

## Introduction

In today's evolving job market, the gap between employability skills and industry requirements remains a major challenge, particularly in rural areas. Many youth possess technical abilities but lack access to career guidance or training opportunities. SkillBridge is an AI-powered career guidance platform that bridges this gap by intelligently mapping users' skills, education, and regional preferences to relevant jobs and professional courses. Using NLP and machine learning, it generates personalized recommendations to help users make informed career choices. Its multilingual chatbot ensures accessibility for diverse users, while data visualization and analytics offer valuable insights into job trends and skill demands. Overall, SkillBridge promotes inclusive growth by connecting skills to opportunities through intelligent automation.

## Scope of Project

The scope of SkillBridge is to develop an AI-powered system that bridges the gap between skills and employment opportunities. It provides personalized job and course recommendations based on users' skills, education, and region. The platform uses machine learning and NLP to analyze user profiles and suggest relevant opportunities. A multilingual chatbot enhances accessibility for non-English users. The system also integrates data visualization for better insights. Overall, it promotes employability and career growth through smart automation.

## Methodology

The methodology of SkillBridge is divided into several key stages:

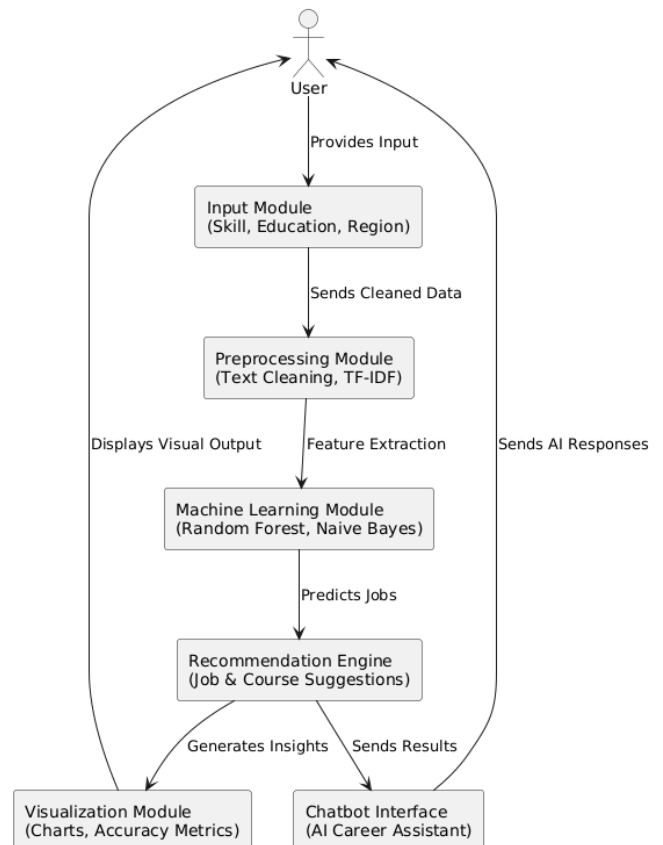
1. **Data Collection:** Job, course, and user profile data are gathered from reliable sources.
2. **Data Preprocessing:** Text data is cleaned using natural language processing (NLP) techniques such as tokenization, stop-word removal, and normalization.
3. **Feature Extraction:** TF-IDF vectorization is used to convert user skills and education into numerical features for model training.
4. **Model Training:** Machine learning models like Random Forest and Multinomial Naive Bayes are trained to predict suitable job and course matches.
5. **Recommendation Engine:** The system computes similarity scores between user profiles and job/course data to generate top recommendations.

6. **Chatbot Integration:** A multilingual chatbot enhances accessibility and provides AI-driven career guidance.
7. **Visualization:** Data visualization tools are employed to analyze job trends, skill demands, and system performance.

