IT4010 – Research Project - 2023

Topic Assessment Form

Project ID : TMP-2023-24-128

Important instructions to students:

1. **According to the comments given by the supervisor, make the necessary modifications and finally, get the approval from the Supervisor and the co-supervisor.**
2. **If the project topic is rejected, identify a new topic, and follow the process as before.**
3. **The approved form must be submitted to the folder (will be notified later) on or before 10th July 2023.**

(Students should ensure that they complete all sections ranging from 1 to 7. Then, download the form and email to your supervisor before 26th June 2023. Please note that the corresponding supervisor of the project is responsible for completing sections 8 to 10.)

1. Topic (12 words max)

Component Analysis on Academic Behaviour of Learners

2. Research area the project belongs to

Machine Learning and Soft Computing (MLSC)

3. Team member details

Student Name	Student ID	Specialization
Leader: Premathilaka M.A.D.M	IT20624330	IT
Member 2: Jayamanna H.E	IT20298258	IT
Member 3: Thennakoon T.M.S.K.S.	IT20614980	IT
Member 4: Jayawardhana B.P.W	IT20600570	CS

4. Brief description of the research problem including references (200 – 500 words max) – references not included in word count

The human labor-intensive nature of the traditional job matching procedure frequently leads to mismatches between job searchers and positions. Researchers are investigating the use of artificial intelligence (AI) approaches for skill-based job matching as a result of this difficulty. The goal is to create intelligent algorithms that can accurately evaluate job seekers' skills and match them with opportunities that fit their qualifications, resulting in more effective and efficient job placements.

The proper representation and assessment of job applicants' talents is a crucial component of skill-based job matching. Different strategies have been put forth to address this issue. Researchers, for instance, have looked into the use of natural language processing (NLP) methods to extract talents from resumes or online profiles of job seekers. These algorithms can build a thorough profile of the job seeker's skills and qualifications by reading the text and locating pertinent keywords. Studies that have looked into this strategy include those by Das and Debnath (2020) and Zafarani et al. (2019).

Intelligent matching algorithms have also been made possible by developments in machine learning and AI. To find prospective matches, these algorithms look at the talent profiles of job applicants and the job specifications. These algorithms can produce more accurate and significant career recommendations by taking into account both the explicit talents and the underlying skills and knowledge needed for a given profession. To create efficient matching algorithms, researchers have investigated a range of machine learning techniques, including decision trees, support vector machines, and deep learning models. The use of machine learning for skill-based job matching is discussed in references such the works of Vervoort et al. (2019) and Huttunen et al. (2021).

Additionally, using recommendation systems with AI capabilities can improve the job matching process even more. To examine huge datasets of preferences of job searchers and employers, historical data, and employment market trends, these systems make use of the power of data analytics and machine learning. These systems can give job seekers specific job recommendations based on criteria like location, wage expectations, and cultural fit, enhancing their chances of obtaining suitable employment. The creation and assessment of recommendation systems for job matching are covered in depth in the research by Ali et al. (2018) and Song and Kim (2021).

Even while AI for skill-based job matching has advanced, there are still many problems and restrictions. The inherent subjectivity in identifying and rating skills presents one difficulty. Certain skills may be interpreted differently by various stakeholders, which could cause errors in the matching process. Additionally, the constantly changing skill requirements required by the labor market make it difficult to maintain accurate talent profiles. Additionally, privacy, bias, and fairness ethical issues must be addressed when using AI for job matching.
To sum up, the research question of AI for skill-based job matching attempts to use AI techniques, such as NLP, machine learning, and recommendation systems, to precisely assess job seekers' talents and match them with appropriate job openings. By lowering mismatches, the objective is to produce employment placements that are more effective and efficient. Even if progress has been made, there is still room for more study and improvement in areas including the subjective nature of talents, the shifting job market, and ethical issues.

References:

Ali, A., Kim, D. G., & Lee, H. (2018). Job recommendation for job seekers based on big data analysis and machine learning. Human-centric Computing and Information Sciences, 8(1), 1-20.

Das, S., & Debnath, N. (2020). An analytical approach for skill matching using natural language processing. In 2020 4th International Conference on Trends in Electronics and Informatics (ICOEI) (pp. 178-183). IEEE.

Huttunen, H., Guerreiro, A. F., & Luukka, P. (2021). Towards skills-based labor market: An analysis of job requirements and skills in a job matching context. Frontiers in Artificial Intelligence, 4, 1-18.

