Future Endeavors

Artificial Intelligence in Chest Wall Injury Deep Learning-Based Automatic Detection and Classification of Rib Fractures from CT Data

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Primary Aim

The **primary aim** is to determine the accuracy of an artificial intelligence algorithm for diagnosing thoracic injuries on Computed Tomography (CT) scans in adult patients who presented to Saint Francis Hospital and Medical Center after having sustained thoracic trauma. Diagnosis can be presence, classification, localization, or severity of injuries.

The accuracy of the artificial intelligence algorithm calculation will be ascertained by comparing it to the evaluation and diagnosis by a panel of clinicians.

Introduction

Thoracic injuries are common and it is estimated 25-50% of trauma patients suffer from thoracic injuries.

Diagnostics are vital to initiate the appropriate treatment. Tentative assessment of radiographs are often made by junior, non-radiology trained, clinicians before the definitive radiology report is complete.

Interpretation errors by these clinicians can have significant consequences for the patient, including delayed treatment and consequently poorer outcomes.

Neural Networks (CNN) have been of particular interest as a possible aid to non-radiology trained clinicians in helping them accurately recognize fractures and make earlier care decisions.

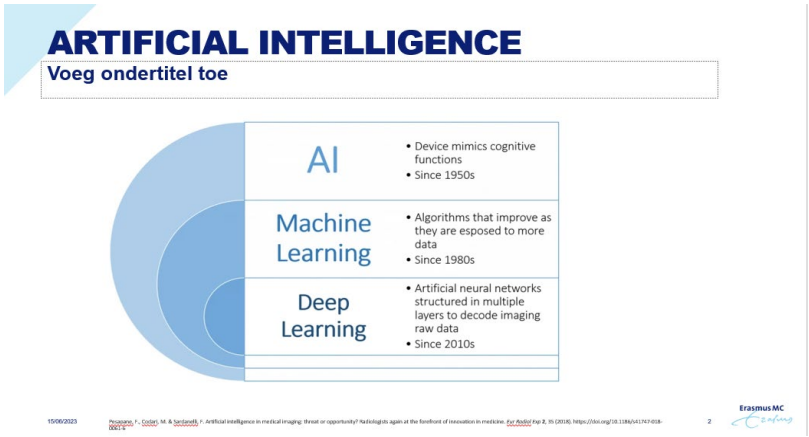
Methods

Posteroanterior (PA) chest Computed Tomography (CT) scans from Saint Francis Hospital rib fracture cases will be **exported and transferred in deidentified form** from the Picture Archiving and Communication System (PACS) to research analysts at Erasmus MC. This transfer will occur using SURFfilesender, an encrypted, secure server designed for fast transmission of research data.

Training the Neural Networks

Once the transfer is complete technical-medical research analysts at Erasmus will run the images through artificial neural networks hosted by the Erasmus Research Suite.

The use of these multiple layer neural networks promotes 'Deep Learning', a type of Artificial Intelligence (AI) using algorithms designed to mimic the learning process of the human brain.



Deep Learning

Deep Learning occurs when a neural network 'learns' how to analyze a predetermined set of data and make predictions about what it means. Every time it comes to an incorrect conclusion, that result is fed back to the system so that it can learn from its mistake. It involves substantial data input and trial and error until the network is able to accurately draw conclusions. This process is referred to as 'training' the neural network and is the purpose for sharing these CT scans.

The accuracy of the artificial intelligence algorithm calculation will be ascertained by comparing it to an evaluation and diagnosis by a panel of clinicians.

Investigating the performance of these various NN architectures, and model hyperparameter tuning are also a part of this study.

This study is currently under review.