Department of Computer Science & Information Technology
Guru Ghasidas Vishwavidyalaya
Koni, Bilaspur - 495007 (C.G.)
(A Central University established by the Central Universities Act. 2009 No. 25 of 2009)

No. 287 /CSIT/2024 Bilaspur, Dated: 05/12/2024

Minutes of DRC Meeting held on 28-11-2024

The DRC meeting was held in the Department of the CSIT on 28th November 2024. The following members/Supervisors were present in the meeting:

1. Dr. Ratnesh Prasad Srivastava: Chairman DRC, Member and Supervisor
2. Prof. Sanjay Tanwani : External Member (Joined Online)
3. Prof. AK Saxena : Member and Supervisor
4. Dr. Girish Kumar Singh: Member and Supervisor
5. Dr. Susluna Jaiswal: Member and Supervisor
6. Dr. Akhilesh Kumar Shrivas : Member and Supervisor
7. Dr. Pushplata Pujari : Supervisor
8. Dr. Rajwant Rao Singh: Supervisor
9. Dr. Babita Majhi: Supersisor
10. Dr. Amit Kumar Chandanan : Supervisor
11. Dr. Vikas Kumar Pandey: Supervisor
12. Dr. Shrabanti Mandal : Supervisor
13. Dr. Santosh Majhi: Supervisor

In the meeting the following the resolution were made:

01. Six monthly progress report of the following research scholars admitted in Session 2021-22.

(1) Anupam Pandey (2) Damodar Patel (3) Hema Vastrakar (4) Himanshu Sahu (5) Prakash Pathak (6) Preeti Shukla (7) Rajeshwar Prasad (8) Rupesh Naik (9) Lokesh Kumar Suryawanshi

Resolution: The above-mentioned scholars presented their research progress of six months of Ph.D. degree which were reviewed by the members and found to be satisfactory.

02. Six monthly progress reports of the following research scholars admitted in Session 2022-23.

(1) Annpurna Singh (2) Aradhy Tiwari (3) Manish Kumar Chandan (4) Pradyumn Pandey (5) Rishabh Gupta (6) Sonu Purohit (7) Yaseera Khan (8) Tannu Kumar Soni (9) Amitesh Jha (10) Vivek Kumar Sarathe (11) Shailendra Kumar (12) Prashant Vaishnav (13) Chandrashekhar

Resolution: The above-mentioned scholars presented their research progress of six months of Ph.D. degree which were reviewed by the members and found to be satisfactory.

Remarks: Student Shailendra Kumar was permitted to appear before DRC based on his attendance approved by his/her research supervisor. He is further advised to be regular in the department in order to appear in the next DRC.

03. One year VRET fellowship extension of following research scholars admitted in session 2021-22.

(1) Anupam Pandey (2) Damodar Patel (3) Hema Vastrakar (4) Prakash Pathak (5) Rajeshwar Prasad (6) Rupesh Naik (7) Himanshu Sahu

Resolution: After the discussion on the above-mentioned matter, the DRC recommended one-year extension for the VRET fellowship for administration approval.

28/11/24
Prof. Ratnesh Prasad Srivastava
(Chairman, DRC and Head, CSIT)

Prof. Sanjay Tanwani 28/11/24
(External member)

DRC Members 28/11/24 05/12/2024

28/11/2024

28/11/24

Six Monthly Progress Report Subject - **Computer Science**

(Registration No. 225251601 date 14.05.2024)

Progress Report
GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (CG)

Six Monthly Progress report of the research scholar work done for the period from 14.05.2024 to 13.11.2024.

1. Name of the Research Scholar : **ANNPURNA SINGH**
2. Name of the Department : Department of Computer Science and Information Technology, School of Studies of Mathematical and Computational Science, GGV, Central University, Bilaspur, (C.G)
3. Name of the Supervisor : Dr. Ratnesh Prasad Srivastava
   Associate Professor, CSIT, GGV
4. Topic registered for Ph. D. degree : **" MOOD BASED SLEEP DISORDER ANALYSIS USING MACHINE LEARNING TECHNOLOGY"**
5. Number of days/duration/periods for which the candidate/research scholar was present in the department/research center (Please mention leaves availed also): **122 days (CL 00 days)**

Please see enclosures for:

1. Monthly attendance record of the Scholar
2. Work done by the Scholar during the reporting period
3. Fee Receipt of academic session 2023-24

28/11/24

Singh

(ANNPURNA SINGH)
Signature of the Research Scholar

Remarks of the Research Supervisor and Signature

.....Satisfactory.....