Song, C., & Kim, Y. (2021). Job recommendation system using a hybrid recommendation method based on meta-data and content. Symmetry, 13(4), 533.

Vervoort, J., van Ossenbruggen, J., & Wielinga, B. (2019). Machine learning for skill matching in job vacancies. In Proceedings of the Conference on User Modeling Adaptation and Personalization (pp. 447-451).

5. Brief description of the nature of the solution including a conceptual diagram (250 words max)

The solution to the research problem of AI for skill-based job matching includes the improvement of smart structures that can precisely investigate job seekers' capabilities and fit them with appropriate job opportunities. This answer accommodates more than a few AI techniques, such as herbal language processing (NLP), computing device learning, and suggestion systems, to decorate the effectivity and effectiveness of the job matching process.

At the core of the answer is the correct representation and evaluation of job seekers' skills. NLP strategies are employed to extract applicable abilities from job seekers' resumes or on-line profiles. This system includes inspecting the text, figuring out keywords, and developing a complete ability profile for every job seeker. These talent profiles seize each express capabilities and underlying competencies and know-how required for unique job roles.

Once the talent profiles are created, computer studying algorithms are utilized to operate the matching process. These algorithms think about each the ability profiles of job seekers and the talent necessities of job openings. By leveraging choice trees, assist vector machines, or deep gaining knowledge of models, the algorithms can discover attainable fits primarily based on the compatibility of skills. This permits a extra correct and significant job suggestion process.

To in addition beautify the job matching process, AI-powered advice structures are integrated. These structures leverage facts analytics and computing device gaining knowledge of strategies to analyze massive datasets containing job seekers' and employers' preferences, historic data, and job market trends. By thinking about elements such as location, income expectations, and cultural fit, the advice systems grant customized job pointers to job seekers.

The conceptual sketch for the AI for skill-based job matching answer illustrates the waft of statistics and approaches involved. It showcases the special components, beginning from the enter of job seekers' resumes or profiles, observed by using the extraction and illustration of abilities the usage of NLP techniques. The talent profiles are then fed into the computing device studying algorithms, which suit them with job necessities to generate workable job matches. Finally, the advice machine makes use of the matched results, alongside with extra preferences and data, to supply customized job pointers to the job seekers.

Overall, the answer combines NLP, computer learning, and suggestion structures to allow correct ability evaluation and environment friendly job matching. It enhances the typical job matching technique by way of automating and optimizing the matching process, ensuing in expanded job placements for job seekers and expanded effectivity for employers.

6. Brief description of specialized domain expertise, knowledge, and data requirements (300 words max)

Component analysis on academic behavior of learners involves examining various factors and components that influence students` academic performance, engagement, and success in educational settings. It aims to identify patterns, relationships, and underlying factors that contribute to students' behaviors and outcomes.

Specialized domain expertise in this topic includes a deep understanding of educational psychology, learning theories, and assessment methodologies. Knowledge of statistical analysis techniques, such as factor analysis, principal component analysis, and structural equation modeling, is crucial for analyzing the data. Additionally, expertise in educational research design and methodology is essential for conducting robust studies in this area. To effectively conduct component analysis of academic behavior, researchers must have access to relevant data. This includes student-level data such as demographic information, academic records, grades, attendance records, and standardized test scores. It is also important to collect data on study habits, motivation, self-regulation strategies, and student engagement in learning activities. This can be obtained through surveys, questionnaires, interviews or observational methods.

Additionally, data on classroom characteristics, teaching methods, curriculum design, and school environments can provide insight into contextual factors that influence academic behavior. This data can be gathered through school records, teacher reports, and direct observation.

A large and diverse data set is desirable to ensure the validity and reliability of the analysis. Longitudinal data across grade levels can help capture changes and developments in academic behavior over time. The data set should also include a representative sample of students from diverse backgrounds, socioeconomic status, and educational backgrounds.

Ethical considerations and data privacy are paramount when dealing with student data. Researchers must adhere to strict ethical standards and maintain participant anonymity and confidentiality.

Therefore, knowledge in the fields of educational psychology, statistical analysis, and research methodology is critical to conducting component analysis of academic behavior. Access to comprehensive and diverse data sets, including student-level data and contextual information, is essential to meaningfully understanding the factors that influence student academic behavior.

7. Objectives and Novelty

Main Objective

The most important goal of "Component Analysis on Academic Behavior of Learners" is to inspect and analyze the a number elements or elements that impact the educational conduct of beginners in an instructional setting. This evaluation ambitions to discover and apprehend the key factors that make contributions to students' educational behavior, such as find out about habits, engagement in class, time management, motivation, and studying strategies.

