Grenze International Journal of Engineering and Technology, June Issue

An Overview on Cognitive Stress Assessment using Deep Learning and EEG: Perspectives on Yogic Interventions

Chellathurai Maria Rethina Bai Edwin T[1], Ashok Vajravelu[2], Asmarashid Bin Ponniran[3], Wan Suhaimizan Bin Wan Zaki[4], Syed Riyaz Ahammed[5] and Kesava Sundara Nathan[6]
[1,6]PhD Research Scholar, Faculty of Electrical and Electronic Engineering (FKEE), Universiti Tun Hussein Onn Malaysia (UTHM), Parit Raja 86400, Johor, Malaysia.
[2]Faculty of Engineering Technology (FTK), Universiti Tun Hussein Onn Malaysia (UTHM), Parit Raja 86400, Johor, Malaysia
Email: ashok@uthm.edu.my
[3-4]Faculty of Electrical and Electronic Engineering (FKEE), Universiti Tun Hussein Onn Malaysia (UTHM), Parit Raja 86400, Johor, Malaysia
[5]Associate Professor, Department of Electronics and Communication Engineering, NITTE University, Mangalore, India

***Abstract*— Excessive stress brings serious risks to both psychological and physiological well-being and affects individuals across all ages and demographics. Conventional methods of evaluating stress generally include collecting self-reported questionnaires and observing behavior, and thus are subjective and usually not consistent between persons. Hence, this study focuses on the objective physiological methods for stress evaluation related to these limitations. Specifically, we study the incorporation of electroencephalogram (EEG) signals in deep learning for the purpose of identifying and classifying brain activity associated with stress. Mood detection through EEG allows for stress characterization through a variety of analytical frameworks, such as event-related potentials, power asymmetry, time-frequency analysis, and spectral analysis. Recent advances in hybrid deep learning architectures made it possible to combine convolutional neural networks and recurrent neural networks, which further improves the accuracy and robustness of the stress classification model. The present work also presents evident changes in the neurophysiological correlates of improved mental states when the Kaiya yoga is introduced as an adjunctive intervention in reducing stress. It found observable changes in alpha and theta wave activity which corresponded to an ameliorated state of both stress and emotional regulation. Bridging neuroscience with machine learning and yogic practices, intelligent real-time EEG-based stress monitoring and intervention systems shall be developed through this study. Stress-related disorders management and holistic mental healthcare advancement have promising applications through such systems.**

***Keywords*— EEG signals, Deep learning, Mental stress detection, Yogic interventions, Emotion recognition.**

I. INTRODUCTION

Anyone of any age, race, gender, or country can feel stressed. Getting rid of this is one way to stop it.

Grenze ID: 01.GIJET.12.2.79_23

It can be hard to break bad habits when you're worried in different. [1][2]. When people are stressed, they talk about how they feel and what their bodies do. People worry more when things aren't going well, like when they are sad, angry, or stressed. Fear can come from inside or outside. Things that make these people who they are are shaped by what they think, believe, and are. Stress can also happen when your family, money, or job are giving you trouble. The government, jobs, and religion can also make people feel stressed [3][4]. When things change all the time at work and you have to do math in your head, bad things can happen. It's okay if you don't work out, sleep enough, or stay away from bad things. Songs and movies are two things that can make you feel stressed. [5][6] Stress comes in two forms: short-term and long-term. Acute stress is when someone is very stressed out for a short time, like when they are looking for a job or making a speech. It's called chronic stress when you worry a lot for a long time. You might feel stressed if you don't get enough sleep, work too hard, or love someone badly. When the body is worried, it does a lot of things. These chemicals [7] are made by the body when some people are stressed. It's what they think will make them feel strong and awake right away. The body is then brought back into balance by the parasympathetic nerves. You are in balance when you don't hurt too much and feel good. Long periods of being scared are bad for your mind and body. High blood pressure, headaches, and strokes due to environment can all be caused by stress [8][9].

Docs and therapists use self-report polls to find out if someone is stressed [10]. You can show that you are noted in a number of ways. Some of these are the clear stress scale, the relative stress scale, and the daily stress inventory. But they were very religious and had strong ideas about how things should be carried out.

A lot of the answers they gave were also false or wrong. Different people have different ideas about what stressed-out people want and how they will act. Aside from what people said, what they did with their bodies and how they moved were also marked [11]. It might be more interesting to watch how people act when they don't know what's going on. Both the test and the behaviour study can be lied on by experts if they are biased, tired, or don't have enough experience. They might be exhausted, too. When this nerve system part does something, the body changes. These changes are known as "stress." Some of the things that change because of these changes are skin temperature, pupil size, heart rate variability (HRV), blood pressure in the voice, and skin sensitivity. Things going on around someone and their health can still change the messages their body sends. A lot of harm can be done by things that change the pH and water content of the skin [12][13].

