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Vector support machine algorithm applied to the improvement of satisfaction levels in the acquisition of professional skills

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ABSTRACT

The study carried out identifies the metricss of the predictive model obtained through the support vector machine (VSM) algorithm, which will be applied in the satisfaction of the acquisition of professional skills of the students of the professional engineering career. As part of the development, the statistical classification tool is used, during the development of the research, it was identified that the predictive model presents as general metrics an accuracy of 82.1%, a precision of 70.72%, a sensitivity of 91.06% and a specificity of 87.60%. Through this model, it contributes significantly to decision-making in relation to improving satisfaction related to the acquisition of professional skills in engineering students, since decision-making by university authorities will have a scientific basis, to take early and timely actions in relation to the predictive elements.

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1. INTRODUCTION

University institutions, like any organization that seeks to improve its service, must make decisions that respond to improving the quality of university service and where the main element is the student and their satisfaction [1]-[3]. Currently, the development of information technology makes it possible to store and manage data on a large scale, which, together with artificial intelligence and machine learning, allows us to obtain useful knowledge that is fully applicable to university environments [4], [5]. In particular, artificial intelligence and data mining applied to university educational processes take on importance due to the predictive analysis and behavior patterns that characterize or particularize the development and achievement of the acquisition of competencies and abilities of the subjects and study programs that they develop [6], [7]. It is evident that there is a need for the use of computer technology applications, strictly linked to data mining and artificial intelligence, in order to extract knowledge of the behavior of the university student with the purpose of obtaining predictive models that help to take decisions to university officials in order to improve student performance [8]-[10]. In turn in [11], [12] the author points out that the ability to predict the performance indicators of the university student today is crucial, because it seeks to detect and prevent negative changes in their behavior, avoid poor performance and the non-acquisition of competences of their subjects.

University institutions play a decisive role within society, since they seek to educate people who manage to acquire skills, which will be used in their professional development, it is therefore very important to link the role of the university with knowledge management supported by artificial intelligence [13]-[15]. In this context of handling a large amount of data or what we know as data mining, an aspect to be highlighted is the generation of grouping or classification models of objects or entities based on the same characteristic or behavior, which will then be used for the decision making [16]-[18]. In [19]-[23] it is indicated that among the different algorithms used to perform predictive classification models we have the models generated through the vector support machine (VSM) algorithm. Also in [24], [25], they point out that VSM is a machine learning algorithm, very useful for classifying data of a linear and non-linear nature, as well as allowing the construction of a predictive model based on decision limits, called hyperplanes.

The author points out that professional competencies are characterized by being a set of knowledge, procedures and attitudes, all of them linked, integrated and coordinated that allow the student to develop optimally at a professional level [26]-[28]. Also in [29]-[31], the author specifies that one of the primary objectives of any university institution is to enable the transfer of learning in such a way as to guarantee the acquisition of professional skills to the student. In [32], [33], it is indicated that predictive models are built through relevant historical data on the behavior of university students, which will be called predictive elements, supported by tools called learning machines or neural networks. In this regard, in [34], the author affirms that it is important to identify and know the descriptive aspects that allow determining the perception of university student satisfaction in its different dimensions, even more, in those that are linked to the acquisition of professional skills. In this sense, the study will identify the metrics (accuracy, precision, sensitivity and specificity) obtained through the support vector machine (VSM) algorithm, which will be applied in the satisfaction of the acquisition of professional skills of the students of the Professional Engineering Career, in order to be able to be used by the university managers to improve the taking of decisions.

2. RESEARCH METHOD

2.1. Investigation methodology

The study focuses on the identification of a problem, which is how to improve the perception related to the acquisition of professional skills of engineering students; as part of the development, the statistical classification tool is used, in order to be used by university managers to improve decision making. Likewise, the performance metrics of the algorithm will be analyzed. For the development of the research, the perception of 761 students of the 7th-10th cycle was obtained; this delimitation is part of the university regulations. The data was collected through a virtual survey which the student accessed through the virtual platform, likewise, data are qualitative ordinal scale; the responses were converted to a Likert scale (1: dissatisfied, 2: somewhat satisfied, 3: satisfied, and 4: very satisfied). Table 1 shows the indicators considered as predictive elements. Alpha coefficientwas used through SPSS V25 to determine the consistency of the data, whose reliability results if the indicator is suppressed is shown in Table 1.

