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Unraveling the Link: Investigating the Correlation Between the Core Subjects of Architecture and Licensure Exam Performance in BS Architecture Graduates

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RESEARCH ARTICLE INFORMATION

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ABSTRACT

This research paper aimed to investigate the relationship between the History, Theory, and Practices Subjects within the BS Architecture curriculum and the corresponding licensure exam results. By employing data mining techniques and leveraging the WEKA platform, this study identified the most influential subject within the History, Theory, and Practices domain for architecture students, using data from the academic years 2013 to 2019. The Decision Stump classifier was utilized, achieving an accuracy rate of 75% with a training time of 0 second. The attribute evaluator employed a search mode ranker, while the mean of the History, Theory, Planning, and Practices subjects was calculated. The findings of this study can assist college administrators and faculty members in guiding their students toward better performance in the licensure exam by identifying strengths and weaknesses in the specific subject area, as well as the overall performance variation. By gaining insights into the impact of these subjects on examination outcomes, educational institutions can enhance their curriculum and teaching methodologies to better prepare future architects for success in their professional endeavors.

Keywords: *BS Architecture, data mining, WEKA, Decision Stump classifier, attribute evaluator, ranker*

Introduction

Architecture, as a profession, is built upon the pillars of knowledge, skill, and creativity. Its practitioners have the power to shape the physical environment, producing settings that do not only inspire but also meet society's basic necessities. To verify prospective architects' competency and proficiency, license tests have become the standard method for assessing their fitness to enter the industry. The licensure examination is a crucial milestone in obtaining a professional license in one's desired field, particularly in architecture. Many students face significant challenges as they diligently prepare daily to ensure success on the examination day. Some individuals may require multiple attempts to pass the exams, while others may opt not to pursue licensure due to various circumstances. To control certain professions or vocations, government organizations frequently conduct licensure examinations. Instead of only concentrating on the interests of the profession, the main goal of licensing is to assure the protection of the public's health, safety, and welfare. Only licensed persons may practice in a regulated occupation or profession after demonstrating a minimum level of proficiency for public health, safety, and welfare.

Board examinations are a legal requirement in the Philippines before any professional may perform their trade. Board examinations are governed by laws that provide the minimum level of expertise in a range of fields. The granting of a certificate of competence by the Professional Regulation Commission ensures that a graduate has mastered a body of knowledge, exhibited a minimum level of professional competence, and acquired the necessary abilities in a certain specialization (Callena et al., 2019). The main aims of higher education institutions are to provide high-quality education to their students and to improve administrative decision-making. One strategy for achieving the highest degree of quality in higher education is to extract information from educational data and assess the primary aspects that may influence a student's performance (Rustia et al., 2018). Data mining proves to be highly advantageous in the realm of higher education, with particular relevance to the facilitation of the teaching and learning process.

The process of obtaining substantial (non-trivial, implicit, previously unknown, and potentially useful) information from enormous volumes of data is known as data mining (Aldowah et al., 2019). It is defined as a method of discovering patterns and trends within large datasets, which also includes a wide range of activities such as description, prediction, estimation, classification, grouping, and association. The application of data mining allows businesses to transform raw data into valuable and efficient information (Bachhal et al., 2021). Specifically, Educational Data Mining (EDM) is a systematic scientific investigation focused on the creation of tools and techniques for identifying and analyzing unique types of data within educational contexts. EDM primarily aims to obtain deeper insights regarding students and their learning environments to strengthen our understanding of their educational experiences. Moreover, EDM enables proponents to discover valuable patterns, trends, and linkages in educational data by employing advanced data mining methodologies which then contribute to the improvement of educational practices and outcomes (Su & Lai, 2021).

Consequently, the examination performance of engineers and architects has received limited research attention. One study focused on electronics engineering board examinations showed that factors such as building infrastructure and laboratory facilities and equipment had the least influence on ECE board exam results. Furthermore, survey respondents stated that higher college admission test scores were related to a higher probability of passing the licensure examination. In like manner, board test passing rates were positively influenced by faculty and instructional materials used (Dayaday, 2018). Some institutions have adopted procedures that aim at identifying predictors of professional test performance, which may

include the development of intervention courses specifically tailored to improve licensure exam success rates (Tamayo et al., 2014).

