Combining feature selection and hybrid approach redefinition in handling class imbalance and overlapping for multi-class imbalanced

Hartono
Universitas Potensi Utama

Erianto Ongko
Akademi Teknologi Industri Immanuel

Yeni Risyani
STMIK IBBI

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Combining feature selection and hybrid approach redefinition in handling class imbalance and overlapping for multi-class imbalanced

Hartono Hartono, Erianto Ongko, Yeni Risyani

Abstract

In the classification process that contains class imbalance problems. In addition to the uneven distribution of instances which causes poor performance, overlapping problems also cause performance degradation. This paper proposes a method that combining feature selection and hybrid approach redefinition (HAR) method in handling class imbalance and overlapping for multi-class imbalanced. HAR was a hybrid ensembles method in handling class imbalance problem. The main contribution of this work is to produce a new method that can overcome the problem of class imbalance and overlapping in the multi-class imbalance problem. This method must be able to give better results in terms of classifier performance and overlap degrees in multi-class problems. This is achieved by improving an ensemble learning algorithm and a preprocessing technique in HAR using minimizing overlapping selection under SMOTE (MOSS). MOSS was known as a very popular feature selection method in handling overlapping. To validate the accuracy of the proposed method, this research use augmented R-Value, Mean AUC, Mean F-Measure, Mean G-Mean, and Mean Precision. The performance of the model is evaluated against the hybrid method (MBP+CGE) as a popular method in handling class imbalance and overlapping for multi-class imbalanced. It is found that the proposed method is superior when subjected to classifier performance as indicate with better Mean AUC, F-Measure, G-Mean, and precision.

Keywords

Class imbalance; Overlapping multi-class; Imbalanced; Hybrid approach redefinition; Feature selection

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Solid work of notable importance. (4)

> *** Novelty and originality: Rate the novelty and originality of the ideas or results presented in the paper.
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Well written. (4)

> *** Strong aspects: Comments to the author: what are the strong aspects of the paper

This paper proposes a method that combining feature selection and Hybrid Approach Redefinition (HAR) Method in handling class imbalance and overlapping for multi-class imbalanced.
The paper is written in good order, and with coherent basis.

> *** Weak aspects: Comments to the author: what are the weak aspects of the paper?

Methodology - The stages of the method in Figure 1 is quite differ than the description. Need to map the Figure with the stages illustrated in text.

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Methodology - The stages of the method in Figure 1 is quite differ than the description. Need to map the Figure with the stages illustrated in text.

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Valid work but limited contribution. (3)

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The proposed method and the result are not sufficiently clear.

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The algorithm, proposed method, and results should be clear.

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2. The working model needs more elaboration.
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This work produces a new method that can overcome the problem of class
imbalance and overlapping in the multi-class imbalance problem with the
minimalization number of classifier. this results in good classifier performance, and minimizes overlap degree in multi-class problems.

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the paper is well written. Nevertheless, I think that the algorithms in Sections 3.1 and 3.2 can be summarized.
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thank you

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Limited data sets are taken. They have small number of attributes and even number of instances.

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Take more data sets wit sizable number of attributes and even number of instances.

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Balas Ke: lppi@uad.ac.id
Kepada: Hartono Hartono <hartonoibbi@gmail.com>

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Revisi Sesuai Masukan

Combining Feature Selection and Hybrid Approach Redefinition in Handling Class Imbalance and Overlapping for Multi-Class Imbalanced

Hartono[12], Erianto Ongko[3*], Yeni Risyani[4]
[1]Department of Computer Science, STMIK IBBI, Medan, Indonesia
[2]Department of Computer Science, Universitas Potensi Utama, Medan, Indonesia
[3]Department of Informatics, Akademi Teknologi Industri Immanuel, Medan, Indonesia
[4]Department of Information Systems, STMIK IBBI, Medan, Indonesia

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ABSTRACT

In the classification process that contains class imbalance problems. In addition to the uneven distribution of instances which causes poor performance, overlapping problems also cause performance degradation. This paper proposes a method that combining feature selection and Hybrid Approach Redefinition (HAR) Method in handling class imbalance and overlapping for multi-class imbalanced. HAR was a Hybrid Ensembles Method in Handling Class Imbalance Problem. The main contribution of this work is to produce a new method that can overcome the problem of class imbalance and overlapping in the multi-class imbalance problem. This method must be able to give better results in terms of classifier performance and overlap degrees in multi-class problems. This is achieved by improving an ensemble learning algorithm and a preprocessing technique in HAR using Minimizing Overlapping Selection under SMOTE (MOSS). MOSS was known as a very popular Feature Selection method in handling Overlapping. To validate the accuracy of the proposed method, this research use augmented R-Value, Mean AUC, Mean F-Measure, Mean G-Mean, and Mean Precision. The performance of the model is evaluated against the Hybrid Method (MBP+CGE) as a popular method in handling class imbalance and overlapping for multi-class imbalanced. It is found that the proposed method is superior when subjected to classifier performance as indicate with better Mean AUC, F-Measure, G-Mean, and Precision.

Corresponding Author:

Erianto Ongko,
Department of Informatics,
Akademi Teknologi Industri Immanuel,
Jalan Jenderal Gatot Subroto Nomor 325, Medan, Indonesia
Email: eriantoongko@gmail.com

1. INTRODUCTION

The problem of Class Imbalance is one of the interesting problems and is included in the top 10 challenging problems, especially when we discuss classification. Where, this problem comes from the existence of one class with a much higher number of instances (majority class) compared to other classes (minority classes)[1]. Majority classes are often referred to as negative classes and minority classes are positive classes. This term arises because the minority class sometimes contains information that is important to observe even though it is often overlooked because the classification results tend to give poor accuracy to classes with smaller number of instances[2]. However, in addition to the class imbalance there are other problems that need attention due to the accuracy of the classification process. These problems often go unnoticed. The problem is overlapping[3]. Surely the problem of overlapping is not a new problem. An

instance of a class is said to be in the overlapping area if the value of k nearest neighbors (KNN), is too close to another class (greater than the value of h which is often assumed to be k / 2[4]. This problem can decrease accuracy more if compared to the imbalance class.

Research on overlapping has not attracted much attention, compared to the class imbalance problem that has caught the attention of many[5]. When these two problems combine, the problem that will occur becomes more serious and will become more difficult if the problem occurs in a multi-class dataset[6]. Class imbalance and overlapping problems are relatively easier to handle in binary class problems and will be more difficult to handle in multi-class problems[7] Some researchers consider that feature selection is the best method in dealing with overlapping.

Research conducted by a number of researchers indeed shows that feature selection offers many advantages in overcoming class imbalance problems, especially those involving the elimination of uninformative predictors, reducing the dimensions of feature space, and most importantly feature selection can also overcome class imbalance problems[8][9]. There are a number of feature selection methods that can be used in overcoming overlapping problems, including Selection Under No Sampling[10][11] and Selection Under SMOTE[12]. [5] Has propsosed the Minimizing Overlapping Selection under No-Sampling (MOSNS) and Minimizing Overlapping Selection under SMOTE (MOSS) methods in overcoming the overlapping problem and both methods have relatively the same performance. [13]. However, the class imbalance problem cannot be overcome by simply using the feature selection. The process of prepocessing in the form of data training resampling is absolutely necessary[14]. The best method of handling imbalance classes in conditions that allow for a preprocessing process to overcome the weaknesses of Feature Selection is the Hybrid Ensembles method[15].

