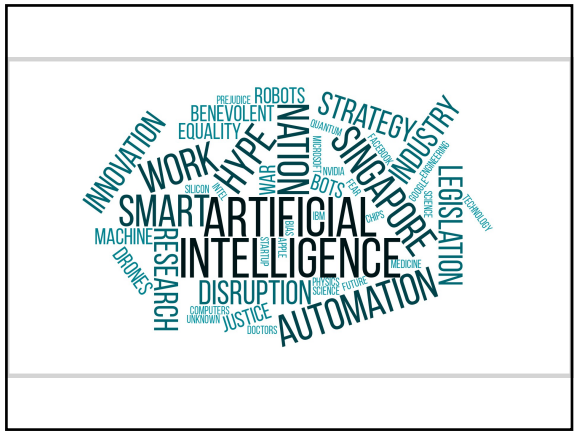

THE SINGAPORE RADIOLOGY AI LANDSCAPE : CHAMPIONING PROGRESS WITH AUGMENTED IMAGING

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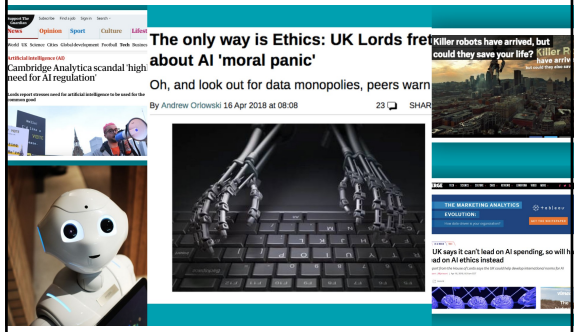
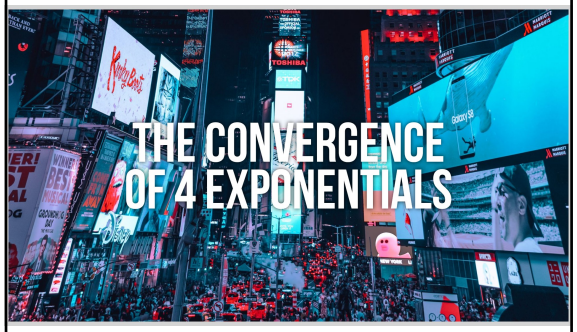
RADIOLOGY AI, DL, DATA SC IMAGING INFORMATICS SRS
Vice Chairperson

OUTLINE

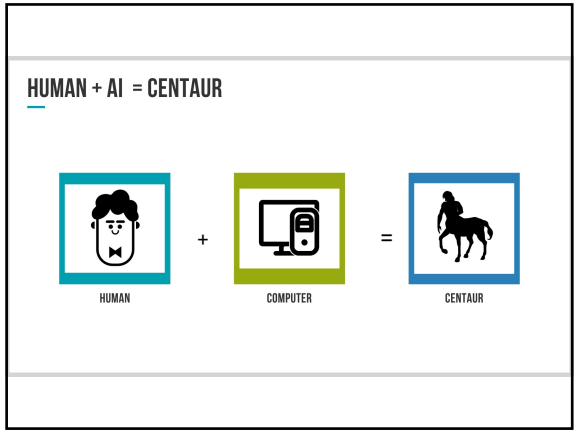
1. AUGMENTING RADIOLOGY, THE CENTAUR CHESS PARADIGM
2. THE SINGAPORE RADIOLOGY LANDSCAPE
3. SINGAPORE RADIOLOGY STRATEGY: CHAMPIONING PROGRESS






