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EMPLOYEE SATISFACTION SCORE PREDICTION (HR ANALYTICS)

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ABSTRACT

Employee satisfaction is an important factor that influences workplace productivity, employee engagement, retention, and organizational performance. Organizations collect information related to workload, salary, working hours, job role, experience, training, performance, work environment, and employee feedback. Analyzing these factors can help organizations understand employee satisfaction patterns.

The **Employee Satisfaction Score Prediction** system is designed to analyze employee-related information and predict satisfaction scores using historical HR data. The system processes attributes such as department, job role, salary, experience, working hours, workload, performance rating, training participation, overtime, and satisfaction-related factors. Data preprocessing techniques are applied to handle missing values, duplicate records, inconsistent formats, and invalid data.

The system performs exploratory analysis to identify relationships between employee characteristics and satisfaction levels. Important indicators such as average satisfaction score, department-wise satisfaction, role-wise satisfaction, workload impact, salary-related patterns, and work-environment factors can be analyzed. Interactive dashboards present these insights through KPI cards, charts, graphs, tables, and filters.

The prediction module uses Machine Learning algorithms to estimate an employee's satisfaction score or classify satisfaction into categories such as low, medium, and high. Features such as workload, working hours, salary, performance, training, experience, and other available HR attributes can be used as predictive inputs. Model evaluation metrics are used to assess prediction performance.

Overall, the proposed system combines HR analytics, employee satisfaction analysis, visualization, and predictive modeling into a centralized platform. It can help organizations understand historical satisfaction patterns and identify factors associated with employee experience. Future enhancements can include employee feedback sentiment analysis, real-time survey integration, attrition-risk analysis, personalized workplace recommendations, and continuous satisfaction monitoring.

I. INTRODUCTION

Employee satisfaction represents how positively employees perceive their work environment, responsibilities, compensation, management, and overall workplace experience. Higher satisfaction can be associated with stronger engagement and organizational stability, while low satisfaction may indicate areas that require attention. Therefore, monitoring employee satisfaction is an important component of modern Human Resource Management.

Organizations collect various types of employee information through HR systems, performance reviews, surveys, attendance systems, payroll platforms, and learning-management systems. This information can contain useful indicators related to workload, compensation, working hours, career development, training, performance, and employee experience.

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Traditional employee satisfaction assessment often depends on surveys and manual HR analysis. Surveys provide valuable feedback, but analyzing large numbers of responses manually can be time-consuming. Satisfaction results may also be available only periodically, making it difficult to continuously analyze changes in employee experience.

Data analytics and visualization can help HR teams identify satisfaction patterns across departments, roles, experience groups, and other employee categories. Dashboards can present satisfaction scores, distributions, trends, and relationships with workplace factors. This makes HR information easier to interpret and supports systematic analysis.

Machine Learning can further enhance satisfaction analytics by predicting satisfaction scores or satisfaction categories using historical employee information. Predictive models can identify relationships between workplace factors and satisfaction outcomes. The proposed system integrates HR data processing, satisfaction analytics, visualization, and Machine Learning-based prediction into a unified framework.

II. LITERATURE SURVEY

Employee satisfaction analytics has become an important area of Human Resource Analytics because organizations increasingly use data to understand workforce experiences. Employee datasets may contain information about job roles, departments, salaries, experience, working hours, workload, performance, training, and satisfaction scores. These attributes can be analyzed to identify patterns related to employee experience.

Employee satisfaction is influenced by multiple workplace factors. Compensation, workload, career opportunities, management support, work-life balance, recognition, job responsibilities, and working conditions are commonly considered when studying employee experience. Statistical analysis can be used to examine relationships between these factors and satisfaction outcomes.

Employee surveys are frequently used to collect satisfaction and engagement information. Survey responses can provide direct feedback from employees regarding their workplace experience. However, survey data may contain missing responses, subjective opinions, and categorical information that requires appropriate preprocessing before analysis.

Data visualization techniques are commonly used in HR analytics to present satisfaction trends and workforce patterns. Bar charts, pie charts, histograms, heatmaps, and trend graphs can show satisfaction differences across departments, roles, experience groups, and other categories. Interactive dashboards allow HR professionals to explore these patterns more efficiently.

Machine Learning techniques can be applied to employee satisfaction prediction. Regression models can predict numerical satisfaction scores, while classification models can categorize employees into satisfaction groups. Features such as workload, salary, working hours, performance, experience, and training can be used as model inputs when supported by the dataset.

Modern HR analytics platforms increasingly combine employee surveys, workforce data, descriptive analytics, predictive modeling, and visualization. Sentiment analysis can also be applied to employee comments to identify positive and negative themes. The proposed system follows this approach by integrating satisfaction analytics with predictive modeling and interactive visualization.