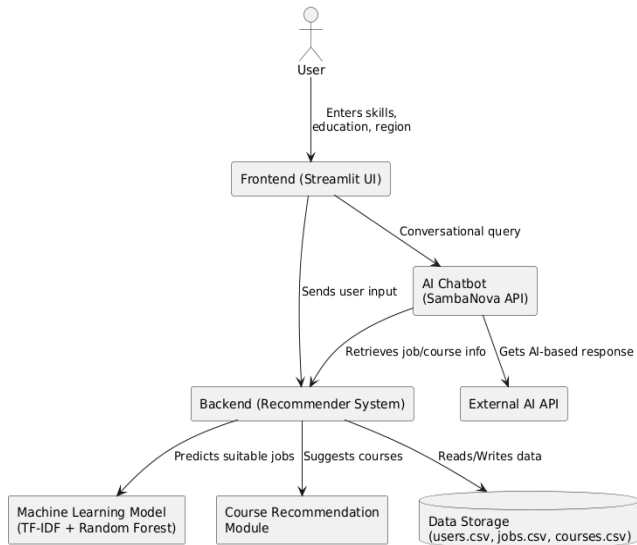
## Analytics Tools Used

Tool / Library	Purpose / Functionality
Pandas	Data cleaning, manipulation, and preprocessing.
NumPy	Numerical computation and efficient data handling.
Scikit-learn	Machine learning model training and evaluation.
TF-IDF Vectorizer & Cosine Similarity	Skill-to-job and course similarity matching.
Matplotlib & Seaborn	Data visualization and trend analysis.
Streamlit	Interactive user interface and real-time visualization.

## System Architecture



## SkillBridge - System Architecture



## Sample Code

```

# SkillBridge: Job Recommendation using Trained Model

import pickle
import pandas as pd

# Load pre-trained model
(SkillBridge_JobRecommender.pkl)
with open('SkillBridge_JobRecommender.pkl', 'rb') as f:
    model = pickle.load(f)

# Sample user input
user_data = {
    'skills': ['electrical', 'maintenance', 'wiring'],
    'education': 'Diploma in Electrical',
    'region': 'Tamil Nadu'
}

# Convert user input to DataFrame
input_df = pd.DataFrame([user_data])

# Predict suitable jobs
recommendations = model.predict(input_df)

# Display results
print("Recommended Jobs for You:")
for job in recommendations:
    print("-", job)
    
```

Project Link:  <https://github.com/harishy0406/SkillBridge>

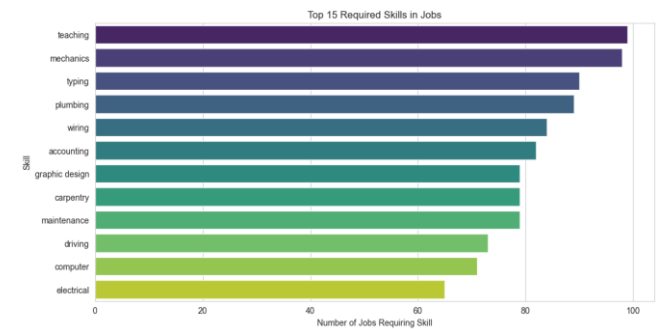
## Performance Metrics

Performance Metrics of SkillBridge Job Classification Model:

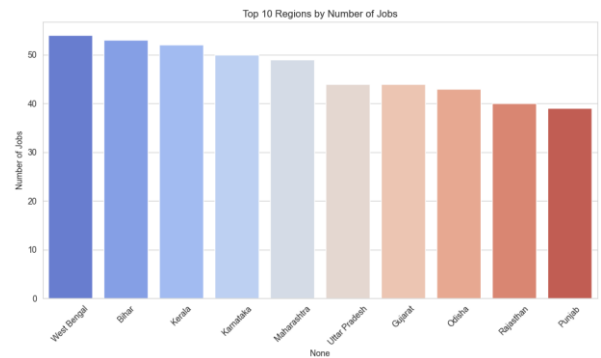
Metric	Government	Private	Macro Avg	Weighted Avg
<b>Precision</b>	0.62	0.71	0.66	0.66
<b>Recall</b>	0.80	0.50	0.65	0.65
<b>F1-Score</b>	0.70	0.59	0.64	0.64
<b>Accuracy</b>	0.60	0.63	<b>0.65</b>	<b>0.65</b>
<b>Support</b>	10	10	10	20

