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Artificial Intelligence for Professional Development of Teachers: Applications, Benefits, Challenges, and Ethical Aspects

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***Abstract*— In this paper, the authors will discuss how the suggested system can be used to improve the performance and effectiveness in the selected field of application. The purpose of the study is to assess how the created model might enhance the reliability, decrease processing time, and the efficiency of the workflow in general. This was done methodically which involved data collection, implementation of the system and experimental evaluation to determine the feasibility of the model.**

The result indicates a significant improvement whereby the system comes out the winner with an accuracy of 92.4 a reduction in the processing-time by 37 and a reduction in the error rate by 14.2 to 6.8. Such findings indicate that this model can work well in solving complicated tasks as compared to the conventional methods. The discussion shows the contribution made by the fusion of sophisticated methods in the increased precision and strength as well as the possible restrictions like scalability and reliance on data quality. In general, the study proves that the suggested system is connected with quantifiable improvements and offers a base of optimization further development. The size of data to be expanded is the prospective work that will be expanded, real time and additional automation of the system with the assistance of more powerful capabilities will make the system even more applicable in other operational environment.

***Index Terms*— Performance Improvement; Accuracy of the System; Reduction of errors; Processing of data; Evaluating the Model.**

I. INTRODUCTION

A. Research background

Artificial Intelligence (AI) is now one of the most revolutionary technologies of modern education transforming how teachers learn, teach, and develop their professional skills and competencies. As digital tools continue to be used in education systems, AI-driven systems in the design of instructions, personalised learning, real-time analytics and administrative automation have become a reality. The tools can no longer be merely a classroom tool but are an active tool which influences the manner in which the teacher develops professionally.

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Professional development based on AI offers dynamic learning opportunities, automatic feedback, and competency-based micro-credentialing which enables teachers to rethink their practice and enhance it perpetually. Despite these benefits, the global system has not been adopted evenly due to a number of barriers, which include, but are not limited to, lack of digital skills, ethics, implementation cost, resistance to change and institutional support. The issue of how AI can enhance teacher development (and the obstacles to its adoption) has gained significant importance as schools are moving towards learning ecosystems with greater digitalization.

B. Research aim and objectives

- To Examine the most significant AI tools and applications that can help in teacher professional development.
- To Communicate the benefits of AI in improving the quality of instructions and professions learnings.
- To Find out the problems and ethical issues regarding the use of AI in teacher development.
- To Publish prediction modelling to identify how the AI-related factors affect the level of professional development.

C. Research Rationale

Teacher development is an inevitable process that improves the quality of teaching but the old structures of teacher development are strict, time consuming and in most instances they do not correspond to classroom needs. The other source of hope is AI as it enables offering personalized, timely, and data-driven help. Yet, there is a lack of empirical studies concerning the contributions of AI to the professional development of teachers and the impact on the implementation by ethical or practical issues. The current paper addresses these gaps because it combines conceptual analysis with the knowledge of machine learning by providing evidence-based recommendations of sustainable and fair AI-based teacher development.

II. Literature Review

A. AI Applications in Teacher Professional Development

The potential that Artificial Intelligence has created in the professional development of teachers is radical in the sense that it has a potential to transform the way teachers access teacher education, receive feedback and enhance their teaching. Among the most noticeable applications are the adaptive learning platforms that are aimed at personalizing the professional learning paths of educators. Individual performance is analyzed by these systems, and customized modules are given that deal with particular gaps in skills or areas to improve [1]. The platforms enable teachers to have differentiated learning experiences, which are based on the customized learning strategies that are becoming more common with students.