In fact, a number of studies on handling imbalance classes and overlapping binary classes and multi-classes have been conducted by a number of researchers. [16]has proposed a hybrid method using a Modified Back-Propagation and Gabriel Graph Editing (GCE) on the class imbalance and overlapping problems for multi-class problems and get the results that the methods they propose, get good results, but if applied to highly imbalanced datasets, the results obtained are still not good and if coupled with the application of SMOTE, the results obtained can be better. Research conducted by also provides results that SMOTE still provides the best solution[6]. [17]has defined the importance of the sampling process in the preprocessing stage by using Clustering Based Under Sampling (CLUSBUS). The Oversampling method by using SMOTE has also been used by [18] in dealing with class imbalance and overlapping problems.

It can be seen that most of the research that deals with class imbalance and overlapping problems is in the binary class problem and there are not many studies that discuss multi-class problems. One of the studies directly related to multi-class problems is the research conducted by [16] the method that they have proposed has been able to overcome the class imbalance and overlapping problems. However, the method they propose is still experiencing limitations when viewed from the performance classifier especially those relating to AUC and G-Mean. Research conducted by[16], has contributed thought in the form of the importance of hybrid methods that use the feature selection process at the preprocessing stage.

Comment [Office1]: Clearly mention the objectives and state of art (pointwise) in the Introduction.

This paper proposes a method that combines feature selection and Hybrid Approach Redefinition (HAR) Method in handling class imbalance and overlapping for multi-class imbalanced. HAR is a Hybrid Ensembles method in dealing with class imbalanced problems, where this method uses SMOTE [19] as a preprocessing stage [20]. The Feature selection method used is MOSS [5] and will be used as a preprocessing stage in this study replacing the SMOTE method that was previously used in the HAR Method, specifically this is intended to develop the HAR Method capability in overlapping handling. The combination of Feature Selection by using MOSS with HAR Method is intended to obtain good results in handling class imbalance and overlapping in multi-class imbalanced. The results obtained will be compared with the MBP + GCE method which is one of the excellent methods in handling class imbalance and overlapping in multi-class imbalanced. Comparison of these results was observed using augmented R-Value, Mean AUC, Mean F-Measure, Mean G-Mean, and Mean Precision.

2. RELATED WORKS

2.1. Augmented R-Value for Multi-Class

The R-Value of each class shows the portion of an instance that overlaps the area. Research conducted by [20] shows that R-Value has a close relationship with performance classifier. [16] has proposed a method for determining R-Value for Multi-Class problems as can be seen in Equation 1.

$$R_{aug}(D[V]) = \frac{\sum_{i=0}^{k-1} |C_{k-1-i}| R(C_i)}{\sum_{i=0}^{k-1} |C_i|} \quad (1)$$

Where $C_0, C_1, \ldots, C_{k-1}$ are k class labels with $|C_0| \geq |C_1| \geq \cdots \geq |C_{k-1}|$ and $D[V]$: Dataset D containing predictors in set V. Larger R_{Aug} is higher overlap degree of a dataset.

2.2. Hybrid Ensembles

The algorithm for creating a hybrid ensemble is as follows[21].

$Input: A\ dataset\ D, a\ se\ of\ classification\ algorithms\ G, the\ number\ of\ classifiers\ n$
$Output: An\ ensemble\ C$
$Steps:$
$(1) For\ i = 1\ to\ n$
$(2)\quad Use\ bootstrap\ sampling\ to\ sample\ D\ and\ Generate\ T_i, whics\ is\ of\ the\ same\ size\ of\ D$
$(3)\quad Select\ the\ (\lceil i\ modulo\ |G| \rceil + 1) th\ element\ in\ G\ as\ A_i$
$(4)\quad Train\ C_i\ by\ applying\ A_i\ on\ T_i$
$(5) End\ For$
$(6) Return\ C = \cup_{i=1}^{n} C_i$

In the previous algorithm it can be seen that in Hybrid Ensembles the process starts from determining bootstrap sampling at the preprocessing stage. In general, the sampling method used is SMOTE. Then it will proceed with the processing stage by selecting the appropriate classification algorithm. One of the Hybrid Ensembles methods is Hybrid Approach Redefinition (HAR) which gives excellent results in handling class imbalance. In the original form of HAR the preprocessing stage is carried out using the Random Balance Ensemble Method and the processing stage is carried out using Different Contribution Sampling[22]. To deal with class imbalance problems as well as overlapping problems in multi-class problems, the preprocessing technique will be modified using Filter Selection, namely Minimizing Overlapping Selection under SMOTE (MOSS).

2.3. Minimizing Overlapping Selection under SMOTE (MOSS)

The algorithm for MOSS is as follows[5].

$1: X\text{-}matrix\ with\ p\ predictors: X = [x_1, x_2, \dots, x_p]; class\ label: y$
$2: Over\text{-}sampling\ the\ Minority\ Class\ with\ SMOTE; merging\ the\ generated\ data\ with\ original\ ones\ to\ get\ updated\ X\text{-}martix, X_{new}\ and\ updated\ cla.$
$3: X \leftarrow X_{new}; Y \leftarrow Y_{new}$
$4: Establish\ sparse\ regularization\ path\ \hat{\beta}(\lambda, \alpha) according\ to\ equation\ 2$
$5: Compute\ the\ optimal\ (\hat{\beta}_1, \hat{\beta}_2, \dots, \hat{\beta}_p)^T\ via\ the\ equation\ 3$
$6: Select\ those\ feature\ with\ \hat{\beta}_j \neq 0\ for\ j = 1, 2, \dots, p$

Sparse selection that would be used to establish sparse regulatization can be seen in Equation 2[23].

$$C_a(\beta) = \frac{1}{2}(1-\alpha)\|\beta\|_2^2 + \alpha\|\beta\|_1 \quad (2)$$

Loss Penalties that would be used to compute the optimal $\hat{\beta}_j$ can be seein in Equation 3

$$Loss = -\frac{1}{n}\sum_{i=1}^{n}(y_i\beta^T x_i - \ln(1+\beta^T x_i)) \quad (3)$$

The preprocessing stage in Hybrid Ensembles will be carried out using the MOSS method so that the preprocessed dataset is generated.

2.4. Classifier Performance

Confusion Matrix shows the outcome of the classification results for each instance as can be seen in Table 1[24].

Table 1. Confusion Matrix

	Classified as Positive	Classified as Negative
Positive Samples	*True Positive* (TP)	*False Negative* (FN)
Negative Samples	*False Positive* (FP)	*True Negative* (TN)

The performance classifier measurement uses a number of parameters as follows.

$$TPR = \frac{TP}{TP + FN} \quad (4)$$

$$FPR = \frac{FP}{TN + FP} \quad (5)$$

$$TNR = \frac{TN}{TN + FP} \quad (6)$$

$$Recall = TPR \quad (7)$$

$$Precision = PPValue = \frac{TP}{TP + FP} \quad (8)$$

$$F\text{-}Measure = \frac{2RP}{R+P} \quad (9)$$

$$G\text{-}Mean = \sqrt{TPR \,.\, TNR} \quad (10)$$

$$AUC = \frac{1 + TPR - FPR}{2} \quad (11)$$

According to [25] in multi-class problems the measurement of classifier performance is determined by an average value. So that the measurement parameters become as follows.

$$Mean\ F\text{-}Measure = \sum_{j=1}^{m} \frac{F\text{-}Measure(j)}{m} \quad (12)$$

$$Mean\ G\text{-}Mean = \sum_{j=1}^{m} \frac{G\text{-}Mean(j)}{m} \quad (13)$$

$$Mean\ AUC = \sum_{j=1}^{m} \frac{AUC(j)}{m} \quad (14)$$

$$Mean\ Precision = \sum_{j=1}^{m} \frac{Precision(j)}{m} \quad (15)$$

In Equation 4 it can be seen that the True Positive Rate (TPR) states the ability of the classifier in classifying a positive sample (minority class) appropriately. The False Positive Rate (FPR) stated in Equation 5 states the classifier's error in classifying the negative sample (majority class) as a positive (minority class). Equation 6 states the classifier's ability to correctly classify negative samples. It should be noted that Equation 7 in this case recall is the same as TPR or some other term states as sensitivity. Whereas the Precision stated in Equation 8 is a measure of exactness that states the proportion of positive samples that are classified correctly compared to negative samples that are incorrectly classified as positive samples. The F-Measure and G-Mean stated in Equations 9 and 10 state the ability of the classifier to balance between positive samples accuracy and negative sample accuracy[13]. The AUC stated in Equation 11 states the random probability of a positive sample to be classified correctly compared to the random probability of negative samples[26].

