AMRITA VISHWA VIDYAPEETHAM
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Zeroth Review Meeting

Detection and Measurement of Bone Fractures in X-ray Images

Presented By: Aman Kshetri, Raj Sah Rauniyar
Supervisor : Dr. Sangapu Sreenivasa Chakravarthi

Department : CSE - CT
Domain : Machine Learning (NLP), Deep Learning

Problem Identification

- In renowned hospitals within developed regions, experienced radiologists proficiently analyze X-ray images, while in smaller hospitals in underdeveloped areas, young and inexperienced surgeons may struggle to interpret X-ray images accurately.

- According to a recent survey, the percentage of X-ray images misinterpreted has reached 26%.

- Although many studies have focused on detecting the location of bone fractures, none have analyzed the length of the fractured bone segment.

Problem Statement

- Develop an advanced ML model capable of detecting both the fractured part of the bone and analyzing the length of the fractured segment.

- This model aims to reduce the workload on radiologists by accurately identifying potential fractures in X-ray images.

Supporting References (1-5)

Author	Title	Journal	Year	Gaps Identified
Rui-Yang Ju, Weiming Cai	Fracture Detection in Pediatric Wrist Trauma X-ray Images Using YOLOv8 Algorithm	ArXiv	2023	Does not analyze the length of the fractured segment
Kosrat Dlshad Ahmed , Roojwan Hawezi	Detection of bone fracture based on machine learning techniques	Measurement: Sensors	2023	Small Bone Cracks is difficult to detect
Ammar Ahmed, Ali Shariq Imran, Abdul Manaf, Zenun Kastrati, Sher Muhammad Daudpota	Enhancing Wrist Abnormality Detection with YOLO: Analysis of State-of-the-art Single-stage Detection Models	Biomedical Signal Processing and Control	2024	Data Augmentation could enhance performance
N Satya Sriveni, K Hema Latha, A Viji Amutha Mary, Mercy Paul Selvan	Detecting Bone Fracture in Medical Images	Journal of Physics: Conference Series	2020	Enhanced image technique is used which is not efficient.
Rinisha Bagaria, Sulochana Wadhwani, A. K. Wadhwani	Bone Fracture Detection in X-ray Images using Convolutional Neural Network	SCRS Conference Proceedings on Intelligent Systems	2022	Validated with a limited number of X-ray Images

Supporting References (6-10)

Author	Title	Journal	Year	Gaps Identified
Kallimpudi Bhaskara Sai Kiran, B Satyasaivani	Bone Fracture Detection Using Convolutional Neural Networks	IJCRT Journal	2022	Lack of images (221 only) in both the training and testing sets.
Tanushree Meena, Sudipta Roy	Bone Fracture Detection Using Deep Supervised Learning from Radiological Images: A Paradigm Shift	National Library of Medicine	2022	Lack of required dataset and labelled training data
Ammar Ahmed, Abdul Manaf	YOLOv10 for Automated Fracture Detection in Pediatric Wrist Trauma X-rays	ArXiv	2024	Model can occasionally miss a fracture
K Thaiyalnayaki, L Kavyaa, Joshua Sugumar	Automated Bone Fracture Detection Using Convolutional Neural Network	Journal of Physics	2023	Only 100 Images are there in the datasets.
Thian et al.	Convolutional Neural Networks for Automated Fracture Detection and Localization on Wrist Radiographs	RSNA Journals	2019	Less dataset is used for training and validation

Significance of the Project

- **Enhanced Diagnostic Accuracy:** Automated detection and measurement of bone fractures will improve diagnostic precision, reduce misinterpretations, and ensure reliable fracture assessment.

- **Reduction of Radiologist Workload:** By automating X-ray analysis, the model will lighten radiologist's workload, especially in resource-limited settings, allowing them to concentrate on more complex cases.

- **Consistency Across Settings:** The model will offer a dependable tool for fracture detection and measurement, providing consistent results in both well-resourced and under-resourced healthcare facilities.

Objectives and Scope

Objectives:

- **Automate Fracture Detection:** Implement a robust algorithm that accurately identifies the location and extent of fractures in X-ray images.