III. SYSTEM ANALYSIS

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The Employee Satisfaction Score Prediction system is designed to analyze employee information and predict satisfaction scores using historical HR data. The system accepts attributes such as department, job role, salary, experience, working hours, workload, performance, training, overtime, and satisfaction score. The input data is validated to ensure that required fields and supported formats are available. A preprocessing module handles missing values, duplicate records, invalid entries, and inconsistent formats. Numerical features such as salary, working hours, workload, and performance scores are standardized when required. Categorical features such as department, job role, education, and employment type are transformed into suitable analytical representations. Feature engineering creates useful attributes such as experience groups, workload categories, salary bands, and performance categories. The analytics engine calculates average satisfaction score, satisfaction distribution, and department-wise and role-wise satisfaction. Correlation analysis can be used to examine relationships between satisfaction and workplace factors. Trend analysis identifies changes in satisfaction across different employee groups or time periods. A Machine Learning module is trained using historical employee data to predict satisfaction scores or satisfaction categories. The prediction module generates an estimated score or category for suitable employee inputs. Visualization components display analytical and prediction results through charts, graphs, tables, and KPI cards. The final dashboard provides an integrated view of employee satisfaction patterns and predictive insights.

Existing System

Existing organizations commonly assess employee satisfaction through periodic surveys, feedback forms, performance reviews, and HR interviews. These methods can provide direct information about employee opinions and workplace experiences. However, satisfaction analysis is often performed manually or through basic spreadsheet-based reporting. Large survey datasets can be difficult to analyze efficiently without specialized analytical tools. Traditional approaches may focus on reporting existing satisfaction scores rather than predicting future satisfaction outcomes. Relationships between workload, salary, working hours, performance, and satisfaction may require additional statistical analysis. Satisfaction trends across departments and job roles may not always be available through interactive dashboards. Employee comments and feedback may remain unstructured and difficult to analyze systematically. Periodic surveys may also provide limited continuous monitoring of employee experience. Separate tools may be required for advanced Machine Learning analysis. These limitations create a need for an integrated system that combines employee satisfaction tracking, analytics, visualization, and prediction.

Disadvantages of Existing System

- Heavy dependence on periodic employee surveys.
- Manual analysis can be time-consuming.
- Limited predictive satisfaction analysis.
- Difficult to process large employee datasets.
- Limited department-wise satisfaction comparison.
- Limited job-role-wise satisfaction analysis.
- Workplace factors may not be analyzed together.
- Employee feedback can remain unstructured.
- Limited real-time satisfaction monitoring.
- Manual report generation may be required.

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- Separate tools may be needed for Machine Learning.
- Difficult to identify complex satisfaction patterns.

Proposed System

The proposed Employee Satisfaction Score Prediction system provides a centralized platform for analyzing employee satisfaction and predicting satisfaction outcomes. Users can upload historical HR datasets or connect the system to an authorized employee data source. The validation module checks required fields, data types, formats, and basic data quality. The preprocessing module removes duplicate records and handles missing, invalid, and inconsistent information. Numerical and categorical features are transformed into suitable formats for analytical and Machine Learning tasks. Feature engineering creates attributes such as workload category, salary band, experience group, performance category, and working-hour group. The analytics module calculates average satisfaction, satisfaction distribution, department-wise satisfaction, and role-wise satisfaction. Correlation analysis identifies relationships between satisfaction and selected workplace factors. The system can analyze the influence of workload, salary, working hours, training, performance, and experience where these attributes are available. A Machine Learning model is trained using historical employee records to predict numerical satisfaction scores or satisfaction categories. The prediction module generates estimated satisfaction outcomes for suitable employee inputs. Interactive dashboards display KPIs, satisfaction distributions, trends, comparisons, and prediction results. The proposed system therefore provides a unified platform for employee satisfaction analytics and predictive HR insights.

Advantages of Proposed System

- Provides centralized employee satisfaction analytics.
- Automates satisfaction-score analysis.
- Supports department-wise satisfaction analysis.
- Supports job-role-wise comparison.
- Analyzes multiple workplace factors.
- Provides interactive dashboards.
- Identifies satisfaction patterns and trends.
- Supports numerical satisfaction prediction.
- Supports low, medium, and high satisfaction classification.
- Reduces manual HR analysis effort.
- Supports data-driven workforce planning.
- Can be extended with employee feedback analysis.

IV. METHODOLOGY

The methodology begins with collecting historical employee and satisfaction data from authorized HR datasets, surveys, or organizational sources. The collected data is validated to check its structure, required attributes, data types, and completeness. Data preprocessing is performed to remove duplicate records and handle missing, invalid, and inconsistent values. Numerical attributes such as salary, working hours, workload, performance, and satisfaction scores are converted into suitable numerical formats. Categorical attributes such as department, job role, education, and employment type are encoded for analysis and Machine Learning. Feature engineering creates useful attributes such as experience groups, workload categories, salary bands, and performance categories. Exploratory Data Analysis is performed to understand satisfaction distributions and identify important workplace patterns. Statistical and

