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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ABSTRACK

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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FOREWORD

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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

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