

#### DETECTION OF MENTAL HEALTH USING DEEP LEARNING

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#### Abstract:

This survey paper explores how deep learning (DL) is used to predict and understand mental health problems. It focuses on the challenges, limitations, and future possibilities of this technology. The paper reviews 20 research studies and groups DL applications based on different mental health issues, such as schizophrenia, bipolar disorder, anxiety, depression, and PTSD. Key uses of DL include diagnosing and predicting mental health problems using clinical data, analyzing genetic information, studying speech and facial expressions, and estimating the risk of mental illness through social media activity. The study also points out challenges like poor data quality, ethical issues, and difficulty in understanding how DL makes decisions. It provides recommendations to overcome these challenges and improve research in this field. A Mental Health Prediction application can be a helpful tool for employees, allowing them to check their mental health regularly. Taking care of mental health isn't just about visiting a professional. It's also about building habits like regular self-check-ins and maintaining a healthy mental state as part of daily life.

#### **Keywords:**

Mental Health Diagnosis; Deep Learning Prediction; Mental Health Problems

#### **1. INTRODUCTION**

Mental health disorders are a serious global issue, affecting millions of people every year. Conditions like depression, anxiety, and bipolar disorder not only harm individuals but also create challenges for families, communities, and healthcare systems. According to the World Health Organization, mental health issues are a major cause of illness worldwide, disrupting daily life and functioning for millions. Early detection is essential because timely treatment can improve outcomes and prevent severe complications, such as social isolation, financial struggles, or physical health problems. Mental disorders can greatly impact a person's ability to work, study, and participate in everyday activities. This highlights the importance of early intervention and proper management to support better mental health and overall well-being.

Mental illness is a health condition that affects a person's thoughts, feelings, or behavior—or sometimes all three—and can also impact physical health. Common mental health conditions like depression, schizophrenia, ADHD, and autism spectrum disorder (ASD) are widespread today, with around 450 million people globally experiencing these issues. Mental health problems don't just affect adults; children and teenagers under 18 are also at risk. Mental illnesses are one of the most serious public health challenges. For example, depression is a major cause of disability and can increase the risk of suicidal thoughts and attempts. Deep learning, a type of advanced technology, is being used to help predict and understand mental health problems. This technique learns and improves over time using statistical and probabilistic methods. Researchers are using deep learning to extract valuable information from data, create personalized solutions, and develop intelligent systems that can assist in managing mental health.

This paper aims to review how deep learning (DL) techniques are being used to predict, diagnose, and identify mental health problems. It provides a detailed summary of the current research, highlights challenges and limitations, and suggests opportunities for future studies. By focusing on the latest advancements and identifying gaps, this paper helps researchers better understand how big data and DL are applied in mental health. While previous reviews have discussed the use of DL in mental health, they mostly focus on general applications. This paper takes a more focused approach by critically analyzing gaps in the research and proposing specific directions for future work. Early



detection of mental health issues is crucial for providing better patient care. Unlike other illnesses diagnosed through lab tests, mental health conditions are often identified through self-reported questionnaires about emotions and social interactions. With the growing availability of mental health data, artificial intelligence (AI) and machine learning (ML) are being used to better understand mental health and support mental health professionals in making decisions.

Deep learning, a type of AI, processes complex data through layers of computation and has shown great success in many areas, including healthcare. This paper organizes research on DL in mental health into four main types of data:

- 1. Clinical Data
- 2. Genetic and Genomics Data
- 3. Vocal and Visual Expression Data
- 4. Social Media Data

Finally, the paper discusses challenges faced by current studies, such as data quality and ethical issues, and suggests ways to bridge the gap between DL research and real-world patient care.

## 2. LITERATURE REVIEW

Song, S., Jaiswal, S., Shen, L., & Valstar, M. (2022). Focuses on analyzing depression automatically from videos by extracting features that capture behaviors over time. The key idea is to use small, easily detectable human actions as a simplified way to describe each video frame. To understand how these actions change over time, the authors introduce two new methods called *spectral heatmaps* and *spectral vectors*. These methods summarize the patterns of behavior across different time scales in a video.

