



UNIVERSIDAD NACIONAL MAYOR DE SAN MARCOS
FACULTAD DE INGENIERÍA DE SISTEMAS E INFORMÁTICA
UNIDAD DE POSGRADO

Cardiopulmonary diseases diagnosis using chest x-ray images and deep learning

by Jhonatan H. Tirado

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12.8 physicians

Per 10,000 inhabitants in Peru, and 6.2 physicians
per 10,000 inhabitants in the Amazon
region

OECD average: 33 physicians per 10,000 inhabitants

Consequences

- **Long waiting times** in public hospitals
- **Not enough specialists**, even more outside the capital city, Lima.



B. Eight visual examples of common thorax diseases

XT

Using a public dataset, develop a web application for diagnosing 14 cardiopulmonary diseases



Atelectasis



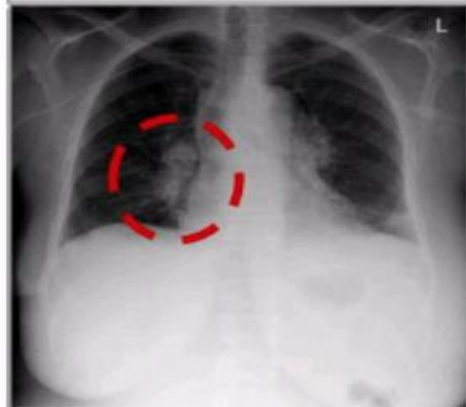
Cardiomegaly



Effusion



Infiltration



Mass



Nodule



Pneumonia



Pneumothorax

Chest X-ray14 Dataset

XT



(a) “No Finding”



(b) “Cardiomegaly”

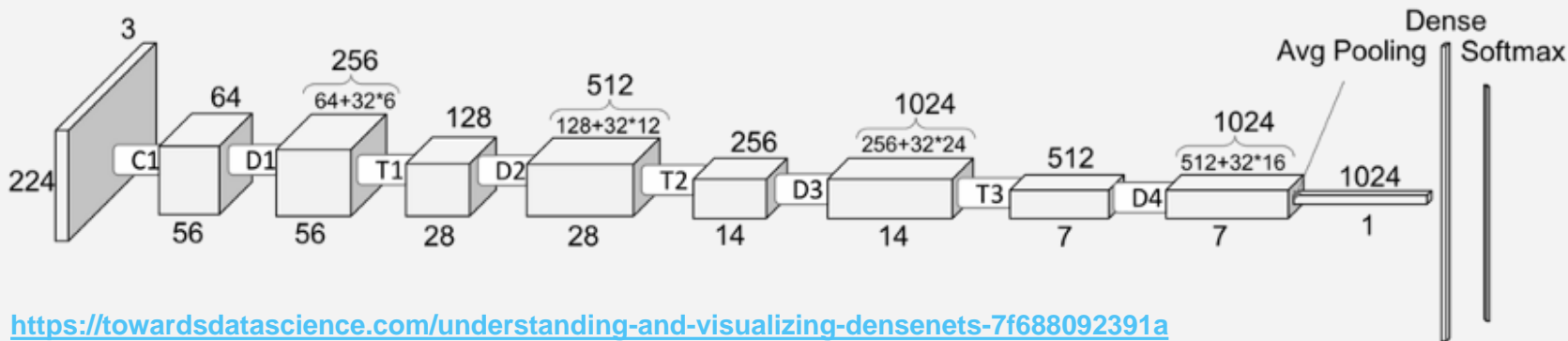


(c) “Pneumothorax”

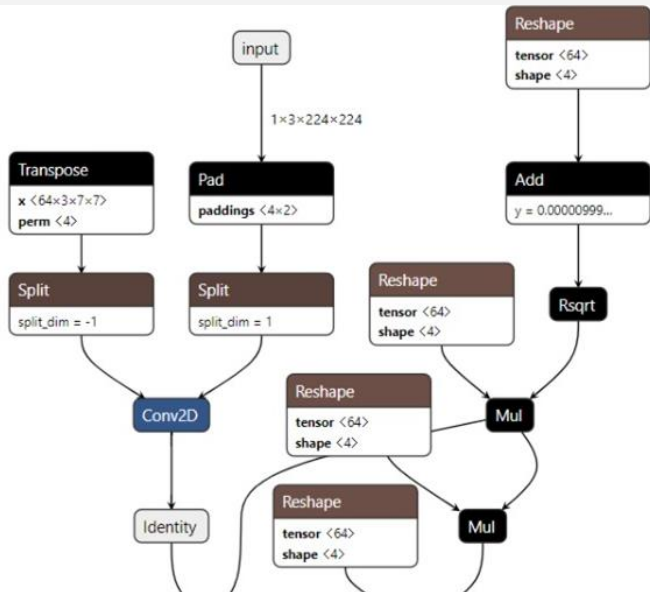


(d) “Pneumothorax”

112,120 frontal thorax x-ray images, 51,708 of which contain up to 14 different pathologies. The remaining 60,412 images have no pathologies at all.



Using a DenseNet-121 model trained on the ChestX-ray14 dataset



Probabilidad de Enfermedades



X-Ray Team

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ML Researcher

Peruvian, pursuing a master degree in systems engineering and currently working as service leader for a software company. Interested in artificial intelligence, machine learning, deep learning and software architecture.

Henry Medina



Fullstack developer

Industrial engineering student at Universidad Nacional de Ingeniería. Software and games developer. Programming: usign Java, JavaScript and Python

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ML Cloud Integrator

Systems engineer (UNI), MSc in Computer Science, specialized in AI (Universidade Federal de Sao Carlos). Working as Data & Analytics Manager at Xertica, a Google partner, developing data solutions using the Google Cloud platform

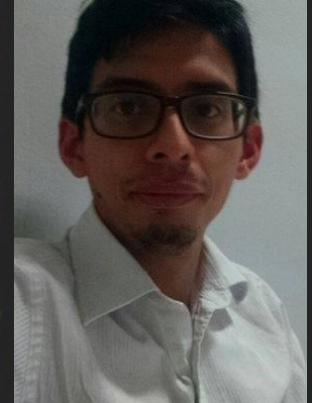
Josimar Chire



ML Researcher

Researcher, pursuing a doctorate in Computer Science, specializing in AI (Universidade de Sao Paulo). Working in Image Processing and Machine Learning using C++, Python, OpenCV, ImagenLO

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ML Researcher

Software engineer for the Universidad Tecnológica del Perú. Currently, researching on Deep Learning and working as Data Engineer for Xertica