Annexure3b- Complete filing

INVENTION DISCLOSURE FORM

Details of Invention for better understanding:

1. TITLE: Mental Health Detector via Typing Patterns with Contextual Emotional Analysis.

2. INVENTOR(S)/ STUDENT(S): All fields in this column are mandatory to be filled

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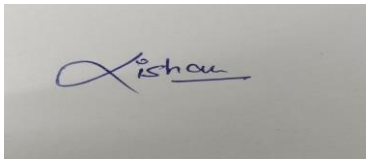
Signature	
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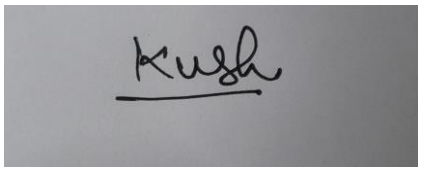
Signature	
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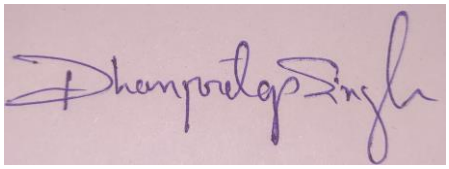
Signature	

Table of Patents

Patent ID	Abstract	Resarch Gap	Novelty

1	US 2025/1056789 A1	AI-driven mental health detector using keystroke dynamics and contextual emotional data for real-time detection	Current models are not context-aware, resulting in false positives and inaccuracy. .	Combining keystroke dynamics, contextual emotional analysis, and physiological signals for accurate detection.
2	WO 2025/223456	An adaptive system that utilizes AI-driven personalized learning models for mental health detection.	Existing models are not adapted to the baselines of individual users and do not have real-time feedback loops.	Adaptive AI-driven learning for personalized mental health assessment.
3	IN 20254198765	Wearable-based proactive diagnosis mental health monitoring system.	Current methods do not incorporate physiological signals for verification.	AI-based multimodal system of first-ever type using behaviour and physiological inputs.
4	EP 2025/678901	Early stress detection emotional sentiment scoring system.	Sentiment analysis in the conventional sense does not include real-time behavioural information.	Context-sensitive emotional sentiment analysis for accurate mental health understanding .
5	JP 2025-654321	Feedback system powered by AI for enhancing mental well-being.	Inadequate automated data-driven mental health intervention recommendations.	Real-time intervention recommendations based on keystroke, behaviour, and environmental data..

3. DESCRIPTION OF THE INVENTION

A. PROBLEM ADDRESSED BY THE INVENTION:

Mental illnesses like depression, anxiety, and stress frequently remain undetected or get detected too late because they depend on subjective self-reports and are not evaluated

clinically on a regular basis. Current AI-powered mental health monitoring systems mainly inspect keystroke dynamics (e.g., typing speed, error rates, and latency) but do not have contextual awareness, so they fall short in differentiating between temporary emotional states and persistent mental illnesses. This invention overcomes these limitations through incorporating contextual emotional analysis, taking into account environmental conditions (e.g., surrounding noise, light intensity, site), user-specific behavioral information (e.g., text sentiment in the last texts, app usage history), and physiological signals (e.g., heart rate variability from wearable sensors). The system improves the accuracy of mental health measurements through a multimodal AI model, allowing for real-time, continuous, and non-invasive monitoring with tailored interventions. This proactive approach helps users and healthcare providers detect early signs of mental health deterioration, allowing timely support and intervention..

B. STATE OF THE ART/ RESEARCH GAP:

Existing AI-based mental health monitoring systems mainly use keystroke dynamics, computing parameters like typing speed, inter-key latency, dwell time, and error rate to deduce psychological and emotional states. Although these approaches have been shown to be effective in detecting psychomotor changes associated with disorders such as depression and anxiety, they are plagued by a number of shortcomings:

1. **Lack of Contextual Awareness:**

- Currently deployed systems are unaware of environmental circumstances (e.g., background noise, ambient illumination, and environment), which impact typing habits tremendously.
- They also do not include user-specific behavioural trends (e.g., recent sentiment of text, social media usage), which can be used to distinguish between short-term mood changes and long-term mental health conditions.