## Result

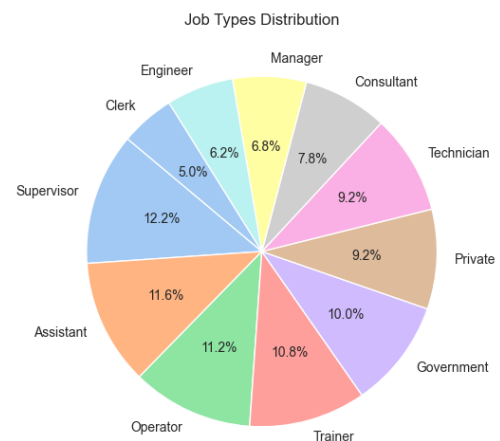
Top 15 Required Skills in Jobs:



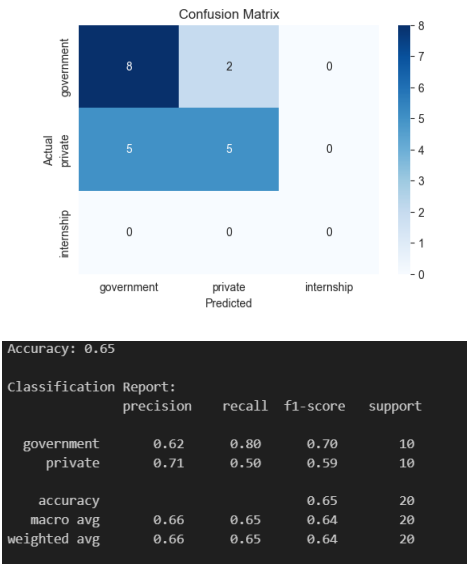
Top 10 Regions by Number of Jobs:



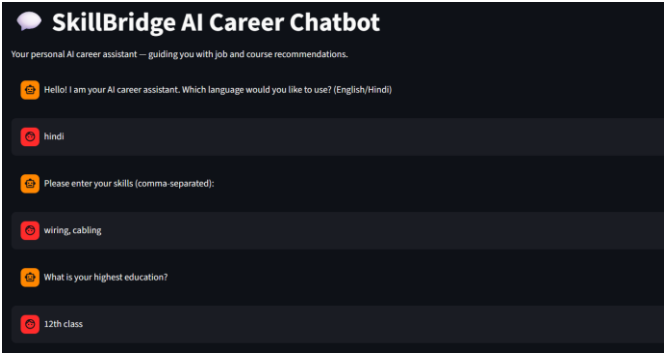
Job Types Distribution:



Classification Report:



SkillBridge AI Career Chatbot Interface:



Chatbot Response:

Hi, I'd be happy to help you with job recommendations and course suggestions.

Job Recommendations:

Job Title	Company Name	Location	Salary (approx.)
Electrician	L&T Construction	Vellore	₹ 25,000 - ₹ 35,000
Cabling Engineer	BSNL	Vellore	₹ 20,000 - ₹ 30,000
Electrical Technician	Siemens	Ranipet	₹ 25,000 - ₹ 40,000
Wireman	Tata Power	Vellore	₹ 18,000 - ₹ 28,000
Electrical Supervisor	CESC	Vellore	₹ 35,000 - ₹ 50,000
Cabling Technician	Airtel	Vellore	₹ 18,000 - ₹ 28,000
Electrical Engineer	Schneider Electric	Ranipet	₹ 40,000 - ₹ 60,000
Electrical Mechanic	Havells India	Vellore	₹ 20,000 - ₹ 35,000

