Future of Healthcare and Artificial Intelligence (AI):

Practical Insights and Diverse Perspectives on AI in Healthcare Project Management [1]

AI for Healthcare and Academia[2]

Dr. Deepa Bhide, MBBS, DCH, PMP

Introduction

The intersection of artificial intelligence (AI) and healthcare is a rapidly evolving field with immense potential to revolutionize patient care, disease diagnosis, and treatment outcomes. However, the successful implementation of AI in healthcare requires meticulous planning, coordination, and risk management, making project management a critical component. With their expertise in AI research, education, and healthcare, academic institutions play a pivotal role in shaping the future of AI project management in this domain.

Professors and researchers in academic settings are instrumental in developing innovative AI algorithms, exploring their applications in healthcare, and understanding the ethical implications of their use. They also contribute to the development of project management frameworks and methodologies specifically tailored to the unique challenges and opportunities presented by AI in healthcare. By providing a strong foundation of knowledge, research, and education, academia ensures that future generations of healthcare professionals and AI experts are equipped to manage AI projects in this critical field effectively.

The Academia – About Knowledge and Learning

Excerpts of interviews with the following experts:

Neil Gogte BE (ECE) Osmania University MTech (CS) IIT Mumbai
Founder Director of KMIT group of institutions.

[1] Editor's note: This series is by Dr. Deepa Bhide, a practicing pediatrician with additional experience in information technology and project management. Her 2023 series of articles introduced readers to a range of important issues related to programs, projects and PM in healthcare. In this new series, Dr. Bhide will interview experienced healthcare, IT and project professionals around the world to reflect on the impact of artificial intelligence on global healthcare. Learn more about Dr. Bhide in her author profile at the end of this article. To read previous works by Dr. Bhide, visit https://pmworldlibrary.net/authors/dr-deepa-bhide/

[2] How to cite this work: Bhide, D. (2024). AI for Healthcare and Academia, Future of Healthcare and Artificial Intelligence (AI): Practical Insights and Diverse Perspectives on AI in Healthcare Project Management; *PM World Journal*. Vol. XIII, Issue X, October/November.

Dr. Rajasekaran Subramanian, Associate Professor, R & D, ImagingAI Lab, Keshav Memorial Institute of Technology (KMIT), Hyderabad, India

Dr. Devika Rubi, Associate Professor, R & D, Imaging AI Lab, KMIT

A few academic experts interviewed wished to contribute anonymously.

The Interviews

How has your institution integrated AI into the healthcare curriculum? What specific courses or programs do you offer?

Many educational institutions globally have recognized the importance of AI in healthcare and have incorporated it into their programs through dedicated AI in Healthcare courses, which provide in-depth knowledge of AI algorithms, techniques, and applications in the healthcare field.

Academia has initiated incorporating AI concepts into traditional medical courses, such as pathology, radiology, or pharmacology, to demonstrate their relevance and potential benefits. This is nascent, with experts from medical institutions and AI technology deciphering the best way to execute this.

Students in premier educational institutions participate in research projects or internships focused on AI in healthcare, gaining practical experience and contributing to the field's advancement. Industry and corporates are at the forefront of creating opportunities such as hackathons for the students to gain practical experience with the problem statements and benefit from them.

“Keshav Memorial Institute of Technology (KMIT) is a premier computer science and engineering institution in Hyderabad, India. KMIT provides a project-based learning system through the Project School (PS) program for three semesters of the B.Tech curriculum. PS contains a list of AI/LLM/NLP industry application projects driven by problem statements of different domains such as healthcare, defense, remote sensing, AR/VR, Cybersecurity, and IoT. Students need to execute the project and implement the relevant applications in the respective PS Lab by exploring the domain and technology knowledge with the help of PS mentors and domain experts.

We have embedded domain programs that regularly provide classes and hands-on sessions on the technologies needed to implement various AI techniques, such as ML, DL, and LLM models.” – Dr. Raja.

What specific AI techniques or tools do you teach in your AI in healthcare courses?

Our objective is to equip students with the necessary skills to tackle complex healthcare problems and adapt to the evolving landscape of AI applications. The healthcare domain

provides opportunities for technology to impact a patient's life directly and, hence, the population. This is a domain where the rubber meets the road.

Machine learning algorithms (e.g., supervised, unsupervised, reinforcement learning), deep learning architectures (e.g., neural networks, convolutional neural networks), Natural Language Processing (NLP) techniques, data mining, and visualization tools are a few common examples of what we incorporate in our teaching programs. There are further detailed courses that deep dive into each of these concepts.