2. **High False Positives and Inaccuracies:**

   -Without context information, keystroke-based prediction models may interpret situational anxiety (e.g., hurried keying in a noisy setting) as symptoms of depression or anxiety, lowering dependability

3. **Limited Personalization & Adaptive Learning:**

   -The majority of current models work based on generalized patterns and fail to account for personal typing baselines as well as dynamic changes in behavior over time.

   - They do not have adaptive learning algorithms that update predictions with user feedback and longitudinal information

   .

4. **Absence of Multimodal Data Fusion:**

- They do not incorporate physiological signals (e.g., skin conductance from wearables, heart rate variability) to cross-validate AI inferences, leaving out an important layer of mental health evaluation

- They do not leverage machine learning models that can conflate multiple streams of data (keystroke dynamics, environmental, and physiological) to enhance accuracy

Research Gap:

The principal gap in current research is the absence of a context-perceiving, holistic AI system incorporating keystroke dynamics, contextual emotional feedback, and physiological signals for real-time, accurate mental health evaluation. This invention fills this gap through the introduction of a multimodal AI-driven solution that greatly improves detection precision, minimizes false positives, and facilitates tailored interventions for proactive mental health monitoring

C. DETAILED DESCRIPTION

1. Introduction:

The Emotional and Mental Health Analysis System based on Intelligent systems is aimed at evaluating a user's mental and emotional well-being through several sources of data, such as keystroke dynamics, environmental variables, physiological parameters, and behavioral variables. This system utilizes artificial intelligence (AI) to process and analyze the information gathered, thereby producing a mental health forecast and giving personalized advice to the user.

System Components:

2.1 **Data Collection :** The system collects various forms of information to know the mood of the user:

•Keystroke Data: Tracks typing speed, errors, delay, and pressure on keystrokes.

•Environmental Data: Records ambient noise levels, lighting conditions, and location information.

•User Behaviour Data: Examin screen interaction behaviour, app usage, and sentiment of text.

•Physiological Data: Acquires heart rate variability, stress levels, and other biometric signals using wearable sensors.

2.2 **Contextual Emotional Analysis Engine :**

- Processes input data and evaluates emotional context.
- Identifies temporary stress indicators versus chronic emotional states.

2.3 Emotional Context Scoring :

- Aggregates and normalizes collected data.
- Computes an emotional score based on behavioral and physiological indicators.
- Feeds this data into an AI model for mental health prediction

2.4 AI Processing Pipeline :

The core of the system consists of several processing stages:

- **Collect Typing Data**: Records keystroke behaviors, including speed, pauses, and errors.
- **Gather Contextual Data**: Collects environmental and behavioral inputs.
- **Normalize Data**: Standardizes keystroke and contextual data for analysis.
- **Run Data Through AI Model**: Machine learning algorithms analyze data to detect emotional patterns.
- **Generate Mental Health Prediction**: Assigns confidence scores for stress, anxiety, or depression risk.
- **Provide Personalized Feedback**: Suggests mindfulness exercises, productivity tips, and alerts.x

2. System Architecture :

3.1 User Device : Captures typing patterns, behavioral interactions, and environmental data**.**

3.2 Processor Message Input Module : Extracts relevant message-based behavioral features. And Tracks user sentiment in typed text.

3.3 Wearable Device (Optional) : Measures biometric signals such as heart rate and skin conductance.

3.4 AI Processing Unit : Centralized system responsible for data processing and model execution.

3.5 Keystroke Analysis Engine : Uses typing behavior as an emotional indicator.

3.6 Contextual Emotional Analysis Engine: Integrates environmental and behavioral factors for a comprehensive assessment.

