Training Radiology Residents When Machines Read Imaging

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This Talk Is Controversial

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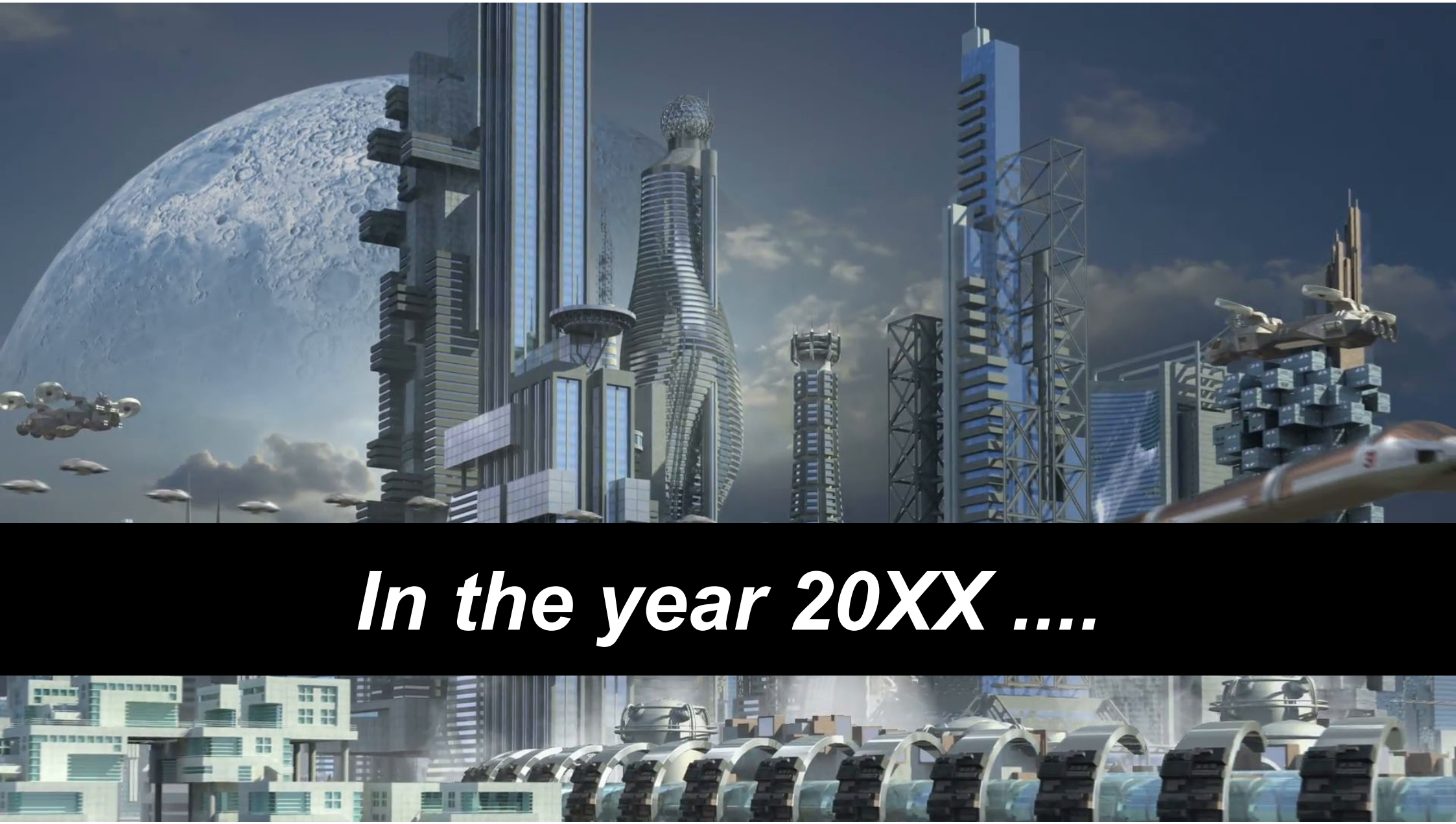
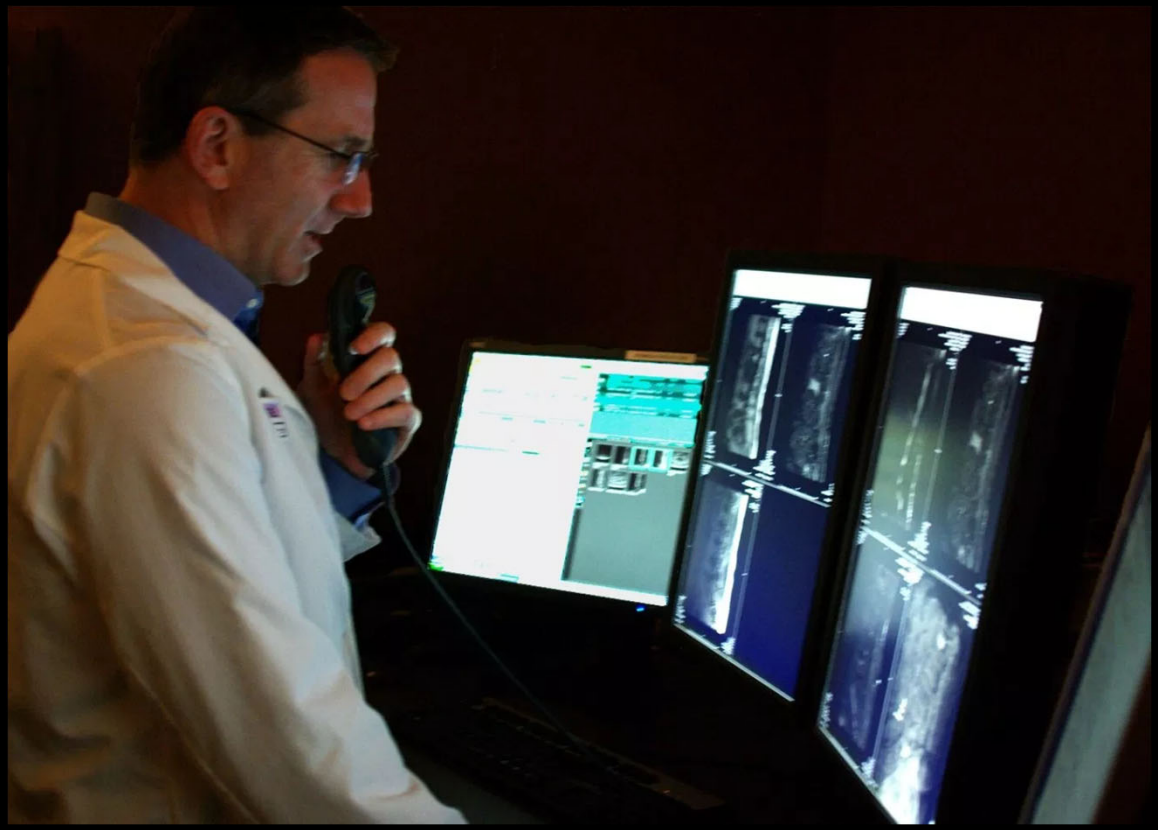