Remarks of the DRC

.....Satisfactory.....

28/11/24

DRC Chairman,
Dr. Ratnesh Prasad Srivastava
Associate Professor and Head, CSIT
Department
GGU, Bilaspur

DRC External Member
Prof. Sanjay Tanwani
HOD, School of Computer Science and
Information Technology, DAVV, Indore (MP)

DRC Members.

1 ..... 2 ..... 3 ..... 4 .....

28/11/24

Singh

ATTENDANCE RECORD

(14.05.2024 to 13.11.2024)

Name of the Research Scholar : **ANNPURNA SINGH**

Name of the Course : Ph.D.

Name of Supervisor : Dr. Ratnesh Prasad Srivastava

Associate Professor, CSIT, GGV

Research center : CSIT Department, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G)

Topic registered for Ph. D. : **MOOD BASED SLEEP DISORDER ANALYSIS USING MACHINE LEARNING TECHNIQUES**

Date of Registration : **14.05.2024**

Registration Number : **225251601**

Enrollment Number : GGV/20/05010

S. No.	Month	Working Days	Holidays	Presence	Sanctioned Leaves	Leave without Payment	Total
1.	MAY-2024	13	01	13	00	00	27
2.	JUN-2024	19	01	19	00	00	39
3.	JUL-2024	22	01	22	00	00	45
4.	AUG-2024	20	02	20	00	00	42
5.	SEP-2024	19	02	19	00	00	40
6.	OCT-2024	20	03	20	00	00	43
7.	NOV-2024	09	01	09	00	00	19
Total		**122**	**11**	**122**	**00**	**00**	**255**

Total Working Days : 122

Total Presence : 122

Total Leave Sanctioned : 00

Total Absence (LWP) : Nil

Signature of Research Scholar

(ANNPURNA SINGH)

27/11/24

Signature of Supervisor

(Ratnesh Prasad Srivastava)

Annexure-4

Progress Report
Guru Ghasidas Vishwavidyalaya, Bilaspur (CG)

Six Monthly Progress report of the research scholar work done for the period from **14.05.2024** to **13.11.2024**.

1. Name of the Research Scholar : **ANNPURNA SINGH**
2. Name of the Department : Department of CSIT
3. Name of the Supervisor : Dr. Ratnesh Prasad Srivastava
4. Topic registered for Ph. D. degree : **MOOD BASED SLEEP DISORDER ANALYSIS USING MACHINE LEARNING TECHNIQUES**
5. Number of days/duration/periods for which the candidate/research scholar was present in the department/research center.

   .....122days.....

   (Please mention leaves availed also)

   .....00days .....

27/11/24 Signature of the Research Scholar

Remarks of the Research Supervisor and Signature

.....Satisfactory.....

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Remarks of the RAC

.....Satisfactory.....

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27/11/24 Convener

RAC Member

27.11.24 RAC Member

Six Monthly Progress Report

14.05.2024 to 13.11.2024.

1. After exploring multiple sources to identify a suitable dataset for the research, a comprehensive and authentic sleep disorder dataset with diverse parameters was obtained from Govt Hospital, Sitapur. This dataset, highly aligned with the research area, offers credible and detailed insights, making it an invaluable resource for the study.
2. A detailed literature review of recent papers from various reputed journals, such as IEEE and Springer, was conducted for this purpose, with the main focus on analyzing sleep disorders in relation to mood.
3. A detailed profiling analysis was conducted using various correlation mechanisms to ensure comprehensive insights

Signature of Research Scholar
(ANNPURNA SINGH)
(Registration No. 225251601 date 14.05.2024)

27/11/24

Signature of Supervisor
(Ratnesh Prasad Srivastava)

Six Monthly Progress Report Subject - **Computer Science**

(Registration No. 225251601 date 14.05.2024)

Progress Report
GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (CG)

Six Monthly Progress report of the research scholar work done for the period from 14.11.2024 to 13.05.2025.

