Software advances changing the global landscape of ultrasound

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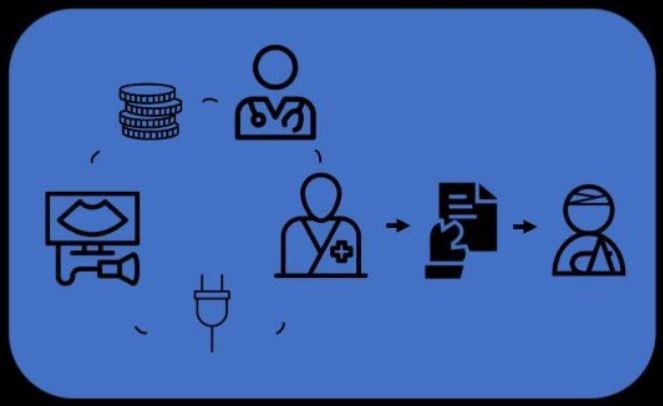
Disclaimers

- No financial conflicts of interest to report
- This talk discusses some commercially available products without intent to endorse.
- Any opinions expressed here are my own.

Access to diagnostic imaging

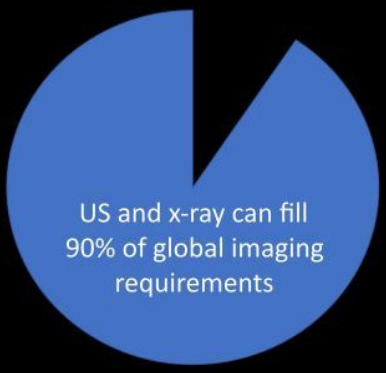
- Available
- Affordable
- Appropriate
- Adequate quality

Access to diagnostic imaging



Ultrasound

- Fills a void
- Cheaper
- Portable
- Point-of-care
- Accurate



Maru, et al. *Globalization and Health. 2010*

Smarter scanning
Movement of data
Availability of interpretation

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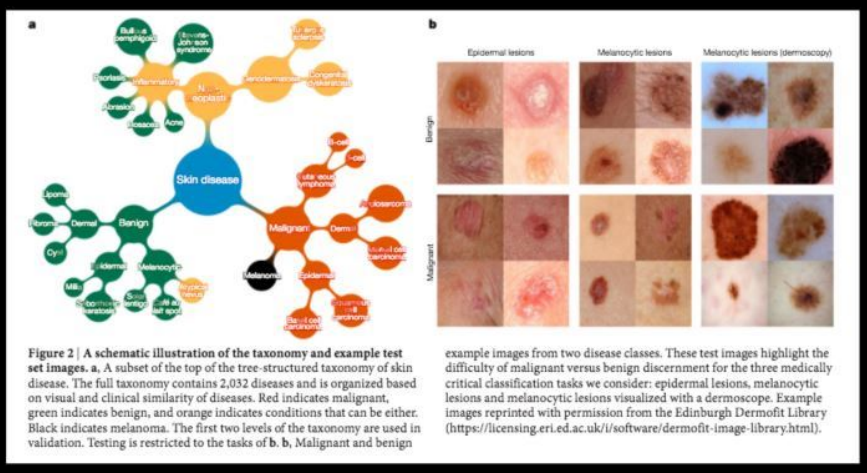
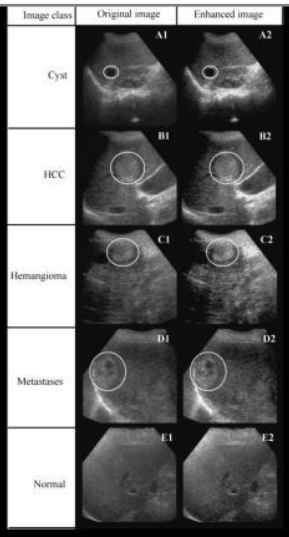
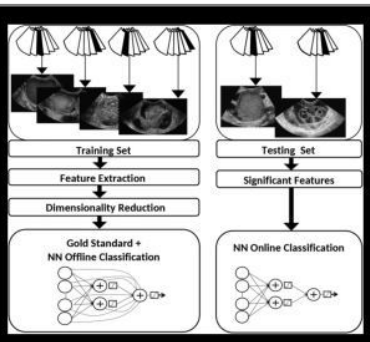


