

ORTHO AI : The Dawn Of A New Era: Artificial Intelligence In Orthopaedics

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OrthoAI is the new buzz word in Orthopaedics. It was launched on 11th Dec 2023 at the hands of Dr Raghunath Mashelkar. It was an amazing event structured around the World's First AI Focussed on Orthopaedics. Artificial Intelligence revolution began in Nov 2022 with advent of Chat GPT 3.5 on the AI landscape. Since then the advancements in Artificial Intelligence (AI) have started to change the landscape of various industries, and orthopaedics is no exception. Based on our observations and research, we firmly believe AI will redefine the landscape of orthopaedics in the near future specially in fields mentioned below but not restricted to it. With OrthoAI as first step we have created the foundation on which we can build on. We would be working in this field and follow it as it unfolds and present our insights from time to time.

OrthoAI: A Generative AI Revolution in Orthopaedics

As said OrthoAI is the foundation of the AI Revolution in Orthopaedics, and we would like to share some more insights about it. OrthoAI primary is a Generative AI like chat GPT. You can even call it OrthoGPT (Ortho Generative Pre-trained Transformer), a type of artificial intelligence model designed for

understanding and generating human-like text. OrthoAI, akin to a specialized version of Chat GPT, or 'OrthoGPT', stands on three foundational pillars:

1. The OrthoAI Database: The essence of OrthoAI lies in its meticulously curated vector database, developed over nine months by a team of expert orthopaedic surgeons. This database is the cornerstone of OrthoAI's reliability and validation.

2. PubMed Access: OrthoAI's integration with PubMed enriches its evidence base, ensuring that its responses are grounded in the latest orthopaedic literature.

3. OrthoTV Access: With over eleven thousand orthopaedic videos, OrthoTV provides a wealth of expert knowledge and experiences. OrthoAI's access to this repository allows it to offer comprehensive answers, supplemented with relevant article links and video content

Before we explore the far-reaching applications of OrthoAI, it's crucial to gain an understanding of what AI is and its main types. At its core, AI involves creating computer systems that mimic human intelligence, enabling them to perform tasks that usually require human intellect.

Before delving into OrthoAI's

applications, it's vital to understand AI's core components:

- Machine Learning (ML) is a subset of AI that allows computers to learn and improve from experience without being explicitly programmed. In simpler terms, it's like teaching a child to identify objects. Over time, the child learns to recognize and distinguish objects on their own, much like ML algorithms learn from data and improve over time. OrthoAI is primed with Machine Learning

- Deep Learning (DL) is a more complex subset of ML that mimics the neural networks of our brain. DL involves feeding a computer system a vast amount of data, which it uses to make decisions. For example, DL can help computers identify diseases by analyzing thousands of radiographs or MRI Scans. This ability to process and analyse a significant amount of data makes DL particularly valuable for OrthoAI.

- Natural Language Processing (NLP) is another critical aspect of AI that focuses on the interaction between computers and humans using natural language. NLP can read and understand human language, enabling it to extract essential information from clinical notes or respond to patient queries in real-time. OrthoAI has NLP built in and will continue to learn from all its interactions. The rise of NLP and Large language models in last few months has infused new life in the AI arena and has piked the interest in these models.

We believe AI will primarily impact in following Five areas of Orthopaedics

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OrthoAI & Clinical Decision Making

OrthoAI as discussed above is built on a validated database, along with PubMed and OrthoTV access. This makes the answers most relevant and trustworthy. With a synthesised answer from all sources, it will be source of having a huge thinking knowledge bank at your fingertips. It will act as CO-PILOT or as EBM Assistant to Orthopaedic Surgeons, helping them in tricky situations. The queries can vary from clinical, academic, case based, surgical steps, drug interactions, rehabilitation, complications, and surgical planning too. This is the version 1, and more things would be added in coming versions

AI and Orthopaedic Imaging

One of the most promising applications of AI in orthopaedics is in imaging. We rely heavily on imaging for diagnosis and treatment planning. AI can help streamline this process. ML algorithms, with their ability to identify patterns, can analyse and interpret imaging data from radiographs, MRIs, CT scans, etc. These algorithms can diagnose conditions like fractures, disc herniations and osteoarthritis with a level of accuracy comparable to experienced radiologists, saving significant diagnostic time. We believe radiologist are already using such algorithms and DL models, but it will soon extrapolate into a more common use by orthopaedic surgeons too

AI in Surgical Planning and Execution

The influence of AI will also transform surgical planning and execution. Patient specific planning and preoperative

templating can be easily done by AI. AI's influence isn't confined to diagnostics—it's also transforming surgical planning and execution. Additionally, AI can help surgeons place implants accurately during orthopaedic procedures, thus reducing complications and improving patient outcomes. With large data available from the rise of robotic surgeries in last decade, will help in training these models and soon a combination of robotic AI will be available to help us. OrthoAI is currently being worked as a platform for surgical planning too

AI in Prosthetics and Rehabilitation

Customised prosthetic development and suggesting innovative strategies in prosthetics that mimic natural movements will be achieved through advanced machine learning algorithms. Furthermore, AI-based rehabilitation programs will offer personalized therapy plans and monitor patient progress in real-time, ensuring a more efficient recovery process. Customisation & utilisation of smart devices in this area will increase.

AI in Predictive Analytics

Predictive analytics is another area where AI is showing tremendous potential. AI algorithms can analyse vast amounts of patient data to identify risk factors and predict disease progression. This information allows orthopaedic professionals to intervene early, potentially preventing the development of severe conditions and improving patient care. The algorithmic nature of these analysis make it most suitable to be plugged in into OrthoAI. A separate team

is working on adding this unique feature to OrthoAI and we are sure that this will come as an update soon.

Ethical Considerations and Challenges

Like any technology even AI has its limitations. The issues of hallucinations of AI and providing wrong information are not uncommonly reported. This is the reason why we started with creating a validated database for OrthoAI and also limit its access to all unnecessary information. The integration of AI into orthopaedics will not be without challenges but we have created a foundation for it. AI will also raise critical ethical considerations concerning data privacy, informed consent, and accountability in the event of AI errors. Additionally, we need to develop a standardized set of regulations for using AI in healthcare to ensure its ethical and safe application.

Conclusion

OrthoAI is launched at the threshold of a new era in orthopaedics, bringing significant improvements in diagnosis, treatment planning, surgical execution, prosthetics, rehabilitation, and predictive analytics. As we start to incorporate AI more comprehensively into our practice, we need to conscientiously navigate the ethical and legal challenges it presents. Our enthusiasm as technologically inclined orthopaedic surgeons drives us to harness OrthoAI's full potential, ushering in an era of precision, efficiency, and patient-centric care in orthopaedics..

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