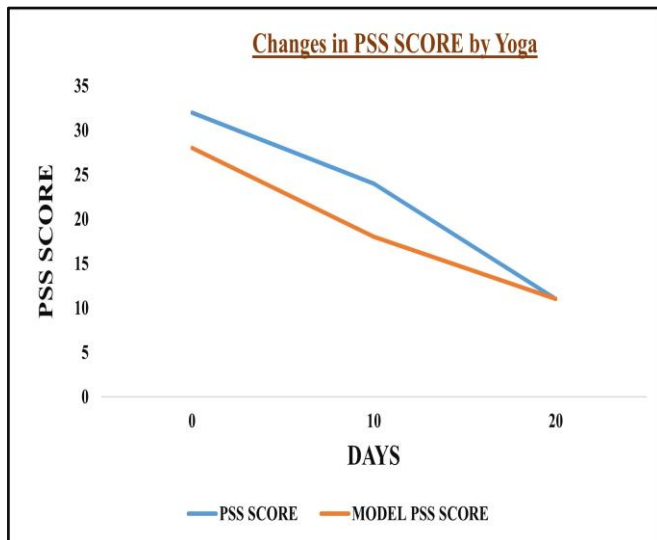**Figure 2. Changes in Working Memory Test Result by Yoga**
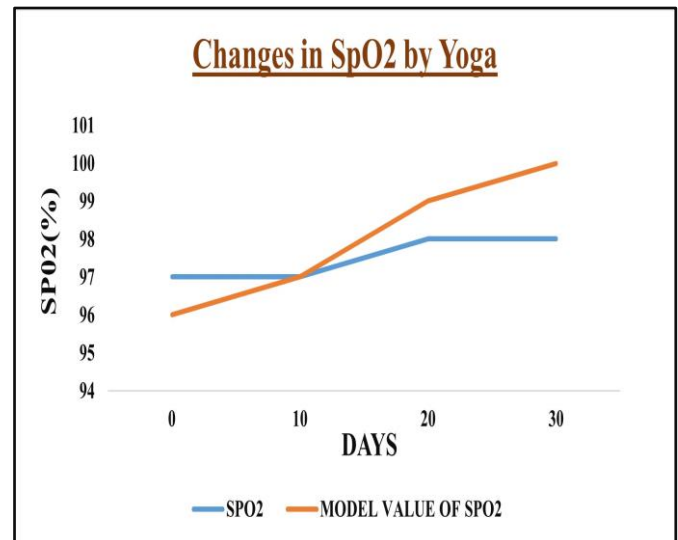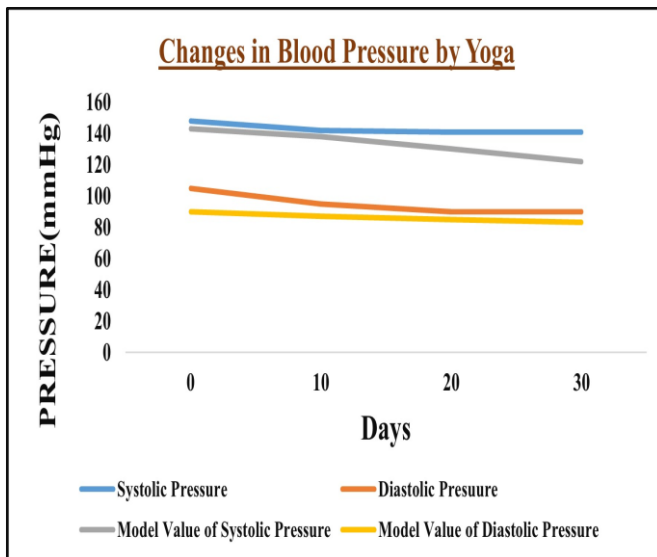
Figure 3. Changes in PSS Score by Yoga

Figure 6. Changes in SpO₂ by Yoga

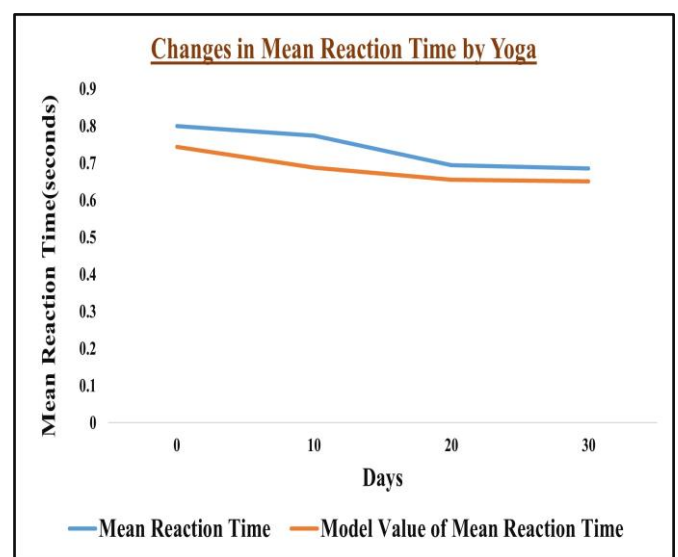**Figure 4. Changes in Blood Pressure by Yoga**

