Artificial intelligence- The robo radiologists

Aishwarya Kulkarni¹, Karan Shah², Ajay Bhoosreddy³

¹³Department of Oral Medicine and Radiology, Mahatma Gandhi Vidya Mandir’s Karmaveer Bhausaheb Hiray Dental College and Hospital, Nasik, Maharashtra, India.

Commentary: Artificial Intelligence (AI) is a branch of computer science dedicated to the development of computer algorithms to accomplish tasks traditionally associated with human intelligence, such as the ability to learn and solve problems which includes machine learning – detection of normal from abnormal by hand labelled images by a method which predicts unknown reliance between input and output variables. When such reliance is observed, it can estimate the future output by recognizing the aimed function that best describes the behaviour governing the input-output patterns, representation learning – classification of data without hand labelled images, deep learning – subset of representation learning, it is normal representation of specific image by large number of normal exams¹³.

AI programs include:

1. **Clinical decision support system** - are designed to support and assisting clinicians in their everyday tasks that rely on the analysis of facts and knowledge. Currently, this is done by interactive user interface with voice control commands that assist the clinician and health care professionals to work efficiently by saving time and cost in dental practice to both patients and dentists³⁴.

2. **Artificial neural networks** - Image analysis inspired by the biological nervous system. It is a algorithm made of large number of connected functioning nodal points that process data by their automated human brain like response to external inputs.

3. **Fuzzy logic** – permits ambiguity and analysis of shades of black and white.

4. **Evolutionary computation** - optimisation algorithms based on natural biological evolution.

5. **Hybrid intelligent system** – rapidly adapting to changing environments¹³⁵.

The applications are multifarious in Maxillofacial Radiology: it reduces interobserver variability and provides an open-ended automated interpretation of radiographs. Hybrid intelligent system, evolutionary computation, etc. helps in determining the infinite no of deviations from usual appearances of structures that may have gone unnoticed by human eyes in almost all radiography procedures thus is a valuable help in incidental findings, detecting exact position of minor apical foramen, working length determination in RCT procedures, not so clear vertical root fractures. Logicon Caries Detector is helpful in identification and characterizing of proximal caries. Neural networks help in age estimation, dental biometrics using meta heuristic algorithms, optimization of CAD/CAM, virtual reality system, bio printing of tissues, intra-oral scanners, cameras, 3D orthodontic evaluation and monitoring, hard and soft tissue tracing, customized aligners. Deep learning helps in early detection of periodontal changes, bone loss, peri-implantitis and changes in bone density via radiographs, radiomics, dose optimization, development of imaging bio banks are achieved using CDSS (clinical decision support system)¹³⁵⁴.

The current limitations include huge data preparation, electronic record is mandate in which safety is issue, training of radiologist, algorithms may not adapt to new machines and imaging software, artefacts may cause faulty interpretation, etc¹⁵. So will AI replace radiologists? the simple answer is: NO. It demands more research and trials for such assumption. AI is a brainchild of humans, to be used as adjunct. But, radiologists’ lives are going to certainly change in this generation of artificial intelligence.

Take home message: Artificial Intelligence assists radiologists in decision making and eases the radiologist’s job rather than taking it away.
Corresponding Author:
Aishwarya Kulkarni,
Department of Oral Medicine and Radiology,
Mahatma Gandhi Vidya Mandir's Karmaveer Bhausaheb Hiray Dental College and Hospital,
Nasik, Maharashtra, India.
Email id: kaishwarya911@gmail.com

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References