Learning Semantic Image-Text Embeddings in the Radiology Context

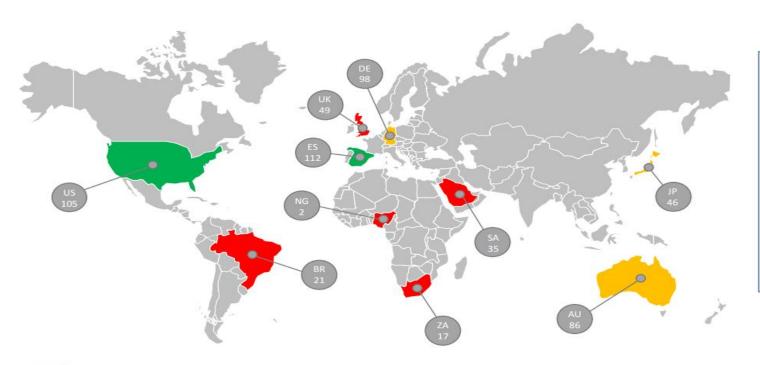
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Motivation

Global shortage of Radiologists



- In most countries there is an insufficient number of radiologists to meet the everincreasing demand for imaging and diagnostic services
- The situation will get worse, as imaging volumes are increasing at a faster rate than new radiologists are entering the field.
- Cognitive computing techniques, such as neural networks, deep learning and predictive analytics, may help by improving the productivity of radiologists

≥100 radiologists per million population

50 - 99 radiologists per million population

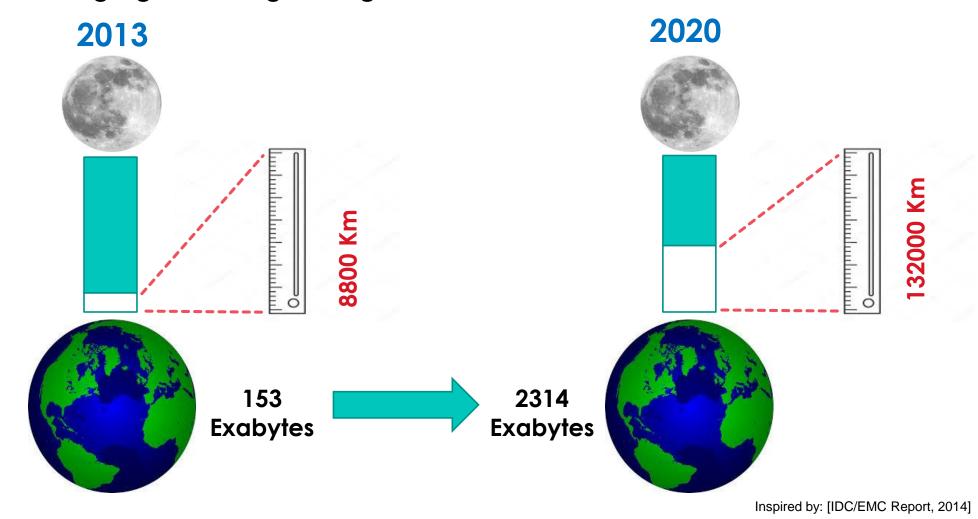
<50 radiologists per million population

Sources: National radiology societies and government agencies. See slide 9 for details

Source: Signify Research.

Motivation

Medical and Imaging data is growing



Motivation

- Average radiologists spend3-4 seconds, 8 hours per day.
- Missed radiological findings can be as high as 30%.
- Diagnostic errors leads to multiple scans, and in the worst case, death of a patient.

50 of diagnosis are in Error translating to

62 diagnostic errors per physician per year

18 Million

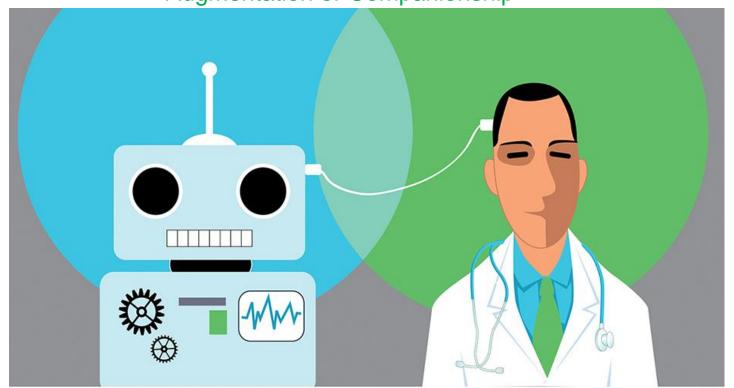
Diagnostic errors per year in United States

H. Singh et al. The frequency of diagnostic errors in outpatient care: estimations from three large observational studies involving US adult populations, BMJ Qual Saf. 2014 Sep;23(9):727-31.