3. METHODOLOGY

The stages of this research can be seen in Figure 1.

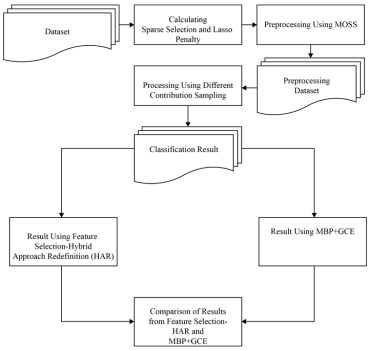

Figure 1. Stages of Research Methods

In Figure 1, the process begins with the determination of the dataset to be used. Sparse Selection and Lasso Penalty calculations are the first processes carried out. The Sparse Selection and Lasso Penalty values obtained will be used for the preprocessing stage by using Minimizing Overlapping Selection under SMOTE (MOSS). The result of preprocessing with MOSS is in the form of preprocessing dataset which will then enter the processing stage. Processing stages are carried out using Different Contribution Sampling (DCS). The process inside DCS is basically done using the Biased Support Vector Machine (B-SVM). Based on the existing Classification Results, in which this study besides observing the results obtained by the Feature Selection-HAR method, it will also observe the results obtained with MBP + GCE. Then, the result using Feature Selection-Hybrid Approach Redefinition (HAR) will be compared with the result using MBB + GCE.

3.1. Preprocessing Stage

Preprocessing Stage on HAR for multi-class problems will be modified using MOSS and using the concept of borderline selection for determining instance in multi-class problems[27]. The preprocessing stages for the proposed method can be seen in the following algorithm.

Require: Set S of examples(x_1,y_1)
Ensure: New set *S'* of examples with *MOSS*
1: *totalSize*←|S|

2: Determine k as the number of *Nearest Neighbor*
3: For All Samples in S do
4: Determine the Borderline of Positive or Minority Class as $E_O C_t^+$
5: Determine the Borderline of Negative or Majority Class as $E_O C_t^-$
6: End For
7: For All Samples in $E_O C_t^+$ do
8: Calculate the $cn(e)_i$ as neigborhood value for each sample
9: Order Ascending the sample according to the $cn(e)_i$
10: End For
11: Building a candidate ensemble for *Safe*, *Borderline*, *Rare*, dan *Outlier* according to k value
12: Calculating Sparse Selection using Equation 2
13: Calculating Loss Penalty using Equation 3
14: Determine sparse regularization
15: For All Samples in *Minority Class* do
16: Sampling All Instance with MOSS
17: Create *newMinority*
18: Create *newMajority*
19: End For
20: Calculate Augmented R-Value
21: Compute the Optimal Loss
22: **return** S'

In the previous algorithm, it can be seen that after selecting a multi-class dataset, the next step is determining the borderline for minority and majority class. After that, the k value will be determined, then each candidate ensemble will be grouped from the existing instances into Safe, Borderline, Rare, Outlier groups. The next step is to determine the Sparse Selection using Equation 2 and determine the Loss Penalty using Equation 3. After that for each Instance in Minority Class, a sampling process using MOSS will be conducted, so that it will produce NewMinority Class and NewMajority Class. After all these processes are carried out, the Augmented R-Value and Optimal Loss will be calculated. The results of this preprocessing stage are preprocessing datasets which will then enter the processing stage.

Comment [Office2]: The working model needs more elaboration.
Psudocodes explanations will be an added advantage.

3.2. Processing Stage

Processing Stage on HAR for multi-class problems will be done using Different Contribution Sampling. Different Contribution Sampling is an excellent processing method in Hybrid Ensembles[22]. The processing steps can be seen in the following algorithm.

1: **for** i = 1 to Number of Instance in Preprocessed Dataset **do**
2: Add Preprocessed Dataset to S_i
3 B-SVM will do for classifying S_i
4: Determine the Majority Class
5: Determine the Minority Class
6: For All Instance in Majority Class do
7: NewSVSets[] will form by checking and delete the noise in SV Sets
8: NewNSVSets[]will form by multiple RUS
9: end while
10: For All instance from new SV Sets and NSV do
11: Create an instance for Majority Class
12: End For
13: For All Instance in Minority Class do
14: SMOTEBoost Process for SV Sets and create SMOTESets
15: end while
16: For All SMOTESets and NewNSVSets do
17: New PositiveSampleSets
18: End For
19: For All NewNegativeSampleSets and NewPositiveSampleSets do
20: ResultDataSet
21: End For
22: End For

In the algorithm, it can be seen that, after going through the preprocessing stage, the preprocessing dataset will be obtained, and the next stage of preprocessing this dataset will enter the processing stage. This stage is carried out using DCS through the B-SVM process that will determine instances that exist in the Majority and Minority Class. For each instance the Majority Class and Minority Class will then enter the next

stage. For each instance of the Majority Class and Minority Class will be grouped into Support Vector Sets (SV Sets) and Non Support Vector Sets (NSV Sets) based on the existing Hyperplane values. For instances that belong to the SV Sets group in the majority class, it will be checked and removed noise while the NSV Sets will undergo a sampling process using Random Under Sampling (RUS). The results of the RUS process will be combined with the results of noise removal on SV Sets to New Majority Class. The SV Sets in Minority Class will undergo the SMOTEBoost process to produce SMOTESets. The SMOTESets and NSV Sets in the Minority class will be combined into a New Minority Class. New Majority Class and New Minority Class will be combined into Result Dataset.

Comment [Office3]: The working model needs more elaboration.
Psudocodes explanations will be an added advantage.

4. RESULT AND ANALYSIS

4.1. Dataset Description

This study uses a multi-class imbalanced dataset that is sourced from the KEEL Repository. The dataset selected in this study has represented a low, medium and high imbalance ratio. For datasets with a low imbalance ratio are Hayes-Roth and New-Thyroid, datasets with moderate imbalance ratio are Car Evaluation and Thyroid Disease, and dataset with high imbalance ratio are Red Wine Quality and Yeast. Dataset description can be seen in Table 2[28].

Table 2. Dataset Description[28]

Dataset	#Ex	#Atts	Distribution of Class	IR
Hayes-Roth	160	4	65/64/31	2.1
New-Thyroid	215	5	150/35/30	5
Car Evaluation	1728	6	384/69/1210/65	18.62
Thyroid Disease	720	21	17/37/666	39.18
Red Wine Quality	1599	11	10/53/681/638/199/18	68.1
Yeast	1484	8	463/5/35/44/51/163/244/429/20/30	92.6

4.2. Testing Result

The first test is to obtain a comparison of the Augmented R-Value and Mean AUC obtained by using Feature Selection-HAR and MBP+GCE Method. The test results can be seen in Table 3.