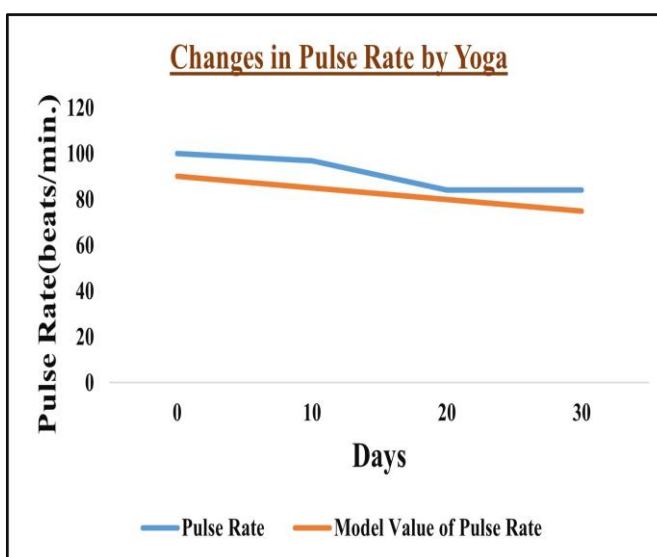**Figure 7. Changes in Mean Reaction Time by Yoga**

Figure 5. Changes in Pulse Rate by Yoga

Figure 2 indicates that regular yoga practice has positive effects on working memory. These techniques induce relaxation, reduce tension, and increase overall mental clarity through a combination of physical postures, controlled breathing, and yoga, thereby boosting working memory capacity and cognitive ability.

Figure 3 depicts the beneficial benefits of yoga on stress levels. Individuals can develop resilience and efficient coping mechanisms via frequent practice, resulting in lower perceived stress levels and greater psychological well-being.

Figure 4 shows how the combination of physical postures, controlled breathing, in yoga allows people to acquire a state of calm, which leads to a drop in blood pressure. This highlights the cardiovascular health benefits of yoga.

Figure 5 shows how physical postures, deep breathing exercises, and yoga engage the parasympathetic nervous system, encouraging relaxation and stress reduction. As a

result, people's resting pulse rates gradually drop, indicating improved cardiovascular health.

Figure 6 shows that yoga improves lung capacity and oxygen exchange through controlled breathing techniques, reduces stress and improves cardiovascular function and blood circulation. These combined effects help to keep oxygen saturation levels (SpO2) at optimal ranges.

Figure 7 depicts the possible advantages of yoga in lowering mean reaction time. Regular use of these mindful strategies enhances cognitive functioning, including improved focus, attention, and reaction time, ultimately leading to better overall cognitive performance.

According to the findings, combining yoga practices can lead to improvements in several dimensions of awareness, which is corroborated by earlier research. These enhancements include improved cognitive factors and overall consciousness. The experimental results are encouraging, demonstrating that yoga can have a positive impact on a person's social, self, bodily, and emotional consciousness.
In conclusion, yoga provides several benefits in terms of health and well-being. These mindful approaches promote tranquility, reduce stress, improve cardiovascular health, increase oxygen intake, lower perceived stress levels, and have a favorable impact on cognitive performance, such as response time and working memory.

The study found a link between physio-psycho parameters and consciousness level that is positive. The findings demonstrated that yoga practice had a positive impact on several aspects of consciousness, resulting in enhancements to cognitive processes and awareness as a whole. According to the study, combining yoga can improve a person's social, self, bodily, and emotional consciousness. It is observed, nonetheless, that a longer period of study and practice may have a more notable impact on mental and spiritual consciousness.