Figure 2 | A schematic illustration of the taxonomy and example test set images. a, A subset of the top of the tree-structured taxonomy of skin disease. The full taxonomy contains 2,032 diseases and is organized based on visual and clinical similarity of diseases. Red indicates malignant, green indicates benign, and orange indicates conditions that can be either. Black indicates melanoma. The first two levels of the taxonomy are used in validation. Testing is restricted to the tasks of **b**. **b**, Malignant and benign example images from two disease classes. These test images highlight the difficulty of malignant versus benign discernment for the three medically critical classification tasks we consider: epidermal lesions, melanocytic lesions and melanocytic lesions visualized with a dermoscope. Example images reprinted with permission from the Edinburgh Dermofit Library (https://licensing.eri.ed.ac.uk/i/software/dermofit-image-library.html).

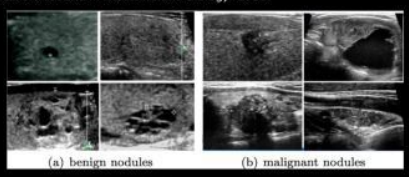
Esteva, et al. Dermatologist-level classification of skin cancer with deep neural networks. Nature. 2017



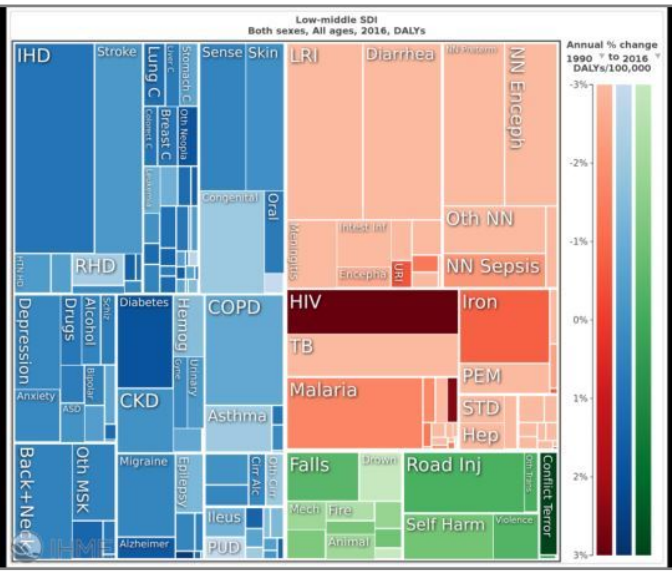
Mittal, et al. *Computerized Medical Imaging and Graphics*. 2011



Aramendia-Vidaurreta, et al. *Ultrasound in Medicine and Biology*. 2016.



