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# AI and ML applications in healthcare

## From the algorithm development sandbox to the clinical wilderness

Today, far too many articles and blog posts suggest that artificial intelligence (AI) and machine learning (ML) is some sort of magic pill that can easily be taken to ensure that all and any problems within healthcare will disappear overnight. However, change is difficult and often a slow process. It is not surprising to see today's AI and ML hype with great hopes and expectations surrounding it, but where actual implementations and deployments in clinical practice is more of a dream than a reality. One of the reasons to this is because of the divisive chasm between the controlled sandbox where algorithm development happens and the clinical wilderness where healthcare happens.

Moving from the algorithm development sandbox to the clinical wilderness is associated with several challenges:

1. Providing and demonstrating clinical value
2. Accessing relevant training data
3. Building user-friendly AI/ML applications
4. Deployment and integration with clinical workflows

### Providing and demonstrating clinical value

To develop algorithms that will be used in clinical care, the developers/researchers need to focus on problems that are of importance to the end users (the healthcare personnel), the management of the end users or the customers of the end users (the patients). For example, will the algorithm make the physicians more efficient or even more effective, or will it allow the physicians to provide care that was not earlier possible to provide?

### Accessing relevant training data

"Data is the new oil!" We have all heard this and it is especially true for ML where access to data is key when training new algorithms. Over the past decade a lot has happened in terms of open access and making even medical image data available. For instance, The Cancer Imaging Archive or Grand Challenges

in Biomedical Image Analysis are great sources for anyone looking for medical image data to train their algorithms. However, these sources can only get you so far as the data is often limited in number of samples and sources. Hence, to ensure robustness of any trained algorithm, it becomes important to establish access to additional data sources.

### Building user-friendly applications

An ill-designed user interface can render an excellent algorithm useless, whereas a well-designed user interface can turn a mediocre algorithm into a highly useful tool. Another aspect of this is that algorithms are not perfect. Hence, user friendly AI applications that ensure that failed predictions are easily spotted and handled are essential, especially in healthcare.

### Deployment and integration with clinical workflows

Healthcare IT is not what it used to be decades ago. Today's healthcare IT is a lot more standardized and with significantly more security routines in place, which is good, but which makes it difficult, especially for non-established entities, to deploy their new AI applications. What kind of HW and SW will the application run on? Will the application run on premise or in the cloud? How is access to protected health information handled? Who will have access to this information? These are just some of all the questions that will be asked by the healthcare IT team.

Once the questions related to the deployment have been handled and answered satisfactorily, there is still the challenge of integrating your AI application within an existing workflow. For example, switching workstations to access another application is most of the time out of the question, and even switching applications on the same workstation is frowned upon. Both aspects, deployment and integration, will be a lot easier to handle with an IT system in place capable of integrating 3rd party applications through standardized protocols and interfaces. ■



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