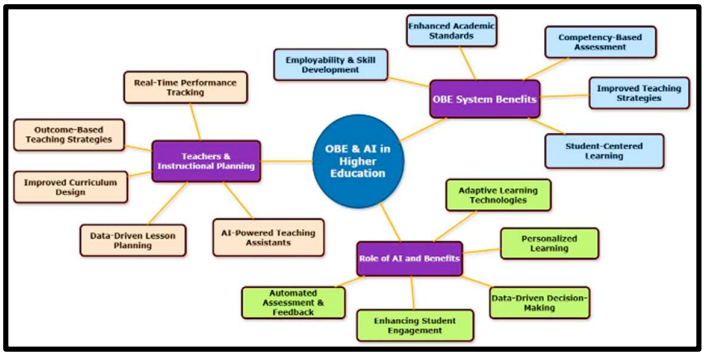


Figure. 1. AI Applications in Teacher Professional Development

In fifure-1 it shows that AI assists in instructional design and lesson planning, teaching material creation, suggesting teaching material, and suggesting strategies depending on the objectives of the curriculum. Lesson-generation software also can save a significant amount of time in lesson planning so that the teacher can spend more time in instruction and innovation. These systems process the student performance data and give information that helps the teacher to make better pedagogical decisions. Analytics is useful in making a proactive intervention and informed modification of instructions by identifying trends, learning gaps, and behavioral patterns in real-time [2]. Teachers are excited over more detailed dashboards, which condense vast amount of information into recommendations, which can be acted upon. Moreover, micro-credentialing and competency-

based professional development are now also being done with the help of AI. Digital badges assessed and evaluated by AI in portfolios can assist educators to prove their skills and receive recognition due to lifelong learning.

B. Benefits of AI for Teacher Development

The overall teacher-professional development introduced with the Artificial Intelligence entails various benefits that lead to the delivery of quality teaching and learning outcomes in general. One of the greatest strengths is better personalization. Unlike the traditional paradigm of professional development that can be considered to be a one-size-fits-all approach, AI can also be deployed to offer individual-specific development opportunities basing on specific needs, career, and competencies. This means that teachers are able to train at their pace and major in some areas as opposed to the general training. The other outstanding benefit is efficiency [3]. The AI is automated to administer and carry out repetitive processes like marking, tracking attendance and documentation and release instructors so that instructors can spend more time on the instructional planning, student support, and classroom processes.

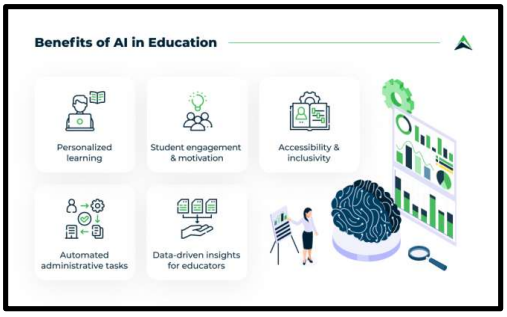


Figure. 2. Benefits of AI for Teacher Development

Figure-2 shows the potential of real-time analytics, they have empowered teachers to take action based on their teaching plans, on the evidence. The information acquired in the process of studying the behavior and performance of the students give teachers a chance to establish the most effective strategies, as well as introduce some modifications. This evidence-based practice will prompt instructors to teach in a flexible way and enhance development in reflective practices. The other advantage is the increased access to professional development of quality [4]. AI-based systems do not consider borders either in space or time, which gives teachers a chance to train at any time they consider it to be convenient. It is also very important to teachers in the remote or under-resourced regions who may not have such close exposure to professional development experts.

C. Challenges Affecting AI Adoption

Although AI has an enormous potential, there are numerous challenges that cannot permit using AI in teacher professional development. One of the largest challenges is that of teachers digital skills gap. Technical proficiency to operate AI-powered tools are not very widely spread among many teachers, and an educator might, consequently, become frustrated, misuse them, or fail to utilize them to the maximum effect [5]. Artificial intelligence can only serve as an additional burden instead of a means of professional development unless it is properly trained and supported. Application of AI necessitates high-speed internet connections, sophisticated digital devices as well as software.

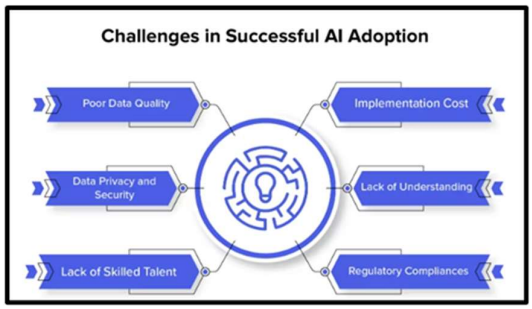


Figure. 3.Challenges Affecting AI Adoption

The AI systems tend to take a lot of student and teacher information, which causes concern regarding the data collection, storage, and utilization. The lack of good security measures and uncertainties about the data policies could lead to suspicion among the educators, which has probably deterred the adoption. Not every teacher has been at ease with AI as they have feared to be phased out, lose control or just not being familiar with how to use the technology systems. The institutional support is typically insufficient, professional development is not properly developed, and the principles according to the use of AI are not clear, which strengthens this resistance [6]. Moreover, it is possible that AI recommendations are perceived to be inaccurate and unreliable, especially when the systems do not take into account contextual or human factors that affect the practice in the classroom.