Ma, et al. *Ultrasonics*. 2017



http://www.healthdata.org/data-visualization/gbd-compare

Pneumothorax

Pleural fluid

Dx of valvular disease rheumatic heart disease

Severe left ventricular systolic dysfunction

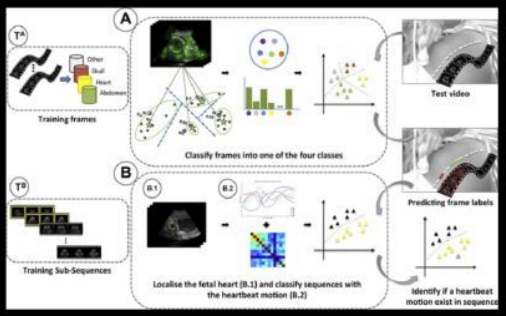
Lung consolidation

Hydronephrosis

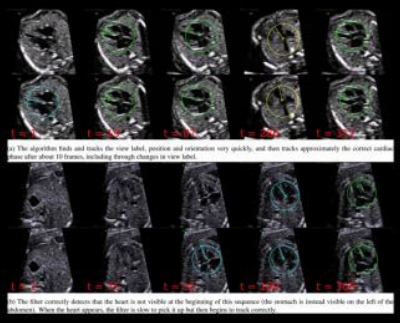
Bowel obstruction

Abscess/soft tissue fluid collection

Peritoneal fluid



Maraci, et al. Medical Image Analysis. 2017. 37.



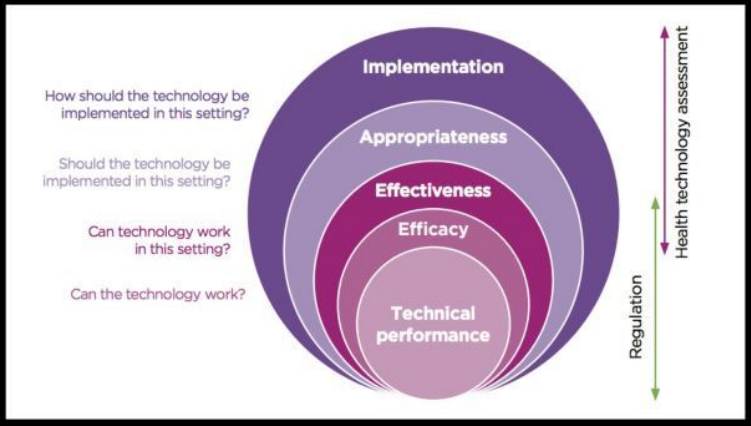
Bridge, Ionnou, Noble. Medical Image Analysis 2017 36.

The Pros

- Not enough radiologists, technologists, sonologists to meet demand
- Increases efficiency of existing resources and infrastructure
- Decreases the price of medical expertise

The Downside

- Our livelihood
- Young technology
- Quality limitations
- Aid in diagnosis, but then what
- Will health care systems take advantage?



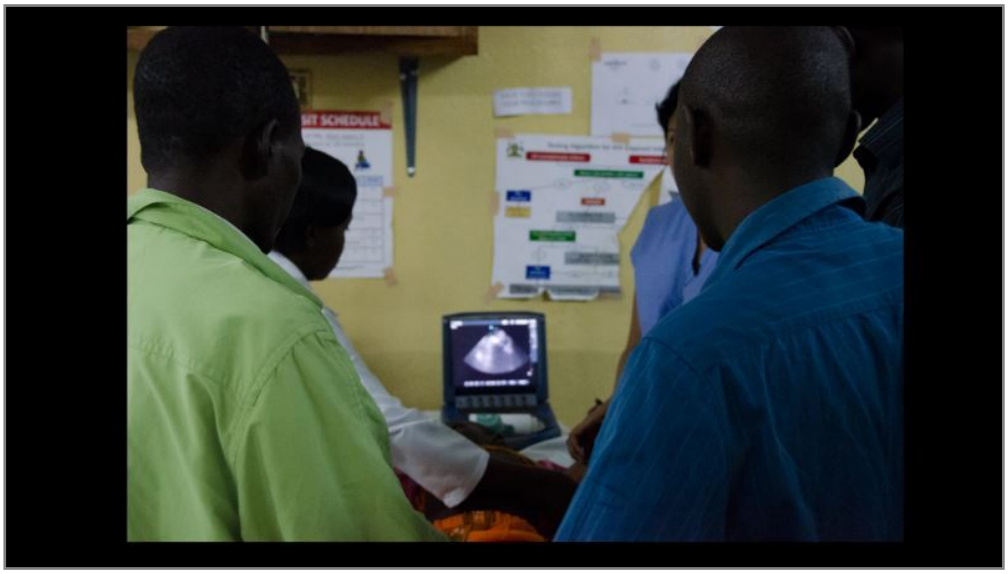
Global atlas of medical devices. Geneva: World Health Organization; 2017.