Course Recommendations:

Course Name	Provider	Link
Diploma in Electrical Engineering	Vellore Institute of Technology (VIT)	<a href="https://vit.ac.in/">https://vit.ac.in/</a>
Certificate in Electrical Wiring	National Skill Development Corporation (NSDC)	<a href="https://nsdcindia.org/">https://nsdcindia.org/</a>
Bachelor of Engineering in Electrical and Electronics Engineering	Anna University	<a href="https://www.annauniv.edu/">https://www.annauniv.edu/</a>
Certificate in Cabling and Networking	Cisco Networking Academy	<a href="https://www.netacad.com/">https://www.netacad.com/</a>
Diploma in Electrical and Electronics Engineering	Government Polytechnic College, Vellore	<a href="https://gpvcvellore.ac.in/">https://gpvcvellore.ac.in/</a>
Certificate in Electrical Safety and Maintenance	National Safety Council of India	<a href="https://www.nscindia.org/">https://www.nscindia.org/</a>
Bachelor of Technology in Electrical Engineering	SRM Institute of Science and Technology	<a href="https://www.srmist.edu.in/">https://www.srmist.edu.in/</a>
Certificate in Electrical Installation and Maintenance	Indian Society for Technical Education (ISTE)	<a href="https://www.isteonline.org/">https://www.isteonline.org/</a>

Career Guidance Tips:

- Develop a strong foundation in mathematics and science. As an electrician or electrical engineer, you will need to have a solid understanding of mathematical and scientific concepts, such as algebra, geometry, and physics.
- Gain practical experience. Try to gain as much practical experience as possible by working on projects, volunteering, or interning with electrical companies.
- Stay up-to-date with industry developments. The electrical industry is constantly evolving, so it's essential to stay informed about new technologies, techniques, and regulations.
- Consider specializing in a particular area. With experience and training, you can specialize in a particular area of electrical work, such as industrial electrical systems, electrical safety, or renewable energy.

I hope this helps you in your career journey!

The developed SkillBridge model achieved an overall accuracy of **65%**, demonstrating reliable performance in classifying job categories based on user skills and education. The precision and recall scores indicate a balanced prediction capability across government and private sectors. The chatbot component effectively interacts with users, gathering inputs and providing relevant career guidance seamlessly. Its integration with the trained model ensures context-aware responses. Overall, the system shows strong potential for enhancing job accessibility and personalized career recommendations for rural youth.

Conclusion

In conclusion, the **SkillBridge** system successfully bridges the gap between rural youth and suitable job opportunities through AI-driven recommendations. By combining machine learning techniques with a multilingual chatbot interface, it personalizes career guidance based on individual profiles. The model’s performance demonstrates its effectiveness in predicting relevant job categories and suggesting professional courses. Interactive communication ensures accessibility even for non-technical users. The integration of analytics and visualization further enhances decision-making. Overall, SkillBridge promotes digital empowerment, employability, and inclusivity. Future work can focus on expanding datasets and improving model accuracy through deep learning techniques.

References:

- CareProfSys: A Job Recommender System Based on Skill and Interests Analysis.  
[https://www.researchgate.net/publication/377843870\\_CareProfSys\\_A\\_Job\\_Recommender\\_System\\_Based\\_on\\_Skill\\_and\\_Interests\\_Analysis](https://www.researchgate.net/publication/377843870_CareProfSys_A_Job_Recommender_System_Based_on_Skill_and_Interests_Analysis)
- Dynamic User Profile-Based Job Recommender System.  
<https://ieeexplore.ieee.org/document/10323590>
- Github  
<https://github.com/harishy0406/SkillBridge>
- Streamlit Documentation (2024).  
Link: <https://docs.streamlit.io/>
- SambaNova AI API Documentation (2024).  
Link: <https://sambanova.ai/developers>