Several studies have also repeatedly demonstrated that the training that architects receive during their education has a substantial impact on their professional practice. These impacts extend beyond its core principles and encompass various aspects including large domains of architecture and its related field of engineering. This has resulted in a significant shift in the design of architectural curriculum, encompassing a broader range of courses and considerations (Danaci, 2015). For learners to have a deep understanding of the curriculum shift, the shift must be infused with the learner's local location (Abu-Ghazzeh, 1997). A regionally focused design curriculum often largely contributes to the enhancement of professional practice (Tamblyn et al., 2002). Moreover, the primary aim of the architectural profession has evolved to involve mediating between practitioners and the culture in which they operate.

In the local context, the Professional Regulation Commission (PRC), which oversees all licensing evaluations, saves the bar exam and administers the Architect Licensure Board Examination. All candidates must have a four-year bachelor's degree in architecture from an approved academy, college, or university to take the license tests. With this, architecture education, as a unique branch of education, must strike a balance between the curriculum design and the architect's projected role in society. More importantly and fundamentally, higher education institutions must guarantee that their professors have the necessary knowledge to assess and ensure quality exam performance (Silvestri et al., 2012). The licensing examination serves as one of the final hurdles on the candidate's path to being a licensed professional. The board's primary mission is to ensure that the examination satisfies technical, professional, and legal requirements, thereby protecting the public's health, safety, and welfare through assessing the competency and proficiency of applicants.

While architectural education covers a broad curriculum, the demand to investigate the direct impact of key core areas on graduates' success on the architecture licensure examination is still evident. For instance, the insufficient study on the effects of licensing examinations for various curricular programs limits the ability of higher education institution (HEI) administration to identify and act on poor licensure performance of its graduates (Polinar et al., 2020). As a result, higher education institutions are unable to propose policy changes, particularly in the areas of student admissions and retention, faculty development, and infrastructure renovations (Antiojo, 2017). Similarly, despite many governments and healthcare payers' strong commitments to increasing professional cooperation, there is limited data on the effectiveness of measures to attain this goal (Zwarenstein et al., 2005).

With this, the proponents of this study aimed to investigate the correlation between the core subjects of architecture and the examination performance of BS Architecture graduates in the licensure exam. This study sought to identify any patterns or trends that can contribute to improving the effectiveness of architecture education by studying the correlation between specific courses taught in the curriculum and license examination success rates. Specifically, the study aimed to (1) examine the performance of BS Architecture graduates in the licensure exam, (2) determine the architecture curriculum's core subjects, and (3) assess the significance of the relationship between core subjects of architecture and licensure examination performance.

In line with this, the study held several important implications for the field of architecture. It would be beneficial in curriculum improvement. This study would be beneficial in refining architectural curriculum by identifying the essential courses that have a substantial impact on licensure exam results. It could help educational institutions in allocating resources and devising effective teaching practices to maximize student learning

and successful examination results. Moreover, the relationship between core subjects and licensure examination performance could be utilized to assess the quality of architectural education. Understanding the subjects that greatly contribute to the success rate of the examination allows institutions to assess the efficiency of their programs and make required modifications. Likewise, this study would also be beneficial for architecture graduates for them to be better prepared for professional practice. They could be equipped with the essential knowledge and abilities to meet the demands of the architecture field by focusing on the courses that are most relevant to the licensure examination. In addition, this study would contribute to the current body of knowledge by giving empirical information on the relationship between certain core subjects and licensing examination performance. It laid the groundwork for future research and discussions about the efficacy of architecture education and the factors that determine examination achievement.

This study presented insights into the board exam performances of BS Architecture graduates from Cavite State University-Main Campus by utilizing WEKA machine learning software as a sophisticated classification tool. The findings of this study have an immense potential for the development of focused interventions aimed at improving the licensure examination performance among current students, with a particular focus on subjects History, Theory, Practices, and Planning of Architecture. These insights would aid in the pursuit of academic achievement and, in turn, assist future generations of aspiring architects.