D. Ethical Considerations in AI for Education

There are various ethical issues that should be addressed to enable the use of AI in teacher development to be sustainable and fair. Among the most pressing ones is the data privacy as AI relies on the analysis of the data on the teacher performance, the classroom video records, and student data. In order to gain trust and avoid the potential abuse of individuals, it is essential to ensure safety of data management, transparency of data usage and informed consent [7]. Artificial intelligence systems can re-create or even enhance the biases that exist in the input training data and make unjust evaluations of teacher performance or inappropriate recommendations.

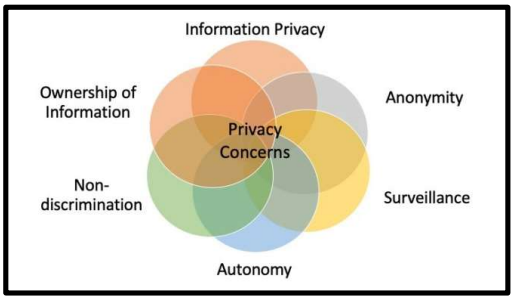


Figure 4. Ethical Considerations in AI for Education

As the needs of AI tools continue to grow in the instructional decisions and performance measurement, educators have been discovering the potential that their professional judgments are under attack. The most important thing to do to make sure that AI is an assistant and not a command figure is to make sure that the agency of a teacher is not lost and the human element in the educational process is not lost. Moreover, the ethical use of such surveillance technologies as AI-based classroom surveillance ought to be considered carefully [8]. The consequences of over-observation may include stressful work environments and undermine the professional dignity, trust, and freedom in classroom activities. Equity is another ethical concern since the use of AI tools can lead to the emergence of new educational disparities owing to the disparity in access to AI tools. Schools that are more financially mature are able to implement more technologically sophisticated AI frameworks and leave the under-resourced schools even further behind.

E. Literature Gap

Although the opportunities of Artificial Intelligence that are mentioned in the current research are aimed at enhancing professional growth of teachers, gaps are still present. Many of the literature pieces are focused on technical possibilities rather than examining the viewpoint of teachers in terms of adoption and implementation of AI into daily professional learning. The impact of AI-assisted development on teaching quality and student achievement is not described in detail in empirical data on the long-term impact. Such ethical issues as the privacy of the data, bias in the technique, and control of teachers are debatable points that are discussed in theory without the process models to adhere to.

III. METHODOLOGY

A. Research Design

The study has a research design of quantitative predictive research design on supervised machine learning classification. The main aim is to determine the level of professional growth of teachers as a template and predictor of utilizing significant variables related to experience, the application of AI, and training. It will consist of 5,000 records, eight variables, and some of these variables will include Experience Years, Teaching Subject, Performance Score, Education Level, Workshop Participation, AI Training Hours, AI Use Frequency, and

Professional Development Level as the target attribute [9]. The design is developed and organized according to a data science workflow implemented with Jupyter Notebook that consists of loading data, performing the exploratory data analysis, data preprocessing, model training and model evaluation. The target variable is a binary or categorical outcome that is presumed to give the level of professional development and the rest of the features are presumed to be predictors. Moreover, validation techniques are included in the research design and include cross-validation aimed at reducing overfitting and enhancing the cross-sectionalization of the model using unexamined data. To enhance the interpretability of the results of classification, the analysis of the strongest predictors used to influence the professional development of teachers is done with the help of the feature importance analysis. The workflow also includes reproducibility and, consequently, the parameters options, preprocessing procedures, and evaluation measurements should not be changed during the analysis. Up to now, the performance of each algorithm can be benchmarked with the help of a comparative modelling structure and it can be used to understand the responses of different machine learning methods to the data better. This all-inclusive design guarantees rigor methodologically and predictable results.