How does your institution collaborate with healthcare industry partners to ensure curriculum relevance and student exposure to real-world challenges?

"KMIT Healthcare Research Professors who act as PS mentors are always having interdisciplinary collaboration with Doctors, Radiologist, Pathologist, Microbiologist, Hospitals, and diagnostic labs such as Tapadia Diagnostic Centre, Basavatarakam Indo-American hospital, etc, to get domain knowledge and real data and to verify AI predicted results. We are implementing a Computer Aided Diagnostic System (CADD) for Metastatic Breast Cancer that encompasses Radiological Screening, Histological Grading, and Hormone Receptor Sub-Typing using digitized images of Radiology and Pathology". Dr. Raja and Dr. Devika elaborated." – Dr. Devika.

"We partner with healthcare academic institutes and research centers. That's a win for us, and we benefit from the partnership by developing new concept ideas and morphing them into new products." - anonymous.

Could you elaborate on some of the most impactful healthcare AI projects undertaken by your students? What were the key challenges and successes?

The sky is the limit for use cases possible as a blend of AI technology and healthcare. The primary areas considered are those that make early diagnosis and, hence, early therapeutic intervention possible. Dr. Raja from KMIT cited the following examples.

- Mobile-based transformers for multi-organ segmentation and cardiac segmentation on CT images
- Mobile-based generation of visual semantic labels and segmentation of lungs on CT images
- Web-based medical transformer for automatic Tuberculosis chest x-ray diagnosis and reporting
- Web-based clinical decision support tool for therapeutic breast cancer biomarker detection and analysis
- Web-based virtual reality for cancer cell segmentation

A few courses to be considered and are in the initial stages are

- AI for drug discovery and development, such as utilizing AI to accelerate the discovery of new drugs and optimize existing ones.

- Exploring the development and application of AI-driven devices for diagnosis, treatment, and monitoring.

A few challenges encountered by academia are as follows:

- Balancing theoretical knowledge with practical applications.
- Ensure ethical considerations are integrated into AI education. Experts believe this forms the DNA of gaining the trust of healthcare professionals.
- Keeping up with the rapid pace of advancements in AI.
- Access to adequate resources and infrastructure for AI education. As highlighted by the experts, the availability of datasets from the specific cohort (e.g., from one particular country, such as India, for Indian set-ups) and the availability of high-computing resources (e.g., GPU, Storage) are key challenges that must be considered.

A few opportunities for this sector are as follows

- Preparing students for a future where AI is crucial in healthcare.
- Enhancing problem-solving and critical thinking skills.
- Fostering innovation and entrepreneurship in healthcare.

How do you ensure faculty members have the expertise to teach AI concepts effectively? What professional development opportunities are provided?

Ensuring faculty members have the necessary expertise to teach AI concepts effectively involves targeted recruitment, such as seeking out faculty candidates with strong AI backgrounds and a passion for healthcare applications and considering interdisciplinary hiring from various fields, such as computer science, engineering, and medicine, to bring diverse perspectives and expertise.

Along with the appropriate hiring, providing professional development through workshops, conferences, and seminars focused on AI and its applications in healthcare, online courses, certifications, sabbaticals, and research grants are required.

Institutions also look at mentorship and collaboration with AI experts from other institutions or industry partners.

As a part of monitoring, there are stringent faculty evaluations via peer review and student evaluations for effective teaching performance.

“Our faculty includes research professors with research experience in the healthcare domain who produce high-quality publications in reputed journals and healthcare professionals. KMIT R&D provides opportunities for the professional development of research professors by forming ties with healthcare professionals, laboratories, premier hospitals, and more who encourage industry-relevant short-term course attendance and seed funding.” – KMIT experts

How is project management integrated into your AI curriculum? What methodologies do students employ (Agile, Waterfall, Hybrid)?

Many universities and institutions integrate project management into their AI curricula to equip students with the skills to manage complex AI projects. This integration can occur as dedicated project management courses focusing on principles, methodologies, and tools or project management concepts incorporated into existing AI courses, allowing students to apply their knowledge to real-world scenarios. Students may work on capstone projects that require them to use AI techniques and manage the entire project lifecycle, and this has been a good way of blending project management and AI learning. Academic institute's weightage on project management is felt as a wanting need, and initiatives such as Project Management Institutes are working with many academics to fulfill this need.

