

AI-Based Employee Stress Detection

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Abstract: Employee well-being significantly affects productivity, job satisfaction, and the success of organizations. Many companies struggle to monitor mental health and engagement effectively. Traditional methods like manual surveys and HR interviews often miss the mark on accuracy, efficiency, and scalability. To tackle this problem, this project introduces a web-based Employee Well-Being Prediction System. It combines structured psychometric surveys with machine learning to deliver automated, data-driven insights into workplace well-being. The system uses the Python Flask framework and an SQLite database for secure user management. It also stores employee responses in Excel. Features include secure login and registration for employees and administrators, structured survey modules, automated score calculation, and predictive modeling of employee well-being. Survey responses are gathered across six areas: recognition, workplace environment, team support, career growth, work-life balance, and emotional state. At the heart of the system is the Decision Tree algorithm, chosen for its simplicity and effectiveness in classification tasks. The model analyzes section scores and creates clear decision rules to classify employees' well-being

status, ensuring transparency and accuracy in predictions. In addition to making predictions, the system improves usability through visual outputs like pie charts to show score distributions. An integrated admin dashboard lets HR professionals monitor employee responses, track well-being trends, and spot potential risks such as disengagement or burnout. By merging psychometric assessment with Decision Tree modeling, the project offers organizations a practical tool to improve workplace conditions, enhance employee support, and make informed HR choices. This method shows how web technologies and machine learning can work together to create smart solutions for employee engagement, offering immediate insights and laying the groundwork for future improvements like interactive dashboards and advanced AI models.

Keywords: Employee Well-being, Workplace Engagement, Burnout Detection, Machine Learning, Decision Tree, Predictive Modeling, HR Analytics, Data Visualization

1. INTRODUCTION

Employee well-being has become a key factor in the success, productivity, and stability of modern organizations. When employees feel valued, motivated, and supported, they usually perform well and help achieve organizational goals. However, many organizations still use traditional methods, such as manual surveys, feedback forms, and HR interviews, to measure well-being. These methods often do not provide accurate or timely insights. With advances in technology and data analysis, organizations can now use smart systems to examine employee feedback and predict well-being levels. This project introduces a web-based Employee Well-Being Prediction System that uses the Flask framework and a Decision Tree machine learning algorithm to streamline the process of collecting, analyzing, and predicting employee well-being.

The Employee Well-Being Prediction System has been developed to provide an automated, data-driven approach to understanding employee satisfaction and emotional health. The system begins with a secure login and registration process for both employees and administrators, ensuring confidentiality and controlled access. Once authenticated, employees complete structured surveys that are divided into six dimensions of workplace experience: recognition, workplace environment, team support, career growth, work-life balance, and emotional state. Each section is scored automatically, and the cumulative results are processed using a Decision Tree prediction model to classify the employee's well-being status. To support efficient data management, responses and prediction outcomes are stored in SQLite and Excel formats, allowing both scalability and ease of retrieval. The system also integrates visualization tools that generate graphical representations of the results, including pie charts and bar graphs, which make trends easier to interpret. These visualizations are consolidated within an administrator dashboard, enabling HR managers to monitor employee responses in real time. By presenting well-being classifications alongside visual insights, the dashboard helps

identify potential issues such as burnout, disengagement, or declining satisfaction. Ultimately, the system provides organizations with a reliable mechanism to track employee well-being, intervene proactively, and foster a healthier workplace environment.

The Employee Well-Being Prediction System is an integrated framework that combines secure access, survey collection, predictive modeling, and visualization. Employees and administrators interact through a secure login and registration module, ensuring confidentiality. The survey module captures responses across six workplace dimensions, and each section is automatically scored. A Decision Tree model processes these scores to classify employee well-being levels. Data is stored in SQLite and Excel formats for efficient management and retrieval. Visualization tools generate graphical representations of responses and predictions, while an administrator dashboard consolidates these features, enabling real-time monitoring and supporting informed organizational decisions.