Methods

Conceptual Framework

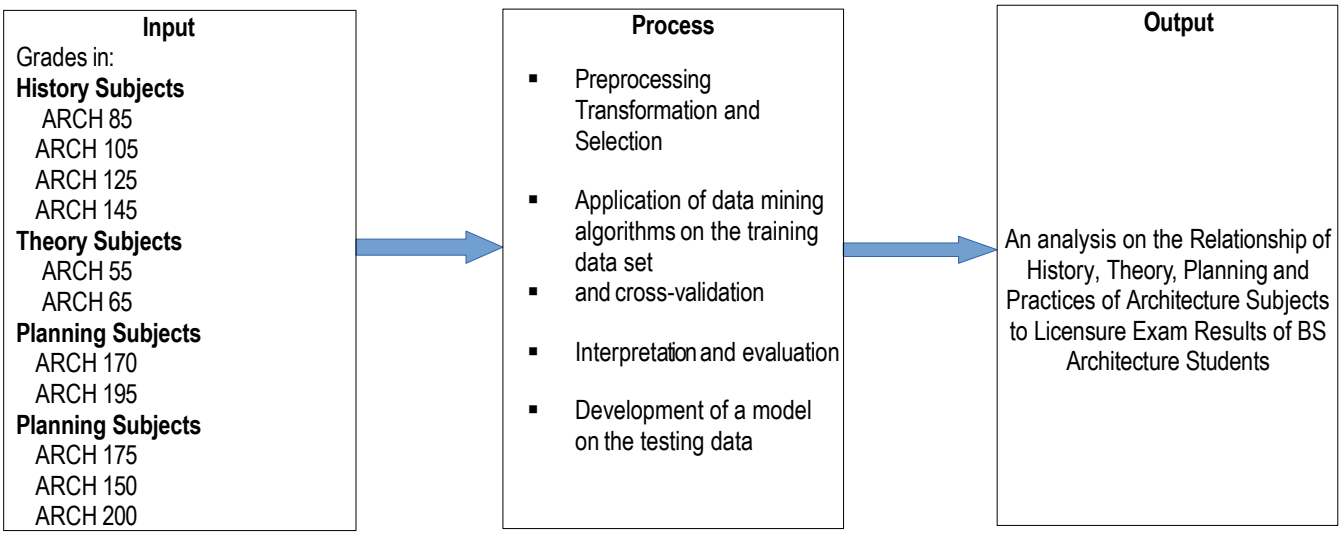

Figure 1. *Theoretical Framework of the Study*

Data Set

The actual datasets consisted of 60 first-time board exam takers from Cavite State University. There were 37 out of 60 first-time takers who passed on the first attempt and 23 of them failed in the board licensure examination. The board exam was taken from June 2013 to June 2019 Architect Licensure Examination. The data for this study came from the alumni of the BS Architecture program's GWA in History, Theory, Practices, and Planning classes. Each alumnus underwent a comprehensive search in both the Professional

Regulations Commission database and the CvSU outcome list of board examinees to determine if they had successfully passed the board exams on their first attempt. Based on their outcomes, the graduates were classified as "Passed" or "Failed". The assessment of their performance was based on the grades achieved in History, Theory, Practices, and Planning classes. These data points were meticulously tallied and utilized as input for the WEKA program. By employing data mining techniques, a robust model was developed to investigate the potential impact of grades on an alumnus' performance in the board exams.

Data Collection Tools

WEKA, an open-source program, provides an extensive range of tools designed to support proponents in various stages of the data mining process. These tools encompass data preparation, implementation of machine learning algorithms, and powerful visualization capabilities. By leveraging WEKA, proponents can construct sophisticated machine-learning approaches and effectively apply them to real-world data mining scenarios. This multifaceted platform empowers users to preprocess and transform their data, explore diverse machine-learning techniques, and gain valuable insights from complex datasets. With its user-friendly interface and comprehensive functionality, WEKA serves as an invaluable resource for proponents seeking to unlock the potential of their data and uncover meaningful patterns and relationships. Utilization of the WEKA software package and the WEKA GUI has granted the machine learning resources without stressing the necessity of expertise in coding to conceptualize and then implement (Johnson III, 2020).

Data Analysis

The WEKA classifier software was used to forecast the subject grades that influenced 60 BS Architecture graduates' performance on the Architecture licensure exam. There were a total of 12 attributes, 11 of which were all of the numerical grade subjects studied in the BS Architecture program, and the last attribute was the takers' board examination result. Furthermore, the proponents employed 47 different classifiers to determine the most accurate classifier. In choosing among the different WEKA software classifiers, the criteria were based on accuracy and training time. If the classifier used in the study fits the given data, the accuracy will be higher while the training time will be reduced (Geollegue et al., 2022).