1. Name of the Research Scholar : **ANNPURNA SINGH**
2. Name of the Department : Department of Computer Science and Information Technology, School of Studies of Mathematical and Computational Science, GGV, Central University, Bilaspur, (C.G)
3. Name of the Supervisor : Dr. Ratnesh Prasad Srivastava
   Associate Professor, CSIT, GGV
4. Topic registered for Ph. D. degree : **" MOOD BASED SLEEP DISORDER ANALYSIS USING MACHINE LEARNING TECHNOLOGY"**
5. Number of days/duration/periods for which the candidate/research scholar was present in the department/research center (Please mention leaves availed also): **115 days (CL 00 days)**

Please see enclosures for:

1. Monthly attendance record of the Scholar
2. Work done by the Scholar during the reporting period
3. Fee Receipt of academic session 2024-25

Singh.
(ANNPURNA SINGH)
Signature of the Research Scholar

Remarks of the Research Supervisor and Signature

.....Satisfactory.....

Remarks of the DRC

.....Satisfactory.....

16/7/2025

DRC Chairman,
Dr. Ratnesh Prasad Srivastava
Associate Professor and Head, CSIT
Department
GGU, Bilaspur

DRC External Member
Prof. Sudhakar Pandey
Dept. of Information Technology
NIT Raipur C.G

DRC Members.

1 ..... 16/7/2025 2 ..... 16/07/25 3 ..... 4 .....

ATTENDANCE RECORD

(14.11.2024 to 13.05.2025)

Name of the Research Scholar : **ANNPURNA SINGH**

Name of the Course : Ph.D.

Name of Supervisor : Dr. Ratnesh Prasad Srivastava
Associate Professor, CSIT, GGV

Research center : CSIT Department, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G)

Topic registered for Ph. D. : **MOOD BASED SLEEP DISORDER ANALYSIS USING MACHINE LEARNING TECHNIQUES**

Date of Registration : **14.05.2024**

Registration Number : **225251601**

Enrollment Number : GGV/20/05010

S. No.	Month	Working Days	Holidays	Presence	Sanctioned Leaves	Leave without Payment	Total
1.	NOV-2024	11	01	11	00	00	23
2.	DEC-2024	20	01	20	00	00	41
3.	JAN-2025	20	03	20	00	00	43
4.	FEB-2025	18	02	18	00	00	38
5.	MAR-2025	19	02	19	00	00	40
6.	APR-2025	19	03	19	00	00	41
7.	MAY-2025	08	01	08	00	00	17
Total		**115**	**13**	**115**	**00**	**00**	**243**

Total Working Days : 115

Total Presence : 115

Total Leave Sanctioned : 00

Total Absence (LWP) : Nil

Signature of Research Scholar

(ANNPURNA SINGH)

15/7/2025

Signature of Supervisor

(Ratnesh Prasad Srivastava)

Annexure-4

Progress Report
Guru Ghasidas Vishwavidyalaya, Bilaspur (CG)

Six Monthly Progress report of the research scholar work done for the period from **14.11.2024 to 13.05.2025.**

1.	Name of the Research Scholar	:	**ANNPURNA SINGH**
2.	Name of the Department	:	Department of CSIT
3.	Name of the Supervisor	:	Dr. Ratnesh Prasad Srivastava
4.	Topic registered for Ph. D. degree	:	**MOOD BASED SLEEP DISORDER ANALYSIS USING MACHINE LEARNING TECHNIQUES**

5. Number of days/duration/periods for which the candidate/research scholar was present in the department/research center.

.....115 days.....

(Please mention leaves availed also)

.....00days .....

Signature of the Research Scholar

Remarks of the Research Supervisor and Signature

.....Satisfactory.....

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Remarks of the RAC

.....Satisfactory.....

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15/7/2025
Convener

15/07/25
RAC Member

15/7/25
RAC Member

Six Monthly Progress Report

14.11.2024 to 13.05.2025.

