

A

Mini Project Report on

AI-Driven Predictive Analytics for Identifying Emerging Trends in Quality-Oriented Employment

Submitted in partial fulfillment of the requirements for the degree
of
BACHELOR OF ENGINEERING
IN

Computer Science & Engineering
Artificial Intelligence & Machine Learning

by

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University Of Mumbai 2024-2025



Parshvanath Charitable Trust's
A. P. SHAH INSTITUTE OF TECHNOLOGY
(Approved by AICTE New Delhi & Govt. of Maharashtra, Affiliated to University of Mumbai)
(Religious Jain Minority)



**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
(ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)**

CERTIFICATE

This is to certify that the project entitled “**AI-Driven Predictive Analytics for Identifying Emerging Trends in Quality-Oriented Employment**” is a bonafide work of Vrushabh Jain (22106120), Harsh Salunkhe (19203020), Sunny Chavan (22106008), Christina D’Cruz (22106024) submitted to the University of Mumbai in partial fulfillment of the requirement for the award of **Bachelor of Engineering in Computer Science & Engineering (Artificial Intelligence & Machine Learning)**.

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**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
(ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)**

PROJECT REPORT APPROVAL

This Mini project report entitled “**AI-Driven Predictive Analytics for Identifying Emerging Trends in Quality-Oriented Employment**” by **Vrushabh Jain, Harsh Salunkhe, Sunny Chavan and Christina D’Cruz** is approved for the degree of ***Bachelor of Engineering in Computer Science & Engineering, (AIML) 2024-25.***

External Examiner: _____

Internal Examiner: _____

Place: APSIT, Thane

Date:

DECLARATION

We declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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ABSTRACT

This report presents the development of an AI-driven predictive system designed to forecast trends in quality-oriented jobs. The increasing complexity of the job market necessitate reliable insights for employers, job seekers, and HR teams. By leveraging historical job market data and skill demand trends, the system employs the Seasonal Autoregressive Integrated Moving Average (SARIMA) algorithm to generate accurate predictions. The implementation follows a systematic approach, encompassing data collection, frontend and backend development, database management using MySQL, and web scraping through Python libraries. Initial findings indicate the system's potential to provide actionable insights into future job roles, thus addressing the growing need for informed decision-making in the dynamic job market. This report outlines the methodology, implementation details, and anticipated outcomes of the project, contributing to a deeper understanding of job market dynamics and aiding stakeholders in strategic planning.

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CHAPTER 1

INTRODUCTION

1. INTRODUCTION

In today's rapidly evolving job market, the nature of employment is undergoing significant transformation, thus with an increasing focus shifting towards quality oriented job roles. Understanding the importance of these job roles is primarily important for all the educational organizations, businesses, students etc. to align their strategies with the future demands of the work force. This project aims to develop a sophisticated software solution that leverages machine learning (ML) techniques to forecast trends in quality-oriented jobs by analyzing the past data of majorly these four sectors: Technology, Healthcare, Finance and Manufacturing. The predictive model developed through this proposed system will offer valuable insights into future job opportunities based on location, industry sector, salary packages, and eligibility criteria. By accurately predicting the future landscape of quality-oriented jobs, this proposed system will contribute to better workforce planning and an improved future in different sectors.

CHAPTER 2

LITERATURE SURVEY

2. LITERATURE SURVEY

2.1-HISTORY

Jobify: A Job Trends Predictor was developed to analyze and forecast job market trends using historical job posting data. The project leverages the SARIMA (Seasonal AutoRegressive Integrated Moving Average) model to generate accurate, time-based predictions of job demand across various sectors. To train and validate the model, we collected and preprocessed datasets from major job portals such as Naukri, LinkedIn, and others. These datasets provided valuable insights into job title frequency, industry demand, and seasonal hiring patterns. Jobify aims to assist job seekers, recruiters, and career advisors by offering data-driven foresight into emerging opportunities and hiring trends.

