

**COMPARATIVE ANALYSIS OF MACHINE
LEARNING APPROACHES FOR ASTEROID
CLASSIFICATION BASED ON THE ORBITAL
MOTION**

Bachelor Thesis

Conducted to obtain Bachelor of Science degree



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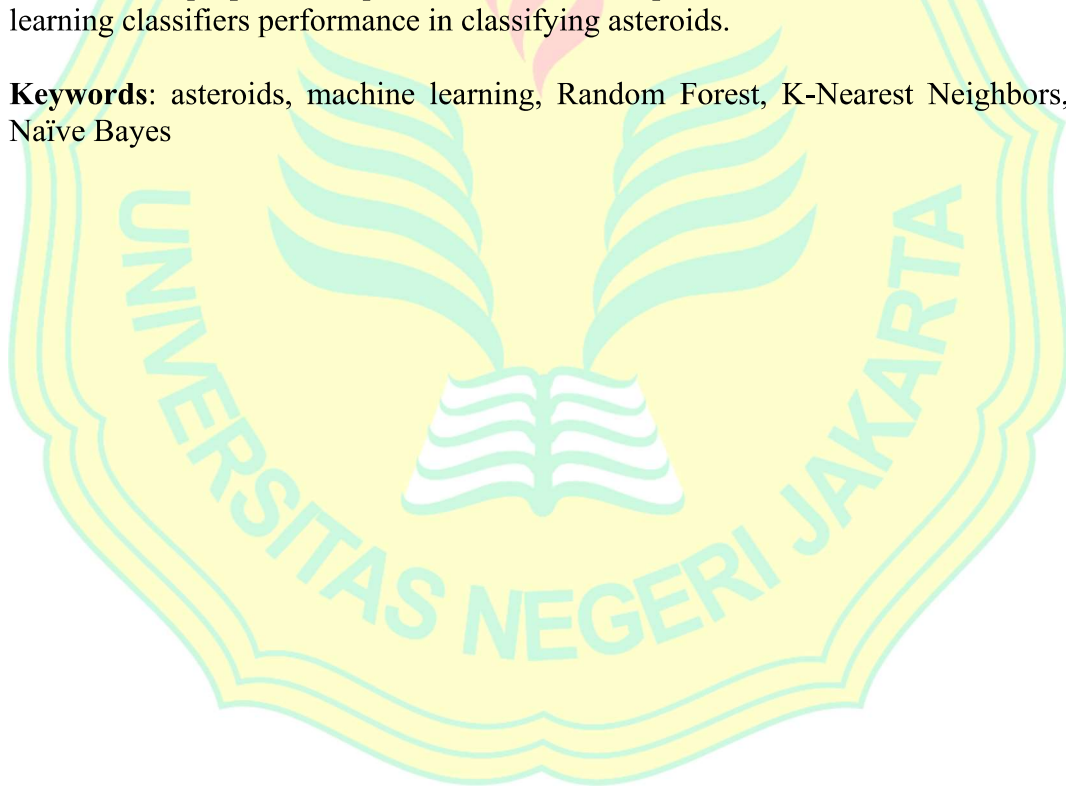
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ABSTRACT

SIVA ARDELIA AZZAHRA. Comparative Analysis of Machine Learning Approaches for Asteroid Classification Based on the Orbital Motion. Supervised by MUTIA DELINA, JANAKA ADASSURIYA.

The study determined the most appropriate machine learning classifiers to detect Potentially Hazardous Asteroid (PHA). The machine learning classifiers: K-Nearest Neighbors (KNN), Naïve Bayes, and Random Forest were applied to develop an asteroid classification program based on orbital parameters. Each classifier was evaluated by its precision, accuracy, F1-score, and recall in determining PHA and non-PHA. The Random Forest achieve the highest accuracy score at 100%, followed by the KNN classifier with an accuracy score at 97.00%, and the Naïve Bayes classifier with an accuracy score at 95.00%. The results of this research are proposed to provide a better comprehension of several machine learning classifiers performance in classifying asteroids.

