Chapter 8
Deep Learning Applications in Medical Imaging:
Artificial Intelligence, Machine Learning, and Deep Learning

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ABSTRACT

Machine learning is a technique of parsing data, learning from that data, and then applying what has been learned to make informed decisions. Deep learning is actually a subset of machine learning. It technically is machine learning and functions in the