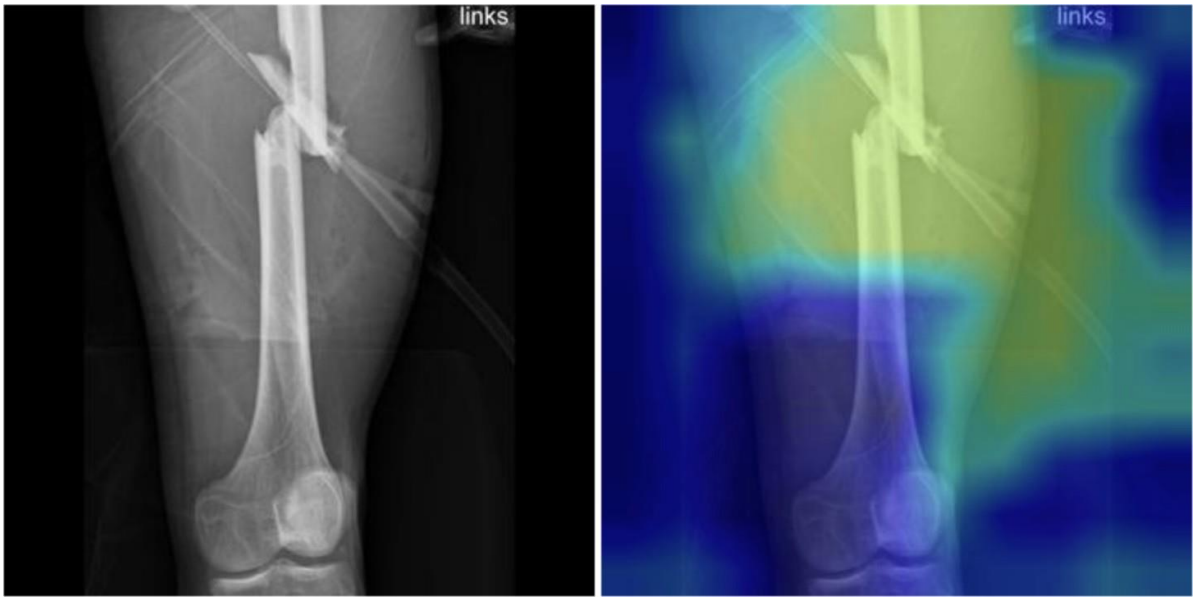
ML REPORT



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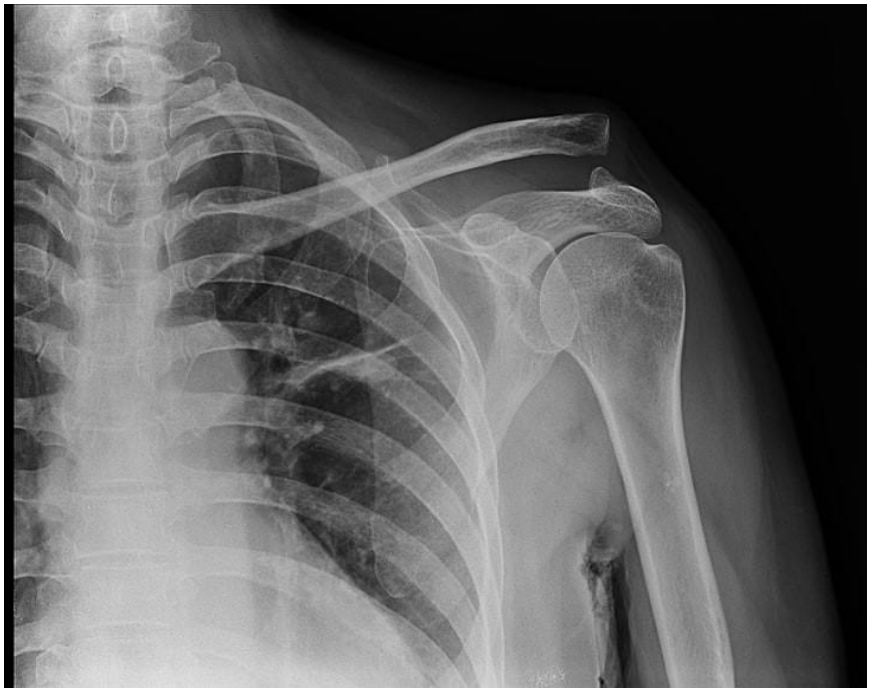
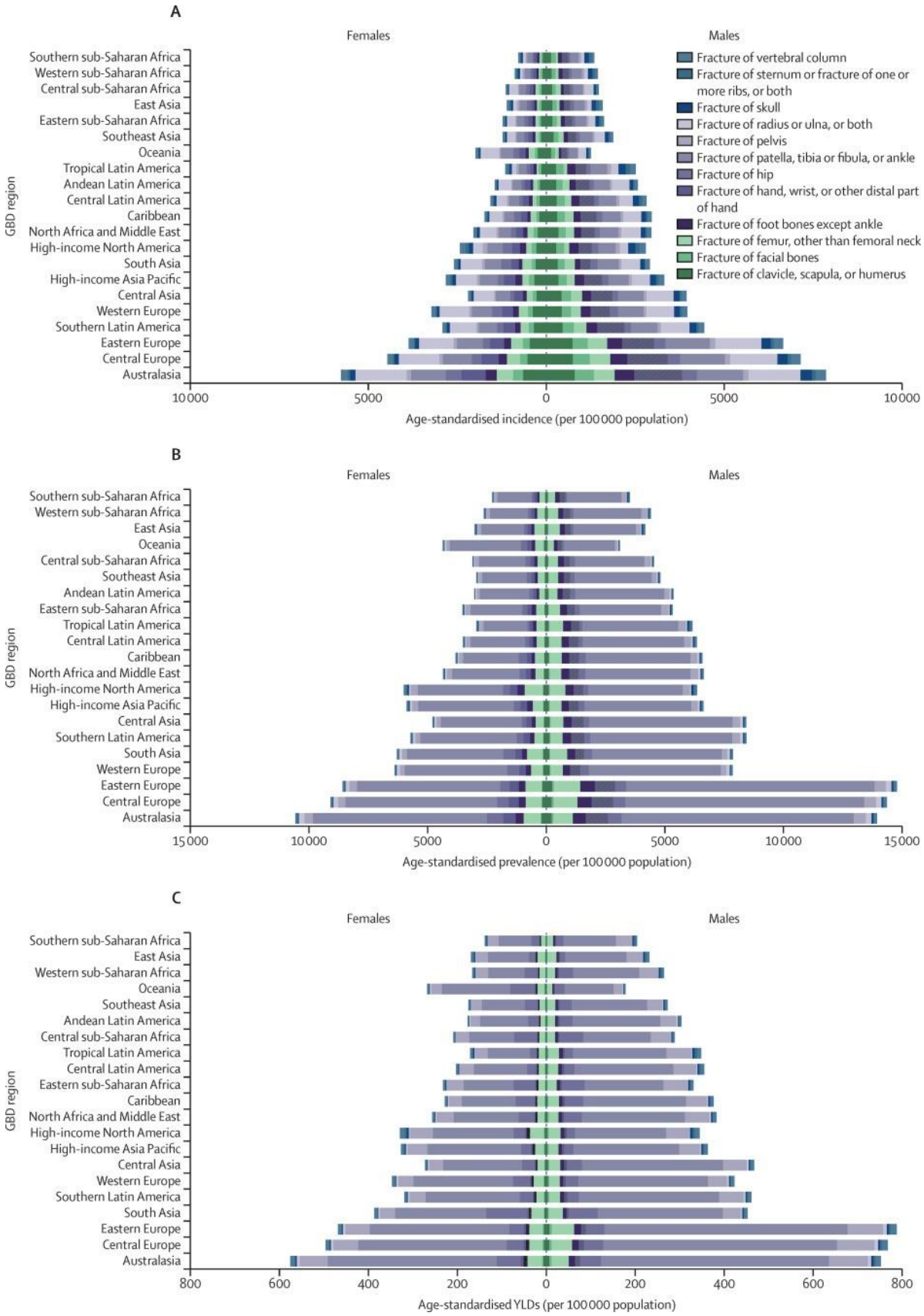
INTRODUCTION



Fractures are a common injury, especially among older patients. Incidents such as falling, slipping, tripping may lead to fractures that sometimes are ignored by patients and left untreated. The fractures can provoke impairment in movement, and in some cases it can lead to serious complications such as ruptured tendons or stiffness. The basic treatment of fractures, that is, immobilization and casting, has not changed much in time.

The process of immobilization is nowadays performed under anaesthesia and thus it is known as Manipulation under Anaesthesia (MUA) and regularly performed in Accidents and Emergency (A&E) departments. The alternative treatment for the fractures is open surgery, which is also known as Open Reduction and Internal Fixation (ORIF). The surgical procedure is far more complicated than manipulation, and can lead to serious complications, however, it is more reliable as a long term treatment as manipulations sometimes fail and then surgery is needed.

Imperfect treatment could affect the whole body, causing disruptions at home, work and negatively impact the quality of life. Thus, it is vital to correctly classify patients' injuries as fractures.


