# Prediction of Hybrid Learning as a Future Study Approach & digitalization of the data analysis course for students

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## *Aim of the Project*

The primary goal of this research is to implement AI models that anticipate hybrid learning based on student opinions. Several supervised machine learning methods (SVM, RF, XGB, DT, and LR) have been trained and evaluated on over 100 samples. Additionally, XAI (SHAP model). The results of each model were significant, having good accuracies. The predictors take into account hybrid learning difficulties, perks, university support, assistance, demography, and other factors. Based on the best model, the plan is to create a web application that may provide prediction results based on the input. This tool will act as a hybrid learning recommender.

## *Project Framework*

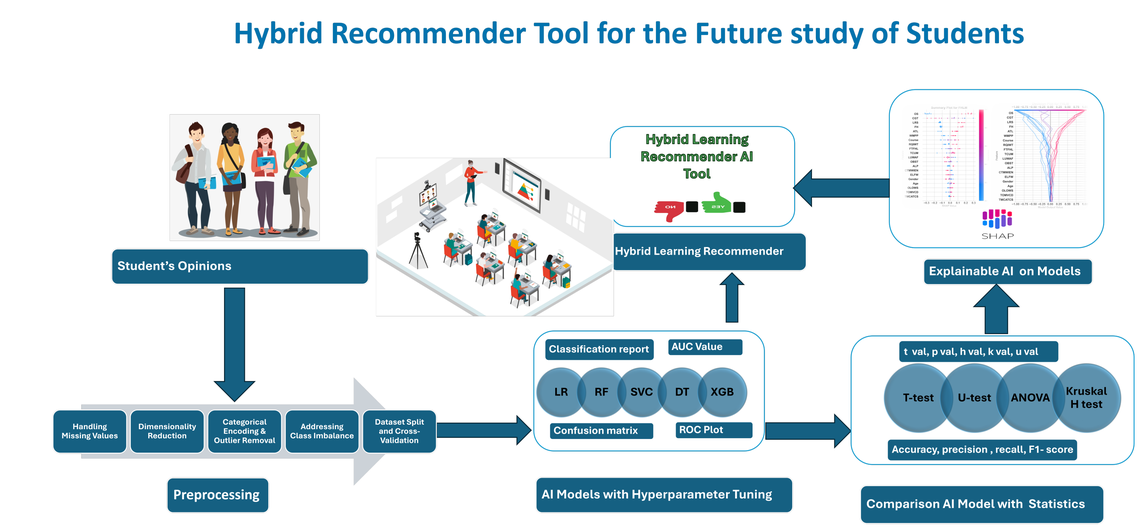


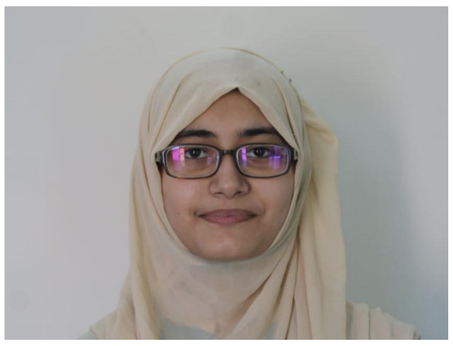

**Figure 1:** *Hybrid Learning Recommender.*

Above is the pictorial representation of the research. It shows the conceptual framework of the proposed research project. As early findings indicate, the most important contribution of this research is the development of an AI web application/tool that identifies the possibility of adopting the hybrid learning mode in higher education. Furthermore, the combination of an explainable artificial intelligence model (SHAP) and a standard machine learning model (SVM) to define the hybrid learning mode in the field of education is a unique contribution.

## *PARTICIPANTS & IMPLEMENTERS*

Dr. Chaman Verma (Assistant Professor, ELTE-IK) is a chief researcher and of R & D Project who is working on the AI part of the project. He pursued a Post-doctorate at the faculty of informatics, Eötvös Loránd University, Budapest, Hungary sponsored by UNKP, MIT (Ministry of Innovation and Technology) the National Research, Development and Innovation (NRDI) Fund, Hungarian Government. He did Ph.D. in informatics from the Doctoral School of Informatics, Eötvös Loránd University, Budapest, Hungary, with the Stipendium Hunagricum Scholarship funded by the Tempus Public Foundation, Hungary. During his Ph.D. degree, he won the EFOP Scholarship, Co-Founded by the European Union Social Fund and the Government of Hungary, as a professional research assistant in a real-time system from 2018 to 2021.