HOW TO BECOME A CENTAUR


1997 GARY KASPAROV VS DEEP BLUE

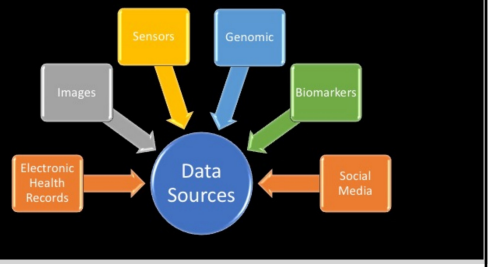

HUMAN + AI = CENTAUR
HUMAN
COMPUTER
CENTAUR

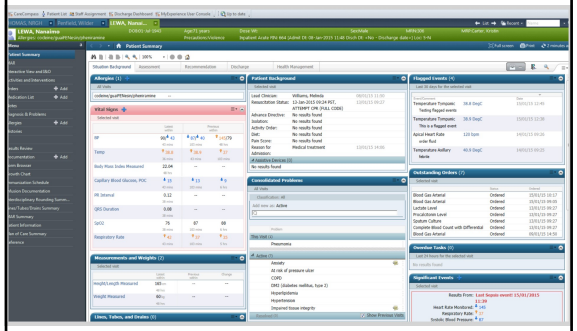

Anna Ushenina
Ukraine
Olena Boytsun
Ukraine


BETTER THAN HUMAN
BETTER THAN COMPUTER
HUMAN
AI


HEALTHCARE IS RICH IN DATA

Healthcare is a rich source of data





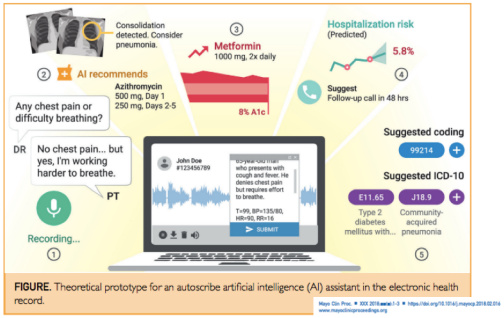
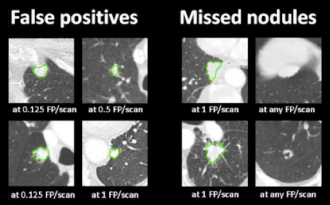


FIGURE. Theoretical prototype for an autoscribe artificial intelligence (AI) assistant in the electronic health record.

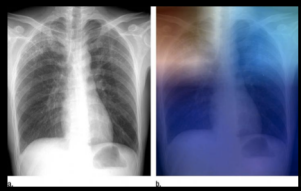
Use case: Lung cancer detection



Radboud University Medical Group in Nijmegen, the Netherlands, and Fraunhof Mevis in Bremen, Germany.

Use cases in Medical imaging : TB detection

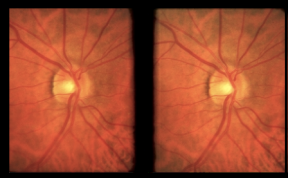
- DL algorithms have been able to diagnose the presence or absence of tuberculosis (TB) in chest x-ray images with astonishing accuracy
- The algorithms achieved an impressive 96% accuracy rate — better than many human radiologists
- Automated detection of pulmonary TB at chest radiography may facilitate screening and evaluation efforts in TB-prevalent areas with limited access to radiologists



Rajpurkar, Pranav, et al. "CheXNet: Radiologist-Level Pneumonia Detection on Chest X-Rays with Deep Learning." arXiv preprint arXiv:1711.05225 (2017).

Diabetic retinopathy: Fundoscopic images

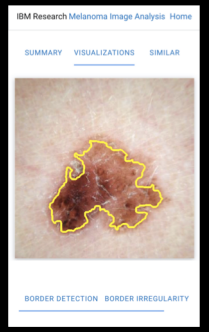
- Early DR can be treated efficiently
- Study published in 2016 by a group of Google researchers in JAMA
- their DL algorithm trained on a large fundus image dataset, has been able to detect DR with more than 90 percent accuracy



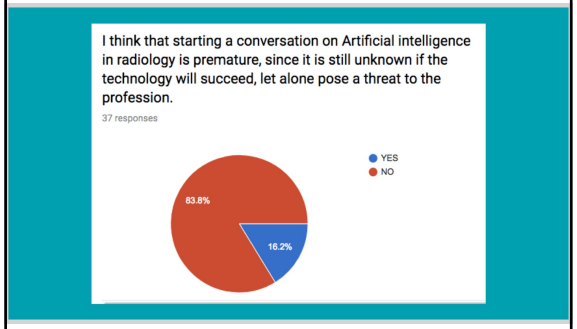
Gulshan V, Peng L, Coram M, Stumpe MC, Wu D, Narayanaswamy A, Venugopalan S, Widner K, Madams T, Cuadros J, Kim R. Development and validation of a deep learning algorithm for detection of diabetic retinopathy in retinal fundus photographs. Jama. 2016 Dec 13;316(22):2402-10.