Research Procedures

The proponents diligently collected the requisite documents from CvSU's Administration office, encompassing the raw grades of students enrolled in the BS Architecture program and the PRC list of test takers associated with CvSU. To ensure the integrity and reliability of the dataset, a meticulous cleaning process was undertaken. The meticulous cleaning method employed by the proponents involved a rigorous process to remove inadequate grades from the dataset. Inadequate grades refer to those that are not directly relevant to the scope of the study, such as grades from subjects outside the focus of the research. To identify and eliminate these grades, the proponents conducted a thorough examination of the dataset, meticulously scrutinizing each entry, taking into account the relevance to the research objectives and the specific subjects under investigation. Any grades that did not meet the established criteria were systematically removed. By implementing this meticulous cleaning method, the proponents ensured that the dataset used for analysis comprised accurate and relevant information, enhancing the validity and reliability of their findings. The proponents, on the other hand, used Microsoft Excel to enter grades without sensitive data such as the student's name or number. This allows for confidentiality and the

avoidance of sharing this information with everyone. The dataset was prepared and delivered to the co-author for verification, review, and testing. The data was loaded into WEKA, which determined the most accurate classifier and rated the subjects with the highest possibility of passing the board licensure exams. The criteria for developing the most reliable and effective classifier model must consider significant factors, including training period and accuracy (Adier et al., 2020).

Table 1. Academic Subjects from BS Architecture

Categorized Subjects	Subject Codes	Subject Description	Value
History Subjects	ARCH 85	History of Architecture I	Numeric
	ARCH 105	History of Architecture II	
	ARCH 125	History of Architecture III	
	ARCH 145	History of Architecture IV	
Theory Subjects	ARCH 55	Theory of Architecture I	Numeric
	ARCH 65	Theory of Architecture II	
Planning Subjects	ARCH 170	Planning I	Numeric
	ARCH 195	Planning II	
Practices Subjects	ARCH 175	Professional Practice I	Numeric
	ARCH 150	Professional Practice II	
	ARCH 200	Professional Practice III	

Table 1 provides a comprehensive overview of the academic subjects within the BS Architecture program, encompassing 4 History Subjects, 2 Theory subjects, 2 Planning Subjects, and 3 Practice subjects. This table serves as a visual representation, showcasing the breadth and diversity of the curriculum in terms of the specific subjects and their corresponding quantities within each category.

Table 2. Used Classifiers of WEKA Software

Categorized Classifier	Sub-Classifier
Bayers Classifier	BayersNet
	NaiveBayers
	NaiveBayersMultinomial
	NaiveBayersMultinomialTest
	NaiveBayersMultinomialUpdatable
	NaiveBayersUpdatable

Functions	Logistics
Classifier	MultilayerPerceptron
	SGD
	SGDText
	SimpleLogistics
	SMO
	VotedPerception
Lazy Classifier	IBK
	KStar
	LWL
Meta Classifier	AdaboostM1
	AttributeSelectedClassifier
	Bagging
	ClassificationViaRegression
	CostSensitiveClassifier
	CVParameterSelection
	FilteredClassifier
	IterativeClassifierOptimizer
	LogitBoost
	MultiClassClassifier
	MultiClassClassifierUpdatable
	MultiScheme
	RandomComittee
	RandomizableFilteredClassifier
	RandomSubSpace
	Stacking
	Vote
	WeightInstancesHandlerWrapper
Misc Classifier	InputMappedClassifier
Rules Classifier	DecisionTable
	JRip
	OneR
	PART
	ZeroR
Trees Classifier	DecisionStump
	HoeffdingTree
	J48
	LMT
	RandomForest
	RandomTree
	REPTree

Table 2 presents the classifiers utilized in the classification of the datasets. A comprehensive selection of 47 classifiers was employed to determine the most effective model for the analysis. A classifier is needed to distinguish between classes, as feature values are often overlapping. Various classifiers have been developed over the years, and their performance and uses depend on the application (Arboleda, 2023).

Notably, the DecisionStump classifier emerged as the top performer, boasting an

impressive accuracy rate of 75%. This accuracy rate signifies the percentage of correct predictions made by the DecisionStump classifier in relation to the total predictions generated. Furthermore, the DecisionStump classifier exhibited exceptional efficiency, achieving a remarkably fast training time of 0 second. These findings highlighted the potential of DecisionStump as a powerful tool for accurately predicting and classifying the relationship between history, theory, planning, and practices of architecture subjects and licensure exam results.