A. Emotional Networks and EEG-based Emotion Recognition

This is the first part of this study about how brain scientists interpret the feelings of an individual. The new work in this area is well demonstrated by this picture [14]. Hard things had to be conceived of by us, so we could quickly understand how the persons felt without the study's hindrance. More brain models that show human understanding of how other people think should be built. Important schemes should also be prepared and executed for this purpose. Cognitive brain models [15][16] represent the continuous effect of feelings on thought and action [17]. PC models could follow rules, be creative, or think of other sure methods by which they would find out how people feel. To that end, we would be interested in this area. This beautiful and well-articulated research was offline before. It beautifully describes how computerized EEGs try to work with mood detection and what is in progress; it may refer to certain valuable traits in the brain and in mood that cannot be found elsewhere but in the EEG data. The next cognitive brain models will be better after these parts added to them. They are meant to reveal how people think and how they feel, and even how brain problematics take place. The thalamus and the amygdala hold the brain areas that store memory concerned with feeling. They are also connected to other brain regions. Mind models seem to work best with this dual-source data of both the heart and brain performance [18-21]. A more integrated understanding of how our brains deal with our feelings would be through this grand network. It is related to mind workings. Much like the other cognitive neuroeconomic models [22-24] we previously attended to, this takes a very high level of skill. If all goes well, you could expect to use what this part of the brain knows about money. These kinds of thoughts tend to spring from the mind's back alleys or from the unconscious. They should be easily communicable and shouldn't cost much.

B. Understanding Emotional Networks

Learn more about how we feel and how to manage those feelings. This is one of the most important goals of mental and social neuroscience. This was a group of brain cells, along with the hippocampus and prefrontal cortex, that some decades ago was called the emotional brain[25-27]. Many opinions once held that this was the best route to understanding how we genuinely feel. We have tried to revisit those concepts in light of our larger understanding. The insula and the anterior cingulate cortex could also form connections within this network [28]. The actual research states that thoughts themselves are formed, recognized, and regulated by various brain areas; these include the prefrontal cortex as well as structures connected to the limbic system. Some of these include

the orbital frontal cortex, the ventral striatum, and the upper cingulate cortex. It is these areas that are more active in individuals experiencing or producing sensations. These areas are not thought to belong to the major mode of production network. Considerably more studies have been testing the circuits for feeling in the brain. Some people with damage to their prefrontal cortex and limbic areas find it difficult to deal with their feelings [28-31]. Similarly, those with schizophrenia, depression, anxiety, and bipolar disorders, as well as antisocial personality disorders, will find it difficult to articulate, comprehend, and act on their feelings. They may have a distorted view of others and the world. To excel in jobs requiring emotions, one must accurately and quickly assemble varied emotions from thoughts occurring at the same time. One should never forget to apply the correct NRF within any conversation.

II. Literature Review

A. EEG-based Emotion Recognition Techniques

The way someone's brain works can tell you a lot about how they feel. Electroencephalography, or EEG, is the name for this. Usually, this process is made up of two main steps: getting rid of features and grouping thoughts together. We get rid of parts of an EEG wave that aren't needed. This is known as taking out features. When you classify thoughts, on the other hand, you use traits to put them into groups. Stats or machine learning are used to do this.

TABLE I: COMPARING EEG FEATURE EXTRACTION METHODS FOR STRESS AND EMOTION IDENTIFICATION

Method of Feature Extraction	Frequency or Part	Important Pros	Some problems	Range of Accuracy	Applications
Potentials Associated with Events (ERPs)	P300, N200, LPP	High temporal resolution; keeps track of changing reactions	Needs more than one try; not very useful in real life	64-74%	Analysing ideas and processing feelings
Features of Spectra	Begins at 8 Hz and goes up to 13 Hz, then goes up to 30 Hz, then to 100 Hz, 4 Hz to 8 Hz, and finally 0.5 Hz to 4 Hz.	Quantifies changes in frequency; widely accepted as accurate.	Could miss changes in the short term	70-80%	Emotional arousal and valence recognition
Analysis of Power Asymmetry	FAA, or frontal alpha asymmetry	Good for emotions of approach-withdrawal	Only in the facial areas	67-77%	The difference between good and terrible feelings
Analysing time frequencies	Wavelet Transform and STFT	combines time and spectrum information	Dedicated to computing	71-81%	Temporary affective responses
Connectivity that works	Cause and effect, PLV, and DCM	Shows the connection between regions	Interpretation that is difficult and needs knowledge	74-82%	Learning about neural circuits

A lot of what the EEG does to figure out mood is also used to figure out traits. The goal here is to find the strange things about what is being looked at that show how someone is feeling. You can do any of these things to break features:

- Event-Related Potentials (ERPs): The EEG tells us about things that happen in the body, mind, or feelings through ERPs. They only occur at certain times, so they don't last long. You can find these numbers by taking the average of the EEG reactions from different shows of the same event. They have now seen the exact part of the brain that manages feelings. The ERP's P300, N200, and LPP all have to do with how we feel and how we deal with those feelings. You can see how people's ideas change over time since they work on ERPs all the time. They did a lot of tests, but they were only a few. This might not be very useful in real life [32].
- A manner in which EEG data segments these frequency bands is by frequency band analysis which corresponds to different studies. In this case, these bands develop arguments for the following: gamma (30-100 Hz); omega (8-13 Hz); beta (13-30 Hz); and delta (0.5-4 Hz). The scope of these bands is at times broader than thinking and feeling but may have a strong charge or power in the other aspects. This would be theta and delta; alpha has been found to have variable effects across different parts of the brain [33-35]. It is more of a question of how I feel. Typically, people would say, oh, you have more alpha on the left side of your brain when you feel good. You have more coming out of the right when you're sad. Research [36] tends to view the way people feel like that. For example, emotions could be connected to the frontal lobe and other parts of the brain that do not show up on tests. This is what the FAA research is all about. You

have more alpha waves in your left frontal brain when you wish to talk to somebody; you might experience sadness when you withdraw. Just with the mind and alpha.