1) A national seminar on Profiling Mood-Based Sleep Disorder Analysis was attended, where the exploration focused on how mood variations affect sleep disorders such as insomnia and apnea. The seminar contributed to a better understanding of physiological and behavioral factors influencing sleep health, and emphasized the importance of mood profiling in clinical analysis. This seminar was part of the International Seminar on Applications of Mathematics in Science & Technology (Hybrid Mode), organized by the Department of Mathematics, Guru Ghasidas Vishwavidyalaya (A Central University), Bilaspur, Chhattisgarh, India, held on December 19–20, 2024, on the occasion of National Mathematics Day.
2) A conference paper titled Mood-Based Sleep Health Profiling and Analysis Using Machine Learning was presented, discussing the role of Exploratory Data Analysis (EDA) in understanding sleep disorders. This presentation took place at the 2025 ABVU-AIMT International Conference on Innovative Research in Science, Management and Technology (ICIRSMT 2025), held on January 13–14, 2025. The work was published in AIMTCP Vol. 5, No. 1, 2025 by the Global Knowledge Foundation (GKF), USA, with ISSN 2769-5093 (Online).
3) The integration of physiological and behavioral data through EDA was carried out, highlighting its effectiveness in enhancing early detection strategies and supporting decision-making processes in sleep health research.
4) The research involved the implementation of essential data preprocessing steps, including handling missing values, normalization, and outlier detection, all of which were found to be critical before applying machine learning algorithms for analyzing sleep disorders.
5) A research paper was communicated to SN Computer Science (Springer Nature) , titled Machine Learning-Based Sleep Stage Classification Using EEG and EOG Modalities with Time–Frequency Feature Extraction, Noise-Based Data Enrichment, and Latent Space Feature Selection. This study introduces a robust and scalable machine learning framework for sleep stage classification using EEG and EOG signals derived from polysomnographic (PSG) data.
    a) The methodology utilized Daubechies-4 (db4) wavelet transform along with statistical descriptors to extract features from both time and frequency domains of EEG–EOG signals. This hybrid approach effectively captured significant physiological patterns, enhancing the modeling of sleep stages.
    b) To address class imbalance and improve generalization, the technique of Gaussian Noise Data Augmentation (GNDA) was applied, generating synthetic samples. Additionally, Autoencoder-Based Feature Selection (AES) was used for dimensionality reduction while preserving key information. These methods contributed to better model training and reduced the risk of overfitting.
    c) Four machine learning models—XGBoost, LightGBM, CatBoost, and CNN-LSTM—were evaluated. Among them, XGBoost demonstrated superior performance, achieving an overall accuracy of 97.27% and an AUC of 99.8% on the EEG–EOG dataset processed using GNDA and AES.

d) The findings confirmed that integrating EEG and EOG modalities delivers superior results compared to unimodal approaches and enhances classification performance across all sleep stages. The proposed methodology is highly applicable for deployment in real-world clinical and research environments.

e) The study contributes to understanding the challenges in analyzing and implementing automated systems for accurate sleep stage identification. It emphasizes that combining advanced feature extraction, noise-based data enrichment, and latent space feature selection can significantly improve the robustness of sleep classification frameworks.

Signature of Research Scholar
(ANNPURNA SINGH)
(Registration No. 225251601 date 14.05.2024)

15/7/2025
Signature of Supervisor
(Ratnesh Prasad Srivastava)

Guru Ghasidas Vishwavidyalaya

Payment Receipt

बैंक ऑफ़ बड़ौदा
Bank of Baroda

Receipt : 113886217452
Date : 2025-08-06 10:19:56

Payer Details

Name	:	Annpurna Singh
Father Name	:	Surendra Singh
Fee Description	:	2nd DRC fee
Mobile No	:	9329027962
Email ID	:	Annpurnasingh389@gmail.com

Fees Details

Amount to Pay	:	12000

Payment Details

Order ID	:	5616001
Tracking ID	:	113886217452
Currency	:	INR
Payment Mode	:	Unified Payments
Card Name	:	UPI
Order Status	:	Success
Payment status	:	Success

Total Amount : 12000

Singh.

