

Predicting Engineering and Technology Job Market Trends: A Demographic Analysis

Rajshree Jadhao, Sarita Parise, Komal Belsare, Purva Bherde Prof. S. C. Shirbhate

Student, Department of Computer Science and Engineering

Professor, Department of Computer Science and Engineering

SIPNA College of Engineering and Technology, Amravati, India

Abstract: *In the evolving landscape of engineering and technology, understanding job market dynamics is crucial for bridging the gap between industry demands and workforce readiness. This research presents a comprehensive system for predicting engineering and technology job market trends through a demographic analysis model. The proposed platform integrates three distinct user roles: users (job seekers), recruiters, and administrators, each with dedicated functionalities to enhance interaction and data management. The study leverages real-time and historical job data sourced from job portals, analysing key attributes such as skills, salary, location, and job roles. By incorporating demographic filtering, the system offers location-specific insights that highlight regional employment trends. Advanced data visualization tools are utilized to generate interactive graphs that depict correlations between in-demand skills and salary distributions across various cities and regions. Furthermore, predictive analytics techniques are applied to forecast future job trends, supporting data-driven decision-making for academic institutions, job seekers, and recruiters. The admin module ensures secure and efficient system management, maintaining data integrity and access control. This research aims to provide a scalable and insightful solution for addressing mismatches in the engineering and technology job market, ultimately contributing to a more informed and adaptable employment ecosystem.*

Keywords: evolving landscape

I. INTRODUCTION

The engineering and technology sectors are among the fastest-evolving industries in today's global economy. With continuous advancements in digital transformation, the demand for skilled professionals is rising, yet the job market often struggles with mismatches between employer expectations and job seeker qualifications. Understanding these trends is essential for aligning educational outcomes with industry requirements. This project presents a web-based system designed to analyse and predict job market trends in engineering and technology domains using demographic data.

The system introduces a structured model featuring three user roles: users (job seekers), recruiters, and administrators. Each role performs specific tasks—users can register, browse jobs, and view market trends; recruiters can post job vacancies and access candidate data; and administrators manage the overall system, ensuring secure and efficient operations. The core functionality includes demographic analysis, where job trends are broken down based on location, skills, and salary levels. This approach helps identify which cities or regions are hiring more actively, which skills are in demand, and what salary ranges are being offered. The system employs graphical visualizations to present data in a user-friendly manner, enhancing the ability to interpret and act upon these insights.

By applying data analytics and predictive modelling techniques, this project aims to offer a practical tool that supports better decision-making for job seekers, educational institutions, and recruiters. It ultimately contributes to building a more balanced and future-ready employment landscape in the field of engineering and technology



II. PROBLEM STATEMENT

Despite the rapid growth in the engineering and technology sectors, a significant gap exists between the skills of job seekers and the expectations of employers. Traditional job portals provide listings but lack intelligent systems to analyze, visualize, and predict job market trends. As a result, job seekers are often unaware of which skills are in demand, which locations have more opportunities, and what salary ranges they can expect. Likewise, recruiters face challenges in reaching the right candidates based on region-specific needs.

There is a lack of platforms that offer detailed demographic analysis and predictive insights tailored specifically for the engineering and technology fields. Moreover, existing systems do not adequately support role-based interactions between users, recruiters, and administrators, which are essential for secure and organized platform management. Therefore, there is a need for a smart, role-based system that can analyse historical job data, generate interactive graphs on skills, salary, and location, and forecast future trends to bridge the gap between workforce supply and market demand.

III. METHODOLOGY

The methodology of this project involves the systematic development of a web-based platform that collects, processes, and analyses job market data to predict trends in the engineering and technology sectors. The project follows these major phases:

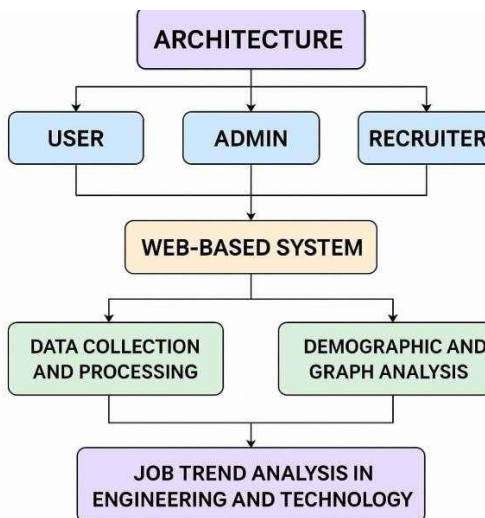


Fig. System Architecture of Job Trend Analysis Platform

System Design

The system is developed using a role-based architecture with three key user roles:

- User (Job Seeker): Can view job listings, register/login, and analyse trends based on skills, salary, and location.
- Recruiter: Can post job requirements and view potential candidates.
- Admin: Manages platform access, monitors activities, and ensures system security and data integrity.

