ABSTRAK

"SISTEM DETEKSI GESTURE TANGAN SECARA REALTIME BERBASIS PENDEKATAN ALGORITMA YOLO (YOU ONLY LOOK ONCE) PADA MEDIA PEMBELAJARAN MATEMATIKA SEDERHANA BAGI ANAK BERKEBUTUHAN KHUSUS"

Kristiawan Dwi Usmanto

Universitas Sanata Dharma

2024

Penelitian ini mengembangkan sistem deteksi gesture tangan secara *realtime* menggunakan algoritma You Only Look Once (YOLO) untuk aplikasi pembelajaran matematika sederhana bagi Anak Berkebutuhan Khusus (ABK). Sistem ini memanfaatkan teknologi *computer vision* dan *deep learning* untuk mengenali gesture tangan dalam video yang kemudian diubah menjadi *input* interaktif dalam media pembelajaran. Pengujian sistem melibatkan metode *hyperparameter tuning*, termasuk penyesuaian *learning rate*, *image size*, dan *momentum*. Hasil pengujian menunjukkan bahwa algoritma YOLO dengan metode *hyperparameter tuning* dengan nilai *hyperparameter learning rate* 0,0001, *image size* 320, *momentum* 0,937 efektif dalam mendeteksi gesture tangan dengan nilai akurasi sebesar 98,76% dan nilai *mean Average Precision* (mAP) pada rentang 50-95 sebesar 0,9327 atau 93,27%. Hasil pengujian tersebut memberikan potensi penggunaan sistem deteksi gesture tangan secara *realtime* sebagai metode pembelajaran yang menarik dan interaktif bagi ABK, terutama bagi mereka yang memiliki keterbatasan dalam berkomunikasi.

Kata kunci : YOLO (You Only Look Once), Deteksi Gesture Tangan, Pembelajaran Matematika, Anak Berkebutuhan Khusus, *Hyperparameter Tuning, Computer Vision, Deep Learning*

ABSTRACT

"REALTIME HAND GESTURE DETECTION SYSTEM BASED ON YOLO (YOU ONLY LOOK ONCE) ALGORITHM APPROACH IN SIMPLE MATH LEARNING MEDIA FOR CHILDREN WITH SPECIAL NEEDS"

Kristiawan Dwi Usmanto

Universitas Sanata Dharma

2024

This research develops a realtime hand gesture detection system using the You Only Look Once (YOLO) algorithm for simple math learning applications for children with special needs. This system utilizes computer vision and deep learning technology to recognize hand gestures in videos which are then converted into interactive input in learning media. System testing involves hyperparameter tuning methods, including learning rate, image size, and momentum adjustments. The test results show that the YOLO algorithm with hyperparameter tuning method with hyperparameter values of learning rate 0.0001, image size 320, momentum 0.937 is effective in detecting hand gestures with an accuracy value of 98.76% and a mean Average Precision (mAP) value in the 50-95 range of 0.9327 or 93.27%. The test results provide the potential for using a realtime hand gesture detection system as an interesting and interactive learning method for children with disabilities, especially for those who have limitations in communication.

Keywords : *YOLO (You Only Look Once), Hand Gesture Detection, Mathematics Learning, Children with Special Needs, Hyperparameter Tuning, Computer Vision, Deep Learning*