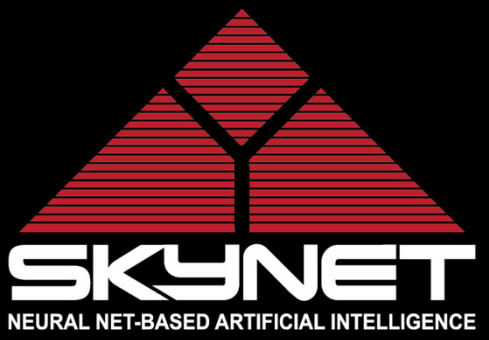
In the year 20XX ....

PREMISE:
Machines can read imaging.



It depends upon what the definition of *'read'* is...

My Definition of the Premise ("Full Skynet")



- "Machines can read imaging."
- DETECT: Given a specific indication, modality, body part, and location, The Machine is capable of analyzing a study, can locate and diagnose all abnormalities or guarantee normality
- INTEGRATE: The Machine, is capable of integrating the study information, with the available electronic medical record for augmented contextual information
- REPORT: The Machine, using standard templates, will draft a full report (equal or superior to current clinical practice) +/- a multi-media report

Responses

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Do Nothing	Reinforce Scope	Expand Scope

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Do Nothing	Reinforce Scope	Expand Scope
Quality Control	Intervention/ Procedure	Service Integration
Algorithm Explainability	Consultation Multi-Disciplinary Boards	Algorithm Improvement