Types Of Well-Being Categories

Based on survey responses, the Decision Tree algorithm classifies employees into three categories:

- Satisfied Employee

A satisfied employee shows high engagement and motivation in their work. They maintain positive relationships with colleagues and contribute actively to goals. Such employees reflect a healthy and supportive workplace environment.

- Neutral Employee

A neutral employee experiences moderate satisfaction with their job. They perform tasks efficiently but may lack enthusiasm or emotional connection. This category indicates areas that require improvement or better support.

- Dissatisfied Employee

A dissatisfied employee shows low engagement and declining motivation. They may experience

stress, burnout, or frustration with workplace conditions. Immediate attention is needed to address their concerns and restore well-being.

II. LITEATURE REVIEW

Purnendu Shekhar Pandey (2017): Proposed a system combining IoT devices and machine learning for stress detection using heart rate variability. Heartbeat data collected via pulse sensors and transmitted through NodeMCU to a cloud server was analyzed using Logistic Regression, SVM, VF-15, and Naive Bayes. The study achieved test accuracies of 66% (Logistic Regression) and 68% (SVM), highlighting the need for larger datasets to improve reliability.

Suresh Kumar Kanaparthi et al. (2022): Designed a facial image processing system with KNN classifiers to detect stress in IT employees. The framework incorporated live monitoring and counseling support, improving upon traditional survey-based methods. PCA was used for feature extraction, and the system successfully distinguished stressed emotions (angry, sad, fearful, disgusted) from non-stressed ones (happy, neutral, surprised).

U. Srinivasulu Reddy et al. (2018): Applied multiple machine learning techniques to the OSMI Mental Health in Tech 2017 survey dataset (750 responses). Models included Logistic Regression, KNN, Decision Trees, Random Forest, Bagging, and Boosting. Boosting achieved the highest accuracy (75.13%) and precision (0.84), while Random Forest showed greater stability. Key predictors of stress were gender, family history, and workplace health benefits.

Rahul Katarya & Saurav Maan (2020): Conducted a survey of smartwatch-based stress detection methods, analyzing signals such as HRV, GSR, skin temperature, and sleep patterns. Algorithms compared included SVM, KNN, Random Forest, Logistic Regression, and Linear Regression. Results showed that skin temperature with Random Forest achieved the highest accuracy (92% with context), and combining multiple signals improved detection reliability.

E.Deepak Chowdary et al. (2016): Developed an ensemble classification model using Pegasos optimization combined with AdaBoost to detect stress among IT professionals. Data from 1000 employees was categorized into eight groups with 26 attributes. The model achieved 96.19% accuracy, outperforming traditional classifiers and benchmark UCI datasets, demonstrating the effectiveness of ensemble methods in workplace stress detection.

III. PROBLEM STATEMENT

In modern organizations, employee well-being plays a crucial role in sustaining productivity, job satisfaction, and overall organizational success. Despite its importance, many companies still depend on traditional approaches such as manual surveys, feedback forms, and periodic HR reviews to assess employee satisfaction and mental health. These methods are often time-consuming, inefficient, and lack the analytical depth required to extract meaningful insights. Traditional systems also fail to provide predictive insights into potential workplace issues such as stress, burnout, or dissatisfaction. Without intelligent analysis tools, organizations may overlook early warning signs, resulting in reduced employee performance, increased turnover rates, and poor workplace morale. Furthermore, managing and analyzing large volumes of employee feedback manually poses a significant challenge for HR departments. It becomes difficult to identify patterns or trends that could guide strategic improvements in the work environment. Therefore, there is a need for an automated, data-driven system that can efficiently collect employee feedback, analyze responses, and generate predictive insights using machine learning techniques. The proposed solution — a web-based Employee Well-Being Prediction System utilizing the Decision Tree algorithm — aims to address these challenges by accurately predicting employee well-being status and helping organizations take proactive measures to enhance workplace satisfaction and emotional health.

