

INTERNATIONAL JOURNAL
ON INFORMATICS VISUALIZATIONjournal homepage : www.joiv.org/index.php/joivSubjective Norms and Academic Dishonesty: A Decision Tree
Algorithm AnalysisPatriani Wahyu Dewanti^{a,*}, Ida Ayu Purnama^b, Sukirno^a, Karthikeyan Parthasarathy^c^aDepartment of Accounting, Universitas Negeri Yogyakarta, Yogyakarta, Indonesia^bDepartment, of Accounting, Universitas Pembangunan Nasional Veteran Yogyakarta, Yogyakarta, Indonesia^cSchool of Management Studies, Kongu Engineering College, Erode, Tamilnadu, IndiaCorresponding author: *ida.ayupurnama@upnyk.ac.id

Abstract— Academic dishonesty becomes an exciting phenomenon to be examined. This research aimed to examine the effect of subjective norms on academic dishonesty. Data were collected from 426 accounting students from public and private universities in Yogyakarta, Indonesia. The data were analyzed with the J48 algorithm decision tree. The interest that happened in the low subjective norms node was divided into public universities and private universities. Based on the decision of tree visualization, male students with the more extended length of study in public universities tended to have lower subjective norms but higher academic dishonesty than their counterparts. The results were discussed, and recommendations were also provided to several relevant parties.

Keyword— Decision tree; academic cheating; subjective norms; student.

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I. INTRODUCTION

Over the past two decades, violations of professional ethics have increased. The existence of corporate scandals committed by company management that mainly involves corporate accountants and public accounting firms has become a tragedy worldwide. These violations have also occurred accompanied by increased academic dishonesty at large universities and the possibility of the relationship between unethical behavior or violations of professional and business ethics committed by company management with academic dishonesty behavior [1]. Research suggests that academic cheating is given the ethical crisis within America's accounting profession [2].

A study in economic and business students found out that almost all students engaged in academic cheating [3], [4]. The study revealed a strong relationship between students who commit academic cheating with their attitude in the business world or workplace [5].

Students used various reasons to commit academic cheating. One of the reasons is that students are often under pressure to get perfect results on their education, such as pressure from parents to get good grades, fulfill scholarships, or get jobs, so they ignore the learning process and only focus on the final results [6]. In line with the result,

Babatunde, Adeyemi, and Adelaja [7] claimed that the key justifications for cheating as perceived by the students are the pressure of getting an excellent grade to retain their scholarship and better prospects for employment.

The seriousness of academic dishonesty in accounting students can lead to ethics violations in their future work. This study aims to examine the influence of the subjective norms of academic cheating on cheating behavior. Subjective norms are social factors that influence an individual to perform an action or behavior, such as the influence of family norms or close friends on an individual [8]. This study's unique contribution was that this study examines the influence of subjective norm in academic dishonesty and classifies it into the type of universities, which were public universities and private universities. This study was reinforced by research in two countries, namely Lebanon and the United States. The study results stated that the level of academic dishonesty of Lebanese students is higher than that of students in the United States; this is due to the existence of culture or social norms in Lebanese society raised to collaborate in completing work that they find difficult [9]. Besides, Day *et al.* [10] revealed that shreds of evidence exist that classroom context attributes also play a part. Whitley [11], Hendy and Montargot [12], Stone *et al.* [13] also stated that academic cheating is also an

impact by classmates or student's team in a university to get good grades.

Academic dishonesty classified as an academic violation or cheating is plagiarism and copying assignments from friends or giving assignments to copy to friends [14], [15]. This study only investigated an academic violation of assignments. Usually, the assignment was given by the lecturers or supervisors in every meeting, so the students did it regularly.

Academic cheating is an eternal incident in the educational system that could affect individual careers [16]. Research conducted on 2,503 students found that individual factors that cheating behavior caused by several factors, namely demographic characteristics (such as gender, social status, length of study), character quality (such as lack of self-control, life-oriented others), experience on campus (academic preparation, the involvement of extracurricular activities or student organizations and work), student perceptions and student attitudes (attitude towards cheating, perception of faculty actions on cheating behavior, and cheating environment). These factors significantly influence cheating behavior [17].

The theory underlying this research is the Theory of Planned Behavior (TPB). TPB states that subjective norms are one predictor of behavioral intention. Intention shows the factors that influence behavior, and intention indicates how hard an individual's efforts to do an action or how well they plan to do an action. In general, it can be said that the higher the intention of an individual to do an action, the higher the effort to achieve that action [18]. The behavioral intention was the probability of an individual that they will employ with the behavior, for example, cheating in the current study [19].