Keywords: asteroids, machine learning, Random Forest, K-Nearest Neighbors, Naïve Bayes



ABSTRAK

SIVA ARDELIA AZZAHRA. Analisis Komparatif Pendekatan *Machine Learning* untuk Klasifikasi Asteroid Berdasarkan Gerakan Orbit. Dibimbing oleh MUTIA DELINA, JANAKA ADASSURIYA.



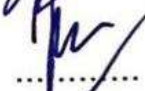


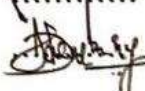

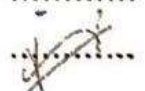
Penelitian ini menentukan metode *machine learning* yang paling sesuai untuk mendeteksi *Potentially Hazardous Asteroid* (PHA). Metode *machine learning*: K-Nearest Neighbors (KNN), Naïve Bayes, dan Random Forest diterapkan untuk mengembangkan program klasifikasi asteroid berdasarkan parameter orbit. Setiap metode dievaluasi berdasarkan presisi, akurasi, skor F1, dan *recall* dalam menentukan PHA dan non-PHA. Random Forest mencapai skor akurasi tertinggi sebesar 100%, diikuti oleh KNN dengan skor akurasi sebesar 97,00%, dan Naïve Bayes dengan skor akurasi sebesar 95,00%. Hasil penelitian ini diusulkan untuk memberikan pemahaman yang lebih baik tentang kinerja beberapa metode *machine learning* dalam mengklasifikasikan asteroid.

Kata Kunci: asteroid, pembelajaran mesin, Random Forest, K-Nearest Neighbors, Naïve Bayes



APPROVAL OF BACHELOR THESIS
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DECLARATION STATEMENT

I declare that the thesis titled "Comparative Analysis of Machine Learning Approaches for Asteroid Classification based on the Orbital Motion" is my original work and has been written by me. I have acknowledged all sources of information which have been used in the thesis. I further declare that all materials from other sources, including charts, diagrams, and other illustrations, are cited and acknowledged. I affirm that I have not engaged in any form of plagiarism in the creation of this thesis and that all content presented is a result of my own research and analysis.

Jakarta, 1st August 2024



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FOREWORD

In the name of Allah SWT, I would like to express my deepest gratitude for His blessings and grace, which have enabled me to complete the thesis titled "Comparative Analysis of Machine Learning Approaches for Asteroid Classification Based on the Orbital Motion." I would like to extend my heartfelt thanks to:

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I hope the study can contribute beneficially to the development of knowledge, especially in the field of asteroid classification based on machine learning. Thank you.

Jakarta, 1st August 2024

Siva Ardelia Azzahra

TABLE OF CONTENT

ABSTRACK	ii
ABSTRAK	iii
APPROVAL OF BACHELOR THESIS	iv
DECLARATION STATEMENT.....	v
FOREWORD	vii
TABLE OF CONTENT	viii
CHAPTER I INTRODUCTION	1
A. Background	1
B. Research Problem.....	3
C. Research Objective.....	3
D. Research Benefits.....	4
CHAPTER II LITERATURE REVIEW.....	5
A. Asteroid	5
B. Orbital Motion.....	6
C. Machine Learning Classifier	11
D. K-Nearest Neighbor Classifier	13
E. Naïve Bayes Classifier	15
F. Random Forest Classifier.....	17
.....	18
G. Relevant Research.....	19
CHAPTER III RESEARCH METHODOLOGY	21
A. Research Plan.....	21
B. Research Method.....	21
C. Tools.....	22
D. Research Flowchart	22
E. Research Procedure.....	22
F. Data Collection and Analysis Techniques	23
CHAPTER IV RESULT AND DISCUSSION	24
A. Dataset Preparation	24

B. Model Training.....	24
C. Model Testing	25
D. Data Visualization.....	26
E. Analysis and Discussion	27
F. Research Strengths and Weaknesses.....	31
CHAPTER 5 CONCLUSION AND SUGGESTION	32
A. Conclusion	32
B. Suggestion.....	32
REFERENCES.....	33
APPENDIX.....	39
BIOGRAPHY	47

