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Editorial

Am I or AI Writing This? Welcoming Dentronics in Dentistry!

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Newer Technologies had always uplifted the field of Medical and Dental Sciences and has never failed to create a healthy research forum and exchange of cross fertilization of ideas among academicians, clinical practitioners and research scholars. Machine learning (ML) have played a significant role over the years in every aspect of the STEM, i.e., science, technology, engineering and medicine. A best recent example which went viral in social media would be the India's first AI generated super model woman conveying Vijayadashami 2023 wishes in Indian traditional cultural form.

Introduction to AI

Artificial intelligence (AI), the term was first coined by John McCarthy and is defined as "a field of science and engineering concerned with the computational understanding of what is commonly called intelligent behaviour, and with the creation of artefacts that exhibit such behaviour". AI is not a new term; the concept of AI can be dated back to 1950. The basic structure of AI is Machine learning depending on sets of data and algorithms without requiring a human intervention and the Deep learning, also known as convolutional neural network (CNN) to analyse the input data. AI is blooming and expanding rapidly in all sectors, its subsets being incorporated into several aspects of Dentistry [1,2].

Chat GPT

Chat generative pre-trained transformer (ChatGPT) is an AI-based computer program, a language model based on the GPT-3.5 which uses a chatbot that has been trained on enormous amounts of data to produce responses to user prompts that are human like to improve the computational linguistics, communication competence, and responsiveness of these bots. Chat GPT is effectively proving to provide multiple services in the field of education, medical and dental [3].

AI and Chat GPT blooming in dentistry

The advancements in AI technology have opened up a wide arena in health care particularly in Dentistry. The next decade will determine whether AI and its applications are a Hype, Hope or a Harm! It is quite certain that more dental research platforms will indulge to explore on AI to deliver it affordably with more precision, fewer errors and holistically beneficial to patients, healthcare providers and society as a whole. Worldwide research papers in dentistry are already focussing more on digital automation and specialized AI with robots to improve reliability, reproducibility, accuracy, and efficiency in dentistry comprehending on disease pathogenesis, diagnosis prediction and risk assessment strategies aiming ultimately to improve tailored treatment outcomes [3].

From a dental perspective, applications of AI can be classified into diagnosis, disease pathogenesis, decision-making, treatment planning, prediction of treatment outcomes and risk assessment strategies.

AI powered paediatrics and preventive dentistry

AI is being widely researched in paediatric dentistry to classify submerged deciduous tooth, to diagnose rare pathologies, to study accuracy in deep dental caries, in pulpitis and periapical pathologies, adenoid hypertrophy, cervical vertebral maturation, including a newer classification of mesiodense in primary and mixed dentition, detection of dental plaque on primary tooth, to diagnose early childhood caries using salivary biomarkers and also in other vast areas to provide personalized preventive care plans for children's oral health and hence AI is proving to be an effective tool for paediatric dentists, allowing them to diagnose and treat more quickly, accurately and cost effectively [4].

AI powered operative endodontics

AI can detect tooth decay, aid in excavation methods of caries, evaluate root caries, predict viability of dental pulp stem cells, prognosis of re treatment procedures and also estimate the working length determination in restorative dentistry.

AI powered orthodontics

The neural network in AI is also applicable in orthodontics to diagnose and plan tailored made treatment, assess growth and development using CBCT for alignment, location of tooth and assessing bone quality, and also in treatment results and outcomes during the follow-up phase.

AI powered oral surgical care

Application of AI in major surgical procedures like orthognathic surgery, segmentation of condyle and glenoid fossa, cleft procedures and rhinoplasty are already blooming.

AI powered prosthodontics

AI has also kept its imprints on Digital impressions, Implant designing and implant success. Utility of AI has also emerged in robotic implant placements and an advanced classification in prosthodontics.

AI powered periodontics

AI algorithms have proven beneficial in gingival and periodontal diseases in terms of image assisted diagnosis, staging, grading, assessment, prediction of periodontal prognosis in association with

systemic illnesses and robotic guided implant placements.

