

## THE EFFECT OF ROI NORMALIZATION FOR HAND RADIOGRAPHIC IMAGE SEGMENTATION

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**ABSTRACT.** *The accuracy of epiphyseal/metaphyseal segmented results of a clustering scheme and the consistency of feature measurement depend on a reliable extraction of regions of interest (ROI) in an automatic bone age assessment system. ROI normalization is an important step for these purposes. The related modeling techniques are different according to the characteristics and applications of the processed images. Most of the epiphyseal metaphyseal ROI extraction schemes in the literature either only use hand normalization or do not use any normalization processing. Here, a novel ROI normalization scheme is proposed, which includes hand rotation to standard orientation as well as the individual finger rotation. An evaluation of the effect of the ROI normalization scheme in experiments derives from our distance approach adaptive 2-means clustering method and literature reviewed methods with regard to the final epiphyseal metaphyseal segmentation. Experimental results reveal that the proposed ROI normalization scheme provides a very well automated segmentation ability to separate accurately the epiphysis and metaphysis from the soft tissue of hand radiographs at the early stage of skeletal development. Furthermore, the experimental results show that the proposed approach provides a more stable performance for the segmentation of epiphyseal/metaphyseal regions.*

**Keywords:** Epiphyseal, Metaphyseal, 2-means clustering, Bone age assessment, Regions of interest, Segmentation

1. **Introduction.** Bone age assessment (BAA) is a procedure frequently performed in the area of pediatric radiology. Its goal is to determine the skeletal maturation based on a detailed examination of left-hand-wrist radiograph regions of interest (ROI). This radiograph is manually compared with standard patterns reflecting the best match which is called bone age. A difference between the bone age (developmental age of bones) and the chronological age (actual age at inspection time) indicates abnormalities in the skeletal development. This procedure is used in evaluating the growth disorder [1,2], monitoring