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(71)**Name of Applicant :**
1)Mr.Ankit Mishra, Amity University, Chhattisgarh
Address of Applicant :Assistant Professor, Department of Electrical and Electronics Engineering, AMITY School of Engineering and Technology, Amity University,Chhattisgarh MANTH (KHARORA),State Highway 9, Raipur - Baloda Bazar Rd, Raipur, Chhattisgarh 493225 Raipur ---------- ----------
2)Mr.Ashutosh Kumar Choudhary, GMR Institute of Technology
3)Mr.Mohini Moitra Bhaduri, Chouksey Engineering College
4)Dr. Prasanna Kumar Sharma, Amity University,Chhattisgarh
5)Mr.Harishankar Singh Yadav, Amity University,Chhattisgarh
6)Dr. Kush Kumar Nayak, Amity University,Chhattisgarh
7)Ms.Raina Jain, Chouksey Engineering College
8)Mr.Arun Kumar Jain, Chouksey Engineering College
9)Ms.Jaishree Wankhede, Priyadarshini College of Engineering
10)Ms.Suniti Purbey, GMR Institute of Technology
Name of Applicant : NA
Address of Applicant : NA
(72)**Name of Inventor :**
1)Mr.Ankit Mishra, Amity University, Chhattisgarh
Address of Applicant :Assistant Professor, Department of Electrical and Electronics Engineering, AMITY School of Engineering and Technology, Amity University,Chhattisgarh MANTH (KHARORA),State Highway 9, Raipur - Baloda Bazar Rd, Raipur, Chhattisgarh 493225 Raipur ---------- ----------
2)Mr.Ashutosh Kumar Choudhary, GMR Institute of Technology
Address of Applicant :Assistant Professor, Department of Information Technology, GMR Institute of Technology Rajam, Srikakulam, Andhra Pradesh, India Rajam ---------- ----------
3)Mr.Mohini Moitra Bhaduri, Chouksey Engineering College
Address of Applicant :Assistant Professor, Department of Electrical and Electronics Engineering, Chouksey Engineering College, NH-49, Masturi - Jairamnagar Rd, Lalkhadan, Chhattisgarh 495004 Lalkhadan ---------- ----------
4)Dr. Prasanna Kumar Sharma, Amity University,Chhattisgarh
Address of Applicant :Associate Professor, Amity School of Applied Sciences, Amity University,Chhattisgarh, MANTH (KHARORA), State Highway 9, Raipur - Baloda Bazar Rd, Raipur, Chhattisgarh 493225 Raipur ---------- ----------
5)Mr.Harishankar Singh Yadav, Amity University,Chhattisgarh
Address of Applicant :Assistant Professor, Department of Mechanical Engineering, AMITY SCHOOL OF ENGINEERING AND TECHNOLOGY, Amity University,Chhattisgarh MANTH (KHARORA), State Highway 9, Raipur - Baloda Bazar Rd, Raipur, Chhattisgarh 493225 Raipur ---------- ----------
6)Dr. Kush Kumar Nayak, Amity University,Chhattisgarh
Address of Applicant :Assistant Professor, Amity Institute of Biotechnology, Amity University,Chhattisgarh, MANTH (KHARORA), State Highway 9, Raipur - Baloda Bazar Rd, Raipur, Chhattisgarh 493225 Raipur ---------- ----------
7)Ms.Raina Jain, Chouksey Engineering College
Address of Applicant :Assistant Professor, Department of Electrical and Electronics Engineering, Chouksey Engineering College NH-49, Masturi - Jairamnagar Rd, Lalkhadan, Chhattisgarh 495004 Lalkhadan ---------- ----------
8)Mr.Arun Kumar Jain, Chouksey Engineering College
Address of Applicant :Assistant Professor, Department of Electrical and Electronics Engineering, Chouksey Engineering College NH-49, Masturi - Jairamnagar Rd, Lalkhadan, Chhattisgarh 495004 Lalkhadan ---------- ----------
9)Ms.Jaishree Wankhede, Priyadarshini College of Engineering
Address of Applicant :Assistant Professor Department of AI&DS, Priyadarshini College of Engineering Nagpur, Maharashtra Nagpur ---------- ----------
10)Ms.Suniti Purbey, GMR Institute of Technology
Address of Applicant :Assistant Professor, Department of CSE, GMR Institute of Technology Rajam, Andhra Pradesh, India Rajam - ---------- ----------

(57) Abstract :
Skeletal age is useful in the diagnosis of growth disorders. A child's skeletal age and their chronological age should match if they are healthy. If developmental issues are identified at an early age, they can be treated more effectively. The subjective Tanner-Whitehouse test is the most widely used method for evaluating the discrepancy between bone and chronological ages by analysing radiographs of the hands. There is significant intra-observer bias within the medical staff with this technique due to years of experience. To aid less-experienced clinicians, we offer an automated bone age prediction method that combines image registration with hand X-ray photos. It uses an advanced residual separable convolution model to optimise its regression network. The regressor network needs a 299/299 picture to forecast bone age using three Xception network modules. To ensure uniformity and consistency, images will undergo preliminary processing by separate convolutional neural networks. There are three stages involved in picture registration: (a) separating the hands from the rest of the image; (b) rotating the hands around four keypoints of interest; and (c) setting alignment to centre the region of interest. MobileNet V1 is used for the keypoint regressor in angle alignment, whereas DeepLab V3 Plus is used for hand segmentation. In each scenario, an individual convolution serves as the principal operator. To avoid underfitting, synthetic data are generated by manually adjusting camera settings, including rotation, magnification, and shearing. In terms of mean absolute error (8.200 months) and mean squared error, the proposed method has the lowest values, as shown by the experimental findings (121.902 months). Thus, a bone age predictor with an error of less than a year is a valuable tool for offering a second opinion. Considering that male and female skeletons are constructed differently, this study might have produced more precise predictions had it taken gender into account.

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