Table 3. Testing Result for Augmented R-Value and Mean AUC for Each Method

Dataset	Feature Selection-HAR		MBP+GCE	
	Augmented R-Value	Mean AUC	Augmented R-Value	Mean AUC
Hayes-Roth	0.298	0.888	0.295	0.848
New-Thyroid	0.323	0.87	0.331	0.85
Car Evaluation	0.335	0.928	0.336	0.913
Thyroid Disease	0.355	0.871	0.359	0.869
Red Wine Quality	0.412	0.848	0.411	0.797
Yeast	0.432	0.832	0.434	0.799

Based on the test results, it can be seen that in terms of the Augmented R-Value and also the Mean AUC there is no significant difference between Feature Selection-HAR with MBP + GCE. This shows that both methods have overcome the overlapping problem well. The Augmented R-Value charger is a higher overlap degree of a dataset. For higher Imbalance Ratio (IR) the results obtained tend to be less good when compared to datasets with lower IR.

The second test is to obtain a comparison of the Mean F-Measure, Mean G-Mean, and Mean Precision obtained by using Feature Selection-HAR and MBP+GCE Method. The test results can be seen in Table 4.

Table 4. Testing Result for Mean F-Measure, Mean G-Mean, and Mean Precision for Each Method

Dataset	Feature Selection-HAR			MBP+GCE		
	Mean F-Measure	Mean G-Mean	Mean Precision	Mean F-Measure	Mean G-Mean	Mean Precision
Hayes-Roth	0.833	0.884	0.862	0.767	0.841	0.793
New-Thyroid	0.793	0.864	0.821	0.759	0.842	0.786
Car Evaluation	0.634	0.927	0.492	0.626	0.911	0.491
Thyroid Disease	0.789	0.765	0.811	0.763	0.739	0.784
Red Wine Quality	0.609	0.835	0.538	0.5	0.773	0.429
Yeast	0.727	0.816	0.8	0.6	0.774	0.6

Based on Table 4 it can be seen that in general the results given by Feature Selection-HAR are better when compared to MBP + GCE.

4.3. Statistical Tests

The statistical test is performed using the Wilcoxon signed-rank test which is a statistical procedure to measure performance based on pairwise comparison[29]. Statistical Tests Result can be seen in Table 5.

Table 5. Wilcoxon Signed-Rank Test for Comparing Performance Measurements

Performance Measurement	P-Value	Hypothesis
Augmented R-Value	0.293177	*H_0 (no significant score difference between HAR-MI and DES-MI) is accepted and this means H_1 (there is a significant difference between HAR-MI and DES-MI in score) is rejected because the p-value >0.05*
Mean AUC	0.0277078	*H_0 (no significant score difference between Feature Selection-HAR and MBP+GCE) rejected and this means H_1 (there is a significant difference between HAR-MI and DES-MI in score) Accepted because the p-value <0.05*
Mean F-Measure	0.0277078	*H_0 (no significant score difference between Feature Selection-HAR and MBP+GCE) rejected and this means H_1 (there is a significant difference between HAR-MI and DES-MI in score) Accepted because the p-value <0.05*
Mean G-Mean	0.0277078	*H_0 (no significant score difference between Feature Selection-HAR and MBP+GCE) rejected and this means H_1 (there is a significant difference between HAR-MI and DES-MI in score) Accepted because the p-value <0.05*
Mean Precision	0.0277078	*H_0 (no significant score difference between Feature Selection-HAR and MBP+GCE) rejected and this means H_1 (there is a significant difference between HAR-MI and DES-MI in score) Accepted because the p-value <0.05*

4.4. Discussion

Based on the results in Table 3, 4, 5 it can be seen that in general the Feature Selection-HAR method gives results that are not significant difference in the Augmented R-Value between Feature Selection-HAR Method. The results given are relatively good and this means that both methods have handled the overlapping problem well. Based on the value of Mean AUC, F-Measure, G-Mean, and precision, the results given by Feature Selection-HAR give better results compared to MBP + GCE. The statistical test also shows that there are significant differences between the two methods.

It should be noted that the results given by both methods indicate that the IR value does not significantly affect the Mean AUC, F-Measure, G-Mean, and Precision values. The test results show that the number of instances and the number of attributes is very influential on the results of Mean AUC, F-Measure, G-Mean, and Precision. The greater the number of instances and the number of attributes, the results obtained can decrease.

5. CONCLUSION

Based on the test results, it can be seen that in terms of overlapping handling, both methods have been able to obtain satisfactory results, which are indicated by a fairly good Augmented R-Value. Meanwhile, when viewed from the Mean AUC, F-Measure, G-Mean, and Precision values, the results obtained by the Feature Selection-HAR Method are better when compared to the MBP + GCE Method. This is supported by the results of statistical tests using the Wilcoxon signed-rank test. Future Research, must be able to overcome the decline in performance if there is a dataset with a large number of instances and also a large number of attributes. The results showed that both methods have weaknesses when there are datasets with a large number of instances and at the same time also have a large number of attributes.

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REFERENCES

[1] L. Abdi and S. Hashemi, "To Combat Multi-Class Imbalanced Problems by Means of Over-Sampling Techniques," *IEEE Transactions on Knowledge and Data Engineering*, vol. 28, no. 1, pp. 238–251, Jan. 2016, doi: 10.1109/TKDE.2015.2458858.

[2] J. F. Díez-Pastor, J. J. Rodríguez, C. García-Osorio, and L. I. Kuncheva, "Random Balance: Ensembles of variable priors classifiers for imbalanced data," *Knowledge-Based Systems*, vol. 85, pp. 96–111, Sep. 2015, doi: 10.1016/j.knosys.2015.04.022.

[3] A. Fernández, M. J. del Jesus, and F. Herrera, "Addressing Overlapping in Classification with Imbalanced Datasets: A First Multi-objective Approach for Feature and Instance Selection," in *Intelligent Data Engineering and Automated Learning – IDEAL 2015*, Cham, 2015, pp. 36–44, doi: 10.1007/978-3-319-24834-9_5.

[4] V. García, J. Sánchez, and R. Mollineda, "An Empirical Study of the Behavior of Classifiers on Imbalanced and Overlapped Data Sets," in *Progress in Pattern Recognition, Image Analysis and Applications*, Berlin, Heidelberg, 2007, pp. 397–406, doi: 10.1007/978-3-540-76725-1_42.

[5] G.-H. Fu, Y.-J. Wu, M.-J. Zong, and L.-Z. Yi, "Feature selection and classification by minimizing overlap degree for class-imbalanced data in metabolomics," *Chemometrics and Intelligent Laboratory Systems*, vol. 196, p. 103906, Jan. 2020, doi: 10.1016/j.chemolab.2019.103906.

[6] Z. Borsos, C. Lemnaru, and R. Potolea, "Dealing with overlap and imbalance: a new metric and approach," *Pattern Anal Applic*, vol. 21, no. 2, pp. 381–395, May 2018, doi: 10.1007/s10044-016-0583-6.

[7] J. Bi and C. Zhang, "An empirical comparison on state-of-the-art multi-class imbalance learning algorithms and a new diversified ensemble learning scheme," *Knowledge-Based Systems*, vol. 158, pp. 81–93, Oct. 2018, doi: 10.1016/j.knosys.2018.05.037.

[8] M. Denil and T. Trappenberg, "Overlap versus Imbalance," in *Advances in Artificial Intelligence*, Berlin, Heidelberg, 2010, pp. 220–231, doi: 10.1007/978-3-642-13059-5_22.

[9] M. Alibeigi, S. Hashemi, and A. Hamzeh, "DBFS: An effective Density Based Feature Selection scheme for small sample size and high dimensional imbalanced data sets," *Data & Knowledge Engineering*, vol. 81–82, pp. 67–103, Nov. 2012, doi: 10.1016/j.datak.2012.08.001.

[10] R. Tibshirani, "Regression Shrinkage and Selection via the Lasso," *Journal of the Royal Statistical Society. Series B (Methodological)*, vol. 58, no. 1, pp. 267–288, 1996.

