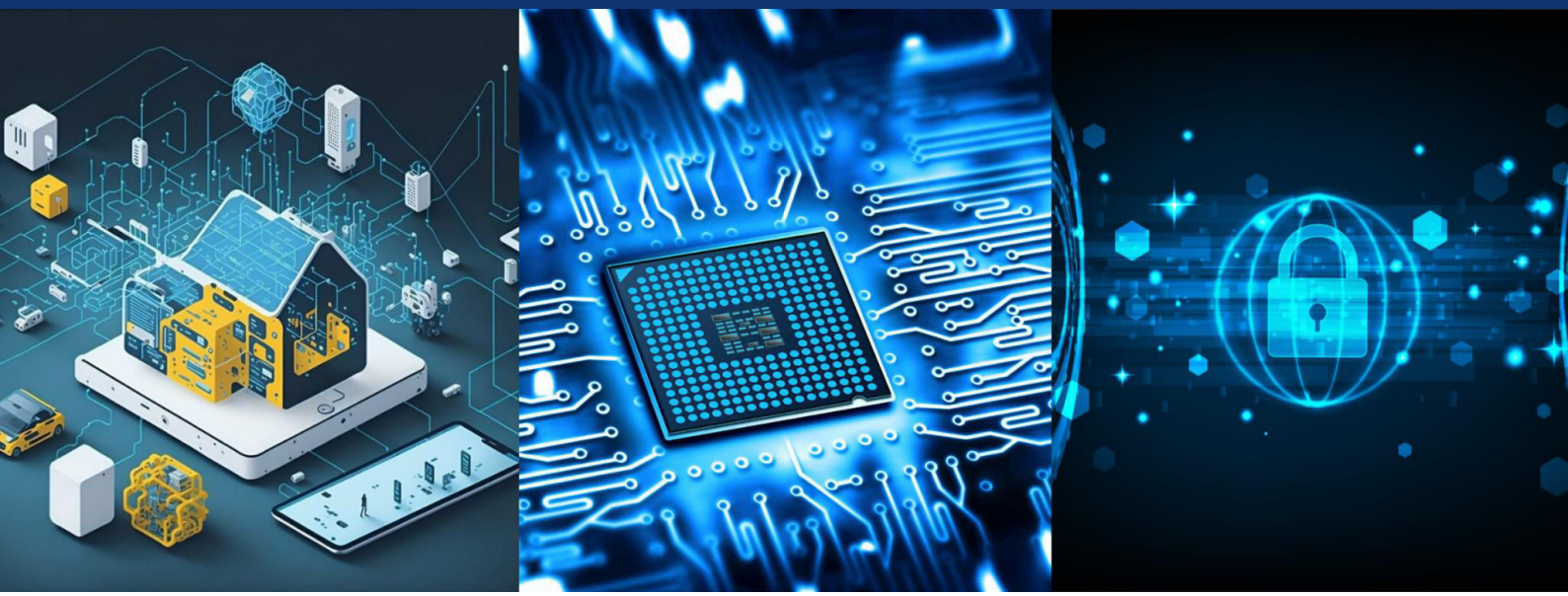
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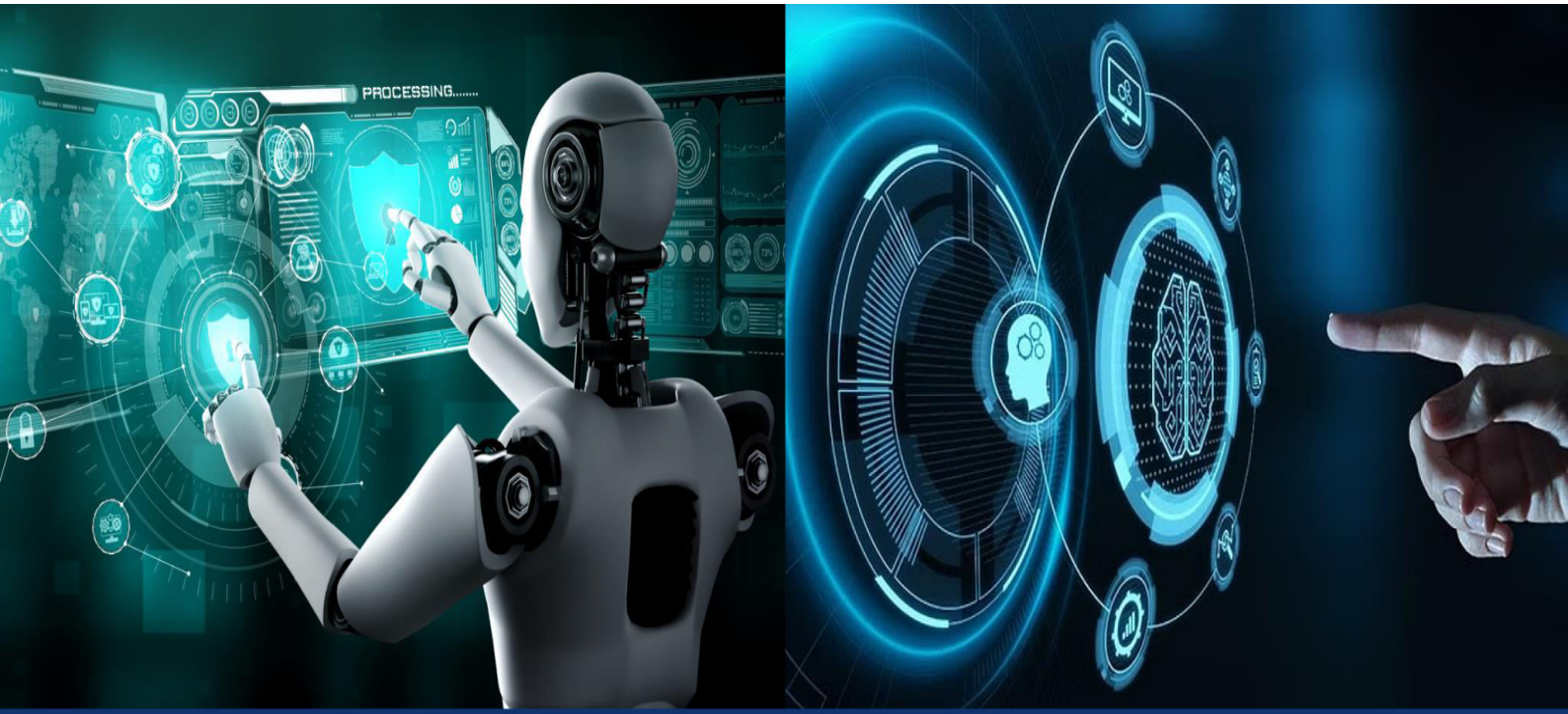
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AI-Powered Career Guidance: A Platform for Student Career Exploration and Job Preparation