- It is free time right now: Electricity-based brain scans are able to differentiate individuals who feel different things. We need to find out how power changes to do this. These trend observations can be performed with the method because of time and range. Both of these analyses greatly assist in the detection of power trends in EEG over time through Wavelet Transform (WT) analysis and Short-Time Fourier Transform (STFT)-based detection of human knowledge through reading brain waves. In this way, it gives information about feelings that are connected to short-term changes in waves of EEG [37].
- A brilliant illustration of how everything fits together: To make the connection, we need to consider more than one part of the EEG at a time. They also consider how different areas of the brain conversed while an individual thinks, and everyone can see activity through different functional ways such as Granger causality analysis, phase-locking value (PLV), or dynamic causal modelling (DCM). Mood apps usually reveal how "close" two people really are. For the same reason, a clearer understanding of the brain that dictates how we feel is realized.

There is a full list of all the ways to get EEG traits in Table 1. What's good or bad about these ways? How can you use feelings and stress to find them?

B. Background of the study

High-frequency bands, mid-band bands, and low-frequency bands are also part of 5G and can be used for speech calls. For each of these bands, it only works in a certain bandwidth range. When millimetre waves are used to send video, they can do so at two different bit rates. These waves move at speeds of 24 to 72 gigahertz. Wavelengths range from 2.4 GHz to 4.2 GHz, and bit rates range from 100 Mbps to 400 Mbps. You can send something with this band. The last type is the low-band range. Because it works with the same kinds of data as 4G cells [38], this network can reach the most people. The bit rate slows down as it goes down, though. Biometric data needs to be able to be sent over 5G networks, processed at the edge, and used by IoT systems that work best with people. IP systems have a number of different ways to protect fingerprints. This article is mostly about the biometric EEG proof. What an EEG scan of your brain tells you is accurate, applicable to everyone, and unique to you. In other words, it can be used for more than just brain–computer interface (BCI) problems. It is used in a lot of different fields, like neuroscience and neuro marketing. Figure 1 shows the best new places to sell EEG data on the Internet of Things.

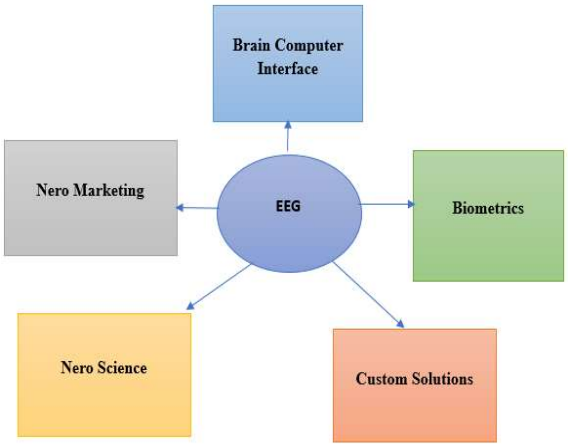

Figure 1. EEG biometric signals have several uses in Internet of Things systems.

There are many ways to use BCI tech. One well-known example is brain-computer interfaces (BCIs), which let people direct machines with their thoughts. People who wear these can use their thoughts as power tools to help them with daily jobs. An ample assortment of tools is available to meet the needs of many who have problems with locomotion. Special categories occupying my mind are bicycles and exoskeletons. Brain-computer interface technology might also be able to promote the restoration of health in people. There is currently speculation about how BCIs might function for the purposes of study, tracking, and even alleviation of depression and anxiety. This is a vast field of application that is of utmost importance because, in parallel to that, brain-computer links are also able to monitor people's health. Biologists are able to use BCIs [39] to survey the variation of

brainwaves in individuals so as to ascertain such things as fatigue or intoxication. The technology could also help identify individuals presenting with some mental health or brain-related concerns. Furthermore, EEG as part of BCI could be used to assess if certain brain maladies such as epilepsy, Alzheimer's duties, and autism spectrum disorder are present [40]. Clinical practice could also use it for ascertaining any mood disturbances, like anxiety or sadness. An EEG could also show difficulties asleep, namely among people who are somewhat awake at hours most sshared with being. Brain activity may be used in an EEG-based BCI, for example, for moving a computer mouse or selecting between images appearing on a screen.

A lot of things induce feelings, thoughts, and behaviors in humans. This is good, for EEG tests provide much for determining such. Therefore, EEG activity is compatible with computer or phone applications. If someone knows how to do it, an EEG can be used to figure out who someone is. An enormous amount of research was done on EEG as a possible corporeal correlate [41]. For this, they examined how different EEGs manifested different trends and traits across individuals. EEGs found their application in VR setups, simulation-based games, yoga classes, and meditation sessions. It is in marketing that the necessities of what people want and their thought processes come together. Understanding the brain is yet another way for people to learn how they feel. Recently, EEG is gaining immense prominence in examining how people respond to advertisements, marketing communication, and concepts for a new product.