Ethical Considerations

This study involved human individuals and their academic records, which require a high level of privacy, confidentiality, and informed permission. To safeguard participants' privacy, all personally identifiable information was anonymized and managed with strict secrecy. The proponents secured informed consent from the appropriate authorities before gaining access to the participants' academic records and grades. The study was also conducted in an ethical, precise, and open manner. The process of data analysis was carried out impartially, objectively, and in accordance with commonly acknowledged research ethical guidelines.

The findings were provided in a responsible and objective way, with the well-being and best interests of the study subjects and the larger academic community coming first. Future students, instructors, and the whole architectural profession stand to gain from the research's contributions to the area of architecture education and pedagogical techniques.

Results and Discussion

The proponents used WEKA software to convert the dataset from csv to arff format for this study. Following the transformation, the proponents visually examined the graphical representation of the file during the preprocessing phase. Subsequently, by utilizing the classify menu, all available classifiers were simulated, employing 5-fold cross-validation to identify the optimal classifier based on accuracy. In the event of multiple classifiers exhibiting the same highest accuracy, the proponents further considered the simulation time to determine the classifier with the fastest performance. Through this rigorous evaluation process, the proponents sought to identify the most suitable classifier within the dataset, ultimately contributing to the accurate analysis of the relationship between history, theory, planning, and practices of architecture subjects and licensure exam results.

No.	1: ARCH 125 Numeric	2: ARCH 170 Numeric	3: ARCH 175 Numeric	4: ARCH 195 Numeric	5: ARCH 145 Numeric	6: ARCH 150 Numeric	7: ARCH 200 Numeric	8: ARCH 85 Numeric	9: ARCH 105 Numeric	10: ARCH 55 Numeric	11: ARCH65 Numeric	12: Remarks Nominal
1	2.25	2.5	2.25	2.5	2.25	2.25	3.0	2.5	2.0	3.0	2.0	FAILED
2	1.75	1.75	1.5	1.5	2.5	2.5	1.75	2.0	2.25	2.0	2.25	FAILED
3	2.0	1.75	1.75	1.75	2.25	2.75	1.5	2.0	2.5	1.75	1.5	FAILED
4	1.5	2.75	1.5	2.25	2.25	2.25	1.5	3.0	2.25	2.25	2.25	FAILED
5	2.25	2.5	1.5	2.25	2.75	2.75	1.5	3.0	1.75	2.25	2.0	FAILED
6	2.25	2.75	1.5	2.25	2.0	2.25	1.5	3.0	2.25	2.25	2.0	FAILED
7	2.0	2.75	2.0	2.25	2.5	1.75	1.75	3.0	2.25	1.75	1.75	FAILED
8	1.5	3.0	2.25	2.25	2.0	2.0	2.75	1.5	1.5	1.5	1.5	FAILED
9	2.0	2.25	1.75	1.75	2.0	1.75	1.5	1.75	2.0	2.0	2.0	FAILED
10	2.0	2.75	2.75	3.0	1.5	1.5	2.25	1.75	2.5	2.25	2.0	FAILED
11	1.75	2.0	1.0	2.75	2.0	2.0	1.5	1.25	1.5	1.25	1.5	FAILED
12	2.5	2.75	2.0	3.0	2.5	2.0	3.0	2.0	2.5	2.5	2.0	FAILED
13	1.75	2.0	1.5	3.0	2.25	1.0	3.0	1.0	1.25	1.5	1.5	FAILED
14	1.75	1.25	1.5	1.5	2.75	2.25	1.5	1.75	2.0	1.5	1.75	FAILED
15	2.25	2.5	1.75	3.0	2.75	2.75	2.75	2.25	2.25	2.5	1.75	FAILED
16	2.25	2.25	3.0	2.25	2.0	2.0	1.5	2.0	2.0	2.25	2.5	FAILED
17	1.75	1.5	3.0	1.75	1.75	2.0	2.5	2.5	2.5	1.5	3.0	FAILED
18	1.75	2.5	2.25	3.0	2.0	2.5	1.5	2.25	3.0	1.75	2.25	FAILED
19	2.5	2.25	2.5	3.0	1.75	2.75	1.75	2.0	2.0	2.5	1.5	FAILED
20	2.0	1.75	2.5	2.25	3.0	2.25	1.25	2.5	2.5	2.0	2.0	FAILED
21	2.0	2.5	2.25	3.0	1.75	1.25	3.0	2.5	2.0	1.75	1.75	FAILED
22	1.25	2.25	3.0	3.0	1.5	2.75	1.75	1.25	1.75	2.25	1.25	FAILED
23	1.75	2.5	2.0	2.0	3.0	2.0	1.75	2.0	1.5	1.75	1.5	FAILED
24	1.5	1.25	1.75	2.0	1.75	2.0	1.5	1.75	1.5	2.0	1.5	PASSED
25	2.25	1.75	2.25	2.0	1.75	2.75	2.25	2.75	2.25	2.0	1.75	PASSED
26	1.5	2.0	1.75	1.75	2.0	2.5	1.75	2.0	2.0	1.75	1.75	PASSED
27	1.25	3.0	1.5	2.0	2.5	1.75	1.75	2.75	1.75	2.0	2.0	PASSED
28	1.75	2.25	1.5	2.0	2.25	1.5	1.75	3.0	2.0	2.25	2.75	PASSED
29	1.75	2.75	1.25	2.0	2.25	2.75	1.25	2.75	1.75	1.75	2.0	PASSED
30	2.5	3.0	2.5	2.25	2.75	2.5	1.5	3.0	2.25	2.0	2.5	PASSED
31	1.0	1.75	1.5	2.0	2.5	2.0	2.0	2.25	1.5	2.0	2.5	PASSED
32	1.75	2.75	2.5	2.75	3.0	2.25	2.0	1.75	2.25	2.5	2.0	PASSED
33	2.0	2.75	1.5	2.25	2.0	2.75	1.5	3.0	2.0	2.0	2.0	PASSED
34	1.75	2.0	1.5	2.25	2.5	2.25	3.0	1.75	1.5	2.0	2.25	PASSED
35	1.75	2.5	1.75	2.25	2.5	2.5	1.75	2.5	3.0	2.5	2.0	PASSED
36	1.75	2.75	2.25	2.25	2.25	2.25	2.0	1.75	1.75	1.75	1.75	PASSED
37	1.75	2.75	1.75	1.75	2.5	1.75	1.5	3.0	2.0	1.5	1.5	PASSED