II. MATERIAL AND METHOD

The research data were taken from 436 accounting students. Based on the data collected, ten respondents' data were incomplete, so that only 426 respondents' data could be further analyzed. Respondents were accounting students who were studying at two state universities and two private universities. This research was explanatory research describing some characteristics of a phenomenon in

analyzing and explaining why or how it was happening [20]. The sampling used a purposive sampling technique. The students who passed the ethics profession and business course were chosen as the criteria in drawing the sample [21].

This study ran data mining and machine learning methods. The algorithm adopted in this study was the J48 decision tree, which was derived from C4.5. The algorithm produced a binary tree where the classification process was built, and each tuple of the tree was applied to the database and the tuple [22]. The J48 decision tree was Weka's implementation of this decision tree learner [23]. Weka used an algorithmic decision tree induction to classify data and produce predictions [24]. The test mode of 10-fold cross-validation was used to optimize the classification parameters. Then, testing the dataset was used to measure and test the validity of the developed prediction models.

The final result of the stages above was a final prediction model that provided new knowledge [25]. The approach of decision tree classifications was considered to be non-parametric. Hence, it did not need any prior assumptions about the type of probability distributions addressed by the class and other significant attributes [26].

III. RESULTS AND DISCUSSION

J48 decision tree algorithm operation was the most excellent classifier, which was to create different classifiers. Eventually, the combined classifier formed, and test data were used to verify the prediction [27]. During this phase, this study analyzed the probability test for the knowledge structure's mechanism. Table 2 describes the precise output accuracy by class from the J48 algorithm. It shows that the model's data classification accuracy (TP Rate) has a value of 63.80%. The percentage of accuracy acquired from the average high, medium, and low class of subjective norms. The high class contributed to the highest number of the class, 84.7%. Additionally, the recall value illustrates the probability of the relevant data used in the analysis had 63.80%. The ROC Area value interprets the relationship between false-positive and valid positive values of 60.8% (Table 1).

TABLE I
WEKA – ALGORITHM J48 DETAILED ACCURACY BY CLASS

Model	Class	TP Rate	FP Rate	Precision	Recall	F-Measure	MCC	ROC Area	PRC Area
Model	High	0.847	0.533	0.677	0.752	0.344	0.627	0.629	High
	Medium	0.469	0.191	0.554	0.508	0.291	0.600	0.429	Medium
	Low	0.000	0.005	0.000	0.000	-0.022	0.526	0.115	Low
	Weighted Avg.	0.638	0.367	0.570	0.638	0.598	0.526	0.608	0.512

*note: TP Rate is True Positive Rate; FP Rate is False Positive Rate; MCC is Matthews Correlation Coefficient; ROC Area is Receiver Operating Characteristic Area; PRC Area is Precision-Recall Area.

Furthermore, this research used WEKA to classify the data and to evaluate the predicted model. Data analysis using WEKA, deeper data mining was performed to determine the root tree in the subjective norm. The results of the J48 decision tree algorithm visualization are shown in figure 1. The decision tree pattern formed by the Weka software using the J48 algorithm is described in figure 1 to explain the level of subjective norms in accounting students. In its formation,

the cross-validation test mode with ten floods was used by researchers with 426 batches of data. Deeper, correctly classified instances show that 63.85% (272 data) had a correct grouping level. Simultaneously, the remaining 36.15% (154 data) belonging to the group incorrectly classified instances (having a grouping error rate). Based on these results, it appears that the visualize tree model formed had an accuracy of 64.85% or 272 data from all available

data. Accuracy was a test to determine the model's ability to

distinguish the value of variables [26].