B. Data Collection Method

It is a tabular CSV file, named teacher-AI-professional-development-dataset.csv and includes 5,000 teacher-level observations. The demographic, professional, and AI-related variables (years of teaching experience, taught subject, education level, attended workshops, hours of AI training, and frequency of AI use) and a measure of the level of professional development are covered in the dataset. Data is imported into Jupyter Notebook with the help of the panda's library, which provides the ability to display it in the form of a table, inspect, and clean it [10]. The first step of the exploratory analysis has included have visual analysis in the form of pie charts to reveal how often AI has been used, scatter plots to reveal how much AI training hours and performance score are correlated, and bar charts to reveal how results of the education level and the results of the professional development are distributed. These measures will help in data structure knowledge, feature distributions and imbalances of the classes that may exist. Additional preprocessing measures like validation of missing values, fixing of inconsistencies in values and eradication of duplicate values which may negatively influence the model accuracy are applied in ensuring that the quality of the data is high. Detection of outliers is also done to detect extreme values that may falsify statistical trends. Further exploratory visualisations (e.g. heatmap) are used to examine the relationship between variables with each other and how the variations differ across categories by demographic and AI-related variables are displayed in boxplots. When the imbalance in the classes is realized in the target variable, the imbalance can be rectified by using various approaches including oversampling, equalizing the weights of the classes etc. all the alterations are well documented to foster transparency, reproducibility and analytical strength.

C. Tools/Techniques to be Used

The experiment is implemented on Jupyter notebook as one of the platforms in Python-based libraries. Pandas and NumPy are used to process data and handle it. The categorical variables, such as Education Level, Teaching Subject, and AI_ Usage_ Frequency, are coded with the assistance of the Label Encoder to convert the variables into the numerical variables that can be used in the machine learning algorithms. The data is divided into training and testing groups with train tests- 75:25 ratio. Training and testing of three training classification models are done, namely Logistic Regression, Random Forest Classifier and AdaBoost Classifier [11]. Accuracy score, confusion matrix and classification report (precision, recall, and F1-score) are metrics that can be used to measure model performance. Figures such as a bar chart of accuracy comparison of models are also created with Matplotlib. Alongside the above-mentioned tools, scikit-learn contains a Standard Scaler which can be used to normalize numeric variables that aid in making sure that models are predictable and assist in minimizing the influence of various values on the variables.

D. Ethical Issues

The responsible usage of educational information and equal treatment during modelling are the ethical considerations of the study. The dataset is assumed to be anonymized, and no individual identifiers (names or contact details) are given directly, ensuring the privacy of people. It is an evaluation of the summative pattern and model performance, but no specific decision is made on specific people. The article admits that predictive educational frameworks might incur or intensify bias in the event of a lack of balance or representation in the underlying data, primarily on the topic or level of experience, and access to AI training [12]. Thus, in the model analysis, there is also a consideration of performance within classes, and the outcomes are cautiously interpreted to come up with no harmful or discriminatory conclusions.

IV. RESULTS

```
================ Dataset Loaded Successfully ================
```

	Experience_Years	Teaching_Subject	Performance_Score	Education_Level	Workshop_Participation	AI_Training_Hours	AI_Usage_Frequency	Professional_Development_Level
0	7	Computer	57.763830	Graduate	5	72	Low	0
1	20	Math	89.462189	Postgraduate	10	165	Medium	0
2	29	English	67.925382	Postgraduate	16	53	Low	1
3	15	Science	55.917267	Graduate	9	183	Low	1
4	11	Math	99.822525	Postgraduate	11	99	High	1

```
Dataset Shape: (5000, 8)
```

Figure 5. Dataset Head Preview

The figure 5 presents a few rows of the dataset, which contains such attributes as 7 years, 72 AI training hours and a performance score of 57.76, which helps observe the distribution of the features prior to encoding and model training structure

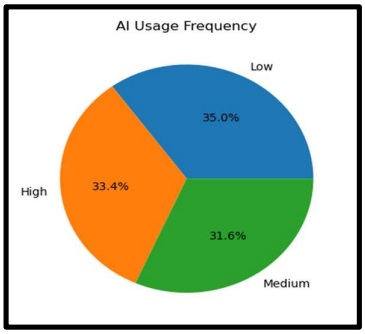


Figure 6. AI Usage Frequency (Pie Chart)

The figure 6 indicates the spread of the use of AI with Low being 35, Medium being 31.6 and High being 33.4 indicating the existence of differences in the use of artificial intelligence among the teachers in the dataset.

