



**PROJECT REPORT**  
**REAL MASS ESTIMATION USING DENSITY-BASED**  
**SPATIAL CLUSTERING OF APPLICATIONS WITH**  
**NOISE (DBSCAN) AND K-NEAREST NEIGHBOUR**  
**CLASSIFICATION**

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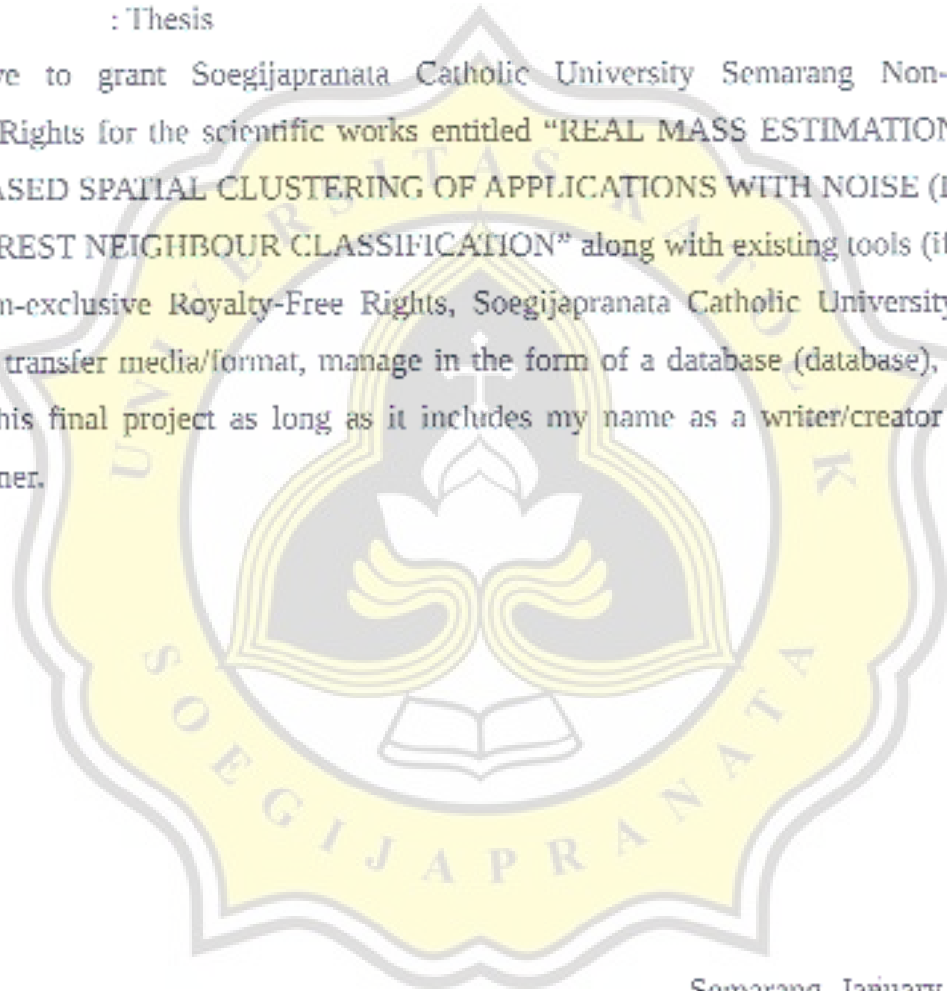
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## **ABSTRACT (Style : Abstract Title)**

*Many real-world applications can be acquired from efficient and effective mass measurement. However, further development is needed for our current mass measurement. Estimating an object's mass through the naked eye is not possible and it's very inconvenient to bring a measurement scale everywhere just to calculate the mass of an object. The proposed study shows that there's no need for human intervention to calculate an object's mass by placing the object one by one into the mass scales, it can be done just by taking pictures of them.*

*Using the object's top view and side view photos, the object's mass can be found. Image processing is needed to achieve a clean edge of the object and replace the object's background with transparency. There are two sections in this model which are object identification and object volume measurement. In the object identification model, processed side view image will be combined with the train data and clustered by the DBSCAN algorithm. A selected cluster of the input image will be used as k-NN classification train data. k-NN will find the nearest neighbor of the input image among the input image's cluster. The object is identified and the object's density is obtained.*