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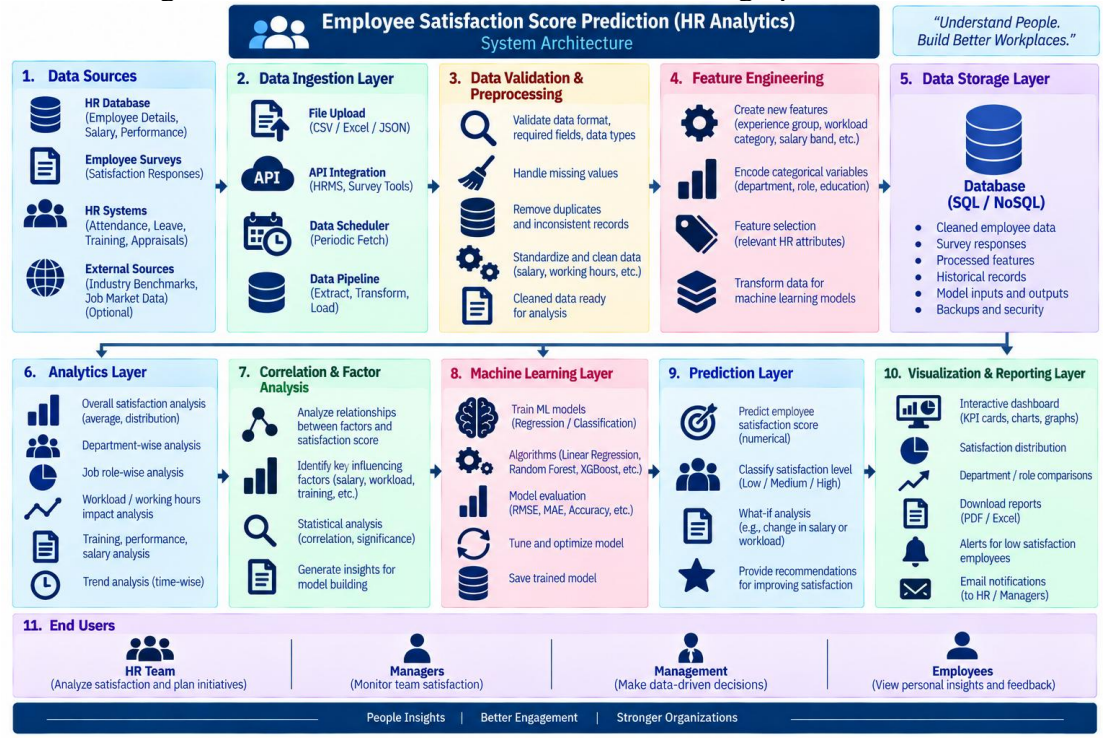
correlation analysis is used to examine relationships between satisfaction and selected employee factors. Visualization techniques are applied to compare satisfaction across departments, job roles, experience groups, and other categories. Machine Learning models can be trained using historical employee features to predict satisfaction scores or satisfaction categories. Suitable evaluation metrics are used to measure model performance and compare prediction results. Finally, analytical insights and predicted satisfaction outcomes are presented through an interactive HR analytics dashboard.

SYSTEM ARCHITECTURE

The system architecture consists of several interconnected layers that process employee information and generate satisfaction analytics and predictions. The Data Source Layer provides employee, salary, department, job-role, workload, working-hour, performance, training, and satisfaction information from authorized HR sources. The Data Input Layer accepts information through CSV files, Excel files, databases, surveys, or APIs. The Data Validation Layer checks file formats, required fields, data types, and basic data quality. The Data Preprocessing Layer handles missing values, duplicate records, invalid entries, and inconsistent formats. The Feature Engineering Layer creates attributes such as experience groups, workload categories, salary bands, performance categories, and working-hour groups. The Data Storage Layer securely stores cleaned employee and satisfaction records. The Satisfaction Analytics Layer calculates average satisfaction, satisfaction distribution, department-wise scores, role-wise scores, and other HR indicators. The Correlation and Factor Analysis Layer examines relationships between satisfaction and available workplace factors. The Machine Learning Layer trains and evaluates models for satisfaction-score prediction or satisfaction classification. The Prediction Layer generates estimated satisfaction scores or categories for suitable employee inputs. The Visualization Layer presents results through interactive dashboards, KPI cards, charts, graphs, tables, and filters.



V. RESULT AND OUTPUT

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VI. CONCLUSION

The Employee Satisfaction Score Prediction (HR Analytics) system provides a data-driven platform for analyzing employee satisfaction and predicting satisfaction outcomes. The system converts employee-related data into meaningful insights through data preprocessing, statistical analysis, visualization, and Machine Learning techniques.

The system analyzes important factors such as salary, workload, working hours, job role, department, experience, training, performance, and work-life balance. These factors help identify patterns and relationships that may be associated with employee satisfaction.

The interactive dashboard presents results through KPI cards, department-wise satisfaction charts, satisfaction-level distribution, job-role analysis, satisfaction trends, factor analysis, and employee-level summaries. These visualizations make complex HR data easier to understand and support effective workforce analysis.

The prediction module can estimate an employee's satisfaction score or classify the employee into categories such as Low, Medium, or High Satisfaction based on available historical data. This can provide useful analytical information for identifying areas where additional employee-support initiatives may be considered.

In the future, the system can be enhanced with real-time employee surveys, sentiment analysis of feedback, personalized engagement recommendations, employee attrition-risk analysis, skill-gap analysis, automated HR alerts, and advanced Machine Learning models. These enhancements can make the system more comprehensive for continuous employee experience and workforce analytics.

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