Department of Computer Science & Information Technology
School of Mathematical and Computational Sciences
Guru Ghasidas Vishwavidyalaya Bilaspur - 495009 (C.G.)
NAAC Accredited A++
(A Central University established by the Central Universities Act. 2009 No. 25 of 2009)

No. 791 /CSIT/2025

Bilaspur, Dated: 19/12/2025

Minutes of DRC meeting held on 16-12-2025

The DRC meeting was held in the Department of the CSIT on 16-12-2025. The following members of the DRC were present in the meeting:

1. Dr. Pushpalata Pujari: Chairman, DRC and Member
2. Prof. Sudhakar Pandey: External Member (*Joined Online*)
3. Prof. AK Saxena: Member
4. Dr. Shrabanti Mandal: Member
5. Dr. Vikas Kumar Pandey: Member
6. Dr Vineet Kumar Awasthi: Member

In the meeting, the following agenda items were placed:

Agenda 1: To consider the presentations of the Third sixth monthly progress reports of the PhD Scholars.

The following research scholars admitted in session 2022-23 presented their progress reports :
1) Annpurna Singh 2)Aradhy Tiwari 3) Manish Kumar Chandan 4)Pradyumn Pandey 5) Rishabh Gupta 6) Sonu Purohit 7) Yaseera Khan 8) Tannu Kumar Soni 9) Amitesh Jha 10) Vivek Kumar Sarathe 11) Shailendra Kumar 12)Prashant Vaishnav 13)Chandrashekhar
Resolution: The presentations and the progress reports of the above-mentioned scholars were reviewed by the DRC members and found to be satisfactory.

Agenda 2: To consider the presentation of the First six monthly progress report of Vivek Pandey.
The Ph.D research scholar Vivek Pandey admitted in session 202-23 not presented his progress Report.
Resolution: Vivek Pandey was not present during the DRC meeting.

Agenda 3: To consider the presentation of the Third sixth monthly progress reports of Lokesh Kumar Suryawanshi.
The Ph.D research scholar Lokesh Kumar Suryawanshi admitted in session 2021-22 presented his progress Report
Resolution: The presentation and the progress report of the Lokesh Kumar Suryawanshi was reviewed by the DRC members and found to be satisfactory.

19/12/25
(Dr. Pushpalata Pujari)
HOD/ Chairman, DRC

22.12.25
(Prof. Sudhakar Pandey)
External member

19.12.2025 19/12/25
(Prof. AK Saxena) (Dr. S. Mandal) (Dr. P. Pujari) (Dr. V.K.Pandey) (Dr. V.K.Awasthi)

Members

Six Monthly Progress Report Subject - **Computer Science**

(Registration No. 225251601 date 14.05.2024)

Progress Report
GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (CG)

Six Monthly Progress report of the research scholar work done for the period from 14.05.2025 to 13.11.2025.

1. Name of the Research Scholar : **ANNPURNA SINGH**
2. Name of the Department : Department of Computer Science and Information Technology, School of Studies of Mathematical and Computational Science, GGV, Central University, Bilaspur, (C.G)
3. Name of the Supervisor : Dr. Ratnesh Prasad Srivastava
   Associate Professor, CSIT, GGV
4. Topic registered for Ph. D. degree : **" MOOD BASED SLEEP DISORDER ANALYSIS USING MACHINE LEARNING TECHNOLOGY"**
5. Number of days/duration/periods for which the candidate/research scholar was present in the department/research center (Please mention leaves availed also): **124 days (CL 00 days)**

Please see enclosures for:

1. Monthly attendance record of the Scholar
2. Work done by the Scholar during the reporting period
3. Fee Receipt of academic session 2024-25

Singh

(ANNPURNA SINGH)
Signature of the Research Scholar

Remarks of the Research Supervisor and Signature

Satisfactory

Remarks of the DRC

Satisfactory

16/12/25

DRC Chairman,
Dr. Pushplata Pujari
Associate Professor and Head, CSIT
Department GGU, Bilaspur (C.G.)

Joined online

DRC External Member
Prof. Sudhakar Pandey
Dept. of Information Technology
NIT Raipur C.G

DRC Members.