*In the volume estimation model, an area calculation and height estimation are required. Object's area is obtained by calculating the non-zero pixels of the thresholded object's top view. While object's height is estimated by drawing a bounding box around the object of the object's side view image. After the object's area and height are obtained, multiplying them will get the object's volume. Object's density and an object's volume have been acquired and by multiplying them, the object's mass is calculated.*

*It was found that this model is able to estimate an object's mass with acceptable error due to small datasets and manual measurements which increase the possibility of human error. The average accuracy of multiple applications reaches 90,2% and this model works best with light color objects. The highest accuracy is obtained with a 19 cm distance from the camera to the object.*

*Keyword: mass measurement, image processing, object identification, object's density, volume estimation.*

## TABLE OF CONTENTS

APPROVAL AND RATIFICATION PAGE (Heading plain).....	ii
DECLARATION OF AUTHORSHIP.....	iii
ACKNOWLEDGMENT.....	iv
ABSTRACT (Style : Abstract Title).....	vi
LIST OF FIGURE.....	ix
LIST OF TABLE.....	x
CHAPTER 1 INTRODUCTION.....	1
1.1. Background.....	1
1.2. Problem Formulation.....	2
1.3. Scope.....	2
1.4. Objective.....	2
CHAPTER 2 LITERATURE STUDY.....	3
CHAPTER 3 RESEARCH METHODOLOGY.....	11
3.1. Data Collection.....	11
3.2. Algorithm.....	11
3.3. Design.....	12
3.4. Coding.....	13
3.5. Analysis.....	14
CHAPTER 4 ANALYSIS AND DESIGN.....	15
4.1. Dataset Preparation.....	15
4.2. Dataset Preprocessing.....	18
4.2.1. Input Image Preprocessing.....	18
4.2.2. Dataset Preprocessing.....	19
4.3. DBSCAN.....	21
4.4. K-NN.....	22
4.5. Object's Volume Estimation.....	23
4.6. Object's Mass Estimation.....	24

4.7. Analysis.....	25
<b>CHAPTER 5 IMPLEMENTATION AND RESULTS.....</b>	<b>27</b>
5.1. Implementation.....	27
5.1.1. Remove Input Image Background to Transparent.....	27
5.1.2. Extract The Zipped Dataset.....	29
5.1.3. Image Hash.....	30
5.1.4. Distance Matrix.....	31
5.1.5. Coordinates Form.....	31
5.1.6. DBSCAN Algorithm.....	31
5.1.7. Input Image Cluster.....	36
5.1.8. k-NN Algorithm.....	37
5.1.9. Get Object's Density.....	38
5.1.10. Volume Calculation.....	39
5.1.11. Object's Mass Estimation.....	41
5.2. Results.....	41
5.2.1. DBSCAN Algorithm.....	41
5.2.2. Object Identification.....	42
5.2.3. Object's Area.....	43
<b>CHAPTER 6 CONCLUSION.....</b>	<b>50</b>
<b>REFERENCES.....</b>	<b>51</b>
<b>APPENDIX.....</b>	<b>a</b>



## LIST OF FIGURE

Figure 4.1: Data Preprocessing Result.....	19
Figure 4.2: Mask Transformation.....	19
Figure 4.3: Real Mass Estimation Flowchart.....	26
Figure 5.1: Cluster and minPts Regression Linear 1.....	47
Figure 5.2: Cluster and minPts Regression Linear 2.....	47
Figure 5.3: Cluster and minPts Regression Linear 3.....	48
Figure 5.4: Cluster and minPts Regression Linear 4.....	48



## LIST OF TABLE

Table 4.1 : Fruits and Vegetables Kinds Dataset Table.....	15
Table 4.2 : Kaggle Dataset Examples.....	16
Table 4.3 : Input Image Examples.....	17
Table 5.1 : DBSCAN Time and Cluster Test Result 1.....	41
Table 5.2 : DBSCAN Time and Cluster Test Result 2.....	42
Table 5.3 : Object Identification Result of 10 Fruit Kinds.....	42
Table 5.4 : Object Identification Result of 20 Fruit Kinds.....	42
Table 5.5 : Mass Estimation Result of 6 Apples.....	43
Table 5.6 : Mass Estimation Result of 6 Lemons.....	44
Table 5.7 : Mass Estimation Result of 6 Oranges.....	45
Table 5.8 : Average Accuracy of Apples .....	46
Table 5.9 : Average Accuracy of Lemons .....	47
Table 5.10 : Average Accuracy of Oranges.....	47