Tabla 1. Indicators unders study

Coding	Indicators	Cronbach's alpha
I1	Teamwork competence	0.960
I2	Competence in problem solving and specialty data	0.958
I3	Competence to act with autonomy and initiative	0.957
I4	Competence to confront own ideas with others	0.958
I5	Competence in public speaking with appropriate language	0.959
I6	Competence to have a positive attitude towards change	0.958
I7	Competence to assume self-education and self-learning	0.958
I8	Competence to work under precision	0.959
I9	Competence to conduct research	0.960
I10	Competence to master professional skills	0.959

2.2. Data processing design

Figure 1 shows the data processing architecture; the data is related to 10 indicators of student satisfaction when perceiving the professional skills, they are acquiring during the distance education environment. The information is stored in Microsoft SQL Server, through Matlab R2021a. Once the data was conditioned in Matlab R2021a, the statistical classification tool was used.

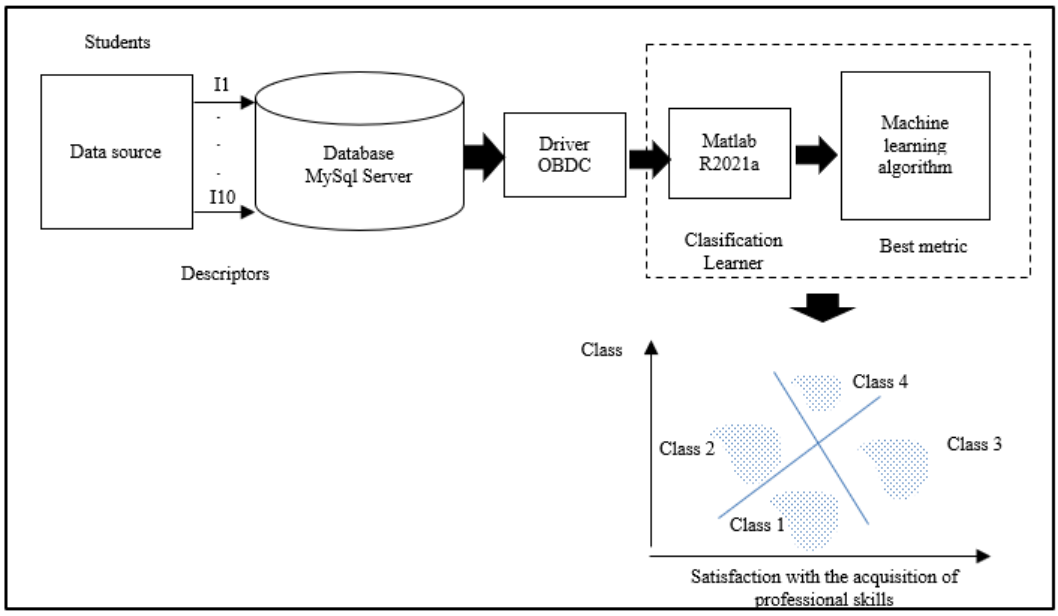

Figure 1. Data processing architecture

3. RESULTS AND DISCUSSION

3.1. Determination of the predictive model

Using the Matlab R2021a software, the algorithm with the best performance indicators is identified. For the case of this investigation, the results of the precision indicator were taken as a reference. Figure 2 shows the results of the "precision" of different algorithms, in which the algorithm with the best precision resulted from the Support Vector Machine (SVM). The precision value for this algorithm turned out to be 82.1%, this value represents the fraction of predictions that the algorithm will perform correctly.