Mr. Zeeshan Mohammad is M.Sc. student at ELTE-IK, who is developing the course "Statistics and Machine Learning for Real-Time Data Analysis in Python". He has completed around 40% of his task.



Ms. Mangi Aqsa Gul is B.Sc. student at ELTE-IK, who is developing the course "Statistics and Machine Learning for Real-Time Data Analysis in IBM SPSS". He has completed around 70% of his task. .

## *SUMMARY OF RESULTS ACHIEVEMENT*

AI models have been implemented with primary samples. Graph shows the vital results of the SVM model with the confusion matrix, learning curve, testing approaches, factor loading, and PCA components.

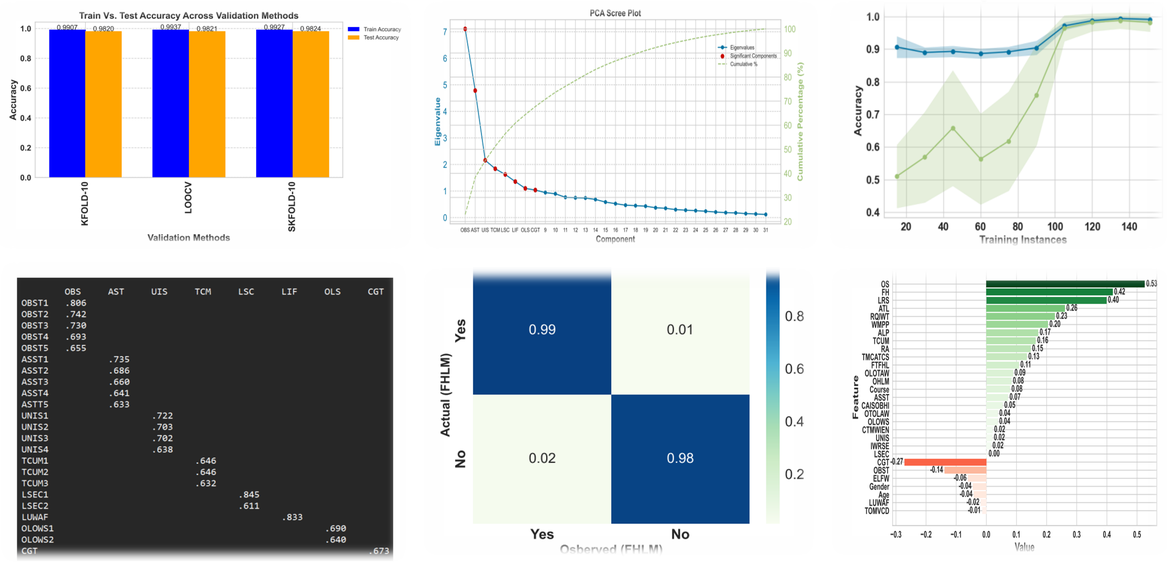



**Figure 2:** *Hybrid learning Recommendation results*

The present project integrated and explained the SVM model with SHAP to predict the hybrid learning in education.The primary samples have been considered for it. Test accuracy was observed, and the best parameters were set to train the model using SVM hyperparameter optimization. The model has been trained with 99% accuracy and tested with 98% accuracy. Hence, SVM has been stabilized and no significant variation has been found in both accuracies. Additionally, the final trained model was further explained using the SHAP approach, which described the novel features that contributed significantly to the classification task. The SVM model acquired the maximum possible f1-score, precision, and recall values, all of which were 0.98. According to the calculations, the AUC equals 1, which indicates a high value for accurate segregation between "Yes" and "No" responses. According to the SVM coefficient, the attributes that had the most impact were Overall Satisfaction (OS), Long Term Solution (LRS), Feeling Happiness (FH), and Overall Satisfaction (OS). These attributes had positive coefficients of 0.78, 0.49, 0.47, and 0.41 respectively. The Challenging Group task (CGT) and the Obstacle (OBST) have negative coefficients, with the former being -0.42 and the latter representing - 0.16. While the selection was being made, Shapley Additive Explanations (SHAP) explained the strength of the SVM model and voted for OS, FH, LRS, and CGT.