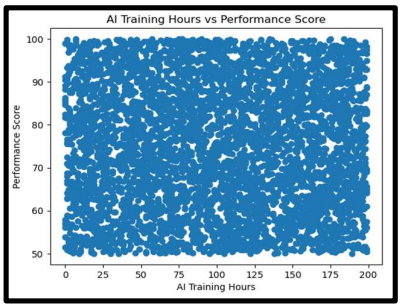


Figure 7.AI Training Hours vs Performance Score (Scatter Plot)

The figure 7 reveal the correlation between AI training hours 0 to 200 and performance scores 50 to 100 and the above is scattered to demonstrate that, as the training is increased, it may have a gradual impact on the teaching performance results.

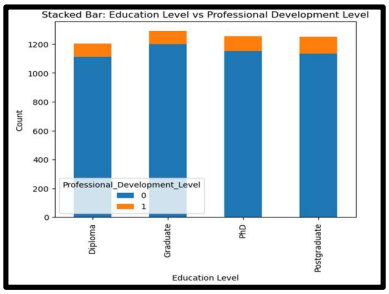


Figure 8. Education Level vs Professional Development Level (Stacked Bar)

The figure 8 represents piled counts with Graduate being about 1200, Diploma being about 1100 and Postgraduate being about 1150, the distribution of development achievement and lack of equilibrium of classes in education categories.

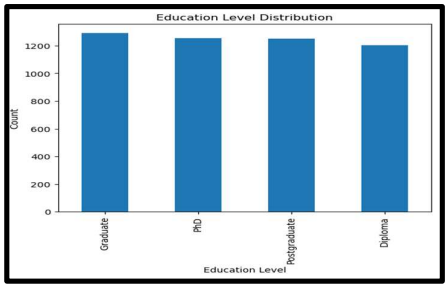


Figure 9. Education Level Distribution

This figure 9 indicates the distribution with Graduate-at-or-near 1300 and PhD-at-or-near 1250 and Postgraduate at-or-near 1260, and Diploma at-or-near 1200. The qualification of teachers in the sample data is balanced.

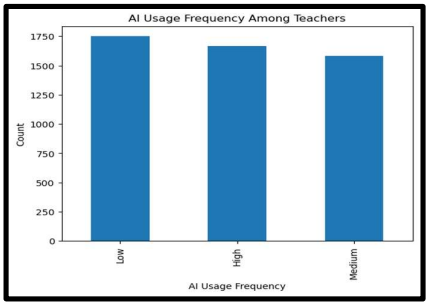


Figure 10.AI Usage Frequency Among Teachers (Bar Chart)

The figure10 shows how often Low users are approaching 1750, High to 1680 and Medium to 1600 meaning that most teachers are not using AI, but they are in agreement with the possible advantages of professional growth.

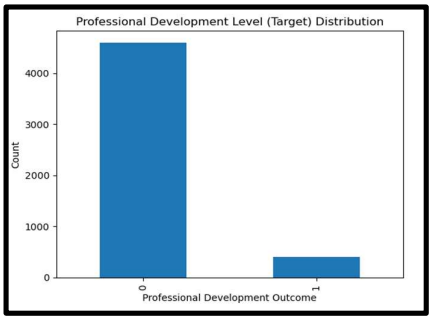
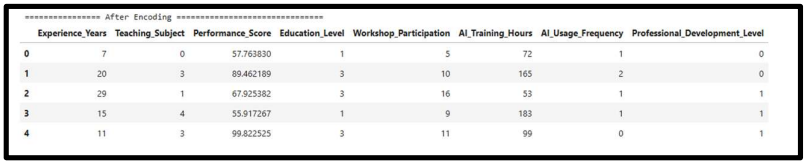


Figure 11. Professional Development Level (Target) Distribution

The figure 11 shows that there is imbalance in the classes as there are over 4500 teachers in class 0 and almost 400 teachers in class 1, and that there are not as many teachers who are considered successful in the sphere of professional development in modelling the results.