7. CONCLUSIONS

Regular yoga practice has numerous benefits for both physical and mental well-being. These attentive strategies have been identified for their beneficial benefits on blood pressure control, mean reaction time reduction, stress management, cardiovascular health improvement, optimal oxygen saturation levels promotion, and working memory enhancement. Individuals can improve numerous elements of their health and overall well-being by including yoga in their daily routines. These techniques promote relaxation, stress reduction, mindfulness, and improved cognitive functioning, providing a comprehensive approach to wellness. Practicing yoga can result in long-term good changes in both the mind and the body, promoting a balanced and healthy lifestyle.
According to the findings, yoga can lead to improvements in several dimensions of awareness, which is corroborated by earlier research. These enhancements include improved cognitive factors and overall consciousness. The experimental results are encouraging, demonstrating that

yoga can have a positive impact on a person's social, self, bodily, and emotional consciousness. It is worth mentioning that prolonged practice and study may have a considerable impact on mental and spiritual consciousness, meaning that continuous participation in these practices can provide additional benefits.

The paper focuses on using physio-psycho correlations to assess the level of consciousness in university students. The study's major objective and theme revolve around investigating the impact of ethical lifestyle elements on awareness levels, which is supported by scientific arguments based on psycho-physiological measures. The study's goal was to look into how yoga affects the improvement of psychological patterns in university students. The pilot study included twenty participants, and the results indicated that yoga practices are especially useful for people who had never undergone yoga training.

References

[1] P. Kora, K. Meenakshi, K. Swaraja, A. Rajani, and M. S. Raju, "EEG based interpretation of human brain activity during yoga and meditation using machine learning: A systematic review," Complement Ther Clin Pract, Vol.**43**, pp.**101329**, May **2021**, doi: 10.1016/j.ctcp.2021.101329.
[2] A. Toshev and C. Szegedy, "DeepPose: Human Pose Estimation via Deep Neural Networks," in 2014 IEEE Conference on Computer Vision and Pattern Recognition, IEEE, Jun., pp.**1653–1660, 2014.** doi: 10.1109/CVPR.2014.214.

[3] K. Luu and P. A. Hall, "Examining the Acute Effects of Hatha Yoga and Mindfulness Meditation on Executive Function and Mood," Mindfulness (N Y), Vol.**8**, Issue.**4**, pp.**873–880**, **2017**, doi: 10.1007/s12671-016-0661-2.

[4] Y.-L. Ng, F. Ma, F. K. Ho, P. Ip, and K. Fu, "Effectiveness of virtual and augmented reality-enhanced exercise on physical activity, psychological outcomes, and physical performance: A systematic review and meta-analysis of randomized controlled trials," Comput Human Behav, Vol.**99**, pp.**278–291**, **2019**, doi: 10.1016/j.chb.2019.05.026.

[5] G. G. Chiddarwar, A. Ranjane, M. Chindhe, R. Deodhar, and P. Gangamwar, "AI-Based Yoga Pose Estimation for Android Application," Int J Innov Sci Res Technol, Vol.**5**, Issue.**9**, pp.**1070–1073, 2020**, doi: 10.38124/IJISRT20SEP704.

[6] Y. Agrawal, Y. Shah, and A. Sharma, "Implementation of Machine Learning Technique for Identification of Yoga Poses," in 2020 IEEE 9th International Conference on Communication Systems and Network Technologies (CSNT), IEEE, Apr., pp.**40–43, 2020.** doi: 10.1109/CSNT48778.2020.9115758.

[7] M. H. B. de Moraes Lopes, D. D. Ferreira, A. C. B. H. Ferreira, G. R. da Silva, A. S. Caetano, and V. N. Braz, "Use of artificial intelligence in precision nutrition and fitness," in Artificial Intelligence in Precision Health, Elsevier, pp.**465–496, 2020.** doi: 10.1016/B978-0-12-817133-2.00020-3.

[8] A. Garbett, Z. Degutyte, J. Hodge, and A. Astell, "Towards Understanding People's Experiences of AI Computer Vision Fitness Instructor Apps," in Designing Interactive Systems Conference 2021, New York, NY, USA: ACM, Jun., pp.**1619–1637, 2021**. doi: 10.1145/3461778.3462094.

[9] R. Kaplan-Rakowski, K. R. Johnson, and T. Wojdynski, "The impact of virtual reality meditation on college students' exam performance," Smart Learning Environments, Vol.**8**, Isuue.**1**, pp.**21**, **2021**, doi: 10.1186/s40561-021-00166-7.

[10] Dm. Kishore, S. Bindu, and N. Manjunath, "Estimation of yoga postures using machine learning techniques," Int J Yoga, Vol.**15**, Issue.**2**, pp.**137**, **2022**, doi: 10.4103/ijoy.ijoy_97_22.