IV. PROPOSED SYSTEM

The proposed system is a web-based application that automates the process of collecting, analyzing, and predicting employee well-being using machine learning techniques. The workflow is organized into several steps, as follows:

1. **Employee Registration and Login:** Employees register through a secure web interface built using the Flask framework in Python. Each employee creates a unique account to ensure privacy and personalized access. Once logged in, they can participate in surveys and track their well-being status.

2. **Survey Collection:** Employees answer structured survey questions divided into sections like recognition, workplace environment, team support, career growth, work-life balance, and emotional state. These surveys capture both objective and subjective workplace experiences. The design ensures a holistic view of employee well-being.

3. **Data Processing:** Survey responses are automatically cleaned, standardized, and converted into numerical values. Section-wise scores are calculated to represent different aspects of well-being. This processed data is prepared for machine learning analysis.

4. **Prediction Model:** The Decision Tree classifier is trained on historical survey data to learn patterns. It predicts employee well-being status such as satisfied, neutral, or dissatisfied. This enables organizations to identify risks early and take proactive measures.

5. **Data Storage:** Employee details, survey responses, and prediction results are stored securely in a database. Additionally, responses are recorded in Excel files for easy export and offline analysis. This ensures systematic management and scalability.

6. **Visualization:** Graphical charts are generated to display the distribution of employee scores. These visuals highlight trends and problem areas across different sections. HR managers can

quickly interpret results without analyzing raw data.

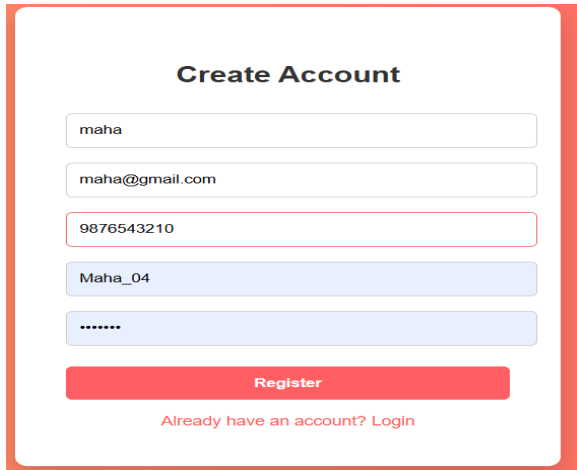
7. **Admin Dashboard:** An admin dashboard consolidates responses, predictions, and visualizations into one interface. HR managers can monitor well-being trends and identify dissatisfied employees. This supports proactive decision-making and workplace improvements.

PyCharm is a cross-platform IDE for Python created by JetBrains. It supports Python 2.x and 3.x and runs on Windows, Linux, and macOS. In this project, PyCharm is used for coding, debugging, and managing the Employee Well-Being Prediction System efficiently.

Python is an interpreted, object-oriented language known for its simplicity and readability. It has a vast standard library for data processing, visualization, and machine learning. In this project, Python powers the backend logic and implements the Decision Tree model for well-being prediction.

Flask is a lightweight Python web framework based on WSGI and Jinja2. It allows developers to build web applications quickly with minimal code. In this project, Flask is used to create the employee registration, login, survey submission, and admin dashboard interfaces.

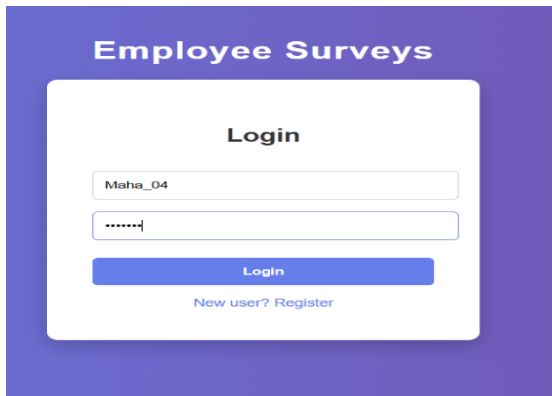
HTML defines the structure of web pages, while CSS controls their layout and design. Together, they form the front-end of the system, ensuring a clean and user-friendly interface. In this project, HTML and CSS are used to design surveys, dashboards, and visualization components.