Quality Control

- No system is perfect
- Our job becomes, to monitor, validate, understand the exceptions, and educate about them
- Nuclear Medicine is culturally ahead of Radiology in this (RE: Utilization of Advanced Workstations)
- Quality Control is related to ultimately, who is most responsible

Algorithm Explainability

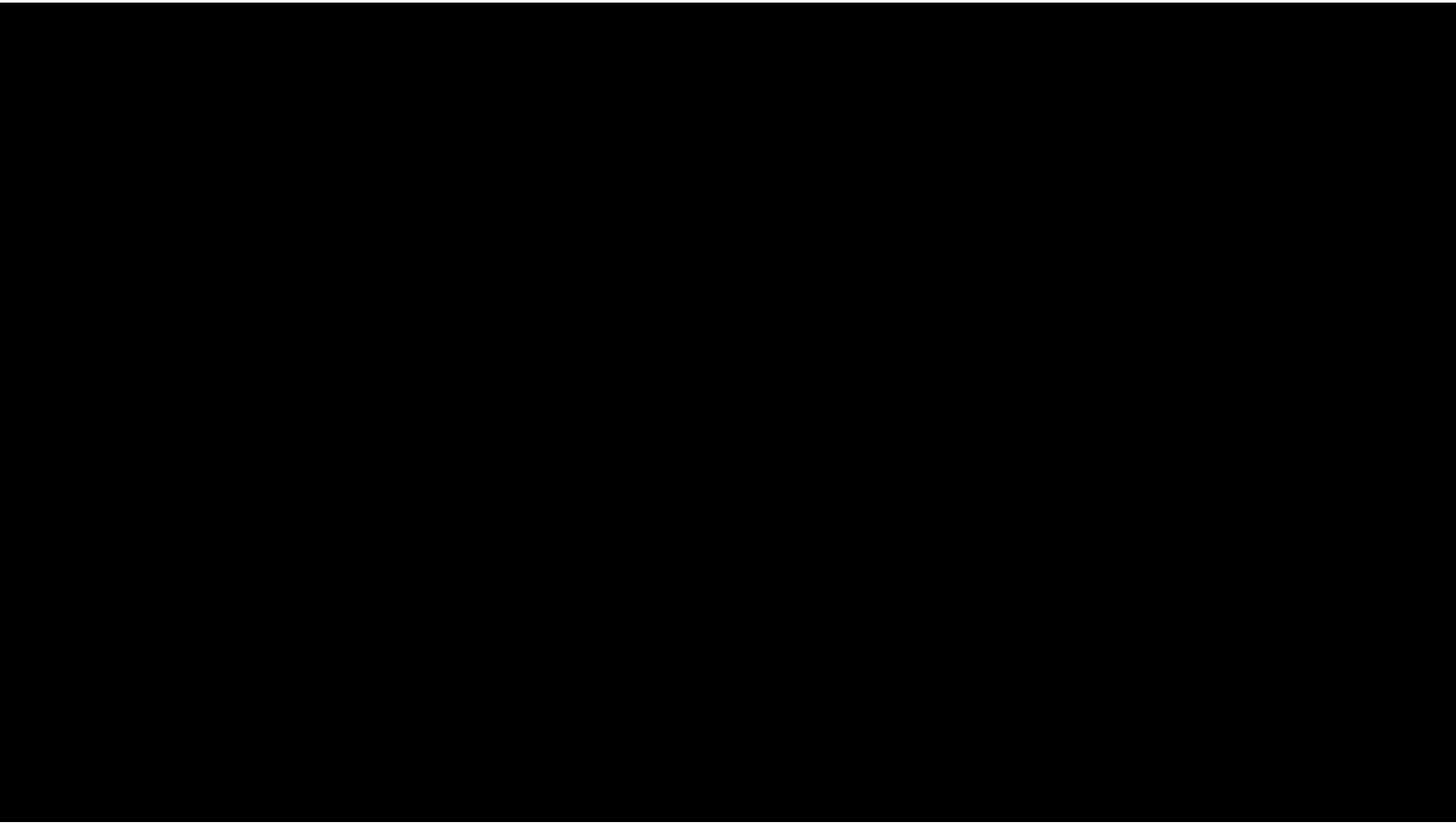
Lycurgus Consulting the Pythia, 1835/1845
Eugène Delacroix

The Oracle of Delphi

"One of the main stories claimed that the Pythia delivered oracles in a frenzied state induced by vapours rising from a chasm in the rock, and that she spoke gibberish which priests interpreted as the enigmatic prophecies and turned them into poetic dactylic hexameters preserved in Greek literature."

