

## Faster R-CNN Detection of Fractures in Pediatric Upper Extremity Radiographs

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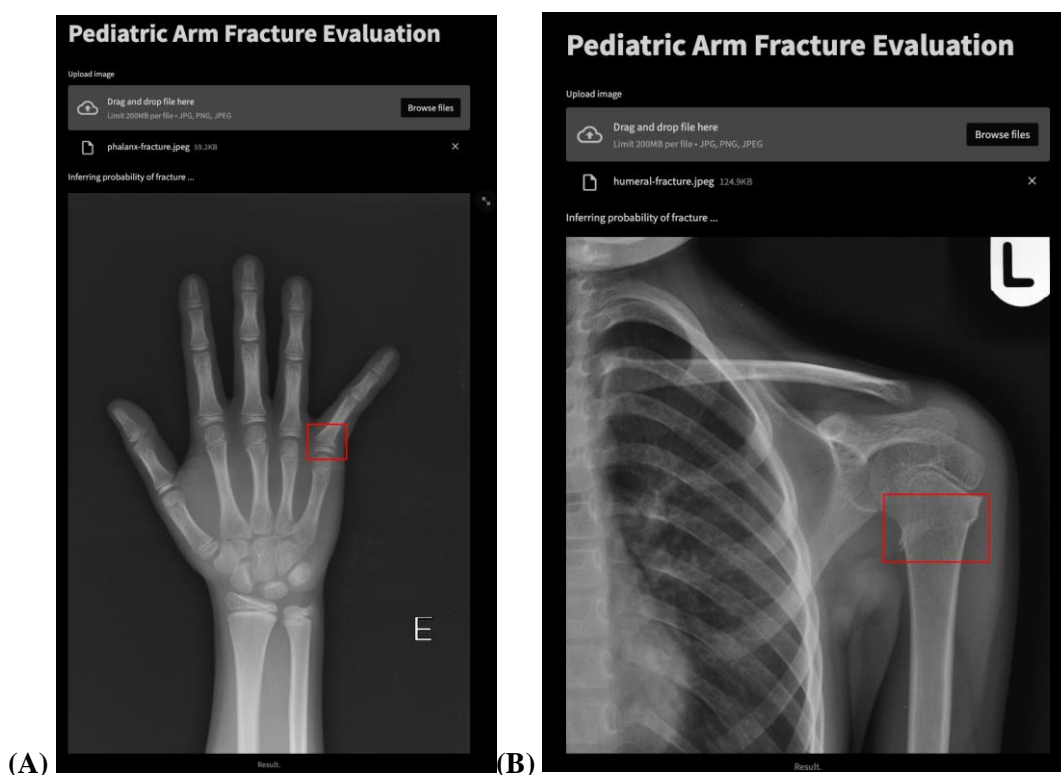
**Background/Motivation:** Fractures are commonly misdiagnosed injuries in the emergency setting. Deep learning-based methods have demonstrated strong performance in detecting fractures in adult patients. Fractures in pediatric patients, while common, have been neglected by most research and commercial applications: an April 2023 PubMed search for “artificial intelligence” and “fracture” yielded 300 results, while “artificial intelligence” and “fracture” and “pediatric” yielded only 12 studies (4% of all results). As children often fall onto their arms, fractures of the upper extremity account for a majority of pediatric fractures. We wished to investigate if an effective deep learning model could be developed to identify these fractures and if a no-code web interface could be created to allow interested researchers to easily evaluate model performance.

**Methods:** 58,846 radiographs from 14,873 pediatric patients at Columbia University Irving Medical Center were obtained. Data were divided into 48,007 training radiographs, 5,089 validation radiographs, and 5,750 test radiographs. Using the Detectron2 library, a Faster R-CNN object-detection model was trained to predict bounding boxes in the portions of a radiograph containing findings suspicious for fracture.

**Results:** A Faster R-CNN fracture detection model trained to detect pediatric upper extremity fractures obtained AUC 0.958 on test data. A web interface was developed using Streamlit to allow access to predictions via a dockerized Detectron2 library.

**Capabilities:** The web interface can offer inference on any individual radiograph that is uploaded within seconds. The underlying code will be made available at <https://github.com/jrzech/pediatric-fracture>.

**Link to Software:** <https://www.childfx.com>. Please note that this software is provided for research/investigational purposes only and is not to be used for clinical diagnosis.



Example of web interface based model prediction on confirmed fractures from publicly available examples from Radiopaedia: 5th proximal phalanx fracture (<https://radiopaedia.org/cases/salter-harris-type-ii-fracture-proximal-phalanx-1?lang=us>), proximal humeral fracture (<https://radiopaedia.org/cases/proximal-humerus-fracture-1?lang=us>). Red boxes designate areas considered highly suspicious by the model, which correspond to confirmed fractures.