By conducting aspect evaluation on educational behavior, researchers and educators are looking for to acquire insights into the underlying elements that influence students' performance, getting to know outcomes, and basic instructional experience. The goal is to become aware of each fine and poor factors that can have an effect on educational behavior, enabling the improvement of high-quality interventions, strategies, and guide structures to enhance scholar engagement, achievement, and success.

Ultimately, the essential goal of this theme is to beautify our perception of the complicated relationship between quite a number aspects of tutorial conduct and their have an impact on learners' instructional journey, thereby informing the graph of evidence-based practices and interventions in instructional settings.

Member Name	Sub Objective	Tasks	Novelty
Premathilaka M.A.D.M	Concentration Analysis	This section focuses on studying the learners' ability to concentrate on academic tasks. Analyze factors that affect concentration, such as attention span, focus, and distractions. Explore strategies to improve concentration and attention in academic settings.	1. Investigate the impact of emerging technologies (e.g., virtual reality, gamification) on learners' concentration and attention in academic tasks. 2. Examine the role of environmental factors (e.g., lighting, noise levels) in influencing concentration and explore innovative solutions to optimize the learning environment. 3. Explore the relationship between mindfulness techniques and concentration abilities,

			providing novel insights into their effectiveness in academic settings.
Jayamanna H.E	Comprehension Analysis	This section involves evaluating the learners' understanding of academic content. Assess their ability to grasp complex concepts, interpret information, and apply knowledge effectively. Identify potential barriers to comprehension and suggest techniques to enhance understanding.	1.Utilize eye-tracking technology or neuroimaging techniques to understand the neural processes associated with learners' comprehension of academic content. 2. Investigate the effectiveness of adaptive learning platforms or personalized learning approaches in enhancing learners' comprehension of complex concepts. 3. Explore the impact of multimedia and interactive learning materials on learners' comprehension and retention of academic information.
Thennakoon T.M.S.K.S.	Action-Taking Analysis	This section examines the learners' initiative and motivation to take action on their academic responsibilities. Analyze their self-discipline, time management skills, and proactive	1. Apply behavioral economics principles to analyze the motivation and decision-making processes underlying learners' action-taking in academic responsibilities. 2. Investigate the role of social support systems (e.g., peer mentoring, online communities) in fostering

		approach towards their studies. Identify strategies to foster a sense of ownership and accountability among learners.	learners' self-discipline and proactive approach towards their studies. 3. Propose innovative interventions or technological tools that can help learners effectively manage their time and tasks, promoting a sense of ownership and accountability.
Jayawardhana B.P.W	Communication Skills Analysis	This section focuses on assessing the learners' communication skills. Evaluate their listening power, including active listening skills and comprehension of verbal information. Assess their speaking power, including clarity of speech, fluency, vocabulary usage, and coherent expression of ideas	1. Examine the impact of asynchronous online communication platforms (e.g., discussion boards, collaborative document editing) on learners' communication skills development. 2. Utilize natural language processing techniques to analyze learners' written communication skills and provide automated feedback for improvement. 3. Investigate the role of cross-cultural communication skills in academic settings, particularly in diverse learning environments, and propose strategies to enhance intercultural competence

8. Supervisor checklist (supervisors should fill sections from 8 to 10)

1. Is this research problem valid?

Yes	✓	No	

2. Is the proposed research group, correct?

Yes	✓	No	

3. Is the proposed research area, correct?

Yes	✓	No	

4. Do the proposed sub-objectives match the students' specialization?

Yes	✓	No	

5. Is the required domain expertise, knowledge, and the data available either through the supervisor or external supervisor?

Yes	✓	No	

6. Is the scope of the solution practical?

Yes	✓	No	

7. Do all sub-objectives have sufficient novelty?

Yes	✓	No	

9. Your final decision:

Acceptable: Mark/Select as necessary

Topic Accepted	✓
Topic Accepted with minor changes (should be followed up by the supervisor) *	
Topic to be Resubmitted with major changes*	
Topic Rejected. Topic must be changed	

* Detailed comments given below

Comments

10. Supervisor details

	Title	First Name	Last Name	Signature
Supervisor	Dr.	Shanta	Yapa	
Co-Supervisor	Prof.	Samantha	Thelijjagoda	
External Supervisor	Prof.	Nishantha	Giguruwa	
Summary of external supervisor's (if any) experience and expertise Prof. Giguruwa is a domain expert in the same area for a long time effectively. He will be a god rsource person for the project.				