The registration page features a white background with a red border. At the top, it says "Create Account". Below this are five input fields: "maha", "maha@gmail.com", "9876543210", "Maha_04", and a password field with dots. A red "Register" button is at the bottom, with a link "Already have an account? Login" below it.

Fig 1 Registration page

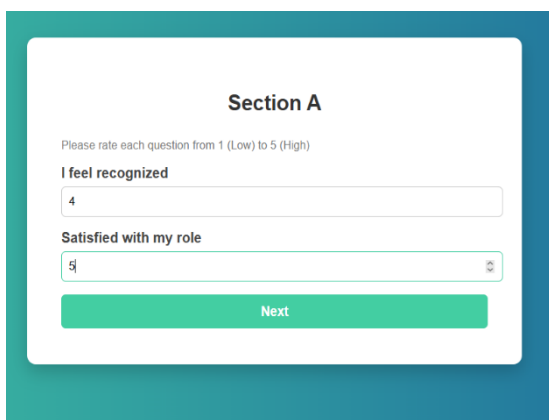
Employees create accounts; details stored in SQLite.



The login page has a purple background. It says "Employee Surveys" at the top and "Login" in the center. There are two input fields: "Maha_04" and a password field with dots. A blue "Login" button is below, with a link "New user? Register" underneath.

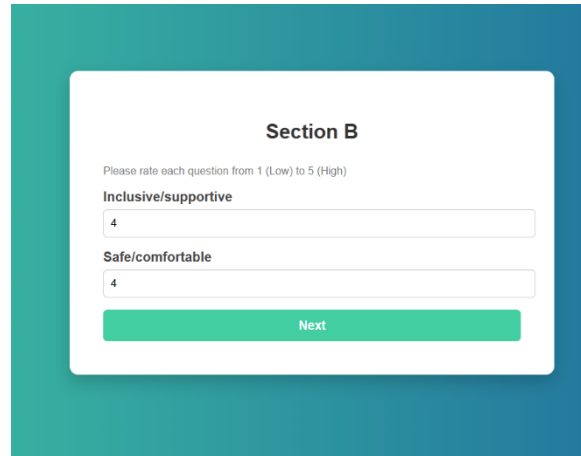
Fig 2 Login page

Authenticates users/admins with secure credentials.



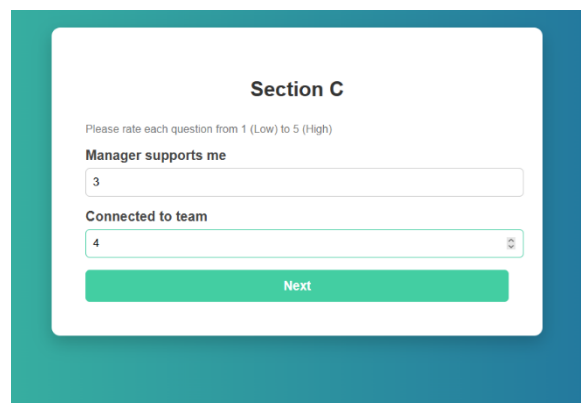
Section A survey page with a teal background. It asks to rate questions from 1 (Low) to 5 (High). The first question is "I feel recognized" with a rating of 4. The second is "Satisfied with my role" with a rating of 5. A green "Next" button is at the bottom.