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ABSTRACT: Choosing a suitable career can be challenging for students who have limited access to individualized guidance or incomplete information about their interests and skills. PathPilot-AI is a career-guidance platform that combines Holland's RIASEC interest framework with machine-learning-based career prediction and supporting tools for skill assessment, resume analysis, skill-gap identification, learning-roadmap planning, job exploration, and mock-interview preparation. The system uses a student's assessment responses and available skill information to build a profile and suggest relevant career directions. The current prediction workflow uses a trained XGBoost model; Decision Tree and Support Vector Machine (SVM) should be described as evaluated models only if they have actually been trained and tested in the project. The platform is intended to help students understand potential career options and identify skills to develop. Its recommendations should be treated as decision support rather than a guaranteed prediction of future employment.

KEYWORDS: Career guidance, RIASEC, machine learning, XGBoost, Decision Tree, Support Vector Machine, skill-gap analysis, resume analysis, learning roadmap.

I. INTRODUCTION

Choosing a career is an important decision, yet students may find it difficult to connect their interests, current abilities, and knowledge of professional roles. General career advice may not account for differences between individual students or explain which skills are needed for a chosen path. A useful guidance system should therefore help students explore their interests, review their existing skills, and identify practical next steps.

PathPilot-AI is designed to bring these activities together in one platform. It combines a RIASEC-based interest assessment with career prediction and skill-related analysis. Resume information and skill-assessment responses can be used to build a more complete student profile. The platform then presents possible career directions and learning guidance. These recommendations are intended to support student decision-making and do not replace advice from qualified career counsellors.