“As this institution is an undergraduate training institution, no formal Project Management course is defined by the university or in the curriculum. However, within our PS program, PS mentors ensure and teach the students to employ an agile project management model to execute their projects. The agile model facilitates the proper implementation of the project while students continue toward academic fulfillment.” – KMIT professors mentioned.

How do you instill ethical considerations into AI projects? What measures are in place to address biases and privacy concerns?

“Before initiating any healthcare-related project, the respective healthcare organizations, such as diagnostic centers, hospitals, and so on, conduct an internal ethical review meeting. Subsequently, they share their review meeting document and ethical bindings with us. Only after reviewing these documents do we agree and sign them; thereon, we start receiving their data. Most of our data analytics projects do not require any PII data, and being imaging projects, they hide PII data.” – Dr. Raja and Dr. Devika mentioned.

How do you foster engineering, healthcare, and business student collaboration in AI projects?

“KMIT Healthcare Research Professors are Computer Science Engineering educated and work with mentors to collaborate with doctors, radiologists, pathologists, microbiologists, hospitals, and diagnostic labs such as Tapadia Diagnostic Centre, Basavatarakam Indo-American hospitals, etc., to gain domain knowledge, data, and verify AI-predicted results. As and when the need arises, research professors undergo industry-relevant short-term courses.” – Dr. Devika.

What specific skills and competencies do you aim to develop in students for successful AI project management roles? What critical AI skill sets are most sought by healthcare employers according to your industry interactions?

Institutions believe technical skills such solid understanding of AI algorithms, techniques, and applications, proficiency in data collection, cleaning, and preparation, expertise in

programming languages commonly used in AI, such as Python or R, and familiarity with AI development tools and frameworks are needed along with Project Management Skills such as the ability to define project goals, create timelines, and allocate resources effectively, identifying and mitigating potential risks and challenges, ability to lead and motivate project teams, effective communication skills to interact with stakeholders, team members, and clients and most importantly the ability to identify and solve problems that arise during the project lifecycle.

A basic understanding of medical concepts, regulations, ethical considerations, and business acumen is essential.

“As the students are in the early stages of their industry careers, they need to be trained initially on the foundational stages of project management, such as requirement management and SDLC cycles.

From our research and born out of our industry collaboration, Machine Learning, Deep Learning, various Deep Learning Models, and tools used to develop these AI models, such as TensorFlow, Keras, PyTorch, MONAI, VIt (Vision Transformer), and PubMedQA, are a few critical AI skill sets most sought after by healthcare employers. As an academic institute of repute, we train our students to meet the healthcare industry's needs”. – Dr. Devika mentioned.

What are the primary challenges and opportunities you foresee for AI in healthcare in the next five years? How is your institution preparing students to address these?

“The availability of a dataset specific to the Indian population and the high computational power (GPU, Storage) are some limitations that we see. We have started to build Indian-specific data repositories like Breast Cancer Pathology/WSI Dataset, Mammo Images, TB Sputum Smear Dataset, and for automatic reports generation using LLM. Also, the institution has procured an NVidia A-100 DGX system with 128 GB GPU and a dedicated storage server with 154 TB storage.

Students are also exploring cloud-based GPU-shared instances for temporary project uses.” – Dr Raja mentioned.

“I think the students need to be exposed to practical situations in healthcare to absorb the complexities and make their inferences. Theoretical knowledge or “gyan” is of little significance. We encourage our students to collaborate on the real-world scenarios that they would have experienced in their day-to-day “healthcare” life.” Every problem is an opportunity for exploration and solution,” – Neil quipped.

Conclusion

Academia plays a pivotal role in shaping the future of AI in healthcare and project management. Academic institutions are nurturing a new generation of AI experts equipped to address this rapidly evolving field's complex challenges and opportunities by providing rigorous training programs and fostering collaborative research initiatives. As

AI revolutionizes healthcare delivery and project management, academia's commitment to fostering ethical, responsible, and innovative AI development is more crucial than ever.

Key Takeaways

1. Academia is a cornerstone of AI in healthcare and project management to provide the intellectual and infrastructural resources necessary for research, education, and innovation.
2. Well-designed AI in healthcare and project management training programs equip students with the technical skills, domain knowledge, and ethical understanding needed to excel in these roles.
3. Partnerships between academic institutions, healthcare organizations, and industry are essential to ensure AI research and development are aligned with real-world needs.
4. Academia is vital in addressing ethical challenges associated with AI in these fields, such as patient privacy, bias, and accountability.
5. Continuous learning and adaptation are essential to staying ahead of advancements. Offering up-to-date curricula and fostering a culture of lifelong learning are ways to do this.