Amaltinga, A. P. M., & Mbinta, J. F. (2020). This study reviewed factors linked to depression in young people across the six World Health Organization (WHO) regions. The findings show that females are more likely to experience depression than males. A genetic link, influenced by maternal rumination (focusing on negative thoughts), was a common factor for depression in all regions. Other significant causes included a history of depressive symptoms, exposure to uncontrollable negative life events, and stressful family situations. The study recommends prioritizing mental health services at the primary healthcare level, especially in Low and Middle-Income Countries (LMICs). Early identification and management of mental health issues in young people are essential to reduce the impact of depression and improve their well-being.

Jain, R. (2023). Depression is a mental health issue that affects people all over the world and is unavoidable for many. However, there are effective and affordable treatments available that can help improve the lives of those dealing with it. It is time to educate ourselves about mental health and take action to address it at personal, community, and national levels. Symptoms of depression include trouble sleeping or sleeping too much, changes in appetite, losing interest in activities once enjoyed, feelings of sadness, anger, or hopelessness, and difficulty focusing on school or work. Depression is typically diagnosed when someone experiences a low mood for at least two weeks.

Huang, X., Hu, N., Yao, Z., & Peng, B. (2022). This study explored how family dynamics, self-esteem, and peer relationships influence depression in teenagers, using theories about family systems, vulnerability to depression, and the protective role of social support. Researchers surveyed 562 Chinese teens (47.15% boys, 52.85% girls, average age 14.33 years) about family functioning, self-esteem, depression, and peer relationships.

The findings showed three key points:

- 1. Good family functioning reduces the likelihood of depression in teens.
- 2. Self-esteem acts as a bridge between family functioning and depression—teens with supportive families tend to have higher self-esteem, which helps lower depression.
- 3. Peer relationships can buffer the effects of low self-esteem on depression—positive friendships make it easier for teens to cope.



These results highlight how family support and positive relationships can protect against depression and suggest focusing on these areas for effective interventions.

Garmabi, M., Andishmand, Z., Naderi, F., Sharifnezhad, A., Darrudi, F., Malekzadeh, R., Amini, A., & Gholami, A. (2024). his study looked at how depression and anxiety affect sleep quality in first-year students at Neyshabur University of Medical Sciences (NUMS) during 2019 and 2020. A total of 471 students participated, and their depression, anxiety, and sleep quality were measured using reliable questionnaires.

The results showed that 21.4% of students experienced depression, 31.9% had anxiety, and 28% had poor sleep quality. Students with depression were 3.5 times more likely to have poor sleep quality, while those with anxiety were 2.1 times more likely. Both findings were statistically significant (P < 0.001).

These results highlight that a significant number of freshmen students struggle with mental health issues, which negatively impact their sleep. The study emphasizes the importance of providing psychological counseling and support programs to help students cope with depression and anxiety, ultimately improving their overall sleep quality and mental well-being.

Barican, J. Lou, Yung, D., Schwartz, C., Zheng, Y., Georgiades, K., & Waddell, C. (2022) This study highlights a serious issue: childhood mental disorders are highly common in high-income countries, yet the services available to address them are severely lacking. This gap in care not only affects children's health but also violates their basic rights. While many countries have strong healthcare systems for physical illnesses like cancer or diabetes, mental health services for children remain inadequate, even though these countries have the resources to do better.

The COVID-19 pandemic has worsened the situation, with children's mental health needs rising and expected to grow further. This study calls for urgent public action to improve mental health services for children. Investing in mental health care will allow more children to overcome challenges, reach their full potential, and contribute to society. Addressing this invisible crisis is essential for a brighter future, where all children can thrive and live healthier, happier lives.

Axelsdóttir, B., Eidet, L. M., Thoner, R., Biedilæ, S., Borren, I., Elvsåshagen, M., Ludvigsen, K. H., & Dahlgren, A. (2021). We have shown that it is possible to create four agreed-upon "top ten" lists of research priorities for anxiety and depression in children and adolescents. These lists were developed with input from young people experiencing anxiety or depression and from clinicians. By combining their perspectives, these lists can help shape research efforts to better reflect the needs and opinions of both patients and healthcare professionals. This approach ensures that future research focuses on what matters most to those directly affected.

