

Pengembangan model machine learning untuk kerangka sistem penilaian dampak infrastruktur transportasi berdasarkan sustainable development goals = Development of machine learning model for transportation infrastructure impact assessment framework based on sustainable development goals

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Abstrak

Salah satu tantangan yang kita hadapi saat ini adalah menghubungkan kinerja keberlanjutan proyek infrastruktur dengan SDGs. Insinyur sipil perlu memiliki alat yang praktis untuk menilai dampak pada proyek yang layak untuk kemudian dilakukan pengambilan tindakan terkait sustainabilitas. Saat penelitian ini dibuat, masih belum ada kerangka penilaian sustainabilitas yang berbasis SDGs yang secara khusus diarahkan untuk mengevaluasi proyek infrastruktur transportasi. Penelitian ini bertujuan untuk mengisi kesenjangan tersebut dengan mengusulkan kerangka sistem untuk menilai dampak infrastruktur transportasi pada tahap perencanaan serta mengembangkan model machine learning yang mampu memprediksi hasil penilaian berdasarkan indikator dari kerangka yang diberikan. Melalui serangkaian studi literatur, diusulkan kerangka sistem penilaian dengan 15 indikator yang merepresentasikan empat pilar sustainabilitas, sosial, ekonomi, lingkungan, dan institusional. Indikator merefleksikan 25 target dari 12 tujuan SDGs. Berdasarkan pembobotan indikator dengan metode Analytic Hierarchy Process, didapatkan indikator persentase pekerja disabilitas memiliki bobot kepentingan terbesar, yaitu 8.08%, dan indikator jumlah pengaduan yang diajukan oleh masyarakat setempat memiliki bobot kepentingan terkecil sebesar 5.30%. Indikator sosial memiliki tingkat kepentingan yang paling tinggi, dilanjutkan dengan indikator lingkungan, ekonomi, dan institusional. Model machine learning yang dihasilkan menggunakan tiga algoritma pengklasifikasi, Naïve Bayes, ANN/Deep Learning, dan Decision Tree. Model dengan algoritma Naïve Bayes memiliki akurasi sebesar 64.7%, algoritma ANN/Deep Learning memiliki akurasi sebesar 86.7%, dan algoritma Decision Tree memiliki akurasi sebesar 75.3%.

.....One of the challenges we face today is linking the sustainability performance of infrastructure projects with the SDGs. Civil engineers need to have a viable practical tool for assessing impacts on a project to be able to take sustainable actions. At the time this research was conducted, there was no framework for SDG-based sustainability assessment that was specifically directed at evaluating transportation infrastructure projects. This study aims to fill this gap by proposing a system framework to assess the impact of transportation infrastructure at the planning stage and develop a machine learning model that can predict the results of the assessment based on indicators from the given framework. Through a series of literature studies, a scoring system framework with 15 indicators is proposed, representing the four pillars of sustainability, social, economic, environmental, and institutional. The indicators reflect 25 targets of the 12 SDGs goals. Based on the weighting of the indicators using the Analytic Hierarchy Process method, it was found that the percentage of disabled workers indicator has the largest importance weight, which is 8.08%, and the indicator of the number of complaints submitted by the local community has the lowest importance with a weight of 5.30%. Social indicators have the highest importance, followed by environmental, economic, and institutional indicators. The resulting machine learning model uses three classifier

algorithms, Naïve Bayes, ANN/Deep Learning, and Decision Tree. The model with Naïve Bayes algorithm has an accuracy of 64.7%, the ANN/Deep Learning model has an accuracy of 86.7%, and the Decision Tree model has an accuracy of 75.3%.