EEG or brain waves may show a lot about what people are doing, their feelings, and their thoughts. You can learn what people want. After that, you can use this knowledge to come up with great goods, marketing plans, and messages. With an EEG, you can look for patterns in nerve waves. EEG fusion is a new tool that does the same thing that IoT and EEG do on their own. You will want many TVs and online tools to make this possible. After that, these links will show you more about how brains work. This is why more and more apps are being made to look for, monitor, and treat all mental illnesses. You can also use the tools to improve your life and your thoughts [42].

From USD 21.5 billion in 2019 to USD 64.8 billion in 2025, it will grow at a rate of 22.0% per annual year. Driving factors could be multiple. The importance of fingerprint-enabled touchscreens has been established in government bodies, banks, and industries. At shopping malls and hospitals, showing ID card credentials has become even more crucial. Fingerprint recognition on mobile phones is growing in popularity among users. A lot of phones come with it [43]. It is very effortless to show your choice. Several fresh trends are burgeoning in relation to the Internet of Things employed. It helps with many things and keeps people away from danger. With these tools, already-connected things are going to track fingerprints. They can read your words, eyes, lips, fingers as well. After those steps, people will not worry about safety while using their linked gear. In place of passwords or passcodes, just show who you are with your body. Then they are going to start believing in you, and the probability of your being truthful is higher. Residences are much more fun for users who don't have to lug around a physical key or remember some complicated password. Biometrics could also be another way to affirm someone's identity in the Internet of Things. Health care, safety, smart homes, and smart houses [44] are just some of the things that need to keep an eye on people. It will be safer and better for everyone.

III. Quantitative EEG Correlates of 'Kriya Yoga'

For people whose job is caring for others, they are sick people themselves for the most part. The viral illness cases like coronavirus disease 2019 (COVID-19) have now risen to greater heights. This means that, over time, the troops on the front lines are being increasingly maimed by an unwholesome atmosphere. There comes in grow the stress, the anxiety, and the fear in raw proportions. Young and his colleagues surveyed HCWs throughout the state and found that nearly half said their mental health got worse during the COVID-19 era. It meant that considerations for self-harm were on the minds of these people. Attention to the mental well-being of health-care professionals should be a priority. [45] looked at the major stressors and coping strategies impacting on the mental health of HCWs. Based on their findings, they contend that people need treatment and effective strategies to deal with their issues. Additionally, Kriya Yoga (KY) deserves recognition for having a major relaxation component wherein all may benefit. An excellent deal can be understood about the inner workings of the brain through EEG. Observe the oscillations in terms of their power and frequency: that's what KY does to the mind. The activation of these EEG waves induces a sort of awakening, along with an alternate utilization of the brain's capacities. The calm and alert state is most likely to activate this type of wave. These waves seem to correspond to the communication among the Thalamocortical network cells. Among the many tasks that alpha waves carry out for the body, pleasant and good input appears to be their fruitfulness. Those who possess alpha waves will possess the memory of things while in an active state of cognitive work. Alpha waves assist in memory and understanding of what is read [46].

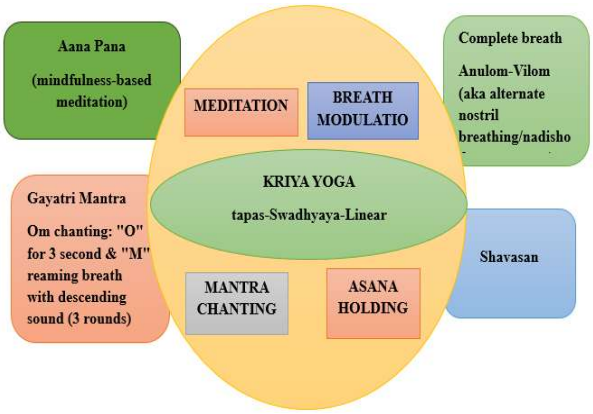

Figure 2. KY's constituent parts.

As per the reference of the event with ky saying beyond the figure 2, the KY time slot could be reserved by those involved in the study at that time. All the participants had to attend at least one lesson in person with the teacher, as they did not know much about KY. Mobility improved one's posture, breathing, and prayer. There was someone teaching yoga, which could be useful in understanding the KY method better or for calming down in case of fear. The practical was followed by a movie for a week, and the participant was provided with a handout to work on at home for six weeks. Some people that were participating in the study were not given help during the study. Participants in the survey will be able to continue their KY practice after the study [47].

IV. EEG-BASED STRESS DETECTION SYSTEMS

The main objective of this study field is to develop EEG-based instruments for quick stress detection in individuals. The equipment may also serve as relaxants when handling various stress sources. By monitoring brain waves, one can tell what kind of worry it is. Developed an EEG-based stress measuring device that works in real time and is predominantly paired with yoga-based relaxation techniques in [48]; the inventors took into consideration the effects of yoga. Many people also noted that deep breathing and meditation could help slow down alpha waves. It would have been more comprehensive if it involved other types of body monitors. [49], deep learning models on EEG and metabolic monitoring data have been proposed to distinguish among various levels of stress. It would be too costly to run to get yoga equipment that is mobile. However, it was more efficient in organizing data. A study [50] had subjects practice yoga for extended periods to determine the effect on their stress management. It was found that under treatment, the levels of stress were gradually reduced within a few weeks. The exercise mats were too large to fit into homes, they said. After practicing yoga, EEG was used to measure the resultant change in the brain states [51]. They were much less stressed after doing yoga. This research cannot be implemented in real time because the data are collected, but not analysed, as it occurs.