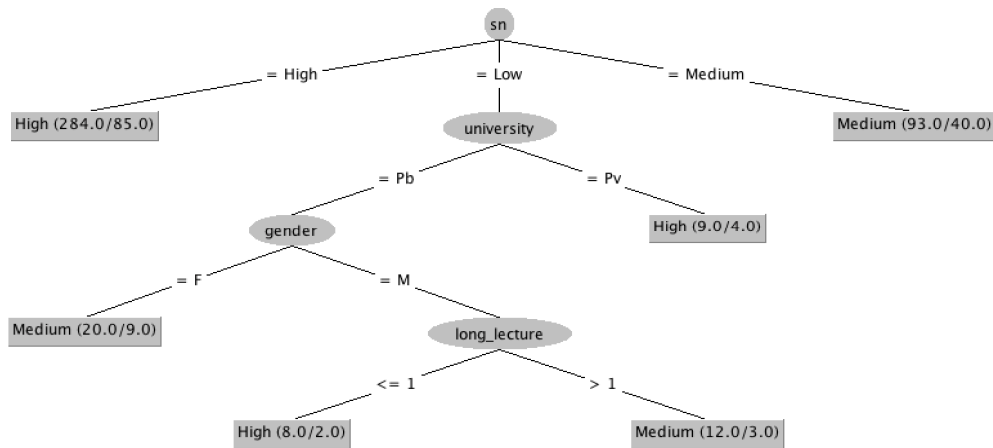


Fig. 1 Visualize Tree Subjective Norm and Academic cheating

In this study, the subjective norm was tested as the root node (top node of a tree). Accuracy in data analysis distinguished subjective norm values into three classifications: high, medium, and low. The classification was based on the tabulated values of subjective norm instrument data filled out by respondents. Table 2 shows the classification of data tabulations for subjective norms.

TABLE II
SUBJECTIVE NORM CLASS

Sn Class	
High	>8
Medium	5-8
Low	<5

Classifications were calculated based on the respondent's answer in the questionnaire, especially in the subjective norm instruments. The classifications were divided into three: high value of more than 8, medium with a total value between 5 to 8, and low for a total value less than 5. Figure 1 also explains six leaves (rectangular symbols) of ten trees formed (the total number of symbols). Internal nodes of the top node of a decision tree (root nodes) were the Subjective norm classification.

The subjective norm group with high scores led to high academic cheating. The tree shows that the high value consisted of 284 data, where 85 data could be wrong. Furthermore, the medium subjective norm, followed by the leaf node's intention, intended to cheat at a medium level with 93 data consisting of 40 data that might be wrong. Meanwhile, an exciting thing shows in the root node of low value, and this node formed the grouping of universities. The low classification number was 49 data with low academic cheatings obtained from the total data reduction with the amount of data formed in other groupings (high and medium). Excel pivot was used to find out more detail about the data in the low subjective norm.

Universities node was divided into two classifications: State Universities (PB) and Private Universities (PV). It was interesting since the node represented that public universities' data were higher than the private universities. It appeared that when the subjective norm was low, the

academic cheating presented 9 data with 4 of them might be wrong. In comparison, the state universities' essential data appeared that the students with low subjective norm were 40 data at the public college node divided by gender: female and male. Female Students with low academic cheating represented 20 data, and males showed 20 data. Other exciting statistics represented the male node and were divided into a long lecture (long study) node—the comprehensive study segregated into three groups (Table 3 and Table 4).

TABLE III
LOW SUBJECTIVE NORM IN PUBLIC UNIVERSITY

SN Class	INT Class	University	Gender	Amount of Intention Cheat
Low	High	Pb	F	4
			M	8
		Pb Total		12
	High Total			12
Low		Pb	F	5
			M	1
		Pb Total		6
	Low Total			6
Medium		Pb	F	11
			M	11
		Pb Total		22
	Medium Total			22
Low Total				40

TABLE IV
LOW SUBJECTIVE NORM IN PRIVATE UNIVERSITY

SN class	INT class	University	Gender	Amount of Academic cheating
Low	High	Pv	F	4
			M	1
		Pv Total		5
	High Total			5
Low		Pv	F	2
			M	1
		Pv Total		3
	Low Total			3
Medium		Pv	F	1
			M	1
		Pv Total		1
	Medium Total			1
Low Total				9

As shown in Table 5, the male leaf node was also influenced by a long lecture of male students. The male students who had low subjective norms but had high academic cheating were 8 data, which 2 data might be wrong; they were students who were studying from semester one to semester four or undergoing college for 2.5 years. On the contrary, male students who had the medium intention to cheat were studying above the fifth semester or experience the university for more than 2.5 years. It can be stated that male students who had not reached the fifth semester had more academic cheating than students who experienced college more than five semesters. Additionally, researchers tried to delve GPA data for male students who had low subjective norms and high academic cheating (Table 6).

TABLE V
CLASSIFICATION OF LENGTH OF STUDY

Groups	Long Lecture (semester)
1	<5
2	5
3	>5

The data in table 6 show that the GPA for male students who had high academic cheating was between 3.00 – 3.78. Finally, testing the effect of subjective norms to cheat was confirmed by forming a decision tree. However, if the subjective norm had a low grouping, there were some numbers of underlying decisions. In this case, students or college students in private tertiary institutions with low subjective norms were lower than college students at public universities. Meanwhile, the students in public universities were divided into males and females. They were influenced by the length of the study they have experienced.