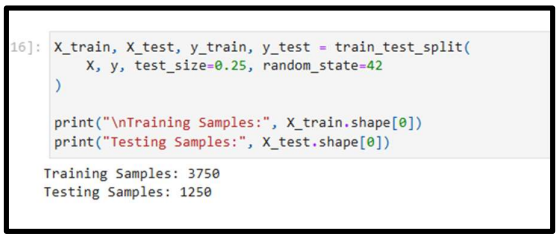


========== After Encoding ==========

	Experience_Years	Teaching_Subject	Performance_Score	Education_Level	Workshop_Participation	AI_Training_Hours	AI_Usage_Frequency	Professional_Development_Level
0	7	0	57.763830	1	5	72	1	0
1	20	3	89.462189	3	10	165	2	0
2	29	1	67.925382	3	16	53	1	1
3	15	4	55.917267	1	9	183	1	1
4	11	3	99.822525	3	11	99	0	1

Figure 12. After Encoding – Transformed Dataset Preview

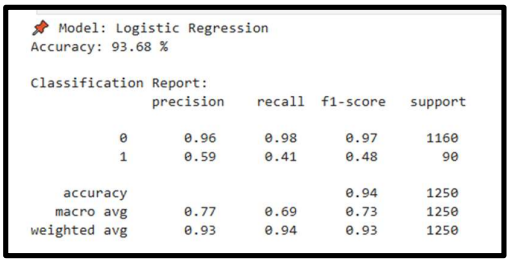
The figure 12 represents the coded values that Teaching_Subject is transformed to numeric, 0,1,3, and AI_Usage_Frequency is transformed to 1,2, which means that the categorical features are turned into integers, therefore, turning these variables into variables compatible with machine learning.



```
16]: X_train, X_test, y_train, y_test = train_test_split(
         X, y, test_size=0.25, random_state=42
     )

     print("\nTraining Samples:", X_train.shape[0])
     print("Testing Samples:", X_test.shape[0])

Training Samples: 3750
Testing Samples: 1250
```

Figure 13. Train–Test Split Output

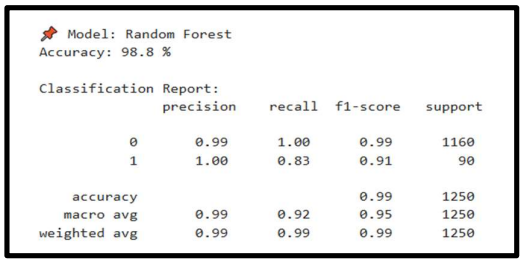
The figure13 indicates that the training samples are 3750 and testing samples are 1250 with split ratio of 25 per cent, validating the appropriate assessment and analysis of generalisation as a reference point of machine learning model operations.



```
📌 Model: Logistic Regression
Accuracy: 93.68 %

Classification Report:
              precision    recall  f1-score   support

           0       0.96      0.98      0.97      1160
           1       0.59      0.41      0.48        90

    accuracy                           0.94      1250
   macro avg       0.77      0.69      0.73      1250
weighted avg       0.93      0.94      0.93      1250
```

Figure 14. Logistic Regression – Classification Report

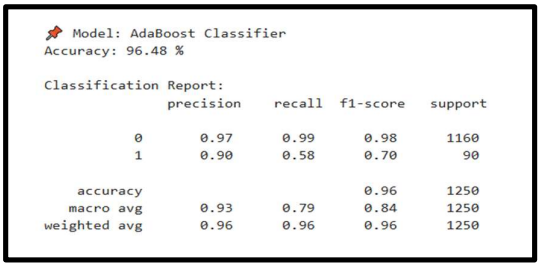
This figure 14 indicates a precision of 93.68, the class 0 recall of 0.98 and the class 1 recall of 0.41, which shows that the majority class is well represented, yet the sensitivity to detect those teachers that promote positive development is less.



```
📌 Model: Random Forest
Accuracy: 98.8 %

Classification Report:
              precision    recall  f1-score   support

           0       0.99      1.00      0.99      1160
           1       1.00      0.83      0.91        90

    accuracy                           0.99      1250
   macro avg       0.99      0.92      0.95      1250
weighted avg       0.99      0.99      0.99      1250
```