A. Hybrid Deep Learning and Machine Learning Approaches for Stress Detection

With the help of deep learning and machine learning, a lot of brain scans have been used to detect stress more quickly and more accurately. These ways work better in real life because of all of this. An EEG dataset could be used with a mixed deep learning model [52] to show how stressed out different people are. In this case, they would work together. A Discrete Wavelet Transform (DWT) and a Convolutional Neural Network (CNN) are what they are. This model was also very good; it got it right 98.10% of the time. This tool can help you find the attitude that makes you feel stressed. A model that combined BiLSTM and Decision Trees helped them tell the difference 82.91% of the time between people who were calm and people who were worried. You could understand and use machine learning and deep learning better when you use them together [53].

B. Short-term Meditation and Brain Activity

The brains and autonomic nervous systems (ANS) of people who meditated for a short time, especially when they were not doing anything, changed. The ANS and EEG of people who learned Taoist meditation for a short time were studied in [54] to find out what happened. People were relaxed and had more theta and alpha waves when their brains were at rest, according to the study. It was clear that the meditation didn't change anything. To put it another way, the workouts went better when there was time to rest rather than think.

C. Yoga's Psychophysiological Impact

The study attempts to investigate the real-world applications of yoga in stress-related conditions, using EEG, HRV, GSR, and EMG, with the study of yoga as a stress reliever [55]. The review also indicated that regular yoga practice could help you not only modulate your autonomic nervous system but also enhance the functioning of your parasympathetic nervous system, thereby offsetting some of the effects of stress on your cognition. In [56], a study was conducted in order to corroborate some of the findings about yoga and its general mental health benefits. It was concluded that yoga is working for your mental health in that it promotes stress reduction and calm, another avenue by which stress could be explored apart from others..

TABLE II: YOGA-INTEGRATED EEG-BASED STRESS DETECTION: DEEP LEARNING VS. MACHINE LEARNING

Study	Year	Method/Architecture	Sensors Used	Accuracy	Key Findings	Limitations	Yoga Integration
Ravi et al. [28]	2025	EEG monitoring in real time	EEG only	Report not made	Meditation and breathing lead to less alpha activity	Not enough mixed sensors	Direct: deep breathing and meditation
Patel et al. [29]	2022	Deep learning (CNN and RCN)	Physiological instruments and EEG	High (no exact value given)	Better accuracy in classifying	High cost to compute; can't be taken with you	Indirect: yoga gadgets that find stress
Singh et al. [30]	2025	Wearable EEG analysis	Wearable EEG	Not reported	Less stress over time over weeks	Large gear; not good for home use	Long-term direct tracking of yoga therapy
Vijay et al. [31]	2023	EEG analysis	EEG	Not reported	A great deal less stress after yoga	No review in real time	Direct: changes in how the brain works after yoga
Roy et al. [32]	2025	Hybrid CNN-DWT	EEG	87.10%	Very good accuracy for classifying stress	Only allowed in certain places	Useful for yoga practices
Madhu et al. [33]	2019	Decision Trees and BiLSTM	EEG	71.81%	Precise description of meditation states	Moderate accuracy	Integration of direct meditation and Rajyog
Rusinova et al. [34]	2024	Monitoring of EEG and ANS	EEG + ANS	Report not made	More theta and alpha waves when not meditating, but when at rest	Only has effects during rest times	Teach yourself Taoist meditation directly
Goud, B. et al. [35]	2025	Multiple types of bio signals	EMG, HRV, GSR, and EEG	Report not made	Better control of the autonomic nervous system; less sympathetic action	Complex set-up with many sensors	Direct and all-encompassing effects of yoga

EEG applications to identify stress have achieved success due to deep learning and machine learning. The results are summarized in Table 2. This can be paired up with yoga or any other means for improvement. That is the big one.

D. Systematic Reviews on Yoga and Stress Relief

Through changes in muscles and the way the body works, one study looked at how yoga can help worried people. Something else has looked at what other things have been found. The study [57] looked at a lot of different measures to see how yoga helped people deal with stress. The study also found that yoga can help people deal with their feelings and calm their sympathetic nervous system. [58] also looked into how yoga and meditation can help people who are sick with brain or nerve problems. People who did these things had more alpha and theta waves in their brains. They felt better and could handle stress better after doing this.

V. CONCLUSION

Deep learning, EEG-based neurophysiological tracking, and yoga can all be used together to help find and treat mental stress. That was the main point of this in-depth study. It is now possible to find and group stress levels very well using machine learning and EEG signal processing. More than 98% of the time, they were right. This method helps us begin to understand how stress and emotions alter the brain. One of these ways is the spectrum analysis. Other ways are the time-frequency methods and the power difference methods. Kriya yoga and other types of yoga have been shown to change the way brain waves are organised by brain scans and other studies. One of these changes is having more alpha and theta sway. You may feel less worried and more at ease after

making these changes. There are two types of mental health care that you should use together: objective EEG-based stress tracking and personalised yogic help. When you take care of your mental health in this way, problems are found and fixed. In the future, the main goal should be to make small, simple stress monitors that can track stress in real time and tell each person what yoga to do. These tools will help people do their jobs better every day. AI can be used to find signs of stress and yoga methods that have been shown to help people with mental health problems in a way that doesn't hurt them. More and more people around the world are having mental health problems. This is something that people who work in healthcare and are stressed out should really think about. This is very important.