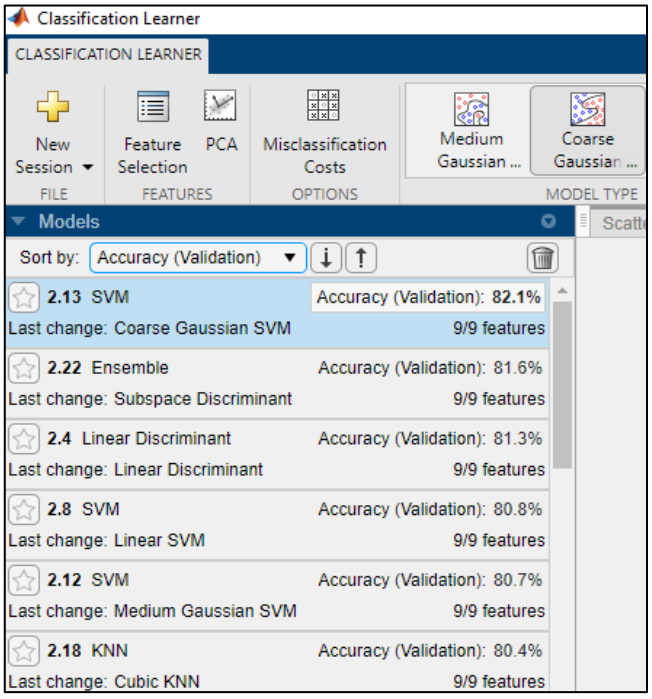

Figure 2. Algorithm validation (accuracy)

3.2. Results of the predictive model metrics

In order to identify the performance metrics of the given algorithm, Figure 3 shows the confusion matrix centered on the true positive rate (TPR) and the false negative rate (FNR), where it can be seen the 4 classes (levels of satisfaction) of the predictive system. As shown, class 3 presents 94.6% of true positives and 5.4% of false negatives, so it can be indicated that a better performance is presented for this class. In Figure 4, I show the confusion matrix of predicted positive values (PPV) and the obtained false rate (FDR). This analysis shows that of the 4 classes (satisfaction levels) of the predictive system, class 1 presents 100% of predicted positive values, in the same way the percentages obtained in the other classes validate the good performance of the algorithm employee. In this way, Table 2 shows the metrics of the predictive model (accuracy, precision, sensitivity and specificity) of the support vector machine (VSM) algorithm. In general, the algorithm presents a precision of 87.6%, accuracy of 91.07%, specificity of 91.04% and a sensitivity of 70.72%.

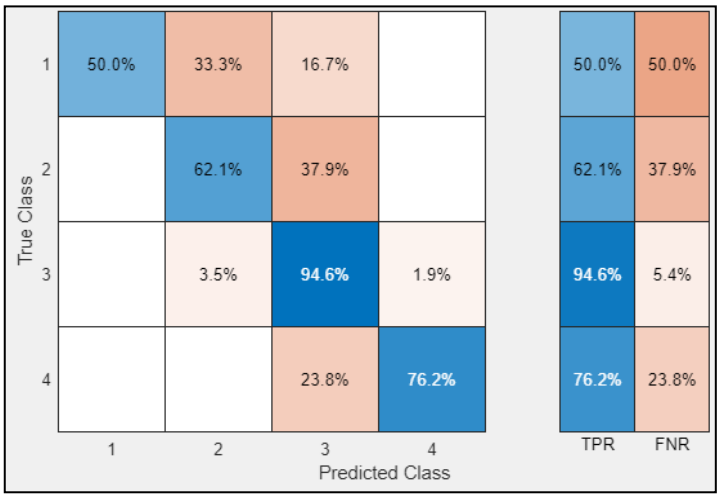

Figure 3. Confusion matrix (TPR and FNR)

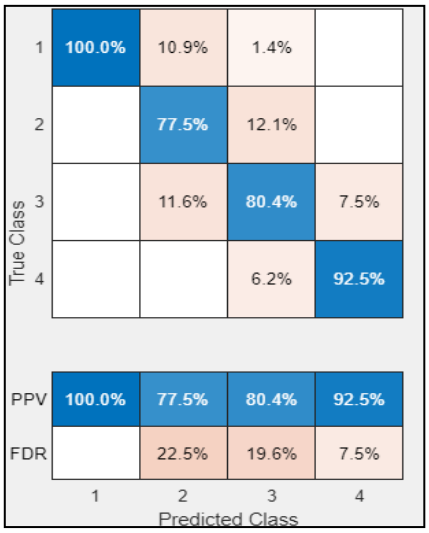

Figure 4. Confusion matrix (PPV and FDR)

Table 2. Metrics of the predictive classification algorithm

Class	Metrics			
	Sensitivity	Specificity	Accuracy	Precision
I1	50.00%	100.00%	97.24%	100.00%
I2	62.11%	95.17%	88.17%	77.52%
I3	94.63%	70.27%	83.97%	80.36%
I4	76.15%	98.73%	94.88%	92.52%