[11] J. Fan and R. Li, "Variable Selection via Nonconcave Penalized Likelihood and Its Oracle Properties," *Journal of the American Statistical Association*, vol. 96, no. 456, pp. 1348–1360, 2001.

[12] N. V. Chawla, K. W. Bowyer, L. O. Hall, and W. P. Kegelmeyer, "SMOTE: synthetic minority over-sampling technique," *Journal of artificial intelligence research*, vol. 16, pp. 321–357, 2002.

[13] A. Ali, S. M. Shamsuddin, and A. L. Ralescu, "Classification with class imbalance problem: A Review," *International Journal of Advances in Soft Computing and Its Application*, vol. 7, no. 3, pp. 176–204, 2015.

[14] E. R. Q. Fernandes and A. C. P. L. F. de Carvalho, "Evolutionary inversion of class distribution in overlapping areas for multi-class imbalanced learning," *Information Sciences*, vol. 494, pp. 141–154, Aug. 2019, doi: 10.1016/j.ins.2019.04.052.

[15] M. Galar, A. Fernandez, E. Barrenechea, H. Bustince, and F. Herrera, "A Review on Ensembles for the Class Imbalance Problem: Bagging-, Boosting-, and Hybrid-Based Approaches," *IEEE Transactions on Systems, Man, and Cybernetics, Part C (Applications and Reviews)*, vol. 42, no. 4, pp. 463–484, Jul. 2012, doi: 10.1109/TSMCC.2011.2161285.

[16] R. Alejo, R. M. Valdovinos, V. García, and J. H. Pacheco-Sanchez, "A hybrid method to face class overlap and class imbalance on neural networks and multi-class scenarios," *Pattern Recognition Letters*, vol. 34, no. 4, pp. 380–388, Mar. 2013, doi: 10.1016/j.patrec.2012.09.003.

[17] B. Das, N. C. Krishnan, and D. J. Cook, "Handling Class Overlap and Imbalance to Detect Prompt Situations in Smart Homes," in *2013 IEEE 13th International Conference on Data Mining Workshops*, 2013, pp. 266–273, doi: 10.1109/ICDMW.2013.18.

[18] W. Xie, G. Liang, Z. Dong, B. Tan, and B. Zhang, "An Improved Oversampling Algorithm Based on the Samples' Selection Strategy for Classifying Imbalanced Data," *Mathematical Problems in Engineering*, pp. 1–13, 2019, doi: https://doi.org/10.1155/2019/3526539.

[19] A. Fernandez, S. Garcia, F. Herrera, and N. V. Chawla, "SMOTE for Learning from Imbalanced Data: Progress and Challenges, Marking the 15-year Anniversary," *1*, vol. 61, pp. 863–905, Apr. 2018.

[20] S. Oh, "A new dataset evaluation method based on category overlap," *Comput. Biol. Med.*, vol. 41, no. 2, pp. 115–122, Feb. 2011, doi: 10.1016/j.compbiomed.2010.12.006.

[21] K.-W. Hsu, "A Theoretical Analysis of Why Hybrid Ensembles Work," *Computational Intelligence and Neuroscience*, 2017. [Online]. Available: https://www.hindawi.com/journals/cin/2017/1930702/. [Accessed: 16-Feb-2020].

[22] H. Hartono, O. S. Sitompul, T. Tulus, E. B. Nababan, and D. Napitupulu, "Hybrid Approach Redefinition (HAR) model for optimizing hybrid ensembles in handling class imbalance: a review and research framework," *MATEC Web Conf.*, vol. 197, p. 03003, 2018, doi: 10.1051/matecconf/201819703003.

[23] H. Zou and T. Hastie, "Regularization and Variable Selection via the Elastic Net," *Journal of the Royal Statistical Society. Series B (Statistical Methodology)*, vol. 67, no. 2, pp. 301–320, 2005.

[24] L. Zhang, H. Yang, and Z. Jiang, "Imbalanced biomedical data classification using self-adaptive multilayer ELM combined with dynamic GAN," *Biomed Eng Online*, vol. 17, Dec. 2018, doi: 10.1186/s12938-018-0604-3.

[25] R. Alejo, J. A. Antonio, R. M. Valdovinos, and J. H. Pacheco-Sánchez, "Assessments Metrics for Multi-class Imbalance Learning: A Preliminary Study," in *Pattern Recognition*, 2013, pp. 335–343.

[26] A. P. Bradley, "The use of the area under the ROC curve in the evaluation of machine learning algorithms," *Pattern Recognition*, vol. 30, no. 7, pp. 1145–1159, Jul. 1997, doi: 10.1016/S0031-3203(96)00142-2.

[27] S. García, Z.-L. Zhang, A. Altalhi, S. Alshomrani, and F. Herrera, "Dynamic ensemble selection for multi-class imbalanced datasets," *Information Sciences*, vol. 445–446, pp. 22–37, Jun. 2018, doi: 10.1016/j.ins.2018.03.002.

[28] J. Alcalá-Fdez *et al.*, "KEEL: a software tool to assess evolutionary algorithms for data mining problems," *Soft Comput*, vol. 13, no. 3, pp. 307–318, Feb. 2009, doi: 10.1007/s00500-008-0323-y.

[29] F. Wilcoxon, "Individual Comparisons by Ranking Methods on JSTOR," *Biometrics Bulletin*, vol. 1, no. 6, pp. 80–83, 1945.

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Congratulations!! Your paper is selected for publication in one of our journals. However, after editorial team meeting and careful re-review, your paper ID #1570632452 entitled "Combining Feature Selection and Hybrid Approach Redefinition in Handling Class Imbalance and Overlapping for Multi-Class Imbalanced" requires MAJOR REVISIONS before being scheduled for publication in one of Scopus indexed journals. We suggest for extension and improvement on results and analysis of your paper. You are asked revise your paper seriously & carefully, and to re-submit your updated manuscript according to reviewers' comments, editors' comments, editorial office comments (http://citei.intconference.org/list-of-accepted-papers-and-registration/, see comments at "Revisions Required" column) and the guidelines for authors. The editors will re-check whether your updated paper already address the comments and guidelines, and fulfill for a Scopus indexed journal standard. Failing to do proper revisions may lead to delays for publication and/or re-evaluation of your paper. So, please take your attention for the requirements.

The reviews are below or can be found at https://edas.info/showPaper.php?m=1570632452, using your EDAS login name hartonoibbi@gmail.com.

Please submit your updated paper through EDAS system before Oct 20, 2020.

Thank you for your cooperation.

Best Regards,
Assoc. Prof. Tole Sutikno, Ph.D.
Editor-in-Chief, Indonesian Journal of Electrical Engineering and Computer Science
General Chair, 2020 1st Conference on Internet of Things and Embedded Intelligence

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COMMENTS FROM REVIEWERS:

======= Full paper review 1 =======

> *** Relevance and timeliness: Rate the importance and timeliness of the topic addressed in the paper within its area of research.
Excellent (5)

> *** Technical content and scientific rigour: Rate the technical content of the paper (e.g.: completeness of the analysis or simulation study, thoroughness of the treatise, accuracy of the models, etc.), its soundness and scientific rigour.
Solid work of notable importance. (4)

> *** Novelty and originality: Rate the novelty and originality of the ideas or results presented in the paper.
Significant original work and novel results. (4)

> *** Quality of presentation: Rate the paper organization, the clearness of text and figures, the completeness and accuracy of references.
Well written. (4)

> *** Strong aspects: Comments to the author: what are the strong aspects of the paper

This paper addresses two major top issues of multi-class classification; which are class imbalance and overlapping.

> *** Weak aspects: Comments to the author: what are the weak aspects of the paper?

This paper only modified the existing algorithms to solve the two problems it claims to have.

> *** Recommended changes: Recommended changes. Please indicate any changes that should be made to the paper if accepted.

