ABSTRAK

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Program Studi	: Teknik Informatika
Judul Proposal Penelitian	: Implementasi Algoritma Random Forest Untuk Menentukan Klasifikasi Tingkat Sulfur Dioksid (SO_2) Terhadap Kualitas Udara Di Jakarta
Pembimbing	: Lukman Hakim S.Kom, M.Kom

(Abstrak -- Meningkatnya polusi udara di Jakarta, khususnya kadar Sulfur Dioksida (SO2), telah menjadi perhatian serius karena dampaknya terhadap kesehatan dan lingkungan. Penelitian ini memanfaatkan Algoritma Random Forest untuk mengklasifikasikan tingkat konsentrasi SO2 di berbagai wilayah Jakarta berdasarkan data citra satelit TROPOMI Sentinel-5P. Data dikumpulkan selama periode tertentu dan diproses melalui teknik clipping, stacking, dan mosaik raster sebelum dimodelkan.Hasil evaluasi model menunjukkan kinerja yang sangat baik dengan variasi hasil antara wilayah yang berbeda. Di Jakarta Barat, model mencapai Cohen's Kappa Score sebesar 95.06%, akurasi 96.49%, precision 97.27%, recall 96.49%, dan F1-Score 96.63%. Di Jakarta Timur, hasil evaluasi menunjukkan Cohen's Kappa Score sebesar 97%, akurasi 98%, precision 98%, recall 98%, dan F1-Score 98%. Jakarta Pusat menunjukkan akurasi 95.24%, precision 95.92%, recall 95.24%, dan F1-Score 95.12%. Di Jakarta Utara, model memiliki akurasi 97.72%, precision 95.69%, recall 97.72%, dan F1-Score 96.64%. Sedangkan di Jakarta Selatan, model menunjukkan akurasi 88.36%, precision 82.71%, recall 88.36%, dan F1-Score 84.55%. Temuan ini menunjukkan efektivitas algoritma Random Forest dalam mengklasifikasikan tingkat SO2 berdasarkan data satelit, serta memberikan wawasan mendalam mengenai pola klasifikasi dan distribusi konsentrasi SO2, berkontribusi terhadap upaya mitigasi polusi udara dengan memberikan informasi berharga.

Kata kunci: Polusi Udara, Sulfur Dioksida (SO2), Algoritma Random Forest, Klasifikasi, Satelit Sentinel-5P

ABSTRACT

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Study Program   : Informatics
Title Research Proposal   : Implementation of the Random Forest Algorithm
to Classify   Sulfur Dioxide (SO$_2$) Levels and Air Quality in Jakarta

(Abstract -- Increasing air pollution in Jakarta, especially levels of Sulfur Dioxide (SO2), is a serious concern because of its impact on health and the environment. This research utilizes the Random Forest algorithm to classify SO2 concentration levels in various areas of Jakarta based on TROPOMI Sentinel-5P satellite image data. Data is collected over a certain period and processed through clipping, stacking and raster mosaic techniques before being modeled. The model evaluation results show excellent performance with variations in results between different regions. In West Jakarta, the model achieved a Cohen's Kappa Score of 95.06%, accuracy of 96.49%, precision of 97.27%, recall of 96.49%, and F1-Score of 96.63%. In East Jakarta, the evaluation results showed a Cohen's Kappa Score of 97%, accuracy of 98%, precision of 98%, recall of 98%, and F1-Score of 98%. Central Jakarta shows 95.24% accuracy, 95.92% precision, 95.24% recall, and 95.12% F1-Score. In North Jakarta, the model has an accuracy of 97.72%, precision of 95.69%, recall of 97.72%, and F1-Score of 96.64%. Meanwhile in South Jakarta, the model shows 88.36% accuracy, 82.71% precision, 88.36% recall, and 84.55% F1-Score. These findings demonstrate the effectiveness of the Random Forest algorithm in classifying SO2 levels based on satellite data, as well as providing deep insight into classification patterns and distribution of SO2 concentrations, contributing to air pollution mitigation efforts by providing valuable information.

Keywords: Air Pollution, Sulfur Dioxide (SO2), Random Forest Algorithm, Classification, Sentinel-5P Satellite.