KLASIFIKASI STATUS EKONOMI MASYARAKAT MENGGUNAKAN *RANDOM FOREST* DAN SVM DENGAN SIG SPASIAL STUDI KASUS : KOTA LHOKSEUMAWE

ABSTRAK

Penentuan status ekonomi masyarakat di Kota Lhokseumawe saat ini sebagian besar masih dilakukan secara manual dan belum terhubung dengan data pemetaan lokasi tempat tinggal warga. Akibatnya, pemerintah daerah kesulitan memantau persebaran tingkat kesejahteraan masyarakat secara merata dan tepat sasaran. Penelitian ini bertujuan untuk membandingkan kinerja algoritma *Random Forest* dan *Support Vector Machine* (SVM) dalam mengklasifikasikan status ekonomi masyarakat, serta mengintegrasikan model terbaik ke dalam sistem WebGIS berbasis spasial. Data penelitian diperoleh melalui survei lapangan langsung kepada 100 kepala keluarga yang tersebar di empat kecamatan di Kota Lhokseumawe dengan mengamati tujuh indikator sosial ekonomi beserta titik koordinat geografis tempat tinggal. Tahapan prapemrosesan data mencakup pembersihan data *(cleaning),* pengkodean *(encoding),* normalisasi *Min-Max*, serta pembentukan label kelas target (Miskin, Kurang Mampu, dan Mampu) menggunakan penskoran skala ordinal dan metode *Equal Interval*. Pengujian dan validasi model dilakukan menggunakan metode *Stratified 5-Fold Cross Validation*. Hasil penelitian menunjukkan bahwa algoritma *Support Vector Machine* (SVM) menghasilkan performa klasifikasi yang lebih unggul dibandingkan *Random Forest.* SVM memperoleh nilai akurasi sebesar 95,00%, presisi 97,32%, recall 95,04%, dan F1-score 95,46%, sedangkan Random Forest memperoleh akurasi 92,00%, presisi 92,52%, recall 92,91%, dan F1-score 90,89%. Model SVM sebagai model terbaik *(best model)* kemudian berhasil diimplementasikan ke dalam sistem informasi geografis berbasis web (WebGIS) menggunakan *framework* Flask dan pustaka Leaflet.js guna memvisualisasikan titik sebaran status ekonomi warga secara interaktif. Dengan demikian, sistem WebGIS berbasis SVM ini dapat menjadi media pendukung keputusan *(decision support)* bagi Pemerintah Kota Lhokseumawe dalam verifikasi dan penyaluran program bantuan sosial agar lebih objektif, terukur, dan tepat sasaran.

Kata Kunci : Status Ekonomi, *Random Forest, Support Vector Machine*, WebGIS, Kota Lhokseumawe.

CLASSIFICATION OF COMMUNITY ECONOMIC STATUS USING RANDOM FOREST AND SVM WITH SPATIAL SIG CASE STUDY : LHOKSEUMAWE CITY

ABSTRACT

Currently, the determination of the economic status of residents in Lhokseumawe City is largely conducted manually and remains disconnected from spatial data regarding the locations of their residences. Consequently, the local government faces challenges in monitoring the distribution of socioeconomic welfare levels in an equitable and targeted manner. This study aims to compare the performance of the Random Forest and Support Vector Machine (SVM) algorithms in classifying the economic status of residents and to integrate the best-performing model into a spatial-based WebGIS system. Data were collected through direct field surveys of 100 heads of households across four districts in Lhokseumawe City, capturing seven socioeconomic indicators alongside the geographic coordinates of their residences. Data preprocessing steps included cleaning, encoding, Min-Max normalization, and the creation of target class labels (Poor, Underprivileged, and Capable) using ordinal scale scoring and the Equal Interval method. Model testing and validation were performed using Stratified 5-Fold Cross-Validation. The results indicate that the Support Vector Machine (SVM) algorithm outperforms Random Forest in classification; SVM achieved an accuracy of 95.00%, precision of 97.32%, recall of 95.04%, and an F1-score of 95.46%, whereas Random Forest yielded an accuracy of 92.00%, precision of 92.52%, recall of 92.91%, and an F1-score of 90.89%. The SVM model, identified as the best-performing model, was subsequently implemented into a WebGIS system using the Flask framework and the Leaflet.js library, enabling the interactive visualization of the distribution of residents' economic status. Thus, this SVM-based WebGIS system can serve as a decision-support tool for the Lhokseumawe City Government, facilitating more objective, measurable, and well-targeted verification and distribution of social assistance programs.

Keywords *: Economic Status, Random Forest, Support Vector Machine, WebGIS, Lhokseumawe City.*