Figure 2. *The Actual Dataset Converted to Arff*

WEKA Classifier Simulation Result

The depiction of the history, theory, and practice subjects, as well as the class, is shown in the diagram below. The red and blue colors reflect the positive and negative classes, respectively. Each category value receives an automated color assignment. The preg distribution would be split down into three colors instead of two if the class value had three categories.

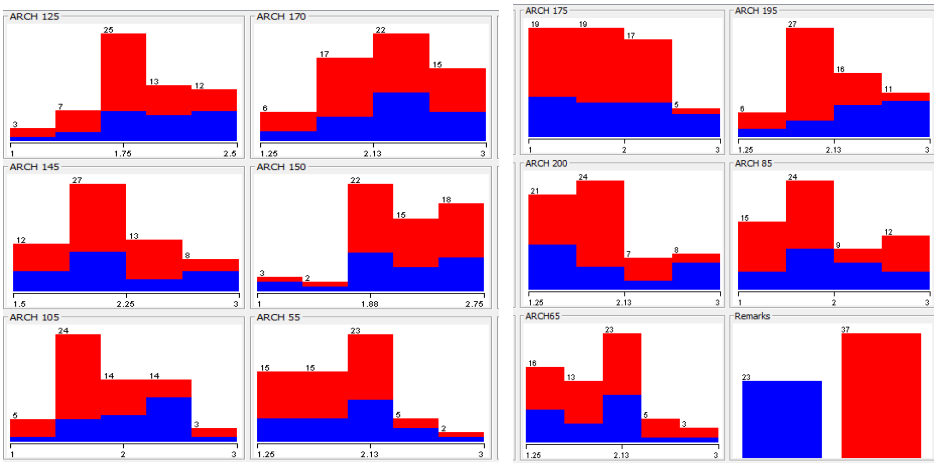

Figure 3. *History, Theory, and Practice Subjects*

Student Average

Table 3 divides the students' grades into four distinct categories. Each group specifies a certain grade range, and the total number of students falling inside each grade range is known as the matching number of students. In order to present a complete view of the outcomes, the graphic also includes separate data for the number of students who passed and failed the board exam.