Fig 3 Survey page Section -A



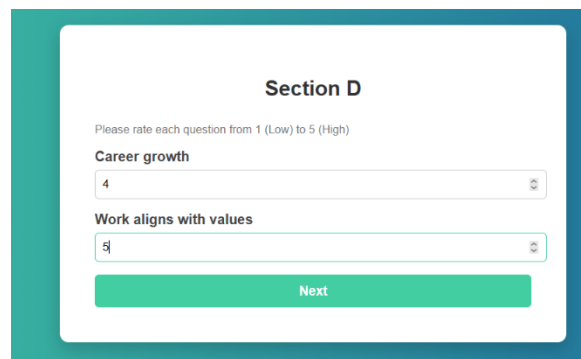
Section B survey page with a teal background. It asks to rate questions from 1 (Low) to 5 (High). The first question is "Inclusive/supportive" with a rating of 4. The second is "Safe/comfortable" with a rating of 4. A green "Next" button is at the bottom.

Fig 4 Survey page Section -B



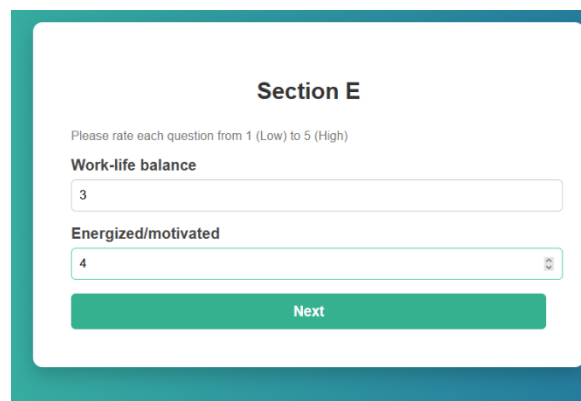
Section C survey page with a teal background. It asks to rate questions from 1 (Low) to 5 (High). The first question is "Manager supports me" with a rating of 3. The second is "Connected to team" with a rating of 4. A green "Next" button is at the bottom.

Fig 5 Survey page Section -C



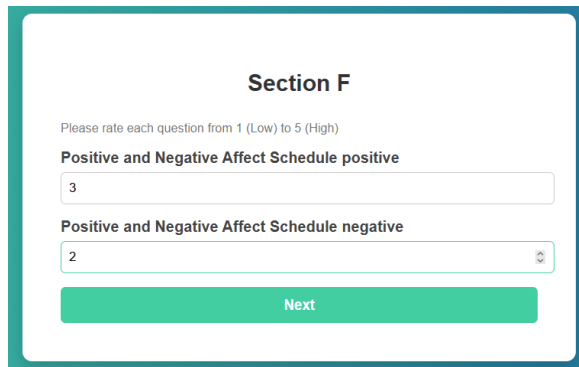
Section D survey page with a teal background. It asks to rate questions from 1 (Low) to 5 (High). The first question is "Career growth" with a rating of 4. The second is "Work aligns with values" with a rating of 5. A green "Next" button is at the bottom.

Fig 6 Survey page Section -D



Section E survey page with a teal background. It asks to rate questions from 1 (Low) to 5 (High). The first question is "Work-life balance" with a rating of 3. The second is "Energized/motivated" with a rating of 4. A green "Next" button is at the bottom.

Fig 7 Survey page Section -E



Section F

Please rate each question from 1 (Low) to 5 (High)

Positive and Negative Affect Schedule positive

Positive and Negative Affect Schedule negative

Next


Fig 8 Survey page Section -F

Six sections covering recognition, environment, support, growth, balance, and emotional state.



Fig 9 Survey completed page

Generates pie charts to show score distribution.



Employee Surveys

Login

Login

[New user? Register](#)

Fig 10 Admin Login page

Admin Dashboard - Employee Survey Results

Name	Date	A	B	C	D	E	F	Prediction
Rani	2026-03-03	4.0	3.5	4.0	3.5	3.5	3.0	Happy
RAJA	2026-03-03	3.0	3.5	3.5	3.0	1.5	3.5	Neutral
Ramya	2026-03-03	3.5	3.0	3.0	4.0	4.0	3.0	Neutral
Ramya	2026-03-03	3.0	3.0	3.0	3.0	3.0	3.0	Neutral
maha	2026-03-03	3.0	3.0	3.0	3.0	2.5	2.5	Neutral
meera	2026-03-11	3.5	3.5	3.5	4.5	4.5	2.5	Neutral
meenu	2026-04-05	2.0	1.0	1.0	1.5	2.0	2.5	Burnout
raju	2026-04-06	4.5	5.0	4.0	3.5	3.5	2.5	Neutral
maha	2026-04-07	4.5	4.0	3.5	4.5	3.5	2.5	Neutral