REFERENCES

[1] H.-J. Kim, I.-N. Wang, Y.-T. Kim, H. Kim, and D.-J. Kim, "Comparative analysis of NIRS-EEG motor imagery data using features from spatial, spectral and temporal domains," Proc. 2020 IEEE International Conference, 2020, pp. 1-4.

[2] O. P. Giri, P. B. Shahi, J. Selvam, S. Poddar, and A. Bhaumik, "Road traffic regulation and enforcement status: A Nepalese traffic police perspective," Transp. Res. Interdiscip. Perspect., vol. 26, p. 101188, 2024, doi: 10.1016/j.trip.2024.101188.

[3] Mentis, Alexios-Fotios A., Donghoon Lee, and Panos Roussos. "Applications of artificial intelligence− machine learning for detection of stress: a critical overview." Molecular Psychiatry 29.6 (2024): 1882-1894.

[4] V. Ashok, J. Anitha, I. De la Torre Díez, and D. J. Hemanth, "Prediction of epileptic seizure using deep learning architectures," Int. J. Med. Eng. Informat., vol. 17, no. 3, pp. 267–278, 2025, doi: 10.1504/IJMEI.2025.145853.

[5] Hemakom, Apit, Danita Atiwiwat, and Pasin Israsena. "ECG and EEG-based detection and multilevel classification of stress using machine learning for specified genders: A preliminary study." Plos one 18.9 (2023): e0291070.

[6] Y. M. Thu and J. Selvam, "Pre-stress linear and nonlinear buckling of cold-formed steel built-up box studs," Int. J. Sustain. Constr. Eng. Technol., vol. 14, no. 2, pp. 114–120, 2023, doi: 10.30880/ijscet.2023.14.02.012.

[7] K. Hariraman, J. Selvam, M. Alagirisamy, and S. S. Sivaraju, "An improved carbon cloth structure for asymmetric supercapacitor design," in Proc. 2022 4th Int. Conf. Inventive Res. Comput. Appl. (ICIRCA), Sep. 2022, pp. 48–56, doi: 10.1109/ICIRCA54612.2022.9985646.

[8] Jafari, Mahboobeh, et al. "Emotion recognition in EEG signals using deep learning methods: A review." Computers in Biology and Medicine 165 (2023): 107450.

[9] P. Thirumoorthy, M. V. Murugasamy, J. Dhanasekaran, K. Sasikumar, M. Periyasamy, and J. Selvam, "Assessment of groundwater quality in Perundurai region of south India using water quality index and statistical modelling," Groundw. Sustain. Dev., vol. 25, p. 101104, 2024, doi: 10.1016/j.gsd.2024.101104.

[10] A. Vajravelu, Y. Thanikachalam, M. H. B. A. Waha, M. M. B. A. Jamil, and S. Sivaranjani, "Human-machine collaboration and emotional intelligence in Industry 5.0," in Human Machine Collaboration and Emotional Intelligence in Industry 5.0, 2024, pp. 220–232, doi: 10.4018/979-8-3693-6806-0.ch012.

[11] Katmah, R., Al-Shargie, F., Tariq, U., Babiloni, F., Al-Mughairbi, F., & Al-Nashash, H. (2021). A review of mental stress assessment methods using EEG signals. Sensors, 21(15), 5043.

[12] Agrawal, Jharna, Manish Gupta, and Hitendra Garg. "Early stress detection and analysis using EEG signals in a machine learning framework." IOP Conference Series: Materials Science and Engineering. Vol. 1116. No. 1. IOP Publishing, 2021.

[13] V. Ashok, A. Nirmalkumar, and N. Jeyashanthi, "A novel method for blood glucose measurement by noninvasive technique using laser," World Acad. Sci. Eng. Technol., vol. 51, pp. 676–682, 2011.

[14] K. Sravanthi, V. Valikar, S. S. N. Kowsalya, S. M. Ghouse, A. Mutharasan, and A. Vajravelu, "Federated learning-based energy management systems for privacy-preserving demand forecasting in smart cities," in Proc. 2025 13th Int. Conf. Smart Grid (icSmartGrid), May 2025, pp. 446–451, doi: 10.1109/ICSMARTGRID66138.2025.11071727.

[15] Saganowski, Stanisław, et al. "Emotion recognition for everyday life using physiological signals from wearables: A systematic literature review." IEEE Transactions on Affective Computing 14.3 (2022): 1876-1897.

[16] van Zonneveld, Sophie M., et al. "An anti-inflammatory diet and its potential benefit for individuals with mental disorders and neurodegenerative diseases—a narrative review." Nutrients 16.16 (2024): 2646.

[17] C. Manonmani, K. Kakade, A. Vajravelu, and S. Degadwala, "The potential of digital twins and blockchain for precision drug development and delivery," in Digital Twin and Blockchain for Sustainable Healthcare 5.0: Real Life Applications and Case Studies, 2025, pp. 145–161, doi: 10.1201/9781003532286-8.