3d for all

Smarter scanning

Movement of data

Availability of interpretation



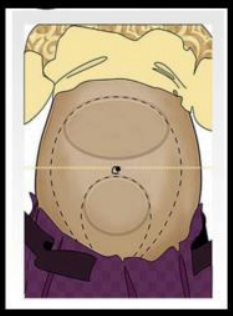
Open source solutions

- Image viewing and processing
  - OsiriX
  - XNAT
  - dcm4chee
- EHRs with DICOM
  - Open EHR
  - Open MRS
  - Bahmi

mHealth

Technology literacy

- Use devices
- Maintain devices
- Troubleshoot devices
- Overall literacy



Martinez, et al.*J Health Inform Dev Ctries.* 2017

However…

- Infrastructure
- Training
- In-country maintenance
- Data Protection, Privacy and Security
- Trust

https://digitalprinciples.org/

Tierney, et al. Stud Health Technol Inform. 2010

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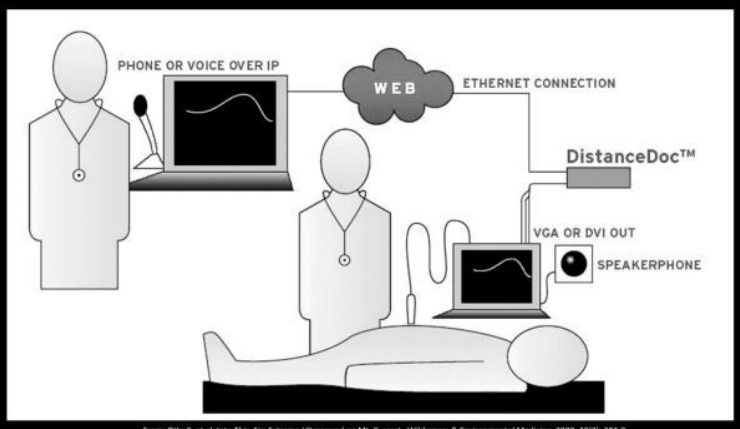
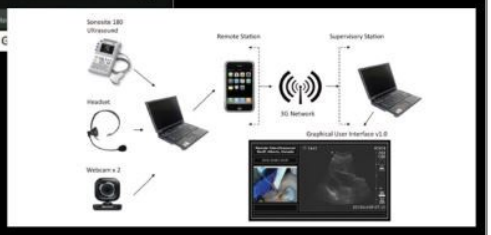


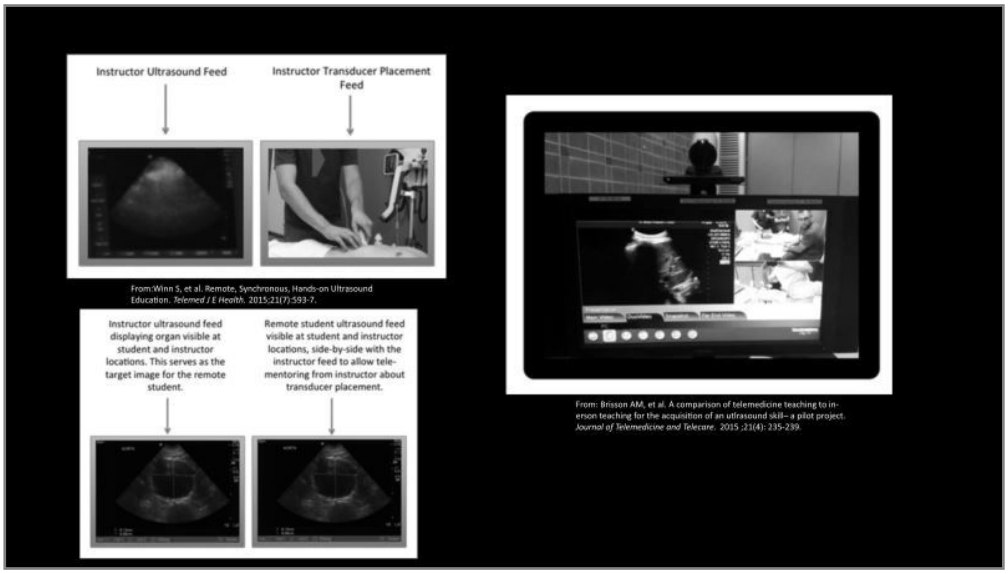
From: Otto C, et al. Into Thin Air: Extreme Ultrasound on Mt. Everest. *Wilderness & Environmental Medicine. 2009; 20(3): 283-9.*

