

ABSTRAK

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Program Studi : Sarjana Teknik Informatika.
Judul : Pengembangan Model *Soft Actor Critic* Berbasis *Ensemble Q-Learning* untuk Rekomendasi Perawatan Sepsis dengan *Continuous Action Representation*.

Penelitian ini berfokus pada pengembangan model rekomendasi terapi sepsis berbasis Reinforcement Learning (RL) di Universitas YARSI, dengan tujuan menghasilkan sistem pengambilan keputusan yang lebih presisi dan adaptif terhadap kondisi pasien di *Intensive Care Unit* (ICU). Pengembangan diarahkan pada perluasan pendekatan sebelumnya menuju *Continuous Action Space*, sehingga dosis cairan intravena dan vasopressor dapat direpresentasikan sebagai nilai kontinu yang lebih sesuai dengan praktik klinis. Untuk mencapai hal tersebut, penelitian ini mengimplementasikan *Soft Actor-Critic* (SAC) yang dikenal stabil dalam *continuous control*, kemudian dipadukan dengan *Ensemble Q-Learning* guna meningkatkan ketahanan terhadap *overestimation* bias serta memperkuat reliabilitas fungsi nilai. Dataset MIMIC-IV (*Medical Information Mart for Intensive Care*) versi 3.1 digunakan sebagai dasar pelatihan untuk membangun representasi state fisiologis pasien secara kontinu melalui pemrosesan variabel vital, laboratorium, dan intervensi medis. Model yang dikembangkan mampu menghasilkan rekomendasi dosis yang adaptif terhadap perubahan kondisi fisiologis pasien, dengan kebijakan optimal yang dievaluasi melalui *expected return* dan capaian *survival*. Pada pengujian, model menunjukkan performa yang menjanjikan dengan *expected return* sebesar 14.4 serta survival rate mencapai 97.5%, menandakan efektivitas kebijakan yang dipelajari dalam meningkatkan peluang keselamatan pasien. Integrasi SAC dan *Ensemble Q-Learning* memberikan peningkatan stabilitas, akurasi, dan konsistensi dibandingkan pendekatan RL sebelumnya, sehingga memiliki potensi kuat untuk diimplementasikan sebagai sistem pendukung keputusan klinis yang dapat meningkatkan kualitas dan keamanan perawatan pasien sepsis di ICU.

Kata kunci: *Reinforcement Learning, Soft Actor-Critic, Ensemble Q-Learning, Continuous Action Space, Rekomendasi Terapi, Vasopressor, Cairan Intravena, MIMIC-IV, Expected Return, Survival Rate.*

ABSTRACT

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Title : *Development of a Soft Actor-Critic Model Based on Ensemble Q-Learning for Sepsis Treatment Recommendation with Continuous Action Representation*

This study presents the development of a reinforcement learning-based therapeutic recommendation model for sepsis management at Universitas YARSI, aimed at supporting more precise and adaptive clinical decision-making in the Intensive Care Unit (ICU). Building on earlier work, this research advances the system toward a Continuous Action Space, allowing intravenous fluid and vasopressor doses to be represented as continuous values that more accurately reflect real-world clinical practice. To enable this capability, the Soft Actor-Critic (SAC) algorithm is employed for its stability in continuous control tasks, and further enhanced through the incorporation of Ensemble Q-Learning to mitigate overestimation bias and strengthen value function reliability. The model is trained using the MIMIC-IV (Medical Information Mart for Intensive Care) version 3.1 dataset, which provides comprehensive physiological and clinical observations essential for constructing continuous state representations. The resulting system is capable of generating dosing recommendations that dynamically adjust to evolving patient conditions. Evaluation of the learned policy demonstrates encouraging results, achieving an expected return of 14.4 and a survival rate of 97.5%, highlighting the model's potential effectiveness in improving patient outcomes. The integration of SAC and Ensemble Q-Learning delivers improved stability, accuracy, and consistency compared to prior reinforcement learning approaches, underscoring its promise as a clinically relevant decision-support tool for enhancing the safety and quality of sepsis care in the ICU.

Keywords: *Reinforcement Learning, Soft Actor-Critic, Ensemble Q-Learning, Continuous Action Space, Therapy Recommendation, Vasopressor, Intravenous Fluids, MIMIC-IV, Expected Return, Survival Rate.*