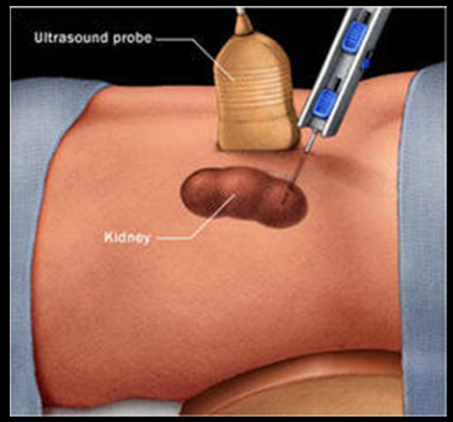
–Sounds like a poorly written radiology report

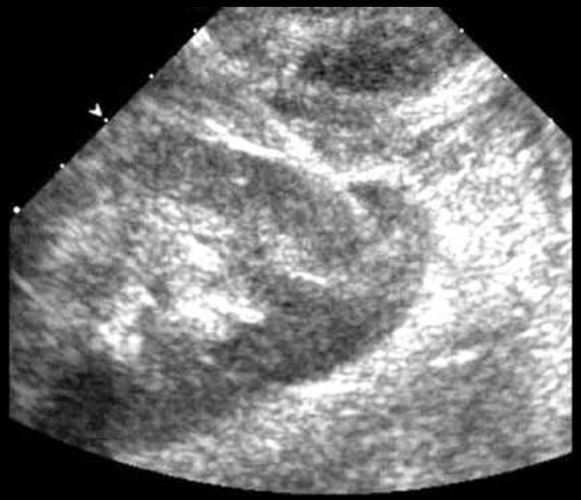
The Machine makes a prediction,
and nobody understands it.



Intervention/Procedure

- Intervention/Procedure automation will subject to substantially greater externalities than diagnostic practice and require exponential improvements in robotics
- Cultural and values issues of patient trust and consent
- Early radiology practice prior to the invention of many of our modalities favoured significantly more interventional and angiographic techniques





Consultation, Multi-Disciplinary Boards

- If routine work becomes automated, consultations of atypical scenarios will likely more prevalent and appreciated
- More attention could be paid to interactive contributions to value of care, that would now be non-competitive with the routine work of reporting
- Skillsets that would improve this as a competency would have to be emphasized (***i.e. reversal of the ABR's positioning...***)