The Need: Augmentation Intelligence

 Human + Computers can achieve better performance than either alone.

Augmentation or Companionship



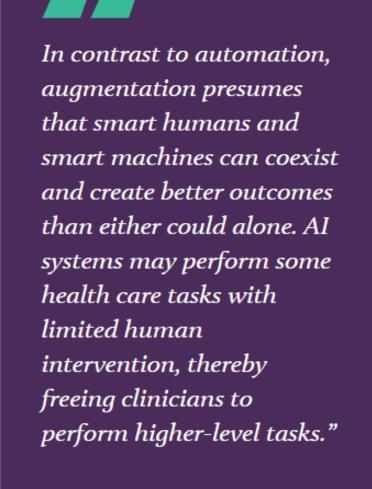


Image Credit: https://www.ups.com/us/en/services/knowledge-center/article.page?name=3-principles-for-bringing-augmented-intelligence-to-life-sciences&kid=cd1a6e81

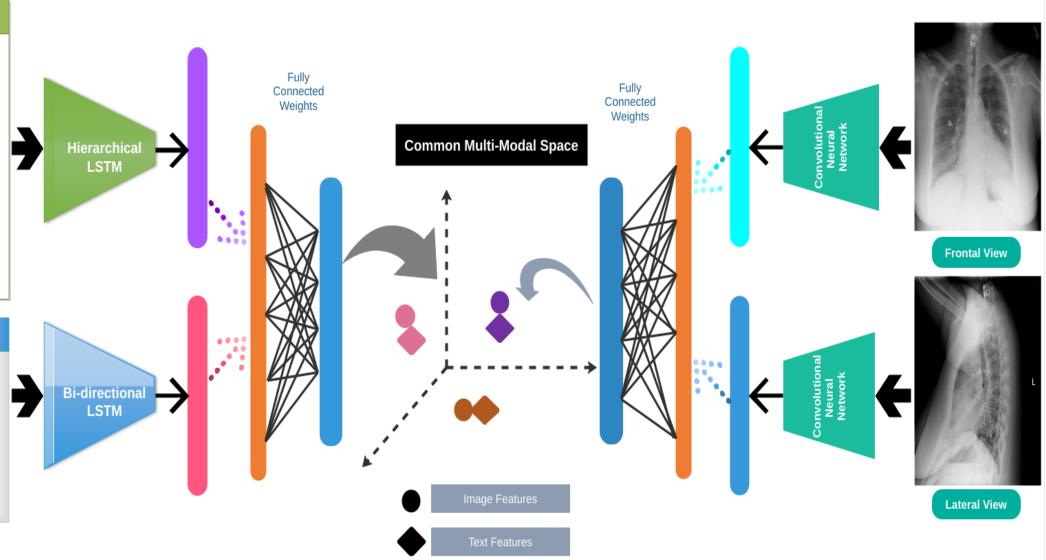
Proposed Model

Radiology Repor

Findings: Interval performance of anterior cervical spinal fusion, xxxx intact without complicating features. There is stable cardiomegaly, with persistent bibalisalar opacities xxxx atelectasis and/or infiltrate. No xxxx focal consolidations, pneumothorax, or pleural effusions. The visualized osseous structures demonstrate mild multilevel degenerative disc disease of the thoracolumbar spine, without acute osseous abnormality. Impression: Stable cardiomegaly and persistent minimal bibasilar atelectasis.

Medical Keywords

atelectases
degenerative disc disease
infiltrates
opacity
cervical spinal fusion
Atelectasis
Cardiomegaly
Cerivical Vertebrae
Lumbar Vertebrae
Spinal Fusion
Surgery



Scope

The proposed model can enhance radiologist's productivity by

Automatic image annotation and quantification

Alert for relevant regions of interest in a medical image

Compare readings, diagnosis, and outcomes of similar cases existing in the Picture Archiving and Communication Systems (PACS)

Retrieving radiology reports given medical image and vice-versa

Allow multi-modal query expansion to retrieve radiology reports or medical images as per radiologists' special needs.