



Real and AI-generated Face Recognition: An ERP Study

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Abstract: The prevalence of deepfakes poses challenges in discerning real from synthetic identities. Previous research hinted at the possibility of the N250 component as a marker for discriminating between real and AI-generated faces. This study aimed to examine the capacity of individuals to discriminate between real and AI-generated faces by investigating the N250 component. Electroencephalographic data were collected from 30 healthy participants (male 47%, female 53%) aged 19–29 years (*mean*= 21, *SD* = 1.6) using a 64-channel EEG system and event-related potential (ERP) analysis were conducted. Results revealed no significant differences in N250 peak latency or mean amplitude between real and AI-generated faces. Further exploration showed Late Positive Potential (LPP) mean amplitude was found significantly larger when observing AI-generated faces in the parietal area. These findings suggest that humans perceive AI-generated faces similarly to real faces during the early processing stage, and differentiating between them requires higher cognitive processing. This study highlights the importance of developing AI-based deepfake detection technology to address the limitations of human ability in quickly recognizing synthetic faces.

Keywords: face recognition, deepfake, artificial intelligence, erp, N250, LPP

Face Recognition pada Gambar Wajah Asli versus AI-generated: Studi ERP

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Abstrak: Munculnya fenomena *deepfake* menjadi tantangan bagi manusia dalam membedakan wajah asli dan wajah buatan *artificial intelligence* (AI). Penelitian sebelumnya mengindikasikan potensi komponen N250 sebagai penanda dalam membedakan wajah asli dan wajah buatan AI. Penelitian ini bertujuan untuk menguji kemampuan manusia dalam membedakan wajah asli dan buatan AI dengan meninjau komponen N250. Data EEG dikumpulkan dari 30 partisipan sehat (laki-laki 47%, perempuan 53%) berusia 19–29 tahun (*mean*= 21, *SD* = 1.6), menggunakan EEG 64-*channel* dengan teknik analisis *event-related potential* (ERP). Hasil menunjukkan tidak ada perbedaan signifikan pada *peak latency* atau rerata amplitudo komponen N250 antara wajah asli dan wajah AI. Namun, Eksplorasi lebih lanjut mengungkapkan bahwa rerata amplitudo komponen Late Positive Potential (LPP) signifikan lebih besar untuk wajah AI dibandingkan wajah asli di area parietal. Temuan ini mengindikasikan bahwa manusia mempersepsi wajah buatan AI sama dengan wajah asli pada tahap pemrosesan awal dan untuk membedakannya membutuhkan pemrosesan kognitif yang lebih tinggi. Penelitian ini menyoroti pentingnya pengembangan teknologi deteksi *deepfake* berbasis AI untuk mengatasi keterbatasan manusia dalam mengenali wajah buatan AI dengan cepat.

Kata kunci: face recognition, deepfake, artificial intelligence, erp, N250, LPP