Table 3. Average per Student

Ranges	Number of Students	Number of Passed	Number of Failed
1.0 - 1.5	0	0	0
1.51 - 2.0	31	22	9
2.01 - 2.5	29	15	14
2.51 - 3	0	0	0
Total	60	37	23

Stratified Cross-Validation

Table 4 shows the data set's stratified cross-validation using WEKA and the DecisionStump classifier. There were 45 correctly classified instances (75% correctly classified) and 15 incorrectly classified instances (25% incorrectly classified). The classifier DecisionStump took 0 seconds to train. The data set has a 75.2877% error and an 87.1344% root relative squared error. There were 60 instances in total in the data sets.

Table 4. Stratified Cross-Validation

Classification	Value	Percentage
Correctly Classified Instances	45	75
Incorrectly Classified Instances	15	25
Kappa statistic	0.3968	
Mean absolute error	0.3574	
Root mean squared error	0.4245	
Relative absolute error	75.2877	
Root relative squared error	87.1344	
Total Number of Instances	**60**	

Detailed Accuracy by Class using WEKA

Table 5 displays the detailed accuracy by class using WEKA and the DecisionStump classifier. The data set is accurate, with a weighted average of 0.822 in accuracy, 0.75 in true positive rate, and a low 0.402 in false positive rate. It also displays the weighted average of the data set's Recall with 0.75, F-Measure with 0.711, MCC with 0.497, ROC Area with 0.615, and PRC Area with 0.65.

Table 5. Detailed Accuracy by Class Using WEKA

	TP Rate	FP Rate	Precision	Recall	F-Measure	MCC	ROC	P
	0.348	0	1	0.348	0.51			
	1	0.652	0.712					
Weighted Av	**0.75**							

Confusion Matrix of DecisionStump Classifier

Figure 4 depicts a visual depiction of the confusion matrix created with visual classifier error.

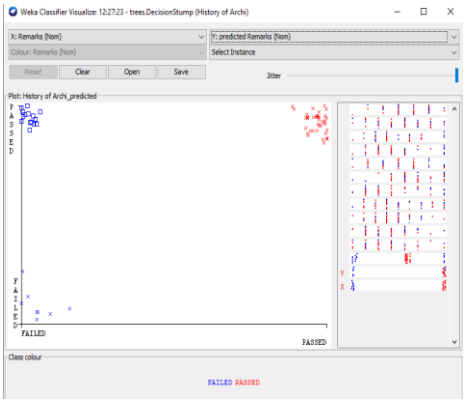

Figure 4. *Visualization of Confusion Matrix*

Table 6 presents the confusion matrix of class remarks using the DecisionStump classifier, as indicated in the table below. The passed variable shows that 37 people were projected to pass the license examination, while the failed variable shows that 8 people were also predicted to pass. The DecisionStump classifier achieved a 75 percent accuracy rate in the data.

Table 6. The Confusion Matrix of Board Passers Using Decision Stump Classifier

Total	Passed	Failed
	37	0
	8	15

Subject Ranking on WEKA

Table 7 shows the average ranking of the History, Theory, Practices, and Planning subjects. Likewise, the WEKA ranking shows the most influential subject. ARCH 195 with a 1 +- 0 average rank and an average merit of 0.082 +- 0.021 has the highest average of all the History, Theory, Practices, and Planning subjects based on utilizing an attribute evaluator with the search mode ranker in WEKA. It was followed by ARCH 105, ARCH 200, and ARCH65.

Table 7. Subject Ranking on WEKA

Subjects	Subject Description	Average Rank by WEKA	Average Merit
ARCH 195	Planning II	1 +- 0	0.082 +- 0.021
ARCH 105	History of Architecture II	4.2 +- 3.43	0.007 +- 0.05
ARCH	Professional	4.6 +- 2.5	-0.002 +-

200	Practice III		0.056
ARCH 65	Theory of Architecture II	5.6 +- 0.49	-0.021 +- 0.026
ARCH 175	Professional Practice I	6.2 +- 3.31	-0.021 +- 0.025
ARCH 55	Theory of Architecture I	6.8 +- 1.94	-0.037 +- 0.023
ARCH 150	Professional Practice II	6.8 +- 2.23	-0.029 +- 0.05
ARCH 85	History of Architecture I	6.8 +- 2.79	-0.028 +- 0.04
ARCH 145	History of Architecture IV	7.6 +- 2.8	-0.036 +- 0.042
ARCH 125	History of Architecture III	7.6 +- 2.24	-0.03 +- 0.039
ARCH 170	Planning I	8.8 +- 2.48	-0.063 +- 0.019
ARCH 55	Theory of Architecture I	6.8 +- 1.94	-0.037 +- 0.023
ARCH 150	Professional Practice II	6.8 +- 2.23	-0.029 +- 0.05
ARCH 85	History of Architecture I	6.8 +- 2.79	-0.028 +- 0.04
ARCH 145	History of Architecture IV	7.6 +- 2.8	-0.036 +- 0.042
ARCH 125	History of Architecture III	7.6 +- 2.24	-0.03 +- 0.039
ARCH 170	Planning I	8.8 +- 2.48	-0.063 +- 0.019