Likewise, through the ROC graph, the sensitivity and specificity of the classifying algorithm will be known; In Figure 5, it is shown that in general all the classes of the predictive model present acceptable levels. Thus, in Figure 5(a) it is specified that the specificity indicator of the algorithm for class 1 has an optimal value of 100%, with a sensitivity of 50%. Also in Figure 5(b), it is shown that for class 2, the algorithm has a value of well over 95%, with a sensitivity of 62%. However, in figure 5(c) it is shown that in class 3, the algorithm shows a sensitivity of 95%, being the class with the highest level. Finally, figure 5(d) shows that for class 4, the specificity indicator is 99%, while the sensitivity indicator is 76%. Additionally, the average Recall and F1 Score macro indicators were determined, resulting in 70.72% and 76.52%, respectively; These results contribute to establishing the feasibility of implementing the predictive model through the VSM algorithm. Since you have a high-precision result for each class and an acceptable recall value, it can be established that the model handles each class correctly.

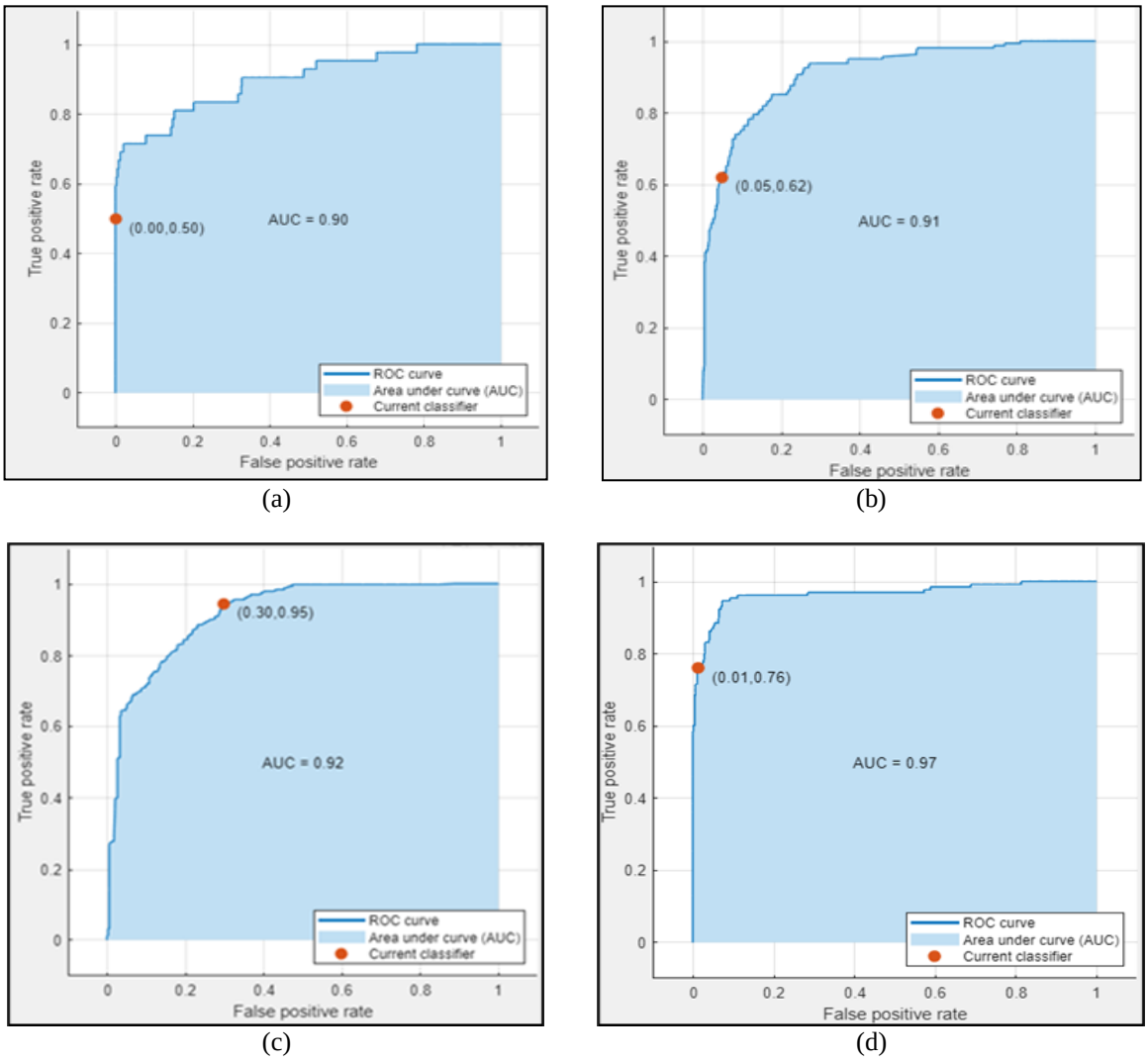

Figure 5. False positive rate of: (a) class 1, (b) class 2, (c) class 3 and (d) class 4

3.3. Discussion of results

The support vector machine (SVM) algorithm presents acceptable performance metrics (accuracy, sensitivity, precision and specificity) for each of its classes (satisfaction levels), in this way of the predictive system is viable for its implementation and contribution to the optimization of the service provided by the superior organization; in this regard in [1], [11], the authors state that as part of implementing corrective and preventive actions, university institutions are relying on technology, which based on forward-looking models manage to obtain results in an easier and faster way, likewise in [27], the author specifies that predictive models represent early detection tools for university students at risk. In [6], he states that his model shows a

high performance, because its general accuracy is 75.42%, in addition, the ROC graph presented a 0.805 sensitivity and specificity; likewise [19], points out that the Support Vector Machine algorithm is better than other classifiers, since it obtained an accuracy of 69.15%. Based on these results and validated research, we can point out that the determined algorithm, when implemented, shows a reliable and safe performance.

4. CONCLUSION