1. Check all typo errors. For example Page 2 line 4; oberlapping instead of overlapping.
2. Check equations 4,5,6 and 7

For example equation 4 should be TPR = True Positive Rate and not T Prate. The same goes for equations 5, 6 and 7.
In the Abstract.
"The main contribution of this work is to produce a new method that can overcome the problem of class imbalance and overlapping in the multi-class imbalance problem with the minimalization number of classifier, achieving good classifier performance, and also minimize overlap degree in multi-class problems."
This sentence is too long and May be hard to understand. Consider Splitting it into two sentences.

> *** Submission Policy: Does the paper list the same author(s), title and abstract (minor wording differences in the abstract are ok) in its PDF file and EDAS registration?

Yes

======= Full paper review 2 =======

> *** Relevance and timeliness: Rate the importance and timeliness of the topic addressed in the paper within its area of research.
Good (4)

> *** Technical content and scientific rigour: Rate the technical content of the paper (e.g.: completeness of the analysis or simulation study, thoroughness of the treatise, accuracy of the models, etc.), its soundness and scientific rigour.
Valid work but limited contribution. (3)

> *** Novelty and originality: Rate the novelty and originality of the ideas or results presented in the paper.
Minor variations on a well investigated subject. (2)

> *** Quality of presentation: Rate the paper organization, the clearness of text and figures, the completeness and accuracy of references.
Unacceptable. (1)

> *** Strong aspects: Comments to the author: what are the strong aspects of the paper

Nothing so strong or special has been highlighted in this article but the topic which is a good on to work on

> *** Weak aspects: Comments to the author: what are the weak aspects of the paper?

first of all the paper format is not acceptable at all how is it possible that the work is accepted in 2018 in International Journal (as mentioned in the paper left side of paper) and is now under review again?
secondly, the paper has lots of copy- paste parts including the equation which is not acceptable

> *** Recommended changes: Recommended changes. Please indicate any changes that should be made to the paper if accepted.

all the paper template must be changed,
Equation has to be written again
more explanation about the equation is required.

> *** Submission Policy: Does the paper list the same author(s), title and abstract (minor wording differences in the abstract are ok) in its PDF file and EDAS registration?

yes

======= Full paper review 3 =======

> *** Relevance and timeliness: Rate the importance and timeliness of the topic addressed in the paper within its area of research.
Good (4)

> *** Technical content and scientific rigour: Rate the technical content of the paper (e.g.: completeness of the analysis or simulation study, thoroughness of the treatise, accuracy of the models, etc.), its soundness and scientific rigour.
Solid work of notable importance. (4)

> *** Novelty and originality: Rate the novelty and originality of the ideas or results presented in the paper.
Some interesting ideas and results on a subject well investigated. (3)

> *** Quality of presentation: Rate the paper organization, the clearness of text and figures, the completeness and accuracy of references.
Well written. (4)

> *** Strong aspects: Comments to the author: what are the strong aspects of the paper

This paper proposes a method that combining feature selection and Hybrid Approach Redefinition (HAR) Method in handling class imbalance and overlapping for multi-class imbalanced.
The paper is written in good order, and with coherent basis.

> *** Weak aspects: Comments to the author: what are the weak aspects of the paper?

Methodology - The stages of the method in Figure 1 is quite differ than the description. Need to map the Figure with the stages illustrated in text.

> *** Recommended changes: Recommended changes. Please indicate any changes that should be made to the paper if accepted.

Methodology - The stages of the method in Figure 1 is quite differ than the description. Need to map the Figure with the stages illustrated in text.

> *** Submission Policy: Does the paper list the same author(s), title and abstract (minor wording differences in the abstract are ok) in its PDF file and EDAS registration?

Nil

======= Full paper review 4 =======

> *** Relevance and timeliness: Rate the importance and timeliness of the topic addressed in the paper within its area of research.
Good (4)

> *** Technical content and scientific rigour: Rate the technical content of the paper (e.g.: completeness of the analysis or simulation study, thoroughness of the treatise, accuracy of the models, etc.), its soundness and scientific rigour.
Solid work of notable importance. (4)

> *** Novelty and originality: Rate the novelty and originality of the ideas or results presented in the paper.
Some interesting ideas and results on a subject well investigated. (3)

> *** Quality of presentation: Rate the paper organization, the clearness of text and figures, the completeness and accuracy of references.
Readable, but revision is needed in some parts. (3)

> *** Strong aspects: Comments to the author: what are the strong aspects of the paper

The result obtained by the proposed approach is better than the based line method.

> *** Weak aspects: Comments to the author: what are the weak aspects of the paper?

In the discussion, it is not mention why HAR method is better. This paper will be more complete if the author explained why feature selection-HAR is good for multiclass imbalance problem.

> *** Recommended changes: Recommended changes. Please indicate any changes that should be made to the paper if accepted.

1. include the reasons of why feature selection-Har is better than the baseline method.

> *** Submission Policy: Does the paper list the same author(s), title and abstract (minor wording differences in the abstract are ok) in its PDF file and EDAS registration?

No

======= Full paper review 5 =======

> *** Relevance and timeliness: Rate the importance and timeliness of the topic addressed in the paper within its area of research.
Good (4)

> *** Technical content and scientific rigour: Rate the technical content of the paper (e.g.: completeness of the analysis or simulation study, thoroughness of the treatise, accuracy of the models, etc.), its soundness and scientific rigour.
Solid work of notable importance. (4)

> *** Novelty and originality: Rate the novelty and originality of the ideas or results presented in the paper.
Some interesting ideas and results on a subject well investigated. (3)

> *** Quality of presentation: Rate the paper organization, the clearness of text and figures, the completeness and accuracy of references.
Readable, but revision is needed in some parts. (3)

> *** Strong aspects: Comments to the author: what are the strong aspects of the paper

The result obtained by the proposed approach is better than the based line method.

> *** Weak aspects: Comments to the author: what are the weak aspects of the paper?

In the discussion, it is not mention why HAR method is better. This paper will be more complete if the author explained why feature selection-HAR is good for multiclass imbalance problem.

> *** Recommended changes: Recommended changes. Please indicate any changes that should be made to the paper if accepted.

1. include the reasons of why feature selection-Har is better than the baseline method.

> *** Submission Policy: Does the paper list the same author(s), title and abstract (minor wording differences in the abstract are ok) in its PDF file and EDAS registration?

No

======= Full paper review 6 =======

> *** Relevance and timeliness: Rate the importance and timeliness of the topic addressed in the paper within its area of research.
Acceptable (3)

> *** Technical content and scientific rigour: Rate the technical content of the paper (e.g.: completeness of the analysis or simulation study, thoroughness of the treatise, accuracy of the models, etc.), its soundness and scientific rigour.
Valid work but limited contribution. (3)

> *** Novelty and originality: Rate the novelty and originality of the ideas or results presented in the paper.
Minor variations on a well investigated subject. (2)

> *** Quality of presentation: Rate the paper organization, the clearness of text and figures, the completeness and accuracy of references.
Substantial revision work is needed. (2)

> *** Strong aspects: Comments to the author: what are the strong aspects of the paper

The paper idea is useful

> *** Weak aspects: Comments to the author: what are the weak aspects of the paper?

The proposed method and the result are not sufficiently clear.

> *** Recommended changes: Recommended changes. Please indicate any changes that should be made to the paper if accepted.

The algorithm, proposed method, and results should be clear.

> *** Submission Policy: Does the paper list the same author(s), title and abstract (minor wording differences in the abstract are ok) in its PDF file and EDAS registration?