Based on the table of results, Planning II emerges as one of the leading subjects among BS Architecture students taking the licensure exam. Notably, this subject is typically undertaken by fourth-year students during their second semester. Additionally, the data reveals that parts 2-3 of the subjects hold significant influence in preparing students for Subject 1 of the Architecture board exam. The significance of planning in the architectural sector cannot be understated, since architects and engineers are responsible for methodically considering not just the buildings but also their accompanying components. Every feature of buildings, bridges, and other structures portrayed in construction plans, specifications, or material lists is an intrinsic part of the overall design. This is evident in practice through the implementation of a unified specification that encompasses the entirety of a given project.

Furthermore, the results of the licensure examination indicate that out of 60 participants, 37 successfully passed the exam, surpassing the 23 individuals who did not. These findings serve as further evidence supporting the relationship between the subjects of history, theory, practices, and planning and performance in the board exams. However, it is essential to acknowledge the limitations of this study. This study focused exclusively on BS Architecture graduates who took the licensing examination between 2013 and 2019, omitting irregular students and those who

undertook the exam multiple times. Additionally, it is worth noting that the assigned instructors for each subject may influence the grade outcomes, potentially reflecting variations in student performance or attitudes within the respective departments.

Conclusion and Future Works

In light of the results presented above, the proponents, therefore, conclude that the History, Theory, and Practices subjects within the BS Architecture curriculum contribute to the licensure examination performances of BS Architecture graduates. Since the main objective of the study was to utilize WEKA to determine the correlation between the core subjects of Architecture and licensure exam performance in BS Architecture graduates from Cavite State University-Main Campus during the years 2013 to 2019, it can be concluded that the classifier DecisionStump is the most accurate classifier for the data set, giving a 75% accuracy and a training time of 0 second. The most influential subject, as depicted in Table 7, was ARCH 195, which came in first in both average ranking and WEKA mining. This was obtained using an attribute evaluator with the search mode ranker. As a result, it is concluded that ARCH 195 or Planning II is the most influential History, Theory, Practices, and Planning subject in BS Architecture.

Furthermore, the impact on board examination performance goes beyond ARCH 195 alone, as indicated by a higher number of students passing the exam compared to those who failed. As a result, it is critical for BS Architecture subjects to thoroughly study all subjects to maximize their chances of succeeding on their first attempt. Additionally, the knowledge learned in these disciplines is applicable to their professional practice, making it an essential tool for their future endeavors in the field. Significantly, it is also equally important to note that the sample size for this study was limited to 60 examples, and therefore increasing the sample size could potentially yield different results. It is hoped that future research incorporates larger datasets to obtain a more favorable outcome that can potentially help address the technical challenges in the classification of large datasets used in the data mining technique. Henceforth, this study emphasized that it is crucial to understand the trend of Architecture students' licensure practices and academic performances for them to pass their respective board examinations. The study also provides guidance to school administrators and faculty members of the college department regarding how to lead students toward quality and successful licensure examination performance.

Meanwhile, exploring additional data mining techniques and machine learning algorithms may contribute to the refinement and improvement of the classification models used in this study. Comparative analyses of different classifiers and feature selection methods could help identify the most effective approaches for predicting licensure exam outcomes based on the History, Theory, Planning, and Practice subjects.

Moreover, investigating the long-term impact of performance in the licensure exam on the professional careers of BS Architecture graduates would provide valuable insights into the real-world implications of the relationship between subject performance and professional success. Such research could shed light on the effectiveness of the licensure exam as a measure of professional competence and guide the ongoing evolution of architectural education and licensure processes. By addressing these future research directions, the understanding of the intricate interplay between architectural subjects and licensure exam results can be refined, contributing to the continued improvement of educational practices, curriculum development, and the success of aspiring architects in their professional journeys.

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