The main contributions of this work are as follows:
1) Interest-based assessment:
The platform uses Holland's RIASEC framework to summarize students' vocational-interest patterns and support career exploration.
2) Machine-learning-assisted career prediction:
A trained XGBoost model is used in the described prediction workflow. Decision Tree and SVM should be included as comparative methods only where implementation and evaluation evidence is available.
3) Skill-gap analysis:
The system combines information from the skill assessment and extracted resume skills with the requirements associated with a target career, where those requirements are available. This comparison can help students identify skills that may need further development.
4) Career preparation support: PathPilot-AI is designed to present learning-roadmap guidance, relevant job suggestions, and mock-interview preparation in addition to career recommendations.

II. RELATED WORK

Research in career guidance has explored vocational-interest frameworks, data-driven career prediction, and decision-support systems. Studies of student career choice have investigated the use of survey responses and educational data to

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identify patterns that may inform career planning [2], [4]. Other work has applied artificial-intelligence techniques to educational prediction tasks, although academic-performance prediction is distinct from career recommendation [3]. These areas provide useful context for systems that help students interpret personal information and explore possible pathways. PathPilot-AI brings interest assessment, skill review, resume-based information, and career-preparation features into a single workflow. The usefulness of such a system depends on the quality of the underlying data, the validity of the model, and the relevance of the career-skill requirements. The bibliographic details of all references should be checked against the original publications before submission.

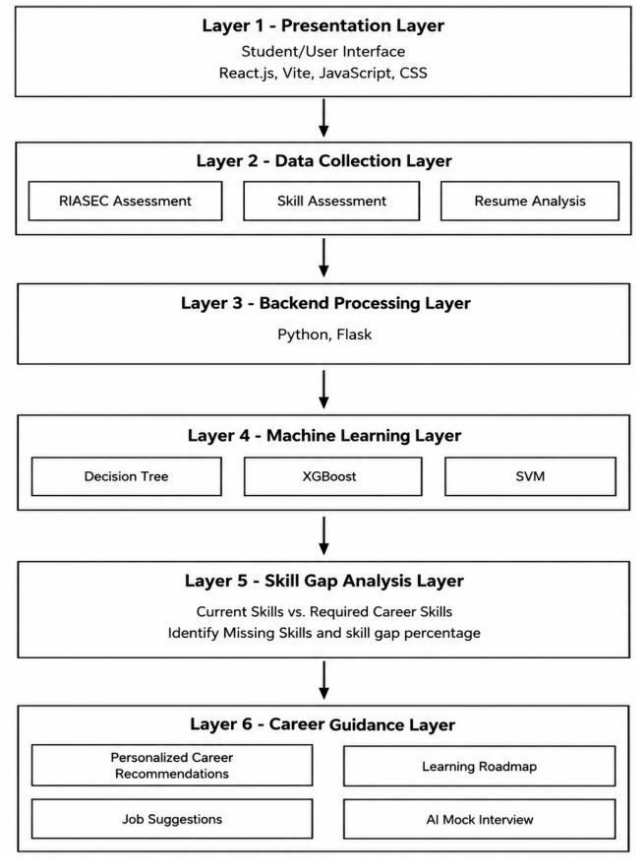


Fig. 1. Layered architecture of PathPilot-AI.

III. SYSTEM ARCHITECTURE

Figure presents the main layers of PathPilot-AI. The layers separate user interaction, application processing, intelligent analysis, data storage, and external AI services.

1) Presentation layer: Provides the interface through which users register, complete assessments, submit resume information, and view their results.

2) Application layer: Receives user requests and coordinates the flow of information between the interface, analysis components, and stored data.

3) AI and processing layer: Processes assessment responses and available skill information, invokes the career-prediction workflow, and supports skill-gap analysis and career recommendations.

4) Database layer: Uses MongoDB to store the user information required by the application. The stored data should be limited to what the system needs and handled according to appropriate privacy practices.

5) External-services layer: Integrates a generative-AI service such as Gemini for mock-interview question generation, response evaluation, and feedback, where this integration is enabled and configured.