YES

======= Full paper review 7 =======

> *** Relevance and timeliness: Rate the importance and timeliness of the topic addressed in the paper within its area of research.
Acceptable (3)

> *** Technical content and scientific rigour: Rate the technical content of the paper (e.g.: completeness of the analysis or simulation study, thoroughness of the treatise, accuracy of the models, etc.), its soundness and scientific rigour.
Valid work but limited contribution. (3)

> *** Novelty and originality: Rate the novelty and originality of the ideas or results presented in the paper.
Some interesting ideas and results on a subject well investigated. (3)

> *** Quality of presentation: Rate the paper organization, the clearness of text and figures, the completeness and accuracy of references.
Well written. (4)

> *** Strong aspects: Comments to the author: what are the strong aspects of the paper

Classification problem discussed

> *** Weak aspects: Comments to the author: what are the weak aspects of the paper?

The results of the analysis are not clear enough

> *** Recommended changes: Recommended changes. Please indicate any changes that should be made to the paper if accepted.

Suggested changes are made

> *** Submission Policy: Does the paper list the same author(s), title and abstract (minor wording differences in the abstract are ok) in its PDF file and EDAS registration?

same authors

======= Full paper review 8 =======

> *** Relevance and timeliness: Rate the importance and timeliness of the topic addressed in the paper within its area of research.
Good (4)

> *** Technical content and scientific rigour: Rate the technical content of the paper (e.g.: completeness of the analysis or simulation study, thoroughness of the treatise, accuracy of the models, etc.), its soundness and scientific rigour.
Solid work of notable importance. (4)

> *** Novelty and originality: Rate the novelty and originality of the ideas or results presented in the paper.
Some interesting ideas and results on a subject well investigated. (3)

> *** Quality of presentation: Rate the paper organization, the clearness of text and figures, the completeness and accuracy of references.
Well written. (4)

> *** Strong aspects: Comments to the author: what are the strong aspects of the paper

The paper is well written and organized. Need some few modifications as follows:
1. Clearly mention the objectives and state of art (pointwise) in the Introduction.
2. The working model needs more elaboration.
3. Psudocodes explanations will be an added advantage.
4. Clearly check the submission template.

> *** Weak aspects: Comments to the author: what are the weak aspects of the paper?

As suggested above

> *** Recommended changes: Recommended changes. Please indicate any changes that should be made to the paper if accepted.

As suggested above

> *** Submission Policy: Does the paper list the same author(s), title and abstract (minor wording differences in the abstract are ok) in its PDF file and EDAS registration?

Yes

======= Full paper review 9 =======

> *** Relevance and timeliness: Rate the importance and timeliness of the topic addressed in the paper within its area of research.
Good (4)

> *** Technical content and scientific rigour: Rate the technical content of the paper (e.g.: completeness of the analysis or simulation study, thoroughness of the treatise, accuracy of the models, etc.), its soundness and scientific rigour.
Solid work of notable importance. (4)

> *** Novelty and originality: Rate the novelty and originality of the ideas or results presented in the paper.
Some interesting ideas and results on a subject well investigated. (3)

> *** Quality of presentation: Rate the paper organization, the clearness of text and figures, the completeness and accuracy of references.
Well written. (4)

> *** Strong aspects: Comments to the author: what are the strong aspects of the paper

This work produces a new method that can overcome the problem of class imbalance and overlapping in the multi-class imbalance problem with the minimalization number of classifier. this results in good classifier performance, and minimizes overlap degree in multi-class problems.

> *** Weak aspects: Comments to the author: what are the weak aspects of the paper?

the paper is well written. Nevertheless, I think that the algorithms in Sections 3.1 and 3.2 can be summarized.
in addition, the title is too long.

thank you

> *** Recommended changes: Recommended changes. Please indicate any changes that should be made to the paper if accepted.

the paper is accepted as it is

> *** Submission Policy: Does the paper list the same author(s), title and abstract (minor wording differences in the abstract are ok) in its PDF file and EDAS registration?

the names are not shown in the EDAS page of registration

Regards

======= Full paper review 10 =======

> *** Relevance and timeliness: Rate the importance and timeliness of the topic addressed in the paper within its area of research.
Good (4)

> *** Technical content and scientific rigour: Rate the technical content of the paper (e.g.: completeness of the analysis or simulation study, thoroughness of the treatise, accuracy of the models, etc.), its soundness and scientific rigour.
Valid work but limited contribution. (3)

> *** Novelty and originality: Rate the novelty and originality of the ideas or results presented in the paper.
Some interesting ideas and results on a subject well investigated. (3)

> *** Quality of presentation: Rate the paper organization, the clearness of text and figures, the completeness and accuracy of references.
Well written. (4)

> *** Strong aspects: Comments to the author: what are the strong aspects of the paper

Hybrid Ensemble Algorithm

> *** Weak aspects: Comments to the author: what are the weak aspects of the paper?

Limited data sets are taken. They have small number of attributes and even number of instances.

> *** Recommended changes: Recommended changes. Please indicate any changes that should be made to the paper if accepted.

Take more data sets wit sizable number of attributes and even number of instances.

> *** Submission Policy: Does the paper list the same author(s), title and abstract (minor wording differences in the abstract are ok) in its PDF file and EDAS registration?

Yes

======= Full paper review 11 =======

> *** Relevance and timeliness: Rate the importance and timeliness of the topic addressed in the paper within its area of research.
Good (4)

> *** Technical content and scientific rigour: Rate the technical content of the paper (e.g.: completeness of the analysis or simulation study, thoroughness of the treatise, accuracy of the models, etc.), its soundness and scientific rigour.
Solid work of notable importance. (4)

> *** Novelty and originality: Rate the novelty and originality of the ideas or results presented in the paper.
Significant original work and novel results. (4)

> *** Quality of presentation: Rate the paper organization, the clearness of text and figures, the completeness and accuracy of references.
Well written. (4)

> *** Strong aspects: Comments to the author: what are the strong aspects of the paper

* Technically sound and a good comparison of the approaches, along with statistical analysis.
* The datasets are well-chosen
* The block diagram is wrong, the Feature Selection block must be before classification block

> *** Weak aspects: Comments to the author: what are the weak aspects of the paper?

* No existing works are compared, like other papers
* Some short forms are introduced before the full forms are introduced, like in the literature review. Sould be removed
* Procedures in 2.2 and 2.3 must be elaborated, and the algorithmic forms and notions are not clear
* The Discussion (4.4) must be elaborated with why the procedure works better (instead of just better)
* In Eqn 1, R(Ci) is not defined, there are many not defined notions in many equations like alpha in C(alpha)(beta) in Eqn 2

> *** Recommended changes: Recommended changes. Please indicate any changes that should be made to the paper if accepted.

Provided above

> *** Submission Policy: Does the paper list the same author(s), title and abstract (minor wording differences in the abstract are ok) in its PDF file and EDAS registration?

yes

======= Full paper review 12 =======

> *** Relevance and timeliness: Rate the importance and timeliness of the topic addressed in the paper within its area of research.
Good (4)

> *** Technical content and scientific rigour: Rate the technical content of the paper (e.g.: completeness of the analysis or simulation study, thoroughness of the treatise, accuracy of the models, etc.), its soundness and scientific rigour.
Valid work but limited contribution. (3)

> *** Novelty and originality: Rate the novelty and originality of the ideas or results presented in the paper.

Significant original work and novel results. (4)

> *** Quality of presentation: Rate the paper organization, the clearness of text and figures, the completeness and accuracy of references.
Readable, but revision is needed in some parts. (3)

> *** Strong aspects: Comments to the author: what are the strong aspects of the paper

the problem is well-addressed and compared.paper can be accepted.

> *** Weak aspects: Comments to the author: what are the weak aspects of the paper?

1) the authors should use a database with large number of instances and attributes.

> *** Recommended changes: Recommended changes. Please indicate any changes that should be made to the paper if accepted.

the fonts of the paper varies throughout the article. it should be corrected.