Skin cancer detection

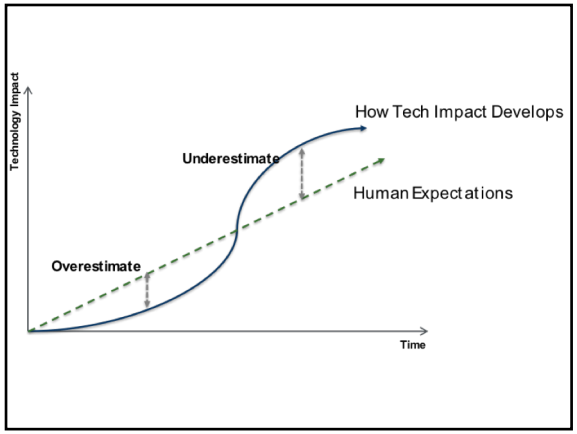
- automated image processing is in detecting melanoma
- IBM Research
- DL algorithm learns important features related to the disease from a group of medical images
- then makes predictions based on that learning



Gutman, David, et al. "Skin lesion analysis toward melanoma detection: A challenge at the international symposium on biomedical imaging (ISBI) 2016, hosted by the international skin imaging collaboration (ISIC)." arXiv preprint arXiv:1605.01397 (2016).



"WE TEND TO OVERESTIMATE THE EFFECT OF A TECHNOLOGY IN THE SHORT RUN AND UNDERESTIMATE THE EFFECT IN THE LONG RUN"
-ROY AMARA



SRS RADII

AI Subsection

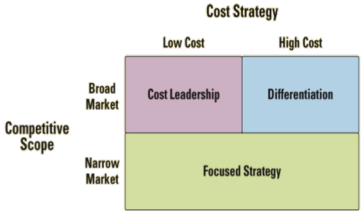
"TO FOCUS AND FACILITATE THE DEVELOPMENT OF AI IN SINGAPORE RADIOLOGY, FOR THE BENEFIT OF PATIENTS, RADIOLOGISTS AND THE NATION"

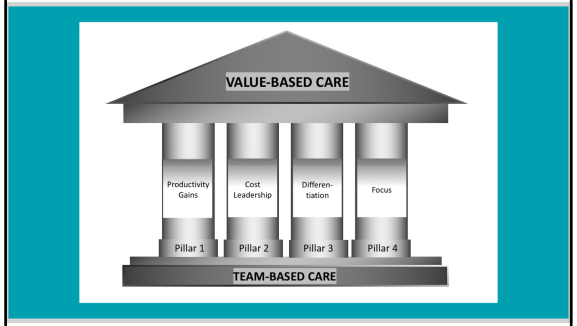
MISSION

- ACT AS A HUB TO FACILITATE AI PROGRESS IN RADIOLOGY
- CREATE EDUCATION AND TRAINING INITIATIVES FOR AI IN MEDICINE
- FOSTER RESEARCH PARTNERSHIPS DEVELOPING AI FOR INDIGENOUS NEEDS
- TRANSLATING "IDEAS INTO ACTION" WITH PARTNERS
- ENSURE QUALITY AND BENEFICIENCE THROUGH BEST PRACTICES AND GUIDELINES THROUGHOUT THE DEVELOPMENT, INTEGRATION AND IMPLEMENTATION CYCLE

"A FUTURE FOR RADIOLOGY IN SINGAPORE WHICH IS AUGMENTED WITH ARTIFICIAL INTELLIGENCE FOR VALUE-ADDED, PRECISE AND SAFE HEALTHCARE, WITH BENEFITS TO ALL SEGMENTS OF THE COMMUNITY"