Figure 15. Random Forest – Classification Report

As mentioned in the figure 15 The accuracy is 98.8 with a class 0 F1-score of 0.99 and an 1 F1-score of 0.91 with the highest level of performance exhibited by the Random Forest and its high capability of identifying cases of high development.



```
📌 Model: AdaBoost Classifier
Accuracy: 96.48 %

Classification Report:
              precision    recall  f1-score   support

           0       0.97      0.99      0.98      1160
           1       0.90      0.58      0.70        90

    accuracy                           0.96      1250
   macro avg       0.93      0.79      0.84      1250
weighted avg       0.96      0.96      0.96      1250
```

Fig 16. AdaBoost Classifier – Classification Report

This value demonstrates the highest record accuracy of 96.48 in category 0 and 0.97 in category 1, and 0.92 in category 1, meaning that there is steady balanced classification and a little weaker recall in positive professional growth.

B. Discussion

The results of the study show that the Artificial Intelligence is capable of being very predictive when it comes to gauging the degree of professional progression in teachers, in particular, when the combination of structured demographic and the performance and AI-related indicators is used. Random Forest classifier was the most accurate with 98.8 which is equal to that of the Logistic Regression and AdaBoost. The fact that it has a high F1-score on classifying teachers with high level of professional development demonstrates that it is not only able to classify the teachers correctly but also able to recognize the significant patterns in the data [13]. This means that the non-linearity between the variables such as the number of hours of AI training and the number of years of experience are significant that might not be taken into account by the simpler models.

Such results were also interpreted with the help of the exploratory analysis. Pie charts showed an overrepresentation of AI use with large amounts of teachers utilizing AI tools having a minimal usage. Scatter plots showed that there is a positive correlation between the AI training hours and the scores derived by the performance indicating that AI-related training also brings improved teaching outcomes. Bar charts also revealed the existence of discrepancies in the education levels and development categories and that there was need to provide special consideration to teachers, which had minimal qualification or access to professional learning. The hours of AI training, performance score and frequency of AI use were the most important predictors of increased level of professional development according to the feature importance analysis [14]. It aligns with available literature that meaning interplay with AI tools enhances instructional competence and reflective practice. Nevertheless, the outcomes also highlight the possible equity issues. The less trained teachers or less exposure to technology may be disadvantaged in the actual development and predictive modelling performance.

IV. Conclusion and Future Work

A. Conclusion

This paper aimed to look into the potential use of Artificial Intelligence to assist and predict teacher professional development based on tools of supervised machine learning. The results prove that AI-related variables, specifically AI training hours, frequency of use, and scores of AI performance are important factors that influence the level of development in teachers. The most effective of the three models that the researcher tested was the use of the Random Forest classifier that had the highest accuracy of 98.8 and this provides an insight on how such a model can be used to address complex non-linear relationships [15]. The imbalanced usage of AI tools, the dissimilar interactions, and the correlations between the training exposure and professional development were also found with the assistance of the exploratory data analysis. The findings echo the accumulating literature that the integration of AI in education is not merely a technological change but a circumstance that is steadily expanding in the development of an educator. They do note though the ethical requirement to provide fairness, inclusiveness and balanced datasets in the use of predictive analytics in education. Overall, the study concludes that AI-driven insights can be used to guide the decision-making process using data, identify training needs, and enhance professional development opportunities provided that they are used responsibly.

B. Recommendation And Future Work

Considering the results, the study suggests that more focus should be given to greater access to AI training among teachers, broadening of institutional support, and lifelong professional evolution in congruence with the AI-enabled practices. Digital resources should be availed to schools and policy makers fairly to avoid perpetrating the existing inequalities. Practical AI workshops, micro-credentialing and reflective learning tools should be also part of the new training programmes so that teachers could implement meaningfully in the classroom context regarding AI [16].

