

ABSTRAK

Praktik *home workout* secara mandiri belum selalu disertai pemantauan postur dan penghitungan repetisi, sehingga kesalahan gerakan dapat terjadi tanpa umpan balik selama latihan. Penelitian ini bertujuan mengembangkan aplikasi desktop berbasis *computer vision* untuk mendeteksi dan menganalisis lima gerakan *home workout* secara *real-time* pada mode *single person* dan *multi person*. Penelitian menggunakan pendekatan kuantitatif dan adaptasi metode *Rapid Application Development*. Data berasal dari rekaman primer dan dataset Kinetics-700 dengan total 1.745 klip setelah prapemrosesan, meliputi *jumping jacks*, *squat*, *mountain climber*, *knee push up*, dan *sit up*. Sistem mengintegrasikan YOLO untuk deteksi dan *tracking* pengguna, MediaPipe Pose untuk ekstraksi *landmark*, LSTM-Attention untuk klasifikasi gerakan, serta aturan kinematik untuk analisis fase, postur, dan repetisi. Model mencapai akurasi 97,42% pada 349 data uji, dengan *macro average precision*, *recall*, dan *F1-score* masing-masing 97%. Setelah diintegrasikan, persentase prediksi benar mencapai 92% pada mode *single person* dan 90% pada mode *multi person*, dengan rata-rata latensi *end-to-end* sebesar 56,919 ms dan 74,880 ms. Seluruh 35 skenario fungsional dan 17 skenario validasi postur menghasilkan keluaran sesuai. Estimasi pose tetap stabil pada variasi kondisi yang diuji, tetapi *tracking* identitas belum konsisten ketika peserta bersilangan atau keluar dari *frame*.

Kata Kunci: *computer vision*, *home workout*, koreksi postur, LSTM-Attention, penghitungan repetisi

ABSTRACT

Independent home workouts are not always accompanied by posture monitoring and repetition counting, allowing movement errors to occur without feedback. This study developed a computer-vision-based desktop application to detect and analyze five home workout exercises in real time in single-person and multi-person modes. The study used a quantitative approach and an adaptation of the Rapid Application Development method. Data were obtained from primary recordings and the Kinetics-700 dataset, totaling 1,745 clips after preprocessing and covering jumping jacks, squats, mountain climbers, knee push-ups, and sit-ups. The system integrates YOLO for user detection and tracking, MediaPipe Pose for landmark extraction, LSTM-Attention for exercise classification, and kinematic rules for phase, posture, and repetition analysis. The model achieved 97.42% accuracy on 349 test samples, with macro-averaged precision, recall, and F1-score of 97% each. After integration, correct-prediction rates reached 92% in single-person mode and 90% in multi-person mode, with mean end-to-end latencies of 56.919 ms and 74.880 ms, respectively. All 35 functional scenarios and 17 posture-validation scenarios produced the expected outputs. Pose estimation remained stable under the tested variations, but identity tracking was inconsistent when participants crossed paths or left the frame.

Keywords: computer vision, home workout, LSTM-Attention, posture correction, repetition counting