[18] C. Manonmani, A. Vajravelu, S. Vidhya, and S. Degadwala, "Design and implementation of self-powered reconfigurable intelligent surfaces: Applications and future trends," in Applications and Challenges of Reconfigurable Intelligent Surfaces in 6G, 2025, doi: 10.4018/979-8-3693-8099-4.ch015.

[19] P. Sarvalingam, A. Vajravelu, M. M. B. A. Jamil, S. R. Ahammed, and J. Selvam, "EEG-based classification for autism spectrum disorder and emotional state recognition—A critical evaluation," in Proc. 2024 4th Int. Conf. Ubiquitous Comput. Intell. Inf. Syst. (ICUIS), Dec. 2024, pp. 1935–1941, doi: 10.1109/ICUIS64676.2024.10866715.

[20] S. Seenuvasamurthi, S. Ashok, B. Shankarlal, A. M. Abbas, and A. Vajravelu, "Brain image compression and reconstruction system using deep learning," Int. J. Med. Eng. Informat., vol. 16, no. 5, pp. 401–413, 2024, doi: 10.1504/IJMEI.2024.140799.

[21] A. Vajravelu, Y. Thanikachalam, M. H. B. A. Waha, M. M. B. A. Jamil, and S. Sivaranjani, “Human-machine collaboration and emotional intelligence in Industry 5.0,” in Human Machine Collaboration and Emotional Intelligence in Industry 5.0, 2024, pp. 220–232, doi: 10.4018/979-8-3693-6806-0.ch012.
[22] R. Palraj, S. Sarkar, K. Kakade, and A. Vajravelu, “Using blockchain-enabled digital twins to optimize healthcare workflows and improve efficiency,” in Digital Twin and Blockchain for Sustainable Healthcare 5.0: Real Life Applications and Case Studies, 2025, pp. 19–32, doi: 10.1201/9781003532286-2.
[23] N. Ashokkumar, R. Pavithra, A. Vajravelu, and S. Degadwala, “Reconfigurable intelligence surface-aided secured wireless communication networks,” in Applications and Challenges of Reconfigurable Intelligent Surfaces in 6G, 2025, pp. 47–86, doi: 10.4018/979-8-3693-8099-4.ch003.
[24] T. S. Kumar, A. Vajravelu, R. Muthalagu, and P. S. Latha, “Detection and classification of Alzheimer's using super-resolution algorithm and convolutional neural network,” Int. J. Med. Eng. Informat., vol. 17, no. 3, pp. 207–218, 2025, doi: 10.1504/IJMEI.2025.145847.
[25] Ghomroudi, Parisa Ahmadi, Michele Scaltritti, and Alessandro Grecucci. "Decoding reappraisal and suppression from neural circuits: A combined supervised and unsupervised machine learning approach." Cognitive, Affective, & Behavioural Neuroscience 23.4 (2023): 1095-1112.
[26] Sayal, Alexandre, et al. "Decoding musical valence and arousal: exploring the neural correlates of music-evoked emotions and the role of expressivity features." IEEE Transactions on Affective Computing (2024).
[27] C. Manonmani, A. Vajravelu, S. Vidhya, and S. Degadwala, “Design and implementation of self-powered reconfigurable intelligent surfaces: Applications and future trends,” in Applications and Challenges of Reconfigurable Intelligent Surfaces in 6G, 2025, doi: 10.4018/979-8-3693-8099-4.ch015.
[28] S. Sarkar, K. Kakade, S. Vidhya, and A. Vajravelu, “Twins in predicting and preventing diabetes,” in Digital Twin and Blockchain for Sustainable Healthcare 5.0, 2023, p. 121, doi: 10.1201/9781003532286-7.
[29] R. Rajaram, M. Janarthanan, J. Selvam, and A. Vajravelu, “Wavelet STC-TransUNet++: Enhanced lung cancer cell segmentation and classification in histopathological images,” Biomedical Signal Processing and Control, vol. 113, p. 109064, 2026, doi: 10.1016/j.bspc.2025.109064.
[30] Jamil, N., Belkacem, A. N., & Lakas, A. (2023). On enhancing students’ cognitive abilities in online learning using brain activity and eye movements. Education and Information Technologies, 28, 4363–4397.https://doi.org/10.1007/s10639-022-11372-
[31] V. Ashok, A. Nirmalkumar, J. Shanthi, and S. R. Singh, “A non-invasive empirical approach of human blood and tissues through laser trans-illumination and back scattering profiles,” Eur. J. Sci. Res., vol. 47, no. 1, pp. 107–117, 2010.
[32] V. Ashok, R. Singh, and A. Nirmalkumar, “Determination of blood glucose concentration by back propagation neural network,” Indian J. Sci. Technol., vol. 3, no. 8, 2010, doi: 10.17485/ijst/2010/v3i8/29910.
[33] V. Ashok, A. Nirmalkumar, T. Balakumaran, and P. Ravikumar, “Spatially resolved laser Doppler based diffused beam reflectance measurement of blood glucose diagnosis in real time by noninvasive technique,” in Proc. 2010 2nd Int. Conf. Comput., Commun. Netw. Technol. (ICCCNT), Jul. 2010, pp. 1–8, doi: 10.1109/ICCCNT.2010.5591889.
[34] Huang, Zhongyu, et al. "Graph-enhanced emotion neural decoding." IEEE Transactions on Medical Imaging 42.8 (2023): 2262-2273.
[35] Kamali, Arash, et al. "The cortico-limbo-thalamo-cortical circuits: an update to the original Papez circuit of the human limbic system." Brain topography 36.3 (2023): 371-389.