Login

Fig 11 Admin Dashboard

Admins view responses, predictions, and monitor trends.

Employee	Date	Section A	Section B	Section C	Section D	Section E	Section F	Prediction
Rani	2026-03-0	4	3.5	4	3.5	3.5	3	Happy
RAJA	2026-03-0	3	3.5	3.5	3	1.5	3.5	Neutral
Ramya	2026-03-0	3.5	3	3	4	4	3	Neutral
Ramya	2026-03-0	3	3	3	3	3	3	Neutral
maha	2026-03-0	3	3	3	3	2.5	2.5	Neutral
meera	2026-03-1	3.5	3.5	3.5	4.5	4.5	2.5	Neutral
meenu	2026-04-0	2	1	1	1.5	2	2.5	Burnout
raju	2026-04-0	4.5	5	4	3.5	3.5	2.5	Neutral
maha	2026-04-0	4.5	4	3.5	4.5	3.5	2.5	Neutral

Fig 12 Employee Scores in Excel

V. METHODOLOGY

The methodology of the Employee Well-Being Prediction System is straightforward and efficient. Employees first register and log in through a secure Flask-based interface, with their details stored in an SQLite database. Once logged in, they complete a structured survey covering six workplace aspects such as recognition, environment, and emotional state. The system processes these responses into section-wise scores, which are analyzed by a Decision Tree model to predict well-being status. Results are stored in Excel files, visualized with charts, and displayed to employees, while administrators can monitor all responses and predictions through the dashboard.

VI. ALGORITHMS

The Decision Tree is a supervised machine learning algorithm used for classification and prediction. It works by splitting data into branches based on feature values, forming rules that lead to outcomes at leaf nodes. In this project, the input features are section scores from six survey areas, and the output is the employee's well-being status. Each internal node represents a decision rule, branches represent outcomes, and leaf nodes give the final prediction. The algorithm is chosen because it is simple,

interpretable, and effective for structured classification problems.

VII.FUTURE SCOPE

The Employee Well-Being Prediction System can be extended in several ways. Advanced machine learning models such as Random Forests or Neural Networks may be integrated to improve prediction accuracy. Real-time stress detection using biometric or behavioral data could complement survey responses. The system can also be scaled to handle larger organizations with cloud-based storage and dashboards. Integration with HR tools and mobile applications would make the system more accessible. Finally, predictive analytics can be used to forecast long-term employee satisfaction trends and guide proactive workplace improvements.

VIII.CONCLUSION

The Employee Well-Being Prediction System was successfully developed as a web-based application using Python Flask and the Decision Tree algorithm, fulfilling its objective of analyzing employee feedback to predict well-being status. The system provides a secure platform for employees to register, log in, and complete structured surveys covering recognition, workplace environment, team support, career growth, work-life balance, and emotional state. Responses are processed into section-wise scores, which serve as inputs for the Decision Tree model to generate accurate predictions. Employee data and survey results are stored systematically in both a database and Excel files, while graphical visualizations help employees interpret their well-being profile. The admin dashboard further enhances usability by allowing administrators to monitor responses and prediction outcomes efficiently. Overall, this system offers organizations a faster, data-driven approach to assessing employee satisfaction, enabling proactive measures to improve engagement, productivity, and workplace culture. With future enhancements such as advanced machine learning models, real-time monitoring, and integration with HR tools, the system holds

strong potential to evolve into a comprehensive solution for employee well-being management.

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