The support vector machine (VSM) machine learning algorithm shows high performance, due to the metrics it presents, for this reason it can be applied to the prediction of the satisfaction of engineering students regarding the acquisition of professional skills by engineering students. In general, the algorithm has a precision of 87.6%, an accuracy of 91.07%, a specificity of 91.04% and a sensitivity of 70.72%, so its implementation is feasible for the improvement of university academic management. Thus, it is also concluded that the predictive model will contribute significantly to decision-making in relation to improving satisfaction related to the acquisition of professional skills in engineering students, since decision-making by university authorities will have a scientific basis, to take action in advance in relation to the predictor elements.

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REFERENCES

[1] C. Vegega, P. Pytel, and M. F. Pollo-Cattaneo, "Application of the requirements elicitation process for the construction of intelligent system- based predictive models in the education area," *Proceedings of Second International Conference (ICAI 2019)*, 2019, pp. 43-58, doi: 10.1007/978-3-030-32475-9.

[2] O. Chamorro-Atalaya *et al*., "K-NN supervised learning algorithm in the predictive analysis of the quality of the university administrative service in the virtual environment," *Indonesian Journal of Electrical engineering and Computer Science*, vol. 25, no. 1, pp. 521-528, 2022, doi: 10.11591/ijeecs.v25.i1.pp521-528.

[3] H. Mella, M. Navarro, and M. Riquelme, "Analysis of satisfaction of students of the faculty of engineering of university of Talca," *Chilean Engineering Journal*, vol. 18, no. 3, pp. 350-363, 2010, doi: 10.4067/S0718-33052010000300009.

[4] O. Chamorro-Atalaya *et al*., "Machine learning model through ensemble bagged trees in predictive analysis of university teaching performance," *International Journal of Advanced Computer Science and Applications*, vol. 12, no. 12, pp. 367-373, 2021, doi: 10.14569/IJACSA.2021.0121249.

[5] R. Salas-Rueda and J. Lugo-García, "Impact of the flipped classroom during the higher education process on the derivatives considering the science of data and learning machine," *Journal of Media Education and TIC*, vol. 8, no. 1, pp. 147-170, 2018, doi: 10.21071/edmetic.v8i1.9542.

[6] E. Ayala, R. Lopéz, and V. Menéndez, "Predictive models of academic risk in computing careers with educational data mining," *Distance Education Journal*, vol. 21, no. 66, pp. 1-36, 2020, doi: 10.6018/red.463561.