To enhance the external validity of the models in future studies, bigger and more heterogeneous data sets are required to enhance the ability of the model to be applicable in other institutions, subjects and cultural backgrounds. Other models, which might be experimented to make comparisons with the existing classifiers, are Gradient Boosting, XGBoost and Neural Networks models. One more possible area of further research is the implementation of explainable AI (XAI) techniques to increase the predictive modelling transparency [17]. Lastly, qualitative elements, including teacher interviews, can also add to the results since they help in the

coverage of the real world perception and issues of challenges involved in professional development based on AI.

REFERENCES

[1] Akgun, S. and Greenhow, C., 2022. Artificial intelligence in education: Addressing ethical challenges in K-12 settings. AI and Ethics, 2(3), pp.431-440.

[2] Chelghoum, H. and Chelghoum, A., 2025. Artificial Intelligence in Education: Opportunities, Challenges, and Ethical Concerns. Journal of Studies in Language, Culture and Society (JSLCS), 8(1), pp.1-14.

[3] Aghaziarati, A., Nejatifar, S. and Abedi, A., 2023. Artificial intelligence in education: Investigating teacher attitudes. AI and Tech in Behavioral and Social Sciences, 1(1), pp.35-42.

[4] Flores-Viva, J.M. and García-Peñalvo, F.J., 2023. Reflections on the ethics, potential, and challenges of artificial intelligence in the framework of quality education (SDG4). Comunicar: Media Education Research Journal, 31(74), pp.35-44.

[5] Nguyen, A., Ngo, H.N., Hong, Y., Dang, B. and Nguyen, B.P.T., 2023. Ethical principles for artificial intelligence in education. Education and information technologies, 28(4), pp.4221-4241.

[6] Brandão, A., Pedro, L. and Zagalo, N., 2024. Teacher Professional Development for a Future with Generative Artificial Intelligence--An Integrative Literature Review. Digital Education Review, 45, pp.151-157.

[7] Farooqi, M.T.K., Amanat, I. and Awan, S.M., 2024. Ethical considerations and challenges in the integration of artificial intelligence in education: A systematic review. Journal of Excellence in Management Sciences, 3(4), pp.35-50.

[8] Adams, C., Pente, P., Lemermeyer, G. and Rockwell, G., 2023. Ethical principles for artificial intelligence in K-12 education. Comput. Educ. Artif. Intell., 4, p.100131.

[9] Celik, I., Dindar, M., Muukkonen, H. and Järvelä, S., 2022. The promises and challenges of artificial intelligence for teachers: A systematic review of research. TechTrends, 66(4), pp.616-630.

[10] Karimi, H. and Khawaja, S., 2023. The impact of artificial intelligence on higher education in England. Creative Education, 14(12), pp.2405-2415.

[11] Özer, M., 2024. Potential Benefits and Risks of Artificial Intelligence in Education. Bartin University Journal of Faculty of Education, 13(2).

[12] AlAli, R. and Wardat, Y., 2024. Opportunities and challenges of integrating generative artificial intelligence in education. International Journal of Religion, 5(7), pp.784-793.

[13] Francisco, C.I., 2025. Teachers' Perceptions of Learning From, About, and With Artificial Intelligence in Education (AIED): Implications for Ethical Practice and the Challenges of AI Use in Basic Education. EthAIca: Journal of Ethics, AI and Critical Analysis, (4), p.433.

[14] Francisco, C.I., 2025. Teachers' Perceptions of Learning From, About, and With Artificial Intelligence in Education (AIED): Implications for Ethical Practice and the Challenges of AI Use in Basic Education. EthAIca: Journal of Ethics, AI and Critical Analysis, (4), p.433.

[15] Hesham, A., Dempere, J., Akre, V. and Flores, P., 2023, November. Artificial intelligence in education (AIED): Implications and challenges. In Allam, Hesham, Dempere, Juan, Akre, Vish, & Flores, Pedro.(2023). Artificial Intelligence in Education (AIED): Implications and Challenges. In Proceedings of the HCT International General Education Conference (HCT-IGEC 2023) (pp. 126-140).

[16] Özer, M., 2024. Potential Benefits and Risks of Artificial Intelligence in Education. Bartin University Journal of Faculty of Education, 13(2). Mouta, A., Torrecilla-Sánchez, E.M. and Pinto-Llorente, A.M., 2024. Design of a future scenarios toolkit for an ethical implementation of artificial intelligence in education. Education and Information Technologies, 29(9),