Porter's Generic Strategies



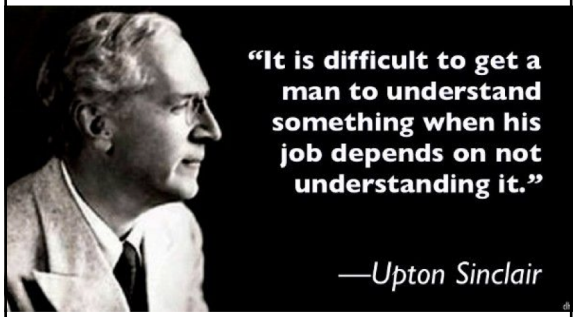


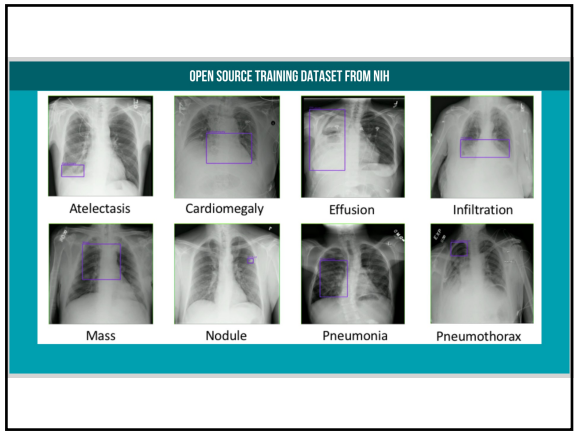
First tier use-cases with highest productivity gains

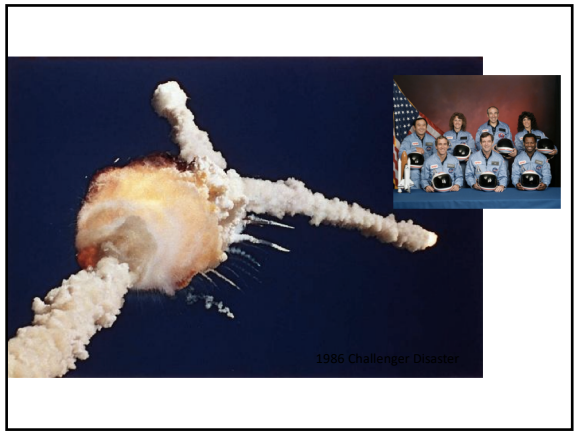
1. Audit plain films
2. Mammography
3. Fracture detection
4. Liver volumetry
5. Cardiac MR segmentation
6. CT Lung nodule follow up
7. Oncology follow up
8. Stroke detection
9. Adrenal nodule characterisation and follow-up
10. Shortened MRI sequences

Challenges faced by Radiologists :

- Not enough interest
- Not enough people
- Not enough funding (Grants and more grants)
- Not enough collaboration (we don't like to be left in the dark !)
- Innovation stifled by regulations







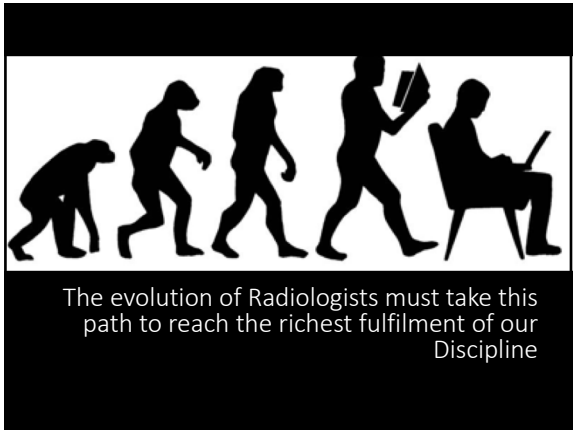
DO YOU HAVE AN O-RING JOB?

Professor David Autor described the 'O-ring principle' in his paper on the future of workplace automation:

given a situation where a collection of tasks need to be done together to successfully accomplish a main task, if some of the tasks can be automated, the economic value of the human inputs for the other tasks that cannot be automated will increase

Autor, DH. "Why are there still so many jobs? The history and future of workplace automation." Journal of Economic Perspectives 29.3 (2015): 3-30.

Thank you



The evolution of Radiologists must take this path to reach the richest fulfilment of our Discipline