



**UNIVERSITI TEKNOLOGI MARA**

**ASSESSMENT OF FOREST ABOVEGROUND BIOMASS  
ESTIMATION FROM SUPERVIEW-1 SATELLITE  
IMAGE USING MACHINE LEARNING APPROACHES**

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requirements for the degree of  
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## AUTHOR'S DECLARATION

I declare that the work in this thesis/dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

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## **ABSTRACT**

Estimating forest biomass in a small-scale forest area is more accurate as it depends on actual field measurements. However, measuring the field to estimate forest biomass in a large region is not feasible because it is labour intensive, a lengthy process and expensive. Therefore, this study aimed (i) to classify the forest aboveground biomass by estimating crown projection area using object-based image analysis (OBIA) and (ii) to determine the accuracy assessment for estimating forest aboveground biomass using an artificial neural network (ANN) and Random Forest (RF). Object-based image analysis (OBIA) is one of the methods designed to classify the satellite image using multiresolution segmentation to obtain the value of the crown projection area (CPA). In contrast, machine learning is used to calculate the accuracy assessment of dependent between independent variables. A combination of approaches has been tested to estimate the forest's aboveground biomass and carbon stock for Selangor's terrestrial ecosystem environment. The result shows the goodness of fit for the distance index (D) was 0.040. The total accuracy for 30 reference polygons was 96.6% and 96% for the total accuracy for distance index (D). The statistical values for min, max, mean, and standard deviation of carbon stock (kg/tree) were 4.891, 196.250, 101.142, and 46.340. The Random Forest algorithm was the best algorithm compared to the artificial neural network, which produced the highest  $R^2$  (0.998) and lowered RSME (55.067). The suitable independent variables (hL, DBH, and CPA) were vital to estimating the dependent variable (Sc) and producing a carbon stock map for the final result. The significant of this study is to prove that the application of object-based image analysis classification and machine learning algorithms for forest aboveground biomass and carbon stock estimation has excellent potential for the future management of forests to maintain their existence and growth.

**Keyword:** Carbon Stock, Object-Based Image Analysis (OBIA), Artificial Neural Network (ANN) and Random Forest (RF)

## TABLE OF CONTENT

	<b>Page</b>
CONFIRMATION BY PANEL OF EXAMINERS	ii
SUPERVISOR’S DECLARATION	iv
ABSTRACT	v
ACKNOWLEDGEMENT	vi
TABLE OF CONTENT	vii
LIST OF TABLES	x
LIST OF FIGURES	xi
LIST OF ABBREVIATIONS / NOMENCLATURE	xii
<b>CHAPTER 1</b>	
<b>INTRODUCTION</b>	
1.1 Research Background	1
1.2 Problem Statement	2
1.3 Research Question	3
1.4 Aim and Objectives	3
1.5 Scope and limitation of Study	3
1.6 Significant of Research	5
<b>CHAPTER 2</b>	
<b>LITERATURE REVIEW</b>	
2.1 Introduction	6
2.2 Forest Aboveground Biomass	6
2.3 Allometric Equation for Aboveground Biomass (AGB) and Carbon Stock	7
2.4 Forest Aboveground Biomass and Carbon Stock Estimation using Remote Sensing.	8
2.4.1 Superview-1 Satellite	9
2.4.2 Light Detection and Ranging (LiDAR)	10
2.5 Canopy Height Model (CHM)	11
2.6 Object-Based Image Analysis (OBIA) Method.	12

3.8.2	Random Forest in R software	32
3.8.2	Regression model evaluation	33
3.9	Summary	34
<b>CHAPTER 4</b>		
<b>RESULT AND ANALYSIS</b>		
4.1	Introduction	35
4.2	Lidar Dataset	35
4.2.1	Analysis of DTM, DSM and CHM Generation	35
4.3	OBIA Approach	37
4.3.1	Analysis of statistical value and accuracy assessment of OBIA output	37
4.3.2	Description of statistical values of dependent and independent variables	39
4.4	Machine Learning	40
4.4.1	The comparison between the hidden layers of artificial neural network (ANN)	41
4.4.2	Model validation of Random Forest (RF)	42
4.4.3	Plot the graph and evaluation model of ANN and RF algorithms	43
4.5	Carbon Stock Map	46
<b>CHAPTER 5</b>		
<b>CONCLUSION</b>		
5.1	Introduction	47
5.2	Conclusion	47
5.3	Recommendation	49
	<b>REFERENCES</b>	50
	<b>APPENDICES</b>	55