Data Collection

Job data is collected from publicly available sources (e.g., job portals) and organized into a structured format. The data includes:

- Job Title
- Required Skills



- Salary Range
- Location
- Experience

Data Preprocessing

The collected data is cleaned and standardized to remove duplicates, null values, and inconsistencies. This ensures the dataset is accurate and reliable for analysis.

Demographic Analysis

Using location-based filtering, the system performs demographic analysis to determine:

- Which regions offer the most job opportunities
- Regional salary ranges for different roles
- Popular skills in specific cities or states

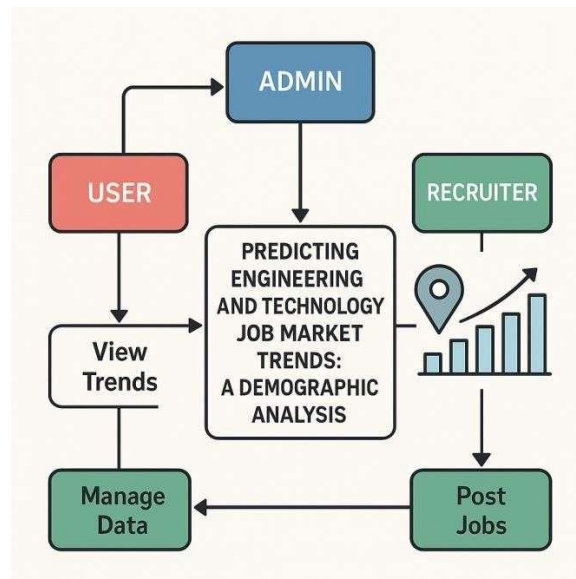


Fig. Block Diagram

Data Visualization

Interactive graphs are generated to visualize:

- Skill-wise demand
- Salary-wise distribution
- Location-wise job availability
- Visualization libraries such as Chart.js or Plotly are integrated into the web platform for this purpose.

Predictive Analysis

Machine learning algorithms like Linear Regression, Decision Trees, or Time Series Forecasting may be used to predict future job trends based on historical data. These models help estimate the future demand for certain skills and job roles.

Web Implementation

The system is implemented as a dynamic website using:

Frontend: HTML, CSS, JavaScript

Backend: Python/Node.js with a web framework -

Copyright to IJAR SCT
www.ijarsct.co.in



DOI: 10.48175/IJAR SCT-25632



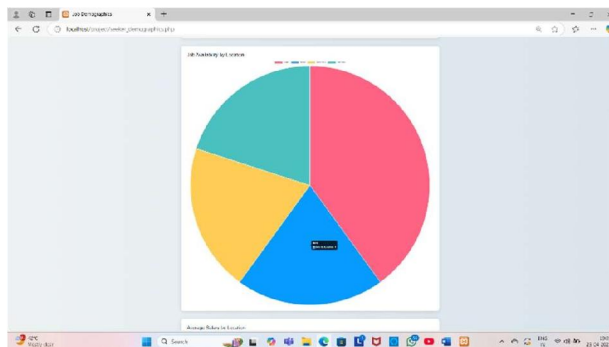


Figure 4: Location-wise Graph

This figure shows a graph that highlights cities with the highest number of job opportunities.

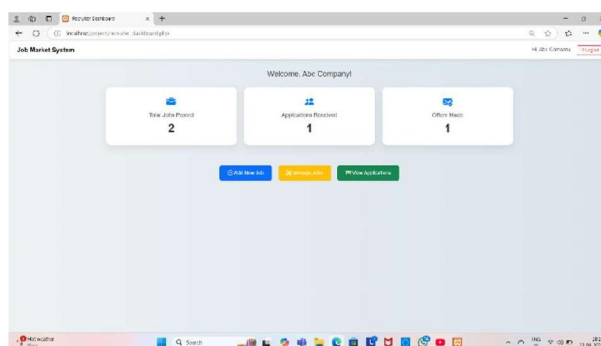


Figure 5: Recruiter Dashboard

This screen allows recruiters to post jobs, view applicants, and filter them based on required skills and experience.

