

AI Will Soon Revolutionize Medical Physics Research & Practice: Against the Proposition

Elizabeth A. Krupinski, PhD
Department Radiology & Imaging Sciences
Emory University





AI Is Inevitable

- There is little doubt that AI will revolutionize healthcare & medical physics
- More important question is - where will it not (or perhaps *should not*) do what many are afraid it will – take over roles & responsibilities medical physicist?



AI Has Advantages

- **Help** provide valuable & accurate information with respect to multitude essential care variables
 - Repeatability & reproducibility
 - Adaptive sequence generation
 - Automated protocolling
 - Assist smart positioning to decrease retakes
 - Assist with treatment planning



However....

- Fundamental role medical physicist = team member
 - Work with physicians, technologists, nurses, therapists, engineers & patients in effective, efficient & safe delivery healthcare
- AI cannot (at least not yet):
 - Engage in team consultation to explain *reasons behind* decision or proposed method completing clinical task
 - Modify decisions based on *collaborative & interactive input derived from knowledge & clinical experience* team members & uniqueness each clinical encounter & patient



Education & Training

- Another key role = education & training junior level & medical physicists in training, other healthcare professionals including residents & fellows
- AI can develop & provide variety training tools but cannot sit down with trainee, listen to their problems, explain subtle concepts & “art” of medical physics, or provide mentorship, guidance & support required to foster their success as independent professionals



Research Example

- Numerous aspects profession require fundamental research, integration concepts & principles across multiple areas
 - Quite simply human ingenuity, creativity & insight
- DICOM GSDF: developed via integration data from variety sources including fundamental data derived by Barten's analysis contrast sensitivity human eye from which he developed model describing typical performance viewing sinusoidal patterns with different spatial frequencies & sizes in uniform luminance backgrounds



- Based on core psychophysical principles, insight, understanding & integration data from multiple sources by medical physicists, engineers & radiologists unifying standard for radiographic image display generated & still in use in everyday clinical practice
- If AI had been around in early days digital radiography would it have been capable of formulating DICOM GSDF & have insight & creativity to realize fundamental need to account for capabilities human visual system when creating tool to standardize image quality across displays, environments and users?
- I think not - that takes human ingenuity, human factors & human interaction



AI Will Be (Is) Useful

- Ideal tasks for AI in radiology & radiation therapy are image classification, object detection image reconstruction & analysis, image guidance, tumor detection & characterization, therapeutic response & toxicity prediction, treatment decision-making & related tasks that can be rather "tedious" for humans
- However.....



Questions?

ekrupin@emory.edu