3.7 Machine Learning Model : Trained on emotional state datasets to detect patterns in user behavior.

3.8 Output Module : Displays results and offers actionable ~feedback.

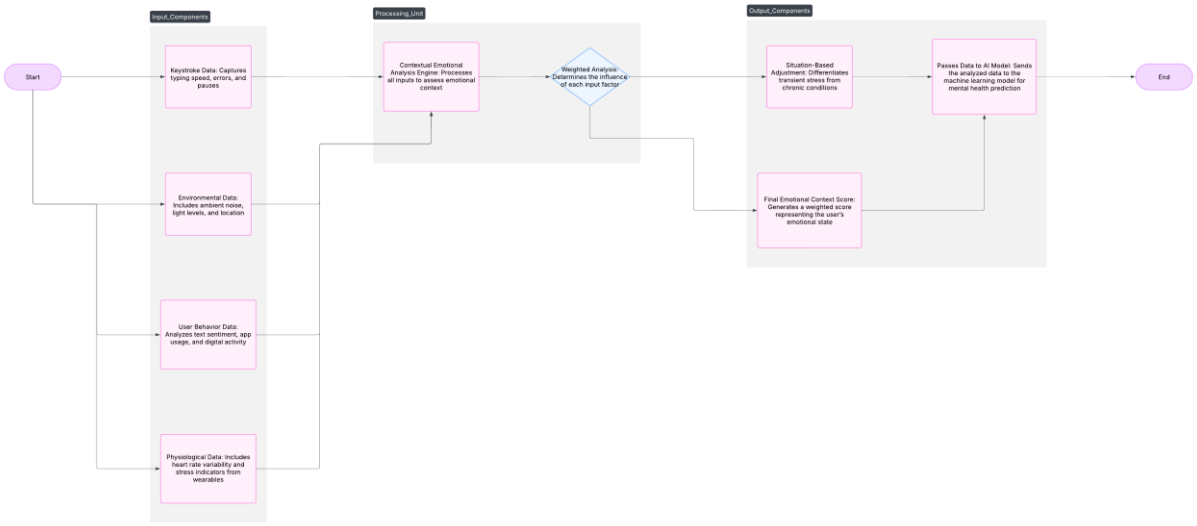
3. Flow Chart: The system consists of interconnected processes represented in the following flowcharts:

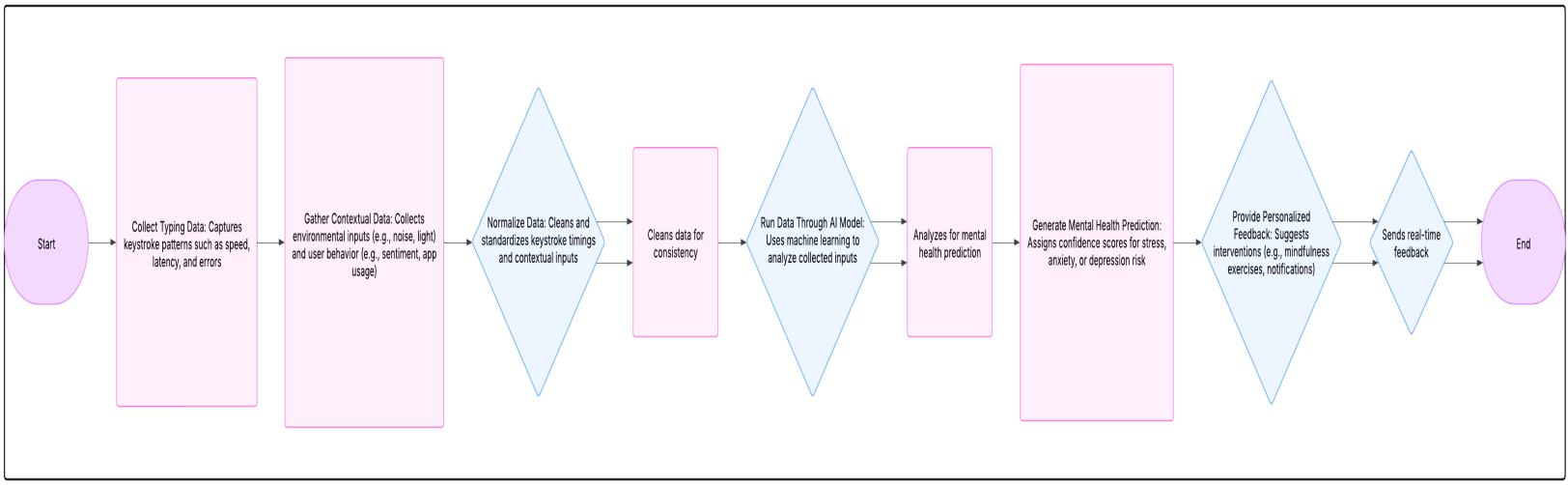
a. Overall System Flow

Start → User interacts with device.
Capture Data → Collects keystroke, environmental, behavioral, and physiological data.
Process Data → Normalizes inputs and runs AI analysis.
Generate Emotional Score → Computes a weighted score based on collected data.
Run AI Model → Machine learning model predicts emotional and mental state.
Provide Feedback → Displays recommendations or alerts if necessary.
End