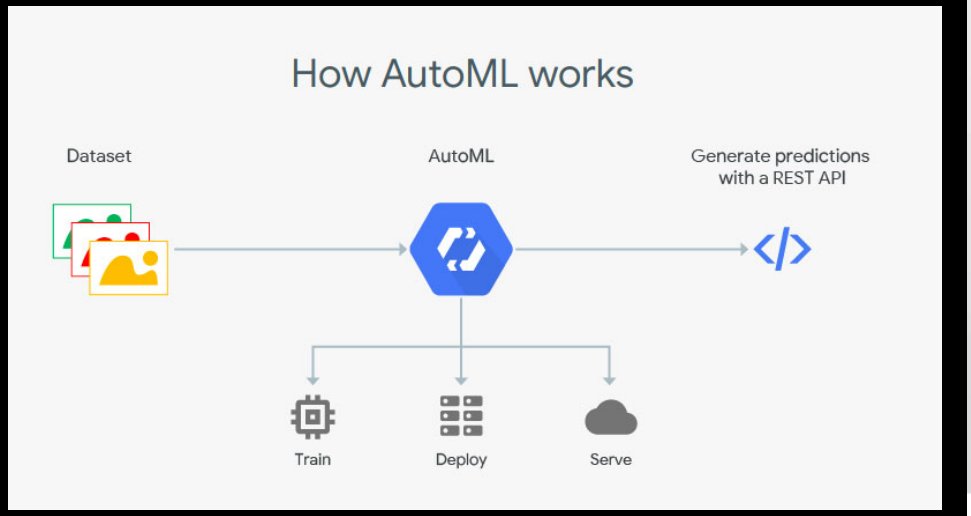
Service Integration

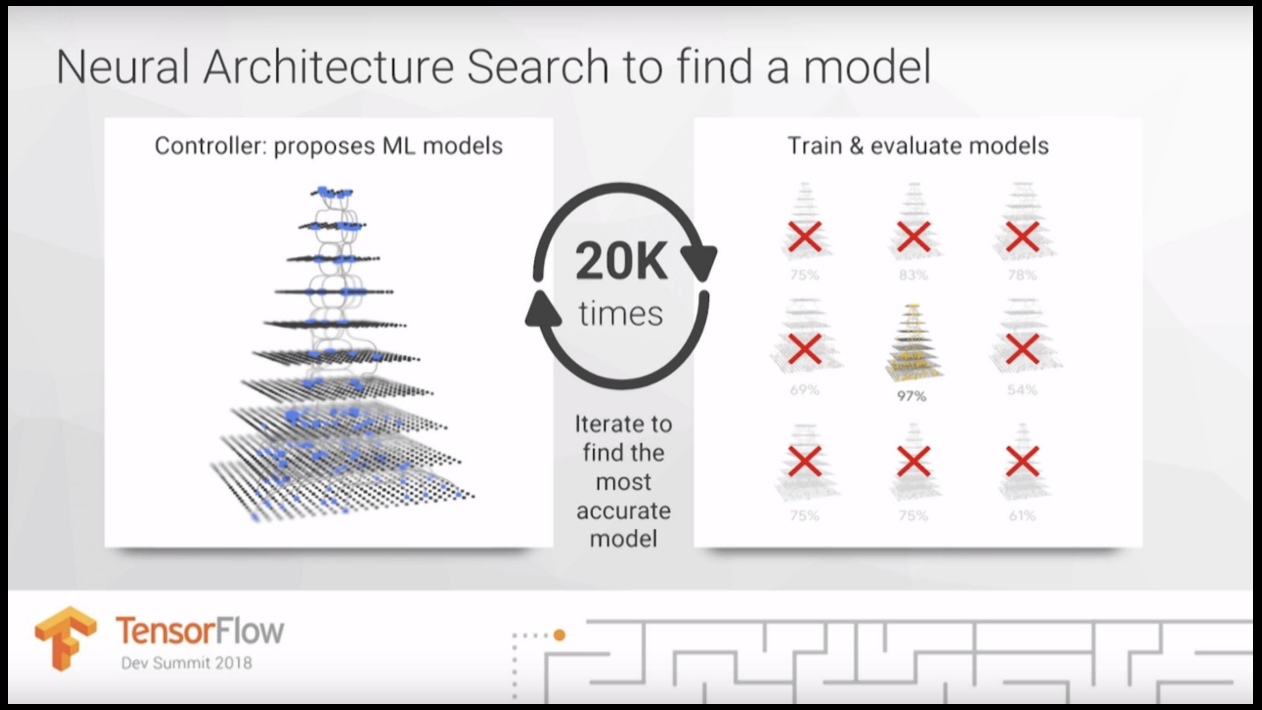
- Systems-based or full-service clinics will become more prevalent with further sub-specialization, with increased patient contact roles and patient communication
- MODEL: Women's Imaging and Mammography

Algorithm Development

- The 'Learn to Code' Argument
- Continued improvements to The Machine ***will require hybridized or interdisciplinary communities*** to direct further development and improvements to the system
- Individuals with **higher level technical skills** will have to be recruited from the UGME level and above
- Improvements in AI tools, will simultaneously improve the accessibility of machine learning techniques (e.g. AutoML, Neural Architecture Search)

AutoML & Neural Architecture Search (NAS)