From: McBeth PB, et al. Simple, Almost Anywhere, With Almost Anyone: Remote Low-Cost Telemontored Resuscitative Lung Ultrasound. *J Trauma.* 2011; 71:1528-1538.



From: Hamilton DR, et al. On-orbit prospective echocardiography on International Space Station crew. *Echocardiography.* 2011; 28(5): 491-501.

From: nasa.gov


Instructor Ultrasound Feed
Instructor Transducer Placement Feed
From:Winn S, et al. Remote, Synchronous, Hands-on Ultrasound Education. Telemed J E Health. 2015;21(7):593-7.
Instructor ultrasound feed displaying organ visible at student and instructor locations. This serves as the target image for the remote student.
Remote student ultrasound feed visible at student and instructor locations, side-by-side with the instructor feed to allow tele-mentoring from instructor about transducer placement.
From: Brisson AM, et al. A comparison of telemedicine teaching to in-person teaching for the acquisition of an ultrasound skill– a pilot project. Journal of Telemedicine and Telecare. 2015 ;21(4): 235-239.

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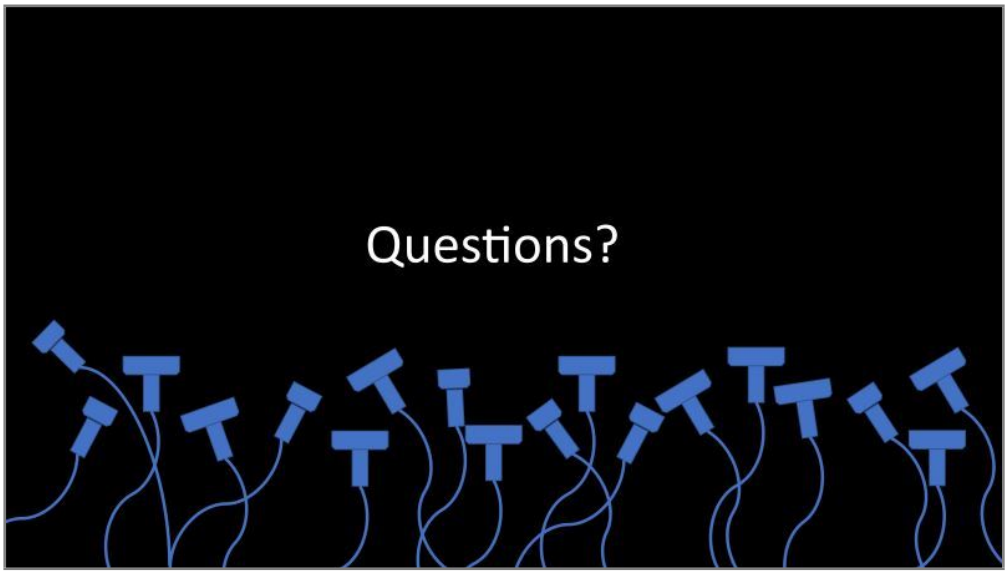
Questions?