Photo: Dr. Bhide with the KMIT professors Dr. Raja and Dr. Devika

A few excerpts of my conversation with a few energetic KMIT AI laboratory students.

What excites you in this research field?

- *"I am excited to learn about new concepts combining tech in healthcare and technology applications that are life-saving."*
- *"I feel AI is a mystery, and we are detectives. I enjoy working with the neural networks, understanding the human brain, and what constitutes our brain!"*

What are a few challenges that you notice in your work?

- *"I think data-related challenges are great. Lack of the required data sets (specific to a cohort), gathering of data, maintaining data privacy, need for the computational power for healthcare data, and similar. We are overcoming these challenges steadily".*
- *"I think choosing the appropriate model, determining and maintaining model accuracy, and gaining the trust of healthcare professionals is key. Gaining the required subject matter knowledge is important. They are our end-users, and any technology needs to work towards enabling them".*

What do you think is the way forward for you?

- *"I think I would like my work to be a helping hand for doctors, not replacing them. I want to bring speed and efficiency to their work, especially early disease detection, just like we do for breast cancer detection in our lab."*
- *I am interested in working in AI for drug development. Using multiple parallel and multi-factorial simulations for drug development, we can simulate the virus behavior and then show how the drugs can be developed. Interestingly, the COVID-19 vaccine Covaxin was developed using technology in 18 months versus 8 years. I am interested in working in the clinical research areas."*
- *"I feel that the AI can simulate super-specialists to train the new doctors and medical students, especially in rural areas where specialists are scarce."*

Why did you choose this AI project?

- *"This is currently a favorite topic for the industry, and I wanted to explore the potential of this technology in healthcare. I recently lost a close relative from dementia, and that intrigued me to find out more about the disease and how we can detect this early and save lives or make life better for such patients. I am happy and proud I chose this field where I can impact the lives".*

What do you know of Project Management methodologies?

- *"We don't have a formal education in project management, and we are interested in knowing more. I believe the project is around understanding the problem statement, gathering resources, understanding the project architecture, selecting*

a technology model, dividing the work amongst team members, and finally merging the work to create a product. Am I correct in my understanding?"

Photo: Dr. Bhide with professors Dr. Raja and Dr. Devika and students of KMIT, R & D, ImagingAI Lab, Hyderabad, India

Disclaimer: The views and opinions expressed in this interview series are those of the speakers and do not necessarily reflect the views of any entities or associated parties. Proprietary names of AI applications have been avoided unless explicitly mentioned by the interviewees.

Acknowledgments: We sincerely thank Sunanda Gundavajhala, Director, DispatchTrack, India, and Gaurav Dhooper for their suggestions on the article.

About the Author

Dr. Deepa Bhide

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Dr. Deepa Bhide, MBBS, DCH, PMP, has over 20 years of professional experience where she has blended medical practice and research with IT and Project Management. She juggles consulting, training, and operations and is proficient in clinical medicine, project management, and healthcare information technology. Starting her career as a medical practitioner, she has worked with varied organizations before her current stint as Vice President, Training, Clinical Support Solutions for Inventurus Knowledge Solutions.

Deepa's growing interest and work in these areas, born from her day-to-day patient interactions, helped her view Project Management as a backbone of progressive healthcare. Her paper on "Patient Care - A Project Management Perspective" has received global recognition and acclaim. With a physician background as a solid foundation to leverage IT/PM skills and knowledge, Deepa has blended her broad-based experience and learnings to present a unified, holistic, and wholesome view of Project Management and Healthcare, a cross-domain confluence. Through various webinars, events, talks, and writings across platforms, Deepa has been an evangelist in championing global project management during the COVID-19 pandemic.

A Gold medalist from Osmania University for standing First in the MBBS course, she pursued her DCH in Pediatrics and Child health. Deepa has served various roles in local and global Project Management Institute (PMI) regions. She remains actively engaged with PMI and has been a participant and speaker for various national and global meetings and online events.

Deepa lives in Hyderabad, India, and loves traveling, singing, and experimenting with global cuisine. She can be contacted at deepa.bhide@gmail.com.