[7] W. Nuankaew, P. Nuankaew, D. Teeraputon, D. Phanniphong, and S. Bussaman, "Perception and attitude toward self-regulated learning of Thailand'sstudents in Educational data mining perspective," *International Journal of Emerging Technologies in learning*, vol. 14, pp. 34-49, 2019, doi: 10.3991/ijet.v14i09.10048.

[8] H. Sokout and T. Usugawa, "Learning Analytics: Analyzing various aspects of learner's performance in blended courses. The case of Kabul Polytechnic University Afghanistan," *International Journal of Emerging Technologies in learning*, vol. 15, no. 12, pp. 168-190, 2020, doi: 10.3991/ijet.v15i12.13473.

[9] Y. Zhang, A. Ghandour, and V. Shestak, "Using learning analytics to predict students performance in Moodle LMS," *International Journal of Emerging Technologies in learning*, vol. 15, no. 20, pp. 102-115, doi: 10.3991/ijet.v15i20.15915.

[10] Z. Yasin, N. Salim, N. Aziz, H Mohamad, and N. Wahab, "Prediction of solar irradiance using grey wolf optimizer least square support vector machine," *Indonesian Journal of Electrical engineering and Computer Science*, vol. 17, no. 1, pp. 10-17, 2020, doi: 10.11591/ijeecs.v17.i1.pp10-17.

[11] O. Chamorro-Atalaya *et al.*, "Supervised learning through classification learner techniques for the predictive system of personal and social attitudes of engineering students," *International Journal of Advanced Computer Science and Applications*, vol. 12, no. 12, pp. 718-725, 2021, doi: 10.14569/IJACSA.2021.0121289.

[12] S. Shrestha and M. Pokharel, "Eductional data mining in moodle data," *International Journal of Informatics and Comunication Technology (IJ-ICT)*, vol. 10, no. 1, pp. 9-18, 2021, doi: 10.11591/ijict.v10i1.pp.9-18.

[13] A. Rico, N. Gaytán, and D. Sánchez, "Construction and implementation of a model to predict the academic performance of university students using the Naive Bayes algorithm," *Dialogues on Education Journal*, vol. 19, pp. 1-18, 2019, doi: 10.32870/dse.v0i19.509.

[14] O. Sifuentes, "Predictive models of student dropout in a Peruvian private university," *Industrial data Journal*, vol. 21, no. 2, pp. 47-52, 2018, doi: 10.15381/idata.v21i2.15602.

[15] J. Zambrano, "Prediction factors of student satisfaction in online courses," *Ibero-American Journal of Distance Education*, vol. 19, no. 2, pp. 217-235, 2016, doi: 10.5944/ried.19.2.15112.

[16] V. Berlanga, M. Figuera, and E. Pons, "Predictive model of persistence University: students with salary scholarship," *Education XXI Journal*, vol. 21, no. 1, pp. 209-230, 2018, doi: 10.5944/educXX1.15611.

[17] G. Gopal and G. Babu, "An ensemble feature selection approach using hybrid kernel based SVM for network intrusion detection system," *Indonesian Journal of Electrical engineering and Computer Science*, vol. 23, no. 1, pp. 558-565, 2021, doi: 10.11591/ijeecs.v23.i1.pp558-565.