1 ..... 16/12/25 2 ..... 3 ..... 16/12/25 4 .....

ATTENDANCE RECORD

(14.05.2025 to 13.11.2025)

Name of the Research Scholar : **ANNPURNA SINGH**

Name of the Course : Ph.D.

Name of Supervisor : Dr. Ratnesh Prasad Srivastava

Associate Professor, CSIT, GGV

Research center : CSIT Department, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G)

Topic registered for Ph. D. : **MOOD BASED SLEEP DISORDER ANALYSIS USING MACHINE LEARNING TECHNIQUES**

Date of Registration : **14.05.2024**

Registration Number : **225251601**

Enrollment Number : GGV/20/05010

S. No.	Month	Working Days	Holidays	Presence	Sanctioned Leaves	Leave without Payment	Total
1.	MAY-2025	13	00	13	00	00	26
2.	JUN-2025	21	00	21	00	00	42
3.	JUL-2025	23	00	23	00	00	46
4.	AUG-2025	19	02	19	00	00	40
5.	SEP-2025	21	01	21	00	00	43
6.	OCT-2025	19	04	19	00	00	42
7.	NOV-2025	08	01	08	00	00	17
Total		**124**	**08**	**124**	**00**	**00**	**256**

Total Working Days : 124

Total Presence : 124

Total Leave Sanctioned : 00

Total Absence (LWP) : Nil

Signature of Research Scholar

(ANNPURNA SINGH)

Signature of Supervisor

(Dr. Ratnesh Prasad Srivastava)

Annexure-4

Progress Report
Guru Ghasidas Vishwavidyalaya, Bilaspur (CG)

Six Monthly Progress report of the research scholar work done for the period from **14.05.2025** to **13.11.2025.**

1. Name of the Research Scholar : **ANNPURNA SINGH**
2. Name of the Department : Department of CSIT
3. Name of the Supervisor : Dr. Ratnesh Prasad Srivastava
4. Topic registered for Ph. D. degree : **MOOD BASED SLEEP DISORDER ANALYSIS USING MACHINE LEARNING TECHNIQUES.**

5. Number of days/duration/periods for which the candidate/research scholar was present in the department/research center.

.....124 days.....

(Please mention leaves availed also)

.....00days .....

Signature of the Research Scholar

Remarks of the Research Supervisor and Signature

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Remarks of the RAC

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Convener

RAC Member

RAC Member

Six Monthly Progress Report

14.05.2025 to 13.11.2025.

1. A conference paper titled **"Intelligent Emotion Prediction from Text: Integrating TF-IDF Representations with Machine Learning Models for Enhanced Accuracy"** has been submitted to the **5th IEEE International Conference on Power, Control and Computing Technologies (ICPCCT 2026)** under the **AI Techniques track**. The study presents a machine learning–based approach for text-based emotion recognition using TF-IDF features and demonstrates the superior effectiveness of linear models. This work strengthens the emotion analysis component of the ongoing Ph.D. research.

2. Research article has been published in the **Global Journal of Computer and Engineering Technology (GJCET)** (ISSN: 2767-1933). The study proposes a robust multimodal framework for sleep disorder classification by effectively integrating facial emotion analysis with wearable sensor-derived physiological signals. This work directly aligns with and substantially strengthens the objectives of the proposed Ph.D. research.

Signature of Research Scholar
(ANNPURNA SINGH)
(Registration No. 225251601 date 14.05.2024)

Signature of Supervisor
(Dr. Ratnesh Prasad Srivastava)

Global Journal of Computer and Engineering Technology (GJCET)

Vol. 5, No. 1, January, 2025 ISSN: 2767-1933

MULTIMODAL SLEEP DISORDER CLASSIFICATION USING EMOTION AWARE FUSION OF FACIAL EXPRESSIONS AND WEARABLE SENSOR DATA

Annpurna Singh, Guru Ghasidas Vishwavidyalaya, India (annpurnasingh389@gmail.com)
Ratnesh Prasad Srivastava, Guru Ghasidas Vishwavidyalaya, India (ratneshsrivastava1504@gmail.com)
Rishabh Vaishnav, Guru Ghasidas Vishwavidyalaya, India (rishabhvaishnav2006@gmail.com)