2.2-LITERATURE REVIEW

1) Title: A machine learning-based job forecasting and trend analysis system to predict future job markets using historical data

Authors: Sharanaja Senthurvelautham, Nipuna Senanayake

Features: a) Accurate predictions in job trends using LSTM model.

b) Considers the required skill and role for accurate prediction.

Algorithm Used:

Auto-Regressive Prediction using A Bidirectional LSTM model

Results and conclusion:

a) Predicting emerging job trends on the basis of skill and role.

b) Generated reports that can be used to illustrate the trends and patterns in various aspects such as role and skill in the job market.

Research Gaps:

Research lacks the use of multiple factors and domains resulting in restricted sectors.

Limitations:

a) Only restricted to certain factors i.e skill and role.

b) Complexity in training and implementation of model.

2) Title: Predicting the Trends of Quality Oriented Jobs

Authors: Sahil Yadav¹, Suyrakant Singh², Dev Patel³, Silviya D'Monte⁴

Features: Focuses on data collection from job sites, trend analysis using machine learning, and predictions based on location, and eligibility.

Algorithm Used: Random Forest Algorithm

Results and conclusion:

- a) Effective in predicting the trends in the IT job sector.
- b) Quick and easy to implement as it focuses on only one job sector

Research Gaps:

- a) Research about other sectors lacks.
- b) Insufficient research on model selection

Limitations:

- a) Focuses only on single sector.
- b) The prediction results are not so accurate.
- c) Large amount of data leading to higher time for preprocessing.

3) Title: Artificial Intelligence on Job-Hopping Forecasting: AI on Job-Hopping

Authors: Nathan Kosylo¹, John Smith¹, Matthew Conover¹, Leong Chan², Hongtao Zhang³, Hanfei Mei³, Renzhi Cao¹

Features: Considers multiple factors like GPA, location, University Major Companies for prediction.

Algorithm Used: Sequentially optimized Naïve Bayesian Algorithm

Results and conclusion:

- a) Detected the Impact of GPA on Job-hopping Pattern.
- b) Detected the Impact of Degree Information on Job-hopping Patterns.
- c) Compared the efficiency of Convolutional Neural Networks and SNOB algorithm.

Research Gaps:

- a) Implementation of long term prediction lacks.
- b) Uses only bar graphs for Data visualizations

Limitations:

- a) Does not accurately predict future trends rather focuses on the present trends more.
- b) Short term prediction analysis.

4) Title: Evaluation of the trends in jobs and skill-sets using data analytics

Authors: Armin Alibasic, Himanshu Upadhyay¹, Mecit Can Emre Simsekler¹, Thomas Kurfess²

Features: Evaluates job and skill trends using data from various sectors, with a focus on automation's impact on jobs.

Algorithm Used: Factor Analysis, Principal Component Analysis (PCA).

Results and conclusion:

- a) Identified critical skill sets and their evolution over time.
- b) Analyzes the impact of automation on certain job roles.

Research Gaps:

Research for other sectors lacks, primarily focuses on oil and gas industry only.

Limitations:

- a) Challenges faced in analyzing on the basis of location.
- b) Focuses on analyzation rather than prediction.

5)Title: AI based suitability measurement and prediction between job description and job seeker profiles

Authors: Sridevi G.M.*, S. Kamala Suganthi

Features:

- a) Prediction based on Job title, Education, location and skills.
- b) Utilized AI and skillset for selection of a better candidate

Algorithm Used: Genetic Algorithm and Artificial neural networks.

Results and conclusion:

- a) Machine learning classifiers were used to predict candidate suitability.
- b) High accuracy based on the XGboost Classifier used.

Research Gaps:

- a) There is a need to utilize the work experience of the candidate from the resume.
- b) Exploring more effective textual features for classification of candidate suitability is required.