[36] V. Ashok and G. Murugesan, “Detection of retinal area from scanning laser ophthalmoscope images (SLO) using deep neural network,” Int. J. Biomed. Eng. Technol., vol. 23, no. 2–4, pp. 303–314, 2017, doi: 10.1504/IJBET.2017.082668.
[37] V. Ashok and K. S. Tamilselvan, “Determination of blood constituents using laser based systems,” Asian J. Inf. Technol., vol. 15, no. 21, pp. 4299–4301, 2016, doi: 10.36478/ajit.2016.4299.4301.
[38] Aggleton, John P., Andrew JD Nelson, and Shane M. O’Mara. "Time to retire the serial Papez circuit: implications for space, memory, and attention." Neuroscience & Biobehavioral Reviews 140 (2022): 104813.
[39] Kaushal, Parth Sarthi, et al. "A brief review of limbic system anatomy, function, and its clinical implications." Santosh University Journal of Health Sciences 10.1 (2024): 26-32.
[40] AlSharabi, Khalil, et al. "Long-Term forecasting of solar irradiation in Riyadh, Saudi Arabia, using machine learning techniques." Big Data and Cognitive Computing 9.2 (2025): 21.
[41] Pandya SP. Yoga education program for improving memory in older adults: a multicity 5-year follow-up study. J Appl Gerontol. 2020; 39:576–87.
[42] Puri, Digambar, et al. "EEG-based diagnosis of Alzheimer's disease using Kolmogorov complexity." Applied Information Processing Systems: Proceedings of ICCET 2021. Singapore: Springer Singapore, 2021. 157-165.
[43] Seo, J. H., Tsuda, I., Lee, Y. J., Ikeda, A., Matsuhashi, M., Matsumoto, R., ... & Kang, H. (2020). Pattern recognition in epileptic EEG signals via dynamic mode decomposition. Mathematics, 8(4), 481.
[44] Moore, J. E., & Garip, G. (2023). The experiences of online students with permanently acquired memory-related issues: A qualitative study. University of Derby. https://doi.org/10.21203/rs.3.rs-2590527/v1
[45] Behzad, Ramina, and Aida Behzad. "The role of EEG in the diagnosis and management of patients with sleep disorders." Journal of Behavioural and Brain Science 11.10 (2021): 257-266.
[46] Bhik-Ghanie, Rebecca. "Pranayama yoga: Measuring brainwaves via EEG." Proceedings of the 13th International RAIS Conference on Social Sciences and Humanities. Scientia Moralitas Research Institute, 2019.

[47] R Ojha, T Deshmukh, N Menon Effects of Kriya Yoga on Healthcare Workers: An EEG Study Biomedical Engineering and Applications, volume 2024, p. 80 - 95 Posted: 2024
[48] Bohlken, Jens, et al. "COVID-19-pandemie: Belastungen des medizinischen personals." Psychiatrische Praxis 47.04 (2020): 190-197.
[49] Srivastava, Ananya, et al. "Kriya yoga in patients with depressive disorders: A pilot study." Journal of Neurosciences in Rural Practice 12.2 (2021): 362.
[50] A Roy, M Iyer, K Banerjee Hybrid Deep Learning Model for Stress Classification Using EEG Signals IEEE Access, volume 2023, p. 150234 - 150245. Posted: 2023
[51] Ravi, Ravi Kant, et al. "Prediction of thermal efficiency of double pass solar air heater having discrete multi-V and staggered ribs." Heat Transfer 54.1 (2025): 41-65.
[52] Patel, Aayushi, et al. "The Use of Nutraceuticals in the Top Five Cancers with the Highest Number of Deaths Globally." Journal of Biotechnology and Biomedicine 5.4 (2022): 192-197.
[53] Singh, Divya, Ashwani Maurya, and Animesh K. Ojha. "CoSe 2/WSe 2/rGO anode for high-performance energy storage device applications." New Journal of Chemistry 49.30 (2025): 12948-12958.
[54] Vijay, Varun, et al. "Incidence of benign renal masses in a contemporary cohort of patients receiving partial nephrectomy for presumed renal cell carcinoma." Clinical Genitourinary Cancer 21.3 (2023): e114-e118.
[55] Roy, Hirakjyoti, et al. "Near-Infrared AIE Probe for Cancer Cell Imaging and Therapeutic Applications." ACS Applied Bio Materials (2025).
[56] Madhu, P., et al. "A review on synthesis and characterisation of commercially available natural fibres: Part I." Journal of Natural Fibres (2019).
[57] Rusinova-Videva, Snezhana, et al. "Biosynthetic capabilities of Antarctic yeast Sporobolomyces roseus AL103: Temperature influence on intracellular metabolites and characterisation of the exopolysaccharide." Research in Microbiology 175.8 (2024): 104247.
[58] Goud, B. Shankar, et al. "FEM to study the radiation, Soret, Dufour numbers effect on heat and mass transfer of magneto-Casson fluid over a vertical permeable plate in the presence of viscous dissipation." Waves in Random and Complex Media 35.4 (2025): 7928-7949.