

INTISARI

Pengembangan Model Deteksi Mycobacterium Tuberculosis dengan Metode HGA-FLVQ

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Tujuan penelitian ini adalah mengembangkan model deteksi bakteri *Mycobacterium Tuberculosis* (MTB) pada data hasil sampling nilai tegangan kurva respon hidung-elektronik yang berasal dari sensing uap sampel sputum pasien Suspect TB untuk memenuhi standard WHO Sensitifitas 85% dan Spesifisitas 95%. Pada penelitian ini, metode jaringan syaraf *Fuzzy Learning Vector Quantization* (FLVQ) dikembangkan dengan memperkuat inisiasinya, Pusat cluster awal yang menjadi input metode FLVQ dioptimasi lebih dahulu oleh metode *Hybrid Genetic Algorithm* (HGA).

Langkah pertama pada metode penelitian ini adalah *sensing* uap masing-masing sampel sputum selama 60 menit dan *sampling nilai tegangan* kurva respon hidung-elektronik setiap lima detik. Langkah *sensing* ini menghasilkan kurva respon hidung-elektronik (maksimal 20 cycle) dan data tegangan hasil *sampling*, namun kurva tersebut masih mengandung derau. Langkah kedua, derau pada data hasil *sampling* tersebut kemudian difilter menggunakan metode *3-Point Moving Average Filter*. Langkah ketiga, setiap data hasil *filter* kemudian diekstrak dengan menghitung Amplitudo Relatif (Ar) setiap *cycle* untuk mendapatkan ciri dari 49 kurva positive-TB dan ciri dari 49 kurva negative-TB. Langkah keempat, model HGA-FLVQ dilatih dengan ciri tersebut (data pelatihan). Langkah terakhir, model HGA-FLVQ diuji dengan 50 Ar pasien suspect TB.

Ada 50 kasus untuk diuji dengan metode Bakteri Tahan Asam Sputum (BTA Sputum), hasil pengujian ini 24 pasien positive-TB dan 26 pasien negative-TB. Hasil proses pengujian model HGA-FLVQ memiliki Sensitifitas 95,83% dan Spesifisitas 96,15% yang memenuhi standard WHO Sensitifitas 85% dan Spesifisitas 95%. Sensitifitas dari model HGA-FLVQ lebih baik dari Sensitifitas metode FLVQ sebesar 70,83% dan Sensitifitas metode LVQ sebesar 87,50%. Spesifisitas model HGA-FLVQ lebih baik dari Spesifisitas metode FLVQ dan metode LVQ sebesar 88,46%. Berdasarkan hasil penelitian ini, model HGA-FLVQ dapat menggunakan Ar sebagai ciri kehadiran MTB pada sputum milik pasien suspect TB. Model HGA-FLVQ ini juga dapat digunakan untuk memperkuat pemeriksaan laboratorium TB di Puskesmas di Indonesia dan untuk mendampingi metode BTA Sputum yang masih digunakan.

Kata kunci: MTB, model HGA-FLVQ, metode FLVQ, metode HGA, Ar.

ABSTRACT

Model Development For Mycobacterium Tuberculosis Detection Using HGA-FLVQ Method

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This research aims at developing a Mycobacterium Tuberculosis (MTB) detection model in sampling result data of electronic-nose response curve which comes from sensing sputum sample vapor of Suspect TB patient to reach Sensitivity and Specificity of WHO standard 85% and 95%. Fuzzy Learning Vector Quantization (FLVQ), neural network method in this research is developed with strengthening its initiation, the initial center of cluster as FLVQ input is optimized first by Hybrid Genetic Algorithm (HGA).

The first step at this research method was sensing sputum vapor of every sample for 60 minutes and sampling it by every five seconds. This step produces the response curve of electronics-nose (maximum 20 cycles) and amplitudes as sampling data, but the sampling data still contain noises. The step of sensing and sampling at this research was labored in Biosafety Cabinet (BSC). The second step, the noises at sampling data were filtered by method 3-Point Moving Average Filter. The third step, each result data of filtering were extracted, which calculated Relative Amplitude (Ar) every cycle of each curve to get the features of 49 positive-TB and the features 49 negative-TB. At the fourth step, HGA-FLVQ model was trained with Ar data of positive-TB and Ar data of negative-TB. The final step of this research, HGA-FLVQ model was tested with the Ars of 50 TB suspect.

There are 50 cases which were tested with ZN staining method, 24 patients were positive-TB, and 26 patients were negative-TB. HGA-FLVQ model which developed at this research has reached sensitivity 95.83% and specificity 96.15% which up to standard WHO sensitivity 85% and specificity 95%. The Sensitivity of HGA-FLVQ model reaches 95.83% which better than the sensitivity of FLVQ method 70.83% and also the sensitivity of the LVQ method 87.50%. The specificity of HGA-FLVQ model which has specificity 96.15% is better than specificity of FLVQ and LVQ methods 88.46%. Based on this result, the Ars from this research can be used by HGA-FLVQ model to become features of MTB presence in the patient's sputum of suspect TB. HGA-FLVQ model can be used to strengthen TB laboratory inspection at Public Health Centers in Indonesia, and this model can accompany ZN staining method.

Key words: MTB, HGA-FLVQ model, FLVQ method, HGA method, and Relative Amplitude.