Responses

Do Nothing	Reduce Scope	Expand Scope
Quality Control	Intervention/ Procedure	Service Integration
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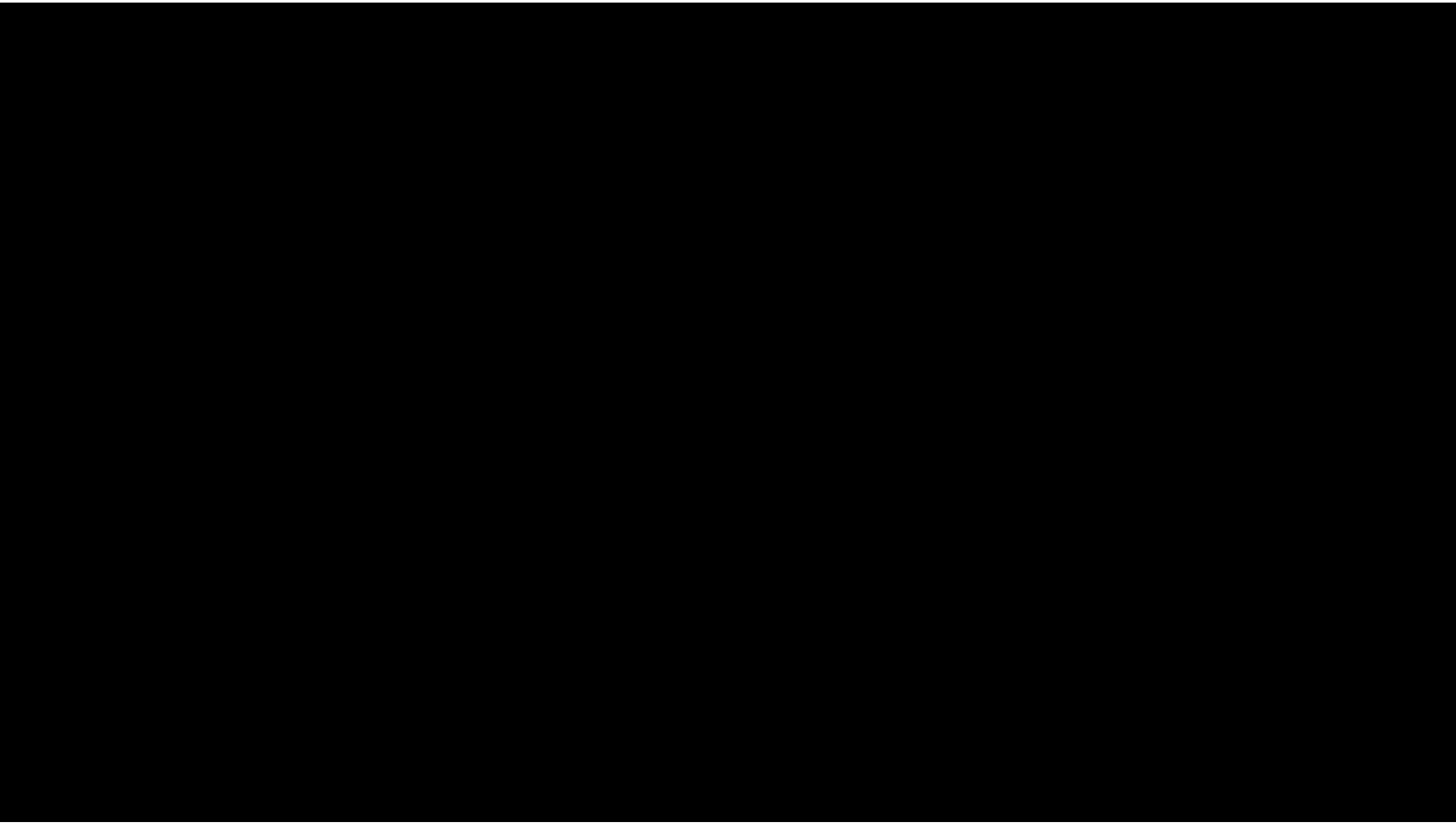
Implications on Trainees

- Emphasize **quality and validation**, improve AI literacy and develop local specialty leaders that will help manage the adaptation and changes to your specialty
- Position your specialty as a **moderator of AI**; with expertise and a positive role in algorithm explainability
- Ensure and develop **procedural** skillsets and **interdisciplinary communication** skills; integrate this explicitly into evaluations
- Explore models of care that **will increase patient contact and responsibility**; increase direct trainees experience to match this enhanced workflow
- Encourage the professional development of **talented technically-oriented trainees**, and establish supportive external collaborations to play a role in algorithm development and improvement

Richard BALDWIN

Professor of International Economics
Graduate Institute of International and Development Studies
Geneva, Switzerland

"The future of work to me, is going to be more human. Because if you want to know what we will be doing, you have to look at what AI can't do....they can't deal with unknown situations.....they can't provide empathy, or apply ethics, or be creative, or manage many people, or motivate many people, or educate people...those are the things that AI can't do. So therefore whatever the new jobs are, and they will appear, we don't know the names of it, just like we didn't in the past 2 transformations, but what we will be doing is the most human of our tasks."



Let Machines be Machines.
Let Humans be Humans.

Be human.

Be human.

And everything should be *all good*.

Thank You!

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