

SKRIPSI

**IMPLEMENTASI ARTIFICIAL INTELLIGENCE DALAM
MEMBANTU PEMBUATAN KEPUTUSAN EKSTRAKSI
GIGI PADA PERAWATAN ORTODONTI**

LITERATURE REVIEW



**Sebagai salah satu syarat
Untuk meraih gelar sarjana pada
Fakultas Kedokteran Gigi Universitas Andalas**

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IMPLEMENTASI *ARTIFICIAL INTELLIGENCE* DALAM MEMBANTU PEMBUATAN KEPUTUSAN EKSTRAKSI GIGI PADA PERAWATAN ORTODONTI

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ABSTRAK

Latar Belakang: Keputusan mengenai ekstraksi gigi dalam perawatan ortodonti bersifat kompleks karena dipengaruhi oleh berbagai faktor klinis, skeletal, dental, dan jaringan lunak. Perbedaan pengalaman klinis dan filosofi perawatan antarortodontis dapat menimbulkan variasi dalam pengambilan keputusan, terutama pada kasus *borderline*. *Artificial intelligence* (AI) berpotensi meningkatkan objektivitas dan konsistensi dalam proses pengambilan keputusan tersebut. **Tujuan:** Mengetahui implementasi AI dalam membantu pembuatan keputusan ekstraksi gigi pada perawatan ortodonti. **Metode:** Penelitian ini merupakan penelitian *literature review* dengan pendekatan naratif. Pencarian literatur dilakukan melalui *PubMed*, *ScienceDirect*, dan *Scopus* menggunakan kata kunci yang berkaitan dengan AI, *machine learning*, *deep learning*, perawatan ortodonti, dan ekstraksi gigi. Artikel diseleksi berdasarkan kriteria inklusi dan eksklusi yang telah ditetapkan. Dari 450 artikel yang teridentifikasi, diperoleh 11 artikel penelitian asli untuk dianalisis dan disintesis. **Hasil:** Implementasi AI berkembang melalui tiga pendekatan, yaitu model berbasis data terstruktur, berbasis citra, dan multimodal. Model *Machine learning*, seperti *Random Forest*, *Support Vector Machine*, dan *Decision Tree*, menunjukkan kinerja kompetitif pada data klinis terstruktur. *Deep learning* efektif dalam mengekstraksi fitur dari citra dental. Pendekatan multimodal yang menggabungkan *intraoral scan* dan *Lateral Cephalometric Radiography* cenderung memberikan performa lebih baik dibandingkan pendekatan modalitas tunggal. *Crowding* dan *arch length discrepancy* merupakan prediktor yang paling konsisten, diikuti variabel skeletal, posisi insisivus, serta profil jaringan lunak. **Kesimpulan:** AI berpotensi digunakan sebagai sistem pendukung keputusan klinis dalam menentukan ekstraksi atau non-ekstraksi, namun AI harus digunakan untuk melengkapi dan bukan menggantikan penilaian komprehensif ortodontis.

Kata kunci: AI, ekstraksi, gigi, ortodonti, *machine learning*, *deep learning*, keputusan klinis

IMPLEMENTATION OF ARTIFICIAL INTELLIGENCE IN ASSISTING TOOTH EXTRACTION DECISION MAKING IN ORTHODONTIC TREATMENT

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ABSTRACT

Background: Decisions regarding tooth extraction in orthodontic treatment are complex and influenced by various clinical, skeletal, dental, and soft tissue factors. Differences in orthodontists' clinical experience and treatment philosophies may result in variability in decision making, particularly in borderline cases. Artificial intelligence (AI) has the potential to improve the objectivity and consistency of this process. **Objective:** To investigate the implementation of AI in supporting tooth extraction decision making in orthodontic treatment. **Methods:** This study was a narrative literature review. A literature search was conducted in PubMed, ScienceDirect, and Scopus using keywords related to artificial intelligence, machine learning, deep learning, orthodontic treatment, and tooth extraction. Articles were selected according to predefined inclusion and exclusion criteria. Of the 450 articles initially identified, 11 original research articles were included for analysis and synthesis. **Results:** The implementation of AI has evolved through three main approaches, structured data based, image based, and multimodal models. Machine learning models, including Random Forest, Support Vector Machine, and Decision Tree, demonstrated competitive performance when applied to structured clinical data. Deep learning models were effective in automatically extracting features from dental images. Multimodal approaches combining intraoral scans and lateral cephalometric radiographs tended to achieve better performance than single modality approaches. Crowding and arch length discrepancy were the most consistent predictors of extraction decisions, followed by skeletal variables, incisor position, and soft-tissue profile. **Conclusion:** AI has the potential to serve as a clinical decision-support system for determining extraction or non extraction treatment. However, AI should be used to complement, rather than replace, the orthodontist's comprehensive clinical judgment.

Keywords: AI, tooth, extraction, orthodontics, machine learning, clinical decision making