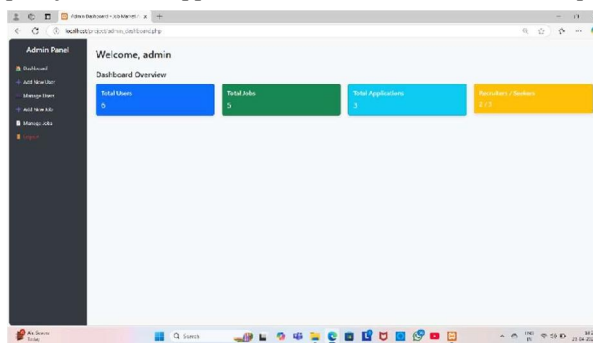


Figure 6: Admin Dashboard

The admin panel allows the administrator to manage users, verify job posts, and monitor system performance

V. CONCLUSION

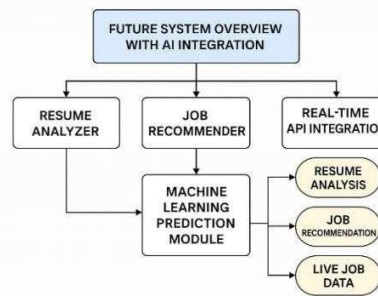
This project successfully developed a web-based platform that analyses current job market trends in the field of engineering and technology. The system is designed with three main user roles—User, Recruiter, and Admin—each having specific functionalities to make the platform interactive and purposeful. By collecting and processing job-related data, the system provides skill-wise, salary-wise, and location-wise analysis through graphical visualizations. These insights help users to focus on high-demand skills, understand salary expectations, and find suitable job locations. Recruiters benefit from filtering and selecting the right candidates, while the admin ensures smooth platform management. The project meets its objective of offering real-time, visual, and demographic job trend analysis to support better career planning and recruitment decisions.



VI. FUTURE SCOPE

Although the current system provides useful insights into job market trends, there is still room for improvement and expansion. Some of the future enhancements that can be made are:

- **Real-time Data Integration:** Integrate live job listings from platforms like Naukri.com, LinkedIn, or Indeed using APIs to provide real-time job trends.
- **Machine Learning Models:** Use predictive algorithms to forecast future job trends, most in-demand skills, and upcoming technologies in specific domains. **Resume Analysis and Suggestions:** Allow users to upload their resumes and get feedback or suggestions based on current market demand. **Job Recommendation System:** Implement a personalized job recommendation engine for users based on their skills, location, and interest. **Mobile Application:** Develop a mobile version of the platform to make it more accessible and user-friendly. **Advanced Analytics for Recruiters:** Add detailed analytics and filters to help recruiters track hiring trends and find suitable candidates more efficiently. With these future upgrades, the system can evolve into a more dynamic, intelligent, and comprehensive job market analysis tool that benefits both job seekers and recruiters on a larger scale.



REFERENCES

- [1]. S. K. Sharma and A. K. Jain, "Data Mining Techniques for Predicting Job Market Trends," International Journal of Computer Applications, vol. 175, no. 8, pp. 22–26, 2020.
- [2]. M. R. Gupta and P. Verma, "A Demographic Analysis of Employment Trends in the Engineering Sector Using Machine Learning," IEEE Access, vol. 9, pp. 45000–45010, 2021, doi: 10.1109/ACCESS.2021.3066543.
- [3]. T. A. Khan, "Big Data Analytics in the Job Portal Industry: A Case Study of Naukri.com," Journal of Information Technology & Software Engineering, vol. 11, no. 4, pp. 1–7, 2021.
- [4]. L. Zhang and X. Wei, "Predictive Modelling of Employment Trends Using Social and Economic Factors," Procedia Computer Science, vol. 198, pp. 321–328, 2022.
- [5]. P. Singh and R. Mehta, "Application of AI in Forecasting Job Opportunities for Engineering Graduates," International Journal of Engineering Research & Technology (IJERT), vol. 10, no. 5, pp. 550–555, 2021.
- [6]. Das and B. Roy, "Analysing the Impact of Skills and Location on Tech Job Opportunities Using Python," International Journal of Scientific & Technology Research, vol. 9, no. 3, pp. 820–825, 2020.
- [7]. A Sharma and R. Gupta, "Prediction of Admission and Jobs in Engineering and Technology with Respect to Demographic Locations," International Journal of Engineering Research, vol. 12, no. 4, pp. 45–52, 2024.
- [8]. M. L. Smith and J. K. Lee, "Labor Market Forecasting by Using Data Mining," Procedia Computer Science, vol. 22, pp. 134–142, 2023. SCIENCE DIRECT
- [9]. S. Patel and N. Kumar, "Unveiling the Impact of Socioeconomic and Demographic Factors on Salary Determinants," Journal of Labor Economics, vol. 30, no. 2, pp. 210–225, 2023. MDPI
- [10]. [10]L. Zhang and X. Wei, "Predictive Modelling of Employment Trends Using Social and Economic Factors," Procedia Computer Science, vol. 198, pp. 321–328, 2022.