Limitations:

- a) The system relies heavily on textual data from resumes and job descriptions, potentially overlooking non-textual qualifications.
- b) The accuracy of the system depends on the quality and completeness of the input data from both resumes and job descriptions.

CHAPTER 3

PROBLEM STATEMENT

3. PROBLEM STATEMENT

In today's dynamic job market, the landscape of employment is evolving towards quality oriented roles that emphasize skill proficiency, job satisfaction, and career growth. Predicting these emerging trends is crucial for individuals, educational institutions, policymakers, and businesses to align their strategies with future job demands effectively. The objective is to develop a software solution to predict the future jobs based on location, sectors, package and eligibility. Big data analysis can be useful to collect and analyse data from different job sites and predict the future requirements applying machine learning /deep learning techniques.

CHAPTER 4

EXPERIMENTAL SETUP

4. EXPERIMENTAL SETUP

4.1 HARDWARE SETUP

The hardware requirements for this system are quite minimal, similar to a standard desktop computer or laptop. It does not require any specific hardware configurations beyond those necessary for everyday computing tasks. This makes it accessible to a wide range of users.

4.2 SOFTWARE SETUP

For the proposed system using the SARIMA model, MySQL is used to manage the user authentication and store necessary data such as job market information.

I. Database Structure and Design

- Users Table (for Login and Authentication)
- Job Trends Table (for storing historical job data)
- Predictions Table (for storing prediction results)
- Industry Table (for categorizing job data by industry)
- Skills Table (for managing job-related skills data)
- To implement the frontend of the proposed system, the core components will be designed using HTML for structure, CSS for styling, JavaScript for interactivity, and PHP for backend integration and server-side functionality
- For the backend implementation of the proposed system till now, we have chosen a combination of PHP, MySQL, and Python to handle different aspects of the system. Here's an overview of the technologies used:

1. PHP for User Login

2. MySQL for Database Management

3. Python for Web Scraping

CHAPTER 5

PROPOSED SYSTEM & IMPLEMENTATION

5. PROPOSED SYSTEM & IMPLEMENTATION

5.1 BLOCK DIAGRAM OF PROPOSED SYSTEM

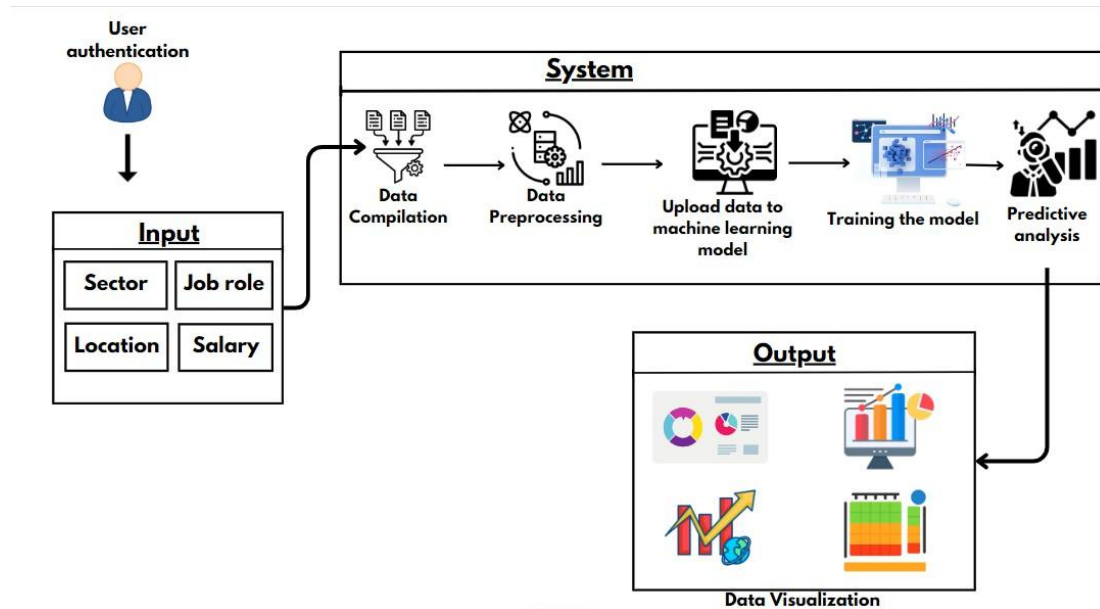


Figure 3-1: Architectural Diagram of Proposed System

5.2 DESCRIPTION OF BLOCK DIAGRAM

1. User Authentication

The system begins with user authentication to ensure secure access.