ABSTRACT

Sleep disorders remain one of the most underdiagnosed yet consequential public health challenges, often hidden beneath surface-level symptoms and fragmented behavioral cues. Traditional diagnostic tools, reliant on either physiological metrics or self-reported mood disturbances, fall short in capturing the complex interplay between emotional state and biometric signals. This paper introduces a novel multimodal prediction framework that fuses temporal mood patterns—extracted from facial expressions across daily intervals—with real-time smartwatch telemetry data. By embedding emotion dynamics alongside features such as heart rate variability, oxygen saturation, and sleep duration, the model classifies individuals into four clinically relevant categories: Normal, Insomnia, Restless Leg Syndrome, and Sleep Apnea. The approach is evaluated on a real-world dataset of 204 subjects, achieving an overall classification accuracy of 98% using a fusion model. The results underscore the predictive strength of integrating emotional context into physiological analysis, opening a new direction in personalized, non-invasive sleep disorder diagnostics

Keywords: Sleep disorders, Mood prediction; Smartwatch biosignals, Facial image analysis, Machine learning; Deep learning, Multimodal framework.

1. INTRODUCTION

Sleep disorders such as insomnia, obstructive sleep apnea (OSA), and restless leg syndrome (RLS) are pervasive clinical conditions that exert profound detrimental effects on both somatic and psychological health globally. Epidemiological estimates indicate that over 30% of the world's population experiences sleep-related disturbances, resulting in adverse outcomes on cognitive functioning, mood regulation, and daytime performance (Ferrie et al., 2011). In particular, patho-physiological manifestations of sleep apnea—characterized by recurrent arousals and oxygen desaturation—have been strongly correlated with an elevated incidence of affective disorders, including major depressive disorder and bipolar spectrum conditions (Lu, Liu, Wang, Zhou, & Wang, 2017).

Despite the growing body of literature delineating the interrelationship between sleep abnormalities and mood dysregulation, integrative computational frameworks capable of concurrently predicting both sleep pathologies and emotional states remain conspicuously underdeveloped in the extant biomedical research landscape. This gap is especially notable in the context of precision health, where multimodal data fusion could substantially enhance early detection and personalized interventions.

The advent of wearable technologies—particularly smartwatches embedded with multi-sensor systems—has enabled non-invasive, longitudinal acquisition of key physiological metrics such as heart rate variability (HRV), oxygen saturation (SpO_2), and sleep architecture (de Zambotti, Godino, Baker, Cheung, Patrick, & Colrain, 2015). These bio signals have demonstrated significant utility in the automated detection of sleep-related disorders, thereby obviating the need for resource-intensive clinical evaluations like polysomnography (Khosla, Deak, Gault, Goldstein, Hwang, & Kwon, 2018). Concurrently, advances in computer vision and deep neural architectures have enabled robust mood inference through facial image analysis, with convolutional neural networks (CNNs) such as VGG Face and ResNet-50 exhibiting high fidelity in emotion recognition across diverse populations (Mollahosseini et al., 2017; Ko & Sim, 2018).

Nevertheless, the majority of prior studies have treated sleep disorder diagnosis and mood classification as disjointed tasks, thereby neglecting the potential synergies afforded by multimodal integration. To address this lacuna, we introduce a unified computational pipeline that concurrently leverages physiological telemetry from wearable sensors and facial image analytics to predict both sleep disorders and mood states.

Guru Ghasidas Vishwavidyalaya

बैंक ऑफ़ बड़ौदा
Bank of Baroda

Payment Receipt

Receipt : 114179136447

Date : 2025-12-24 14:36:20

Payer Details

Name	:	Annpurna singh
Father Name	:	Late surendra singh
Fee Description	:	PHD DRC III FEES
Mobile No	:	9329027962
Email ID	:	annpurnasingh389@gmail.com

Fees Details

Amount to Pay	:	12000

Payment Details

Order ID	:	6470436
Tracking ID	:	114179136447
Currency	:	INR
Payment Mode	:	Unified Payments
Card Name	:	UPI
Order Status	:	Success
Payment status	:	Success

Total Amount : 12000