Published in final edited form as:

Acad Radiol. 2020 January ; 27(1): 121–122. doi:10.1016/j.acra.2019.08.019.

Accelerating the Translation of Artificial Intelligence From Ideas to Routine Clinical Workflow

MingDe Lin, PhD

Department of Radiology and Biomedical Imaging, Yale School of Medicine, 300 Cedar Street – TAC N312A, New Haven, CT 06520 (M.L.); Visage Imaging, Inc., 12625 High Bluff Drive, Suite 205, San Diego, California 92130 (M.L.).

The 2018 AUR Academic Radiology and Industry Leaders Roundtable “Artificial Intelligence (AI) in Radiology” discussion gives a high-level perspective of how AI is shaping the field of radiology and highlights the importance of academic-industry partnerships (AIPs) in order to foster development and implementation of AI into routine clinical workflow (1). It is well credited to the organizers of the Roundtable for bringing together many academic and industry leaders in radiology and related fields. The discussion covered the definition of AI, radiology-specific opportunities and challenges, and development and validation of AI algorithms. This is very timely given the growing number of AI applications in radiology that include computer-assisted triage, detection, diagnosis, and response assessment/prediction, methods to improve image acquisition/reduce use of x-ray dose or contrast agent, and image quality recovery. At the same time, there are ethical and legal issues about data use/sharing, regulatory approval, and modes of collaboration between industry, private practice, and academia that are being discussed actively (2).

I feel it would be beneficial for future Roundtable discussions to include representatives from the National Institutes of Health (NIH) who have expertise in AIPs. It has been demonstrated that the 4 NIH institutes (NCI, NIDCR, NIDDK, and NIBIB) that implemented AIPs have successfully bridged the gap between prototype development and commercialization. Specifically, >70% of NIH AIPs over the past 11 years have translated ideas into products (3–5). The multidisciplinary nature of AI requires not only academia and industry working together, but also clinicians and researchers working together in sharing their specific domain expertise to create clinically meaningful and translatable results. Tools that can help facilitate/accelerate that translation are being developed. For example, democratizing the development of AI algorithms like the recently introduced and freely available American College of Radiology (ACR) AI-Lab™ can help inform and educate, lower the entry barrier for clinical AI research (6), and could potentially be used to overcome the brittle nature of AI algorithms trained locally and/or at few locations (while domain adaptation methods are developed (7)) through federated learning approaches (8). Furthermore, vendor-specific tools are being developed with architectures that allow for straightforward embedding of in-house (academia) built algorithms into a research image viewer/picture archiving and communication system (PACS) platform that is that same

production PACS used in the clinic, can help in facilitating tasks like image export into research friendly file format types (i.e., NIfTI), generating ground-truth measurement/segmentation/annotation using the same tools as in the clinic, and testing newly developed algorithms in a “sand-box” environment before deployment into clinical production (9,10). That way, rather than spending resources on data conversion/transfer (“data gymnastics”), the focus is on designing, training, validating and implementing the AI algorithm.

Radiologists trained with knowledge about/practitioners of AI will greatly help in identifying opportunities and provide clinical context for where AI can be best applied for improving patient care. This fits well with the mission of the Association of University Radiologists (AUR) to inspire and educate the academic radiology community. Organized and regular meeting events between academia and industry (including companies that have primary product offerings of the Food and Drug Administration (FDA)-approved AI products and PACS vendors [because they are the platforms/ecosystems where many of the AI applications operate] in use at the top 20 ranked hospitals in the United States (11)) with the AUR and perhaps jointly with other organizations/societies, can help foster partnerships in developing and implementing AI into routine clinical workflow. I look forward to future AUR Roundtable discussions about this exciting and revolutionary journey in augmenting the capabilities of the radiologist for improved clinical and operational outcomes, enhancing interpretation efficiency and accuracy, while reducing the cost of care.

ACKNOWLEDGMENTS

Dr. Lin received funding from NIH/NCI R01 CA206180 and is a Visage Imaging, Inc. employee.

REFERENCES

1. Chan S, Bailey J, Ros PR. Artificial intelligence in radiology: summary of the AUR academic radiology and industry leaders roundtable. *Acad Radiol* 2020; 27:117–120.
2. BiOethics, the law, and data-sharing: AI in radiology (BOLD AIR) summit. New York, NY: NYU Langone Medical Center, 2019.
3. Baker H Translating technologies to end users—academic-industrial partnership grants. San Antonio, TX: AAPM, 2019.
4. Fund NIOH-OoSC-TC. Common Fund Journal Editors’ Workshops - Executive Summary. 2019.
5. Strategy NIOH-OoDS. NIH Strategic Plan for Data Science. 2018.
6. American College of Radiology Launches ACR AI-LAB™ to Engage Radiologists in AI Model Development 2019.
7. Valindria VV, Lavdas I, Bai W, et al. Domain Adaptation for MRI Organ Segmentation using Reverse Classification Accuracy. *arXiv e-prints* 2018.
8. Coombs L Independent validation of AI algorithms: centralized and distributed solutions In: 2019 Data science summit: data access in health-care - implications for the artificial intelligence Ecosystem. Denver, CO; 2019.
9. Roseland ME, Kazerooni EA, et al. Needs assessment using a structured prioritization schema: an open letter to PACS vendors. *J Am Coll Radiol* 2019; 16:170–177. [PubMed: 30219343]
10. Fedorov A, Clunie D, Ulrich E, et al. DICOM for quantitative imaging bio-marker development: a standards based approach to sharing clinical data and structured PET/CT analysis results in head and neck cancer research. *PeerJ* 2016; 4:e2057–e. [PubMed: 27257542]
11. Harder B 2019–20 best hospitals honor roll and medical specialties rankings. *US News & World Report*, 2019.