A
Females
Males
Fracture of vertebral column
Fracture of sternum or fracture of one or more ribs, or both
Fracture of skull
Fracture of radius or ulna, or both
Fracture of pelvis
Fracture of patella, tibia or fibula, or ankle
Fracture of hip
Fracture of hand, wrist, or other distal part of hand
Fracture of foot bones except ankle
Fracture of femur, other than femoral neck
Fracture of facial bones
Fracture of clavicle, scapula, or humerus
GBD region
Southern sub-Saharan Africa
Western sub-Saharan Africa
Central sub-Saharan Africa
East Asia
Eastern sub-Saharan Africa
Southeast Asia
Oceania
Tropical Latin America
Andean Latin America
Central Latin America
Caribbean
North Africa and Middle East
High-income North America
South Asia
High-income Asia Pacific
Central Asia
Western Europe
Southern Latin America
Eastern Europe
Central Europe
Australasia
10000
5000
0
5000
10000
Age-standardised incidence (per 100000 population)
B
Females
Males
GBD region
Southern sub-Saharan Africa
Western sub-Saharan Africa
East Asia
Oceania
Central sub-Saharan Africa
Southeast Asia
Andean Latin America
Eastern sub-Saharan Africa
Tropical Latin America
Central Latin America
Caribbean
North Africa and Middle East
High-income North America
High-income Asia Pacific
Central Asia
Southern Latin America
South Asia
Western Europe
Eastern Europe
Central Europe
Australasia
15000
10000
5000
0
5000
10000
15000
Age-standardised prevalence (per 100000 population)
C
Females
Males
GBD region
Southern sub-Saharan Africa
East Asia
Western sub-Saharan Africa
Oceania
Southeast Asia
Andean Latin America
Central sub-Saharan Africa
Tropical Latin America
Central Latin America
Eastern sub-Saharan Africa
Caribbean
North Africa and Middle East
High-income North America
High-income Asia Pacific
Central Asia
Western Europe
Southern Latin America
South Asia
Eastern Europe
Central Europe
Australasia
800
600
400
200
0
200
400
600
800
Age-standardised YLDs (per 100000 population)

Nowadays, X-ray images have been widely used to visually examine the internal condition of patient abnormalities. The radiologist's interpretation of the X-ray image as a case based clinical information available is a critical point on how the patient is treated. The condition of bone fractures has become an intensive focus, as reflected by the increased demand for diagnostic imaging and interventional radiology. There have been solutions based on not just clinical perspective but also combination with technology works.

Traditional analysis of fractures has focused on geometric measurements that are extracted either manually or through image processing. However, in recent times, Artificial intelligence (AI) inspired technology has been used to tackle some of the difficult problems in many areas, among them those related to healthcare and medical imaging.

What is MURA?

MURA (musculoskeletal radiographs) is a large dataset of bone X-rays with labels (manually assigned by radiologists) identifying whether an X-ray study is normal or abnormal. The studies are classified into 7 bone types: elbow, finger, hand, humerus, forearm, shoulder, and wrist.

Musculoskeletal conditions affect more than 1.7 billion people worldwide, and are the most common cause of severe, long-term pain and disability, with 30 million emergency department visits annually and increasing. The dataset aims to lead to significant advances in medical imaging technologies which can diagnose at the level of experts, towards improving healthcare access in parts of the world where access to skilled radiologists is limited.

MURA is one of the largest public radiographic image datasets containing 40,561 images from 14,863 studies. We have used this dataset in our project.

Our Task

We have investigated the performance of thirteen different models to classify bones into two classes: normal or abnormal. We have also trained the models separately for each bone type. Finally we have created an ensemble model using these models. Our aim is to correctly classify X-Ray images of bones as abnormal or normal.

FUTURE SCOPE

In future we can maybe consider more number of models for ensembling.We can also customize according to bone category like customizing by including more pretrained models for categories for which it works and DCNN for others.

Once we reach an accuracy of 90+ we can even take it to masses.

WHY

Musculoskeletal conditions affect more than 1.7 billion people worldwide, and are the most common cause of severe, long-term pain and disability, with 30 million emergency department visits annually and increasing. Computer aided diagnosis (CAD) has a vital role and becomes an urgent demand nowadays. Bone fractures cases are considered from the most frequently occurred diseases among individuals. Moreover, the incorrect diagnosis of the bone fractures cases may cause disability for the patient. Hence, CAD system for bone fractures has become a must.

CONCLUSION

1. Initially, We applied a simple CNN model with different layers and pooling layers.
2. Then we applied some pre-trained models.
3. After this we applied ensemble on the 13 models we trained.
4. The maximum accuracy we got is 78%.

REFERENCES:

1) https://sci-hub.hkvisa.net/10.1109/MCNA50957.2020.9264285