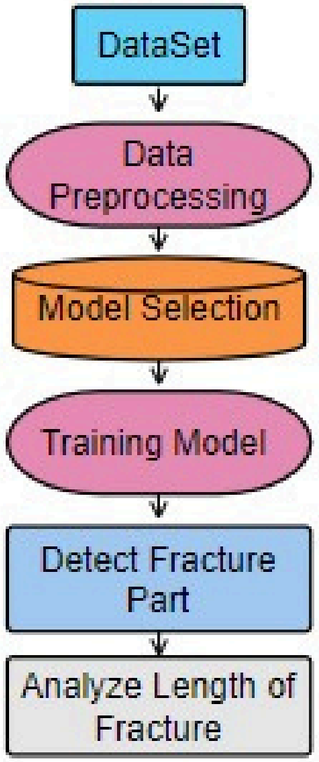
- **Measure Fracture Length:** Integrate functionality to precisely measure the length of the fractured bone segments, providing detailed insights for treatment planning.

Scope:

- **Detection Algorithm Development:** Develop high-accuracy machine learning or deep learning algorithms for detecting fractures in X-ray images.

- **Evaluation and Testing:** Perform thorough testing and validation with a diverse X-ray dataset to ensure clinical accuracy and reliability.

Data Flow Diagram



Gantt Chart

TASKS	STATUS	PROJECT GANTT CHART - PHASE 1																			
		2024																			
		JULY				AUGUST				SEPTEMBER				OCTOBER				NOVEMBER			
		W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4
PHASE -1	**PLAN**																				
INTRODUCTION	**ACTUAL**																				
1. Detail discuss with supervisor about the project 2. Problem statement 3. Objectives																					
REVIEW LITERATURE WORK	**PLAN**																				
1. Review literature (Journal and book) 2. Findings additional information and	**ACTUAL**																				
METHODOLOGY 1. Design Algorithms 2. Prediction Results	**PLAN** **ACTUAL**																				
IMPLEMENTATION PROCESS	**PLAN** **ACTUAL**																				
ANALYZE AND DISCUSSION 1. Analyze data collection 2. Discussion	**PLAN** **ACTUAL**																				
PREPARATION AND PRESENTATION OF FINAL REPORT	**PLAN** **ACTUAL**																				

Reference

1	Ju, R. Y., & Cai, W. (2023, April 11). Fracture Detection in Pediatric Wrist Trauma X-ray Images Using YOLOv8 Algorithm. arXiv.org. https://arxiv.org/abs/2304.05071v5
2	Ahmed, K. D., & Hawezi, R. (2023). Detection of bone fracture based on machine learning techniques. Measurement. Sensors, 27, 100723. https://doi.org/10.1016/j.measen.2023.100723
3	Ahmed, A., Imran, A. S., Manaf, A., Kastrati, Z., & Daudpota, S. M. (2024). Enhancing wrist abnormality detection with YOLO: Analysis of state-of-the-art single-stage detection models. Biomedical Signal Processing and Control, 93, 106144. https://doi.org/10.1016/j.bspc.2024.106144
4	Sriveni, N. S., Latha, K. H., Mary, A. V. A., & Selvan, M. P. (2021). Detecting Bone Fracture in Medical Images. Journal of Physics. Conference Series, 1770(1), 012008. https://doi.org/10.1088/1742-6596/1770/1/012008
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6	Bhaskara Sai Kiran, Kallimpudi, et al. “BONE FRACTURE DETECTION USING CONVOLUTIONAL NEURAL NETWORKS.” International Journal of Creative Research Thoughts, vol. 10, no. 6, 2022, pp. 2320–2882, ijcrt.org/papers/IJCRT22A6087.pdf.
7	Meena, T., & Roy, S. (2022). Bone Fracture Detection Using Deep Supervised Learning from Radiological Images: A Paradigm Shift. Diagnostics, 12(10), 2420. https://doi.org/10.3390/diagnostics12102420
8	Ahmed, A., & Manaf, A. (2024, July 22). YOLOv10 for Automated Fracture Detection in Pediatric Wrist Trauma X-rays. arXiv.org. https://arxiv.org/abs/2407.15689v1
9	Thaiyalnayaki, K., Kavyaa, L., & Sugumar, J. (2023). Automated Bone Fracture Detection Using Convolutional Neural Network. Journal of Physics. Conference Series, 2471(1), 012003. https://doi.org/10.1088/1742-6596/2471/1/012003
10	Thian, Y. L., Li, Y., Jagmohan, P., Sia, D., Chan, V. E. Y., & Tan, R. T. (2019b). Convolutional Neural Networks for Automated Fracture Detection and Localization on Wrist Radiographs. Radiology. Artificial Intelligence, 1(1),

Thank you

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