Author, year	Aim	Sample data set	Algorithm	Conclusion
Song, S.,	Analyzing	conducted	Machine	The performance of
Jaiswal, S.,	depression	experiments on	Learning	using CNN to
Shen, L., &		the AVEC 2013		train from spectral
Valstar, M.		and AVEC 2014		heatmaps can be
(2022).		benchmark		potentially improved
				if more training data
				is available.
Amaltinga, A. P.		considered		Reproductive health
M., & Mbinta, J.	Depression	young people		education should
F. (2020)	Among Young	aged 10-24 years	Machine	include mental
	People	old in high-	Learning	health to help
		income countries		expectant mothers
		and Lower and		take measures to
				prevent stress during

## **Summary of Literature Review:**



		middle-income		pregnancy to reduce
		countries.		the risk of
		countries.		depression later in
				the life of young
				neonle
Iain R (2023)			Machine	concluded that
Julii, IC. (2023)	Depression	The many large-	Learning	depression is a
	Among	scale universal	Learning	mental disorder
	Adolescents	issues and		which is
	7 Rolescents	answers for the		characterized by at
		sadness is within		least two weeks of
		reach which is		low mood that is
		useful and		nresent across
		financially sayyy		situations. It is also
		medicines are		known as major
		accessible to		depressive disorder
		improve"		(MDD) Bipolar and
		mprove		Dersistent disorders
				are types of
				depression Its
				symptoms are less
				self esteem loss of
				seli-esteelli, 1055 01
				insomnia feelings of
				guilt and worthiness
				feelings of sadness
				change in mood no
				interest in any kind
				of activities
Huong V Hu	Family	A comple of		This study simed to
Hualig, $\Lambda$ ., Hu, N. Vao, $\overline{\Lambda}$ &	functioning and	A sample of		avplore the
$N_{1}, Ta0, Z_{1}, \alpha$	adologoont	adalagaanta (n –		explore the
Pelig, D. (2022).	doprossion	$562 \ 47 \ 150$		modiation
	depression.	302, 47.13%		mediation
		famala maan		hotwoon family
		age 14.22 years		functioning and
		age 14.55 years, $SD = 1.81$ years)		
		SD = 1.81 years)		domescien and
				aupression, and
				expands the existing
				understandings of
				domescien It also
				improved our
				understandings of
				the mechanism of
				ne mechanism at
				piay in the
				family functioning
				and adologoont
				and adolescent
				depression.



Garmabi M	The Prevalence	A total number		These programs
Andishmand Z	of Depression	of 471 freshmen		should include
Naderi F	and Anxiety and	students		strategies to manage
Sharifnezhad	Its Association	(NUMS)		depression and
A Darrudi F	with Sleen	narticinated in		anxiety encourage
Malekzadeh R	Quality in the	the study		healthy sleen habits
Amini A &	First-Year	ninpointing that		and promote overall
Gholami A	Medical Science	the data are		well-being in the
(2024)	Students	collected in 2019		academic
(2024).	Students	and 2020. In line		environment
		with measuring		
		depression		
		anxiety and		
		sleep quality		
Barican I Lou	Prevalence of	A pooled sample	Machine	This collective
Yung D	childhood	of 61 545	Learning	flourishing will in
Schwartz C	mental disorders	children aged 4	Learning	turn benefit all—
Zheng Y	in high-income	18		when fewer children
Georgiades K	countries	vears including		needlessly
& Waddell C	countros	eight reporting		experience mental
(2022)		service use		disorders and
(2022)				associated disability.
				and
				when more children
				go on to thrive.
				contribute and meet
				their
				full potential.
Axelsdóttir, B.,	Priorities for	Top ten lists of	REK, Regional	successfully created
Eidet, L. M.,	research in child	treatments and	Committees for	four top ten lists of
Thoner, R.,	and adolescent	outcome	Medical and	research priorities
Biedilæ, S.,	anxiety and	domains of	Health Research	for anxiety and
Borren, I.,	depression	anxiety and	Ethics	depression in
Elvsåshagen, M.,	I	depression in		children and teens,
Ludvigsen, K.		children and		with input from both
H., & Dahlgren,		adolescents was		young people
A. (2021).		identified by		dealing with these
``´´´		youth and		issues and clinicians.
		clinicians		These lists reflect
				their perspectives
				and can help shape
				research efforts to
				meet the needs and
				opinions of both
				patients and
				healthcare
				professionals.

# **3.PROPOSED WORK**





#### **4.CONCLUSION**

In recent years, deep learning (DL) has become more widely used in healthcare, including mental health. This study reviews research on how DL is applied to mental health. The findings show

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that DL has great potential to improve the diagnosis and treatment of mental health conditions. However, there are still challenges that need to be solved before DL can be used in everyday medical practice. The study also highlights opportunities to improve and expand DL's role in mental health care.

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