## *Data Analysis Course Content Development*

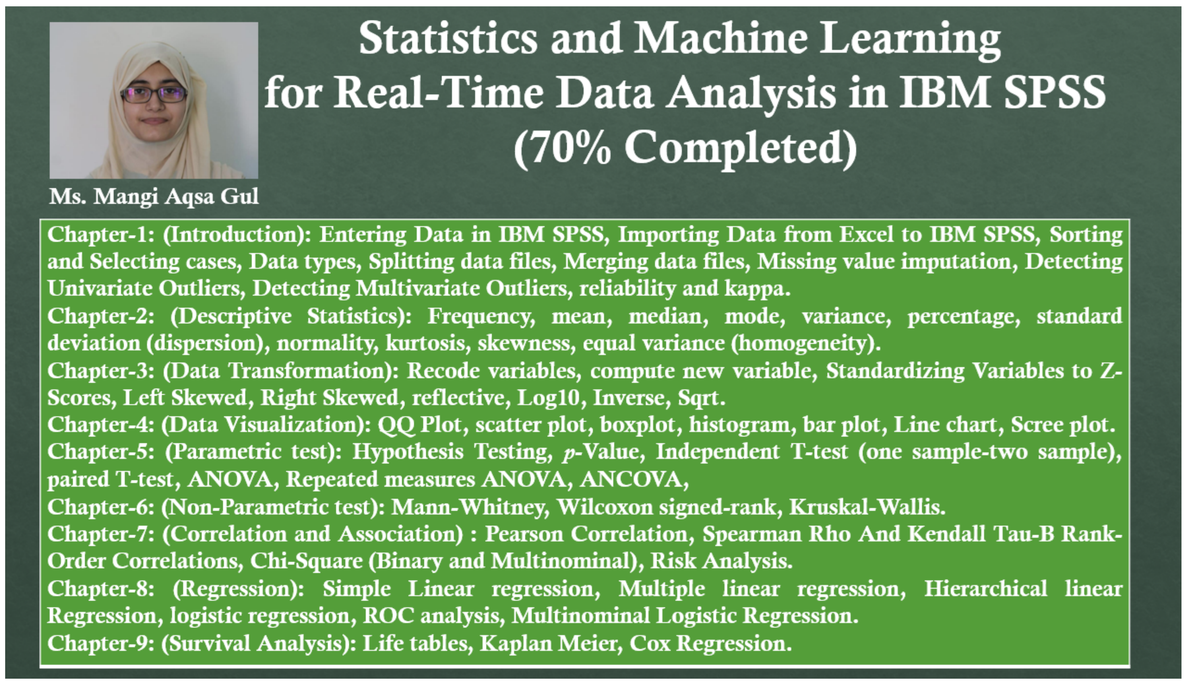



**Figure 3:** *Data analysis Course: IBM SPSS.*

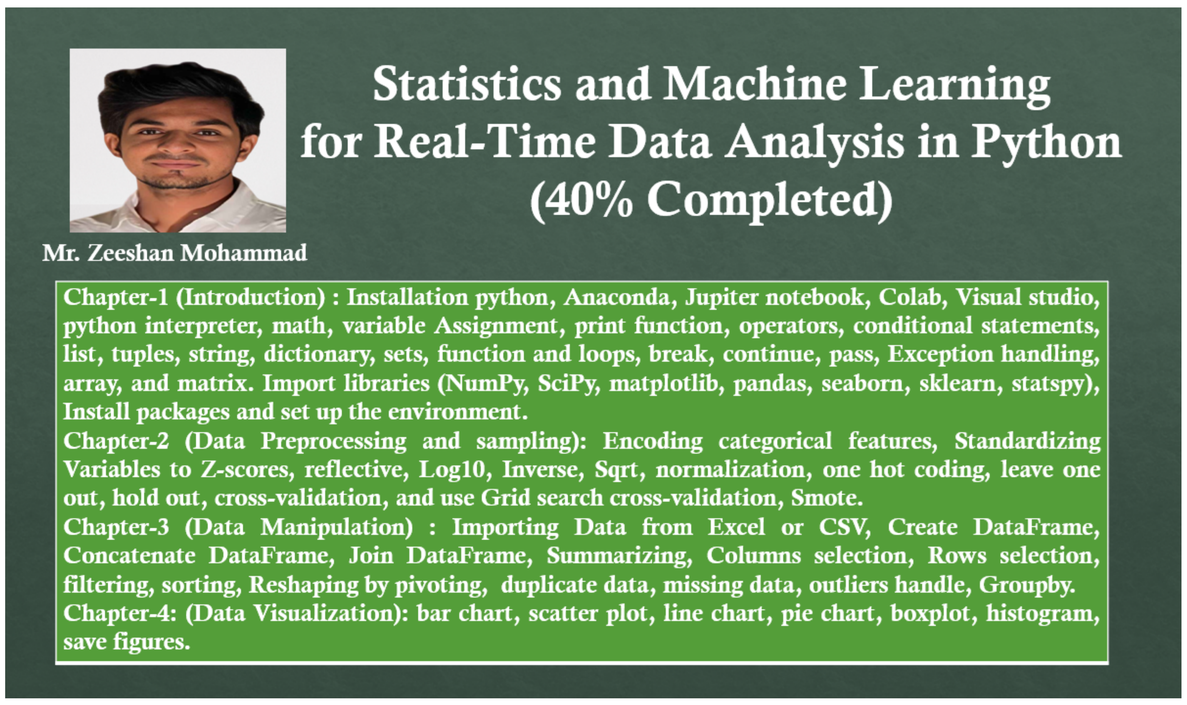



**Figure 4:** *Data analysis Course: Python.*

## RESULT & BENEFIT

This machine learning project is used to determine whether or not students would like to pursue education via hybrid learning mode. There will also be fresh aspects that will be suggested, such as challenges, benefits, university support, assistance, and demographics, all of which can assist in arriving at a meaningful option. The findings will make it possible for policymakers to gain a better understanding of the true challenges and potential advantages associated with the acceptability of hybrid learning in our educational system.

Further, the developed content will be scientific and quality-based. To digitalize the higher education, the present project with content will be appropriate. This content will also be closer to the industry requirements. The PPTs will be permanent assets to the university. The designed course will attract more international students after polishing it. The designed course based on project will be useful for informatics, social science, and psychology students.