2. Input Section

The user provides job-related inputs, including:

Sector (Industry category)

Job Role (Specific position)

Location (Geographical area)

Salary (Compensation details)

3. System Workflow

The system processes input data through several stages:

Data Compilation: Collects relevant job data from various sources.

Data Preprocessing: Cleans, normalizes, and prepares data for analysis.

Upload Data to ML Model: The processed data is fed into a machine learning model.

Training the Model: The ML model learns patterns from the data.

Predictive Analysis: The trained model makes predictions based on input parameters.

4. Output Section

The final results are visualized through:

Charts and Graphs

Trend Analysis

Insights on Salary, Job Demand, and Market Trends

5.3 IMPLEMENTATION

For the AI-driven predictive analysis to forecast trends in quality-oriented jobs, we propose utilizing the **SARIMA** (Seasonal Autoregressive Integrated Moving Average) model. This model is particularly suited for analysing time series data with both trend and seasonal components, making it ideal for predicting job market trends over time. Below is the proposed overall algorithm for the system:

1. Data Collection and Preprocessing
2. Exploratory Data Analysis (EDA)
3. Stationarity Check and Differencing
4. Model Selection (SARIMA)
5. Model Training
6. Model Evaluation and Validation
7. Prediction and Forecasting
8. Post-Processing and Insights Generation
9. Visualization of Results

Implementation of Front end

To implement the frontend of the proposed system, the core components will be designed using HTML for structure, CSS for styling, JavaScript for interactivity, and PHP for backend

integration and server-side functionality

Implementation of Backend

For the backend implementation of the proposed system till now, we have chosen a combination of PHP, MySQL, and Python to handle different aspects of the system. Here's an overview of the technologies used:

4. PHP for User Login

- PHP is responsible for managing user authentication and session handling. We've implemented a secure login system where:
 - User credentials are validated by comparing the submitted login data with records stored in the **MySQL database**.
 - Passwords are hashed before storing to ensure security.
 - PHP sessions are used to manage user logins and permissions across the website.

5. MySQL for Database Management

- The MySQL database stores essential data, including user credentials. We may use the same database in order to store the vast amount of data of different job roles that will be scraped from the website using web scraping.

6. Python for Web Scraping

- Python is used to handle web scraping the Naukri.com website, utilizing Selenium and BeautifulSoup (bs4) libraries.
 - Selenium is employed for dynamic web pages, allowing the automation of browser actions to gather job-related data from online sources that require user interactions (like scrolling or clicking).
 - BeautifulSoup is used for parsing the HTML content, extracting valuable information such as job postings, company details, salary data, etc.

The scraped data is processed and stored in the MySQL database, where it can be further analysed or used for trend prediction using the SARIMA model

CHAPTER 6

CONCLUSION

6. CONCLUSION

In conclusion, this project can be considered an efficient and a robust system that leverages big data analysis and advanced machine learning techniques to forecast trends in quality-oriented jobs. This system will identify and highlight key factors driving the demand for quality oriented jobs, such as technological advancements, economic conditions, and changes in industry standards. The system will help provide job seekers with insights into emerging job roles, required skills, and salary expectations, helping them align their career paths with future opportunities. By providing actionable insights, the system supports the creation of a more dynamic, resilient, and future-ready workforce, ultimately contributing to economic stability and growth of the nation.

7. REFERENCES

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