[18] B. T. Ahmed, "Data minig techniques for lung and breast cancer diagnostic:a review," *International Journal of Informatics and Communication Technology*, vol. 10, no. 2, pp. 93-103, doi: 10.11591/ijict.v10i2.pp93-103.
[19] A. Kesumawati and D. Tri, "Predicting patterns of student graduation rates using naïve bayes classifier and support vector machine," *AIP conference proceedings*, vol. 1, 2021, pp. 344-351, doi: 10.1063/1.5062769.
[20] N. Purnamasari, M. Fauzi, and L. Dewi, "Cyberbullyng identification in twitter using support vector machine and information gain based feature selection," *Indonesian Journal of Electrical engineering and Computer Science*, vol. 18, no. 3, pp. 1494-1500, 2020, doi: 10.11591/ijeecs.v18.i3.pp1494-1500.
[21] M. D. Salawu *et al*., "A chi-square-SVM based pedalogical rule extraction method for microarray data analysis," *International Journal of Advances in Applied Sciences*, vol. 9, no. 2, pp. 93-100, 2020, doi: 10.11591/ijaas.v9.i2.pp93-100.
[22] N. Kulkarni, "Support vector machine based alzehimer's disease diagnosis using synchrony features," *International Journal of Informatics and Comunication Technology*, vol. 9, no. 1, pp. 57-62, 2020, doi: 10.11591/ijict.v9i1.pp.57-62.
[23] J. Sirkunan, J. Tang, N. Shaikh-Husin, and M. Marsono, "A streming multi-class support vector machine classification architecture for embedded systems," *Indonesian Journal of Electrical engineering and Computer Science*, vol. 16, no. 3, pp. 1286-1296, 2019, doi: 10.11591/ijeecs.v16.i3.pp1286-1296.
[24] S. Muthukrishnan, H. Krishnaswamy, S. Thankodi, D. Sundaresen, and V. Venkatra-Man, "Support vector machine for modelling and simulation of heat exchangers," *Thermal Science journal*, vol. 24, no. 1B, pp. 499-503, 2020, doi: 10.2298/TSCI190419398M.
[25] I. Ahmad *et al*., "Performance comparison of support vector machine, random forest, and extreme learning machine form intrusion detection," *IEEE Access*, vol. 6, pp. 33789-33795, doi: 10.1109/ACCESS.2018.2841987.
[26] O. Chuan, N. Aziz, Z. Yasin, N. Salim, and N. Wahab, "Fault classification in smart distribution network using support vector machine," *Indonesian Journal of Electrical engineering and Computer Science*, vol. 18, no. 3, pp. 1148-1155, 2020, doi: 10.11591/ijeecs.v18.i3.pp1148-1155.
[27] M. Fikri and R. Sarno, "A comparative study of sentiment analysis using SVM and SentiWordNet," *Indonesian Journal of Electrical engineering and Computer Science*, vol. 13, no. 3, pp. 902-909, 2019, doi: 10.11591/ijeecs.v13.i3.pp902-909.
[28] M. Ali, N. Aziz, and R. Besar, "Comparison of microarray breast cancer clasification using support vector machine and regression with LASSO and boruta feature selection," *Indonesian Journal of Electrical engineering and Computer Science*, vol. 20, no. 2, pp. 712-719, 2020, doi: 10.11591/ijeecs.v20.i2.pp712-719.
[29] M. Azad, A. Majunder, J. Das, and M. Islam, "Improving signal detection accuracy at FC of a RCN using machine learning and fuzzy rules," *Indonesian Journal of Electrical engineering and Computer Science*, vol. 21, no. 2, pp. 1140-1150, 2021, doi: 10.11591/ijeecs.v21.i2.pp1140-1150.
[30] S. Huang, N. Cai, P. Penzuti, S. Narrandes, Y. Wang, and W. Xu, "Applications of support vector machine (SVM) learning in cancer Genomics," *Journal Cancer Genomics & Proteomics*, vol. 15, no. 1, pp. 41-51, 2018, doi: 10.21873/cgp.20063.
[31] R. Campaña-Jiménez and M. Gallego-Arrufat, "Teaching strategies for the acquisition of skills in vocational training: student profiles," *Educar Journal*, vol. 55, no. 1, pp. 203-229, 2019, doi: 10.5565/rev/educar.876.
[32] M. Moukhafi, K. E. Yassini and B. Seddik, "Instrusions detection using optimized support vector machine," *International Journal of Advances in Applied Sciences*, vol. 9, no.1, pp. 62-66, 2020, doi: 10.11591/ijaas.v9.i1.pp62-66.
[33] R. Salas-Rueda, R. Salas-Rueda, and J. Salas-Silis, "Analysis of student's perception of the use of infromation and comunication techonologies in the educational process trough data science," *Electronic Journal quality in higher education*, vol. 10, no. 1, pp. 96-124, 2019, doi: 10.22458/caes.v10i1.2463.
[34] D. Rodríguez-Gómez, C. Armengol, and J. Meneses, "The acquisition of professional competences through the curricular practices of initial teacher training," *Education Journal*, vol. 37, pp. 229-251, 2017, doi: 10.4438/1988-592X-RE-2017-376-350.

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