b. AI Processing Pipeline Flow

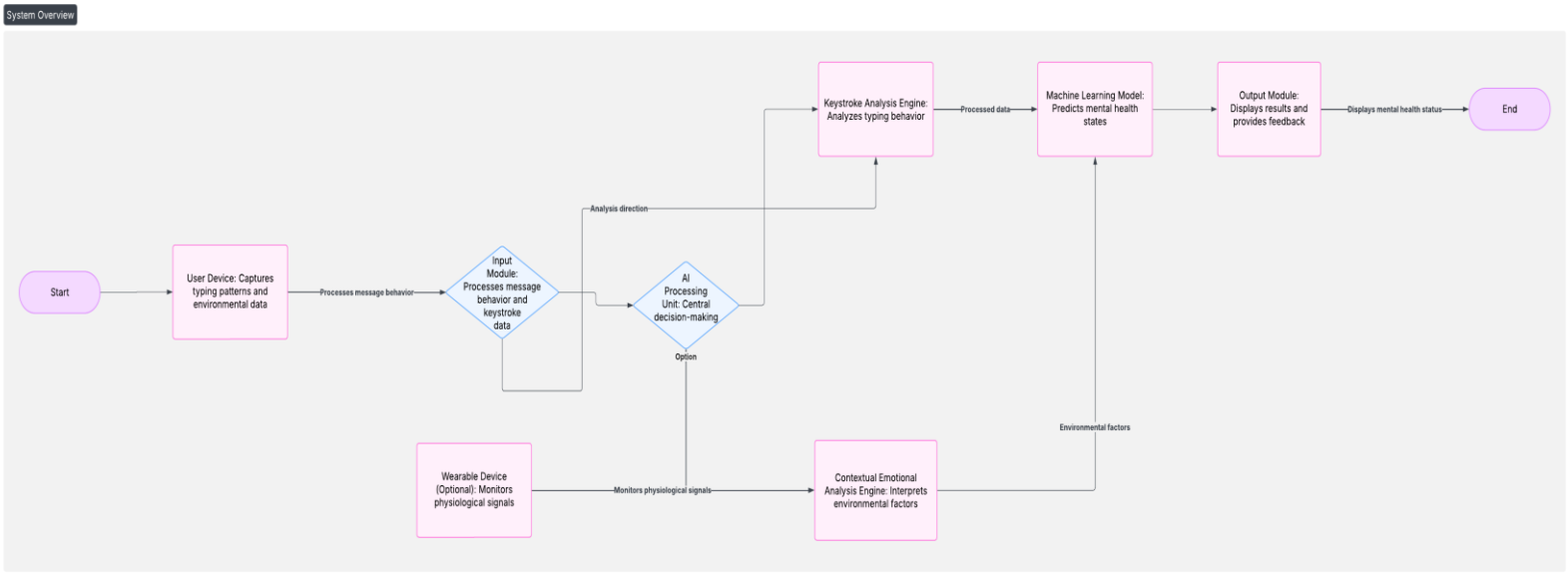
Collect User Input → Records keystroke and behavioral data.
Context Analysis → Evaluates environmental and physiological indicators.
Normalization & Preprocessing → Standardizes data for AI processing.
Machine Learning Model Execution → Predicts user emotional state.
Output Decision → Determines whether intervention is needed.
Feedback & Recommendations → Provides personalized suggestions.




