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## How accurate is artificial intelligence for estimating the legal majority?

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### Abstract

**Background:** Age estimation plays a key role in forensic medicine. From adolescence through early adulthood, doubts may arise regarding the actual age, which can have critical medical, legal, and social implications [1]. Age assessment in this age group is closely related to the development of the third molars, when present [2]. The technological innovation is overcoming the inherent subjective errors of traditional methods and enabling the application of a wider variety of combinations of regions of interest by developing automatic approaches and high-performance algorithmic modeling [3, 4]. Currently, the focus is on the study of imaging applied to deep learning platforms, both for training on as broad a population as possible, and for increasing the robustness of such age assessment models [5]. **Objective:** Application of dental images to an automatic platform to evaluate the method's practicality and the accuracy of age estimation in the Portuguese population. **Methods:** A selection of 70 orthopantomograms from the Faculty of Dental Medicine of the University of Porto was submitted to Panacea<sup>®</sup> software to perform automatic age assessment. The inclusion criteria were participants aged 14 to 22, Portuguese nationality, and the presence of healthy lower third molars. The exclusion criteria were the presence of dental disorders, third molars rotation and/or overlap, and magnification, noise, and/or artifacts. Statistical analysis was performed using the Statistical Package for Social Sciences<sup>®</sup> software. **Results:** The sample presented a heterogeneous distribution by sex: 23 males and 47 females. The mean chronological age was 18.39 years old (+/- 1.50) for males and 17.98 years old (+/- 1.57) for females. The estimated mean age was 19.54 years old for males (+/- 1.40) and 19.38 years old for females (+/- 1.19). Comparison of the means revealed statistically significant differences between chronological and estimated ages in both cases ( $p < 0.001$ ), and such differences were greater in females than in males (mean differences of -1.40 and -1.15, respectively). **Conclusions:** The combination of multiple relevant features is becoming increasingly diverse in the refinement of machine learning models [3]. The size and heterogeneity of the study sample likely contributed to the overestimation of age. Therefore, the potential for improving the parameters of convolutional neural networks for the Portuguese population should be considered. Alternatively, there may have occurred overfitting.

**Keywords:** adulthood; age assessment; machine learning; third molars

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