> *** Submission Policy: Does the paper list the same author(s), title and abstract (minor wording differences in the abstract are ok) in its PDF file and EDAS registration?

the EDAS page shows one author and the paper has three authors.

COMMENTS FROM EDITORS: GUIDELINES FOR REVISIONS

For ORIGINAL/RESEARCH Paper Type, the paper should be presented with IMRaD model:
1. Introduction (I)
2. The Proposed Method/Algorithm/Procedure specifically designed (optional). Authors may present complex proofs of theorems or non-obvious proofs of correctness of algorithms after introduction section (obvious theorems & straightforward proofs of existing theorems are NOT needed).
3. Method (M)
4. Results and Discussion (RaD)
5. Conclusion.
We will usually expect a minimum of 25-30 references primarily to journal papers, depending on the length of the paper (number of minimum references = 2n+10, n=page length). Citations of textbooks should be used very rarely and citations to web pages should be avoided. REMOVE ALL LOCAL REFERENCES. All cited papers should be referenced within the text of the manuscript. Choose ONLY the most important figures and/or tables, and prepare all figures in high quality images. Avoid paper with too many Figures and/or Tables. Figures and Tables are each MAX 4 entries.

For REVIEW Paper Type, the paper should present a critical and constructive analysis of existing published literature in a field, through summary, classification, analysis and comparison. The function and goal of the review paper is:
1) to organize literature;
2) to evaluate literature;
3) to identify patterns and trends in the literature;
4) to synthesize literature; or
5) to identify research gaps and recommend new research areas.
The structure of a review paper includes:
1. Title – in this case does not indicate that it is a review article.
2. Abstract – includes a description of subjects covered.
3. Introduction should be presented within 3-6 paragraphs, includes a description of context (ex: paragraph 1-3), motivation for review (ex: paragraph 4, sentence 1) and defines the focus (ex: paragraph 4, sentences 2-3)
4. Body – structured by headings and subheadings
5. Conclusion – states the implications of the findings and an identifies possible new research fields
6. References (“Literature Review”) – organised by number in the order they were cited in the text.
Number of minimum references for review paper is 50 references (included minimum 40 recently journal articles).

We would like also your cooperation with the double check of your revised paper:
---
(1) TEMPLATE- Please Strictly use and follow to the template Manuscript:
-- IJEECS: http://iaescore.com/gfa/ijeecs.docx (Word Format)
-- IJAI: http://iaescore.com/gfa/ijai.docx (Word Format)
-- IJERE: http://iaescore.com/gfa/ijere.docx (Word Format)

(2) Authors may present complex proofs of theorems or non-obvious proofs of correctness of algorithms after introduction section (obvious theorems & straightforward proofs of existing theorems are NOT needed).

(3) Introduction section within 3-6 paragraphs: explain the context of the study and state the precise objective. An Introduction should contain the following three (3) parts:
- Background: Authors have to make clear what the context is. Ideally, authors should give an idea of the state-of-the art of the field the report is about.
- The Problem: If there was no problem, there would be no reason for writing a manuscript, and definitely no reason for reading it. So, please tell readers why they should proceed reading. Experience shows that for this part a few lines are often sufficient.
- The Proposed Solution: Now and only now! - authors may outline the contribution of the manuscript. Here authors have to make sure readers point out what are the novel aspects of authors work.
Authors should place the paper in proper context by citing relevant papers. At least, 15 references (recent journal articles) are cited in this section to explain gap of analysis and to support your state of the art.

(4) Method section: the presentation of the experimental methods should be clear and complete in every detail facilitating reproducibility by other scientists.

(5) Results and discussion section: The presentation of results should be simple and straightforward in style. This section report the most important findings, including results of statistical analyses as appropriate and comparisons to other research results. Results given in figures should not be repeated in tables. This is where the author(s) should explain in words what he/she/they discovered in the research. It should be clearly laid out and in a logical sequence. This section should be supported suitable references.

(6) (URGENT)!!! About Figures & Tables in your manuscript:
- Because tables and figures supplement the text, all tables and figures should be REFERENCED in the text. Authors MUST EXPLAIN what the reader should look for when using the table or figure. Focus only on the important point the reader should draw from them, and leave the details for the reader to examine on her own.
- Tables are to be presented with single horizontal line under: the table caption, the column headings and at the end of the table. All tables are produced by creating tables in MS Word. Captured tables are NOT allowed.
- All figures MUST in high quality images

(7) Conclusion section: Summarize sentences the primary outcomes of the study in a paragraph. Are the claims in this section supported by the results, do they seem reasonable? Have the authors indicated how the results relate to expectations and to earlier research? Does the article support or contradict previous theories? Does the conclusion explain how the research has moved the body of scientific knowledge forward?

(8) Most importantly, please ensure the similarity score is less than 25%. You can refer to EDAS to see the similarity score of your paper. Any paper with a similarity score of more than 25% will be dropped. Please make sure your revised paper follow this rule. If the similarity score of final version is more than 25%, the Editors has the right to cancel the paper to be published in one of our Scopus indexed journals.

(9) Please ensure the maximum page of your final paper is 8-page, but still allowed up to 12 pages (required to pay an extra fee).

Hartono Ibbi <hartonoibbi@gmail.com> 13 Oktober 2020 pukul 08.48
Kepada: ijeecs.iaes@gmail.com

Dear Assoc. Prof. Tole Sutikno, Ph.D.,

Thank you for your comments and your valuable suggestions. I will finish my revision in a few days. Thank you for the opportunity for participating in this conference.

Best Regards,

Hartono
[Kutipan teks disembunyikan]

Hartono Ibbi <hartonoibbi@gmail.com> 16 Oktober 2020 pukul 09.12
Kepada: ijeecs.iaes@gmail.com

Dear Assoc. Prof. Tole Sutikno, Ph.D.
Editor-in-Chief, Indonesian Journal of Electrical Engineering and Computer Science
General Chair, 2020 1st Conference on Internet of Things and Embedded Intelligence

Thank you for the opportunity to participate in CITEI 2020. We need to inform you that we have followed up on all comments from reviewers, editors, and also input from Dr. Tole. We have also checked turnitin for similarity and the result was 23%. We have uploaded it to Edas System and we also include it in this email attachment. However, we realize that there may still be things that are not

according to the wishes of reviewers and editors, please don't hesitate to tell us about it. We will follow up soon again and will fix it soon. Finally, we hope that we can participate again in CITEI 2021. Thank you.

Best Regards,

Hartono

Pada tanggal Sab, 3 Okt 2020 pukul 00.43 ijeecs.iaes@gmail.com <ijeecs.iaes=gmail.com@edas.info> menulis:
[Kutipan teks disembunyikan]

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4805K

Upload Hasil Revisi

Hartono Ibbi <hartonoibbi@gmail.com>
kepada ijeecs.iaes

Jum, 16 Okt 2020, 10.12

Dear Assoc. Prof. Tole Sutikno, Ph.D.
Editor-in-Chief, Indonesian Journal of Electrical Engineering and Computer Science
General Chair, 2020 1st Conference on Internet of Things and Embedded Intelligence

Thank you for the opportunity to participate in CITEI 2020. We need to inform you that we have followed up on all comments from reviewers, editors, and also input from Dr. Tole. We have also checked turnitin for similarity and the result was 23%. We have uploaded it to Edas System and we also include it in this email attachment. However, we realize that there may still be things that are not according to the wishes of reviewers and editors, please don't hesitate to tell us about it. We will follow up soon again and will fix it soon. Finally, we hope that we can participate again in CITEI 2021. Thank you.

Best Regards,

Hartono

•••

Satu lampiran • Dipindai dengan Gmail

IJEECS Hartono d...