[11] V. Agarwal, K. Sharma, and A. K. Rajpoot, "AI based Yoga Trainer - Simplifying home yoga using mediapipe and video streaming," in 2022 3rd International Conference for Emerging Technology (INCET), IEEE, May, pp.**1–5, 2022.** doi: 10.1109/INCET54531.2022.9824332.

[12] A. Dutta, M. Aruchunan, A. Mukherjee, K. G. Metri, K. Ghosh, and I. Basu-Ray, "A Comprehensive Review of Yoga Research in 2020," Journal of Integrative and Complementary Medicine, Vol.**28**, Issue.**2**, pp.**114–123**, **2022**, doi: 10.1089/jicm.2021.0420.

[13] S. Yao, "Construction of Relationship Model between College Students' Psychological Status and Epidemic Situation Based on BP Neural Network," Comput Intell Neurosci, vol. 2022, pp. 1–11, Feb. **2022**, doi: 10.1155/2022/5115432.

[14] P. Li and F. Liang, "An Assessment and Analysis Model of Psychological Health of College Students Based on Convolutional Neural Networks," Comput Intell Neurosci, vol. 2022, pp.**1–10, 2022**, doi: 10.1155/2022/7586918.

[15] J. L. Solas-Martínez, S. Suárez-Manzano, M. J. De la Torre-Cruz, and A. Ruiz-Ariza, "Artificial Intelligence and Augmented Reality in Physical Activity: A Review of Systems and Devices," in Augmented Reality and Artificial Intelligence, pp.**245–270, 2023.** doi: 10.1007/978-3-031-27166-3_14.

[16] P. L. Bhari and C. D. Kumawat, "A Study of Artificial Intelligence Education System and Traditional Education System," International Journal of Computer Sciences and Engineering, Vol.**7**, no.**10**, pp.**124–129, 2019,** doi: 10.26438/ijcse/v7i10.124129.

[17] A. Sharma and P. Singh, "Use of Artificial Intelligence for Healthcare Purposes: A Structured Review," International Journal of Computer Sciences and Engineering Open Access Review Paper, Vol.**10**, Issue.**8**, **2022**, doi: 10.26438/ijcse/v10i8.2327.

AUTHORS PROFILE

Shubham Chahar earned his B.Sc. (Hons.) Mathematics from University of Delhi in 2020 and M.Sc. Mathematics from Dayalbagh Educational Institute, Agra in 2022. He is at present working as Mathematics Lecturer in Technical College, Dayalbagh Educational Institute, Agra.

Dr. Jyoti Kumar Arora's research interests are Mathematical Modeling and Computational Fluid Dynamics. He has over four years teaching experience in the Department of Mathematics, Faculty of Science, Dayalbagh Educational Institute [DEI] (Deemed University), Agra. He is at present working as Lecturer in DEI Technical College, DEI, Agra since 2000.
He is also the Coordinator of the Department of Applied Sciences and Humanities and In-charge, Examination from last 10 years. Presently He is Chief Proctor of Technical College of DEI. He did his Ph.D. in Mathematics on the subject "Mechanics of Bio-Fluids" from Agra University, Agra in 1996.
He has more than 20 publications in the international and national journals of repute and around 30 publications in the international and national conferences. He also has attended many high-profile conferences at the national and international level including World Congress of Engineers 2011 at Imperial College, London (UK) and
Toward Science of Consciousness 2012 at University of Arizona, Tucson, (USA). He also chaired sessions and was invited speaker at several national conferences.
Dr. Arora is working on many projects funded by the UGC and MHRD in collaboration with the Department of Chemistry, Faculty of Science, DEI, India.
He has also published two books entitled, "Comprehensive Applied Mathematics-I" and "Comprehensive Applied Mathematics-II" in the subject of Mathematics for the Diploma level students by well known "IK International" publishing house, Delhi.

Dr. Utkarsh Kumar earned his M.B.B.S., M.S. (General Surgery) from The Institute of Medical Sciences, Banaras Hindu University in 2015 and 2018 respectively. He worked as senior resident in AIIMS Rishikesh for a year and then got commissioned as Government Assistant Professor of General Surgery in Haryana in 2020.
Dr. Kumar is working as Assistant Professor in Department of General Surgery, Kalpana Chawla Government Medical College, Karnal since 2020.
He has been awarded by Hon'ble Chief Minister of Haryana in 2021 for his tremendous work as Doctor and incharge of various posts in KCGMC, Karnal. He has more than 10 publications in the international and national journals.