The proposed factors may help the university decision-makers to decide to switch from an offline mode to a hybrid mode of education of course. Three levels: BSc. MSc., and Ph.D. students can join the course to take industry-oriented case studies. Additionally, students and teachers from other faculty, and schools can also be trained to improve their data analytic skills.

## Publication

1. Verma, C., & Others. (2024). An investigation of novel features for predicting student happiness in hybrid learning platforms – An exploration using experiments on trace data. *International Journal of Information Management Data Insights, 4*(1), 100219. https://doi.org/10.1016/j.jjimei.2024.100219
2. Verma, C. (2024). NextGen Learning: Hybrid Mode Prediction with Machine Learning. In *2024 11th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO)* (pp. 1-8). Noida, India. https://doi.org/10.1109/ICRITO61523.2024.10522445
3. Verma, C., & Illes, Z. (2024). Hybrid learning dynamics: Unveiling difficulty, benefits, and satisfaction through statistical analysis. In *EDULEARN24 Proceedings, 16th International Conference on Education and New Learning Technologies* (pp. 147-153). Palma, Spain. https://doi.org/10.21125/edulearn.2024.0067

## ACKNOWLEDGMENT

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ELTE Eötvös Loránd University

NEMZETI KUTATÁSI, FEJLESZTÉSI ÉS INNOVÁCIÓS HIVATAL

AZ NKFI ALAPBÓL MEGVALÓSULÓ PROJEKT