Start
Collect Typing Data: Captures keystroke patterns such as speed, latency, and errors
Gather Contextual Data: Collects environmental inputs (e.g., noise, light) and user behavior (e.g., sentiment, app usage)
Normalize Data: Cleans and standardizes keystroke timings and contextual inputs
Cleans data for consistency
Run Data Through AI Model: Uses machine learning to analyze collected inputs
Analyzes for mental health prediction
Generate Mental Health Prediction: Assigns confidence scores for stress, anxiety, or depression risk
Provide Personalized Feedback: Suggests interventions (e.g., mindfulness exercises, notifications)
Sends real-time feedback
End

c. Data Processing Flow

Receive Raw Data → Collects typing, behavior, and sensor data.
Extract Features → Identifies key indicators such as typing speed, pauses, and sentiment.
Normalize & Encode → Converts data into AI-friendly format.
Run Classification Model → Predicts likelihood of stress, anxiety, or emotional shifts.
Display Results → Outputs emotional insights and feedback**.**



D. ADVANTAGES:

•Through the incorporation of contextual emotional analysis, this system minimizes false positives and

•increases accuracy in identifying mental health disorders relative to conventional keystroke analysis.

•The system learns from user behaviour continuously and refines its predictions over time, offering personalized feedback based on individual baselines.

•In contrast to current solutions, this invention integrates keystroke dynamics with environmental variables (noise, light, location) and physiological inputs (wearable device inputs) for a comprehensive evaluation.

•The system offers instant feedback and proactive interventions like mindfulness exercises, stress management skills, or reminders to caregivers when necessary.

•The passive data gathering guarantees that users are not forced to fill out self-assessments or input their emotional states manually, thus making it perfectly suited for use in real-world scenarios.

•Through identifying subtle behavioural and emotional changes, the system aids in detecting mental health concerns early, which enables timely interventions before conditions aggravate.

•The system can be rolled out to various digital environments, such as smartphones, laptops, and corporate systems, and applied extensively across workplaces, educational establishments, and private health domains.

•As the system is based on behavioural and context data, and not psychological questionnaires in a direct form, it lessens the call on sensitive personal disclosure, limiting the stigma on monitoring mental health.

•The Contextual Emotional Analysis Engine (CEAE) differentiates between transient emotional changes and sustained mental health issues, resulting in more accurate diagnoses.

•The technology can produce reports and analysis that help clinicians make sense of long-term patterns of behaviour, in addition to current diagnostic procedure.

E.ALTERNATIVES/ EXPANSION: NA

F. WORKING PROTOTYPE/ FORMULATION/ DESIGN/COMPOSITION: No working prototype is required for this invention at this stage. Given the novelty of integrating AI-powered typing pattern analysis with contextual emotional analysis, there is no prior implementation or reference model available. The development of a fully functional prototype would require extensive research, data collection, and model training, which is estimated to take at least 18 months. Therefore, this patent focuses on the conceptual framework, system architecture, and methodology, laying the foundation for future prototype development and implementation.

G. DATA: No specific datasets have been used or referenced in the development of this invention. The system is designed to process real-time user-generated data for mental health analysis

4. USE AND DISCLOSURE (IMPORTANT): Please answer the following questions:

A. Have you described or shown your invention/ design to anyone or in any conference?	YES ( )	NO (✓)
B. Have you made any attempts to commercialize your invention (for example, have you approached any companies about purchasing or manufacturing your invention)?	YES ( )	NO (✓)
C. Has your invention been described in any printed publication, or any other form of media, such as the Internet?	YES ( )	NO (✓)
D. Do you have any collaboration with any other institute or organization on the same? Provide name and other details	YES ( )	NO (✓)
E. Name of Regulatory body or any other approvals if required.	YES ( )	NO (✓)

5. Provide links and dates of such activities if you have disclosed the information in public before sharing with us. NA

6. Provide the terms and conditions of the MOU also if the work is done in collaboration within or outside university. NA

7. Potential Chances of Commercialization. Very high

8. List of companies which can be contacted for commercialization along with the website link. NA

9. Market potential of the invention. Very high

10. Any basic patent which has been used and we need to pay royalty to them. NA

11. FILING OPTIONS: The invention is being considered for filing under the appropriate patent category. The applicant intends to pursue protection under relevant national and international patent laws to secure intellectual property rights**.**

12. **KEYWORDS:** AI-powered mental health detection, typing patterns, keystroke dynamics, contextual emotional analysis, machine learning, mental health monitoring, real-time feedback, personalized interventions, wearable integration, ambient data analysis**..**

13. **LOG BOOKS AND NOTEBOOKS:** the idea and development process have been internally discussed and recorded through digital documentation. The concept was conceived and refined over time, with internal research and analysis conducted independently.

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