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IV. ALGORITHM: ML-AUGMENTED CAREER GUIDANCE SYSTEM

Input: RIASEC questionnaire responses, skill-assessment responses, uploaded resume, and available career-skill requirements.
Output: RIASEC profile, career suggestions, skill-match and skill-gap estimates, and learning-roadmap guidance.
1. Validate and preprocess the assessment responses and resume-derived information.
2. Calculate each RIASEC dimension score. For dimension j, $R_j = (\Sigma_i x_{ij}) / n$, where x_{ij} is the response score for item i in dimension j and n is the number of items included in that dimension.
3. Identify the highest-scoring RIASEC dimensions to summarize the student's interest profile.
4. Combine the available assessment results, technical-skill information, and resume-derived skills into a student profile.
5. Pass the prepared features to the trained XGBoost model and obtain the career category or categories supported by the model.
6. For each recommended career with an available skill-requirement list, compare the student's identified skills with the required skills.
Skill match (%) = (number of matched skills / number of required skills) × 100.
Skill gap (%) = (number of missing skills / number of required skills) × 100. These percentages are meaningful only when the required-skill list is defined and non-empty.
7. Repeat the skill comparison for each relevant career recommendation.
8. If a labelled test dataset and model predictions are available, evaluate the prediction model using accuracy, precision, recall, and F1-score. Report the measured values and evaluation procedure; do not infer them from functional testing.
9. Present the career suggestions, RIASEC profile, skill-gap information, and learning-roadmap guidance to the user.
10. End.

V. IMPLEMENTATION DETAILS

PathPilot-AI is described as a web application built with Python and Flask for backend services, React for the user interface, MongoDB for data storage, and machine-learning components for career prediction. The specific functions available to users depend on the implemented version of the project.
1) User registration: Users create an account and access the application through the available authentication flow.
2) RIASEC assessment, skill assessment, and resume analysis: Users complete the interest questionnaire and skill assessment and can provide a resume for skill extraction, where the relevant feature is implemented.
3) Skill-gap analysis: The system compares identified skills with the requirements available for a selected or recommended career and presents missing-skill information.
4) Career prediction: The prepared student profile is supplied to the trained prediction model to generate career-category suggestions.
5) Learning roadmap and interview preparation: The platform presents guidance on skills to develop and learning steps. Mock-interview questions and feedback may be supported through the configured generative-AI service.
6) Dashboard and results: The dashboard brings together the assessment profile and the results produced by the available modules. Claims about each module should match the version demonstrated and tested.

VI. EXPERIMENTAL EVALUATION

The system can be evaluated using representative student profiles containing RIASEC responses, skill-assessment information, and resume-derived skills. A reproducible evaluation should describe the dataset, sample size, train-test procedure, and the versions of the modules tested. These details must be completed from the project's actual records.

A. Setup: The stated application stack includes Python, Flask, React, and MongoDB. Functional checks may cover questionnaire submission, skill-information processing, resume upload and analysis, career prediction, and display of results. Include only checks that were actually performed.

B. Metrics: If the career-prediction model was tested against labelled examples, report accuracy, precision, recall, and F1-score with the test-set size and evaluation method. No numerical metric is reported in this draft because verified values were not provided in the original manuscript.

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C. Observations: The system modules are intended to support career exploration and preparation by presenting interest information, skill-related findings, and learning guidance. A claim of successful model performance requires measured results; functional operation alone does not establish predictive accuracy.

Module	Description
RIASEC assessment	Summarizes the student's vocational-interest profile.
Skill assessment	Collects information about the student's current skills.
Resume analysis	Identifies skills from the supplied resume, where supported.
Skill-gap analysis	Compares identified skills with available career requirements.
Career recommendation	Presents career-category suggestions from the prediction workflow.
Learning roadmap	Provides suggested learning steps and resources, where available.
Mock interview	Supports interview practice through configured question and feedback features.

VII. DISCUSSION

PathPilot-AI combines several kinds of information to support student career exploration. The RIASEC profile provides a structured view of vocational interests, while resume and skill-assessment information can help describe current capabilities. Career suggestions and skill-gap estimates may then help students plan further learning. The quality of these outputs depends on the assessment design, resume extraction, model training data, and the completeness of career-skill requirements. Recommendations should be reviewed by students and, where possible, career counsellors. The platform should be presented as a decision-support tool rather than as a system that guarantees a particular career or job.

VIII. FUTURE WORK

Future development may include internship matching, progress tracking for learning-roadmap activities, more detailed industry-specific learning resources, and broader testing with appropriately consented student data. Future evaluation should also examine model performance across different student groups and document the limitations of the available dataset.

IX. CONCLUSION

PathPilot-AI is a career-guidance platform intended to connect vocational-interest assessment with career prediction and practical preparation tools. By combining a RIASEC profile with available skill and resume information, the system can help students explore career directions and identify areas for further learning. The platform's value depends on reliable data, transparent evaluation, and accurate descriptions of the functions that have been implemented. Further testing is needed before making quantitative claims about prediction performance or the effectiveness of the recommendations.

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