AI powered oral medicine and radiology

Oral Medicine speciality deals with numerous diagnoses at the maxillofacial region. Many a times, the speciality on its own is a challenge as "Diagnosis is always an Art". AI has proven beneficial in classifying, diagnosing and in predicting the prognosis of potentially malignant lesions, conditions and oral cancer. Extensive research on machine learning is being done for identification of head and neck malignancies. AI has also marked its presence in detecting osteoporotic changes in Temporomandibular joint disorders. The machine learning algorithms have tremendously explored the salivary gland pathologies in terms of diagnosing syndromes, prediction of recurrences of malignancies and facial nerve injury during surgical procedures [5]. In Dental radiology, Cone beam computed technology (CBCT) has nearly replaced the need of a man guidance to diagnose.

AI powered oral pathology and public health

The main limitation for an oral pathologist in image interpretation is the inter and intra observer variations due to combination of architectural changes and the appearance of specific histological features. AI is built up to address such issues of inconsistency in interpretations. AI is researched extensively in oral pathology to classify histopathological grading of oral premalignant conditions, identifying keratin pearls from in situ, computer aided tongue cancer detecting systems and also to study prognosis and relapse of malignancies. Literature studies also report an oral malignancy index, which can help clinicians to objectively detect benign and malignant lesion by just one number. Recent fascinating research projects which I came across includes a Mobile Mouth Screening Anywhere (MeMoSA) app, which is used to capture images of the oral cavity for remote interpretation by specialists, undertaken at UK and Malaysia and a study titled 'AI assisted screening of potentially malignant disorders' commissioned by INAI- an applied AI research centre run by Intel, Telangana Government, Public health foundation of India and IIIT-H- International Institute of Information Technology, Hyderabad. Both the studies work on cost effective smart phone models using mobile camera lights for early identification of suspicious lesions during community outreach programs for early cancer detection [2].

AI powered academics and research

AI based applications have transformed virtual learning platforms for the benefit of dental educators. ChatGPT has both advantages and disadvantages in terms of virtual learning, though it serves mutual benefit for teachers and students, it can also automatically generate answers for assignments leading to academic dishonesty and ethical concerns. The threat part should not be focussed more as the benefits are numerous. Chat GPT provides instant updates on new publications, feedbacks and also provide additional source of research information.

AI powered clinical practice

Chat GPT have tremendous role in private clinical practice as the entire clerical work becomes easier to a nut shell from regular reminders, patient education, appointment scheduling, billing, diagnosis, treatment planning, follow up monitoring and daily check ins.

Limitations with AI

Currently AI powered systems carry inherent issues with accuracy, reliability, applicability, expertise, dependability, usability, ethical concerns, cost and regulatory issues before implementing into clinical practice. Chat GPT raises concerns on confidentiality of patient, as it contains personal information across the globe. It cannot provide emotional and psychological support to counsel patients as it does not have the humane characteristics of empathy, compassion and sympathy. Many authors have documented flawed data with Chat GPT when it comes to research. Open AI also acknowledges that Chat GPT may write answers which might sound reasonable but are incorrect and nonsensical. The greatest challenge what I feel personally is in Academics, as we will find difficulty in identifying whether the published article is written by AI or a Humane!

Future challenges

Advanced language models, such as ChatGPT, have immense potential to enhance clinical applications and research in dentistry. Their judicious utilization can bring about a revolution in dental diagnosis and treatment planning. Chat GPT aids as a value-added supplementation and not merely an entire replacement for in-person care. Definitely it will be put into use as an evidence-based protocol, but it will be a double-edged sword, as no technologies can ever replace a human touch specially in health sciences. We can expect more policies to combat machine hazards concerning ethical issues. Also, that no health care professional should be afraid of losing his/her position due to these tech advancements in their fields, and let us go with the process flow and strive to be best equipped to interpret findings and create new research ideas aiming to improve the overall quality of life patients.

Lastly, I have written this and not AI, by welcoming Dentronics in Dentistry!

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