

## Deep Neural Networks for Chronological Age Estimation from OPG images

**Título** Deep Neural Networks for Chronological Age Estimation from OPG images

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**Abstract** Chronological age estimation is crucial labour in many clinical procedures, where the teeth have proven to be one of the best estimators. Although some methods to estimate the age from tooth measurements in orthopantomogram (OPG) images have been developed, they rely on time-consuming manual processes whose results are affected by the observer subjectivity. Furthermore, all those approaches have been tested only on OPG image sets of good radiological quality without any conditioning dental characteristic. In this work, two fully automatic methods to estimate the chronological age of a subject from the OPG image are proposed. The first (DANet) consists of a sequential Convolutional Neural Network (CNN) path to predict the age, while the second (DASNet) adds a second CNN path to predict the sex and uses sex-specific features with the aim of improving the age prediction performance. Both methods were tested on a set of 2289 OPG images of subjects from 4.5 to 89.2 years old, where both bad radiological quality images and images showing conditioning dental characteristics were not discarded. The results showed that the DASNet outperforms the DANet in every aspect, reducing the median Error (E) and the median Absolute Error (AE) by about 4 months in the entire database. When evaluating the DASNet in the reduced datasets, the AE values decrease as the real age of the subjects decreases, until reaching a median of about 8 months in the subjects younger than 15. The DASNet method was also compared to the state-of-the-art manual age estimation methods, showing significantly less over- or under-estimation problems. Consequently, we conclude that the DASNet can be used to automatically predict the chronological age of a subject accurately, especially in young subjects with developing dentitions.

**Palabras clave** Deep Learning, panoramic images, chronological age, dental age, forensic age.

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