TABLE VI
GPA MALE STUDENTS

Gender	GPA	University	Long Lecture
M	3.54	Pb	<5
M	3.06	Pb	<5
M	3.5	Pb	<5
M	3	Pb	<5
M	3.78	Pb	<5
M	3	Pb	<5
M	3.74	Pb	<5
M	3.25	Pb	<5

The exciting results in low subjective norms were divided into two leaf nodes: Public Universities and Private Universities. The result described that Public Universities had higher low subjective norms than Private Universities. This research was not following the study conducted by Brown [28]. This study investigated the levels of academic dishonesty in Public and Private United States universities, and the result reported remarkably similar levels of academic dishonesty between students in Public and Private Universities in the United States. Moreover, Ahmed [29] investigated academic dishonesty in a tertiary level institution in one of the gulf countries, and the result was students in Private Universities statically significant evidence that cheating exists. This result also contradicts this study.

Meanwhile, other data showed in this study that male students with a more extensive study in Public Universities tended to have lower subjective norms but higher academic dishonesty. This data had a similar result with a study held

by Yang *et al* [30] that stated females reported less acceptable behavior and behaved less academic dishonesty than males. Several reasons could cause a low subjective norm. Namely, parents did not pay attention to the learning process and only paid attention to the final grade, which was when most of the classmates cheated on the lecturer's assignments, which caused cheating was no longer an act of impunity. Dishonesty became a reasonable action; besides, there was a thought of helping each other helped fellow friends get good grades. In general, this dishonest behavior was generally an action to get good grades, which aimed to make parents happy to have children with good grades. In that social environment, they would be considered smart, and besides that, good grades also aimed to get a good job quickly or get a scholarship.

This research finding contradicted the theory of planned behavior developed by Beck and Ajzen [31], which stated the higher the subjective norm, the lower individual's academic cheating. Cronan *et al.* [15] examined 1,300 freshman business students who found that the higher the subjective norms, the lower academic cheating. Gentina *et al.* [32] used the social bonding theory to investigated academic cheating among French and Chinese teens. The result of the study for French teens was peer involvement and moral values undermine cheating. For Chinese adolescents, all social bonds contributed to cheating, similar to the whole sample. For girls, parental attachment is deterred, but peer involvement enhanced cheating. While for boys, parental attachment was the only social bond that did not affect cheating. Even though this study had a different framework from Gentina *et al.* [32], the result stated that family and friends had influenced academic cheating. Research by Day *et al.* [10] showed that classroom context predicted academic cheating. Business students in classrooms with mastery cultures, where learning was the supreme goal, were less likely to justify cheating or see it as more likely, than those in performance cultures where the grade was all-important. This outcome was consistent with Hsiao [19] on social learning theory in that peer's attitudes toward cheating was the most critical determinant to cheat. Consistent with this view, Park [4] adapted the goal content theory to research students' academic dishonesty in Korean. Park divided the research into two types of academic cheating: severe and minor cheating. The result showed that intrinsic goals, such as self-growth and social concern, negatively predicted serious and minor cheating. Also, it presented that intrinsic goals, such as self-growth and social concern, negatively predicted serious and minor cheating. However, extrinsic goals such as the wealth goal and score grades positively predicted serious and minority academic cheating. Similarity finding was also explained by Bong [33] that a classroom context that focuses on extrinsic outcomes (e.g., score grades) was a significant predictor of higher academic cheating.

IV. CONCLUSION

Working with the data using decision tree algorithm analysis made this study challenging to find the difference between tertiary education characters or cultures. This research found that students with higher subjective norms would have higher academic dishonesty. Based on the decision of tree visualization, male students with a longer

length of study in Public Universities tended to have lower subjective norms but higher academic dishonesty. On the contrary, male students with shorter studies and female students showed lower academic dishonesty. This study contradicts the theory of planned behavior, which states that when a person's subjective norm is ethical or has a high subjective norm, the higher the individual is considering (intention) to commit an action. If the subjective norm is high, academic cheating or commits plagiarism will be low.

Based on those anomalies, it is recommended that teachers and officers provide better treatments, especially to male students, with the longer length of study by facilitating them to have more frequent and effective academic consultation and supervision. For future researchers, exploring behind factors, which affect the higher students' academic dishonesty having a more extended study will be exciting and challenging. Also, the scope of further respondents should represent accounting students in Indonesia. This study's limitation is that the model used in this study has an accuracy of 63.80% with a data success rate of 63.85% and an error of 36.15%. Further research is expected to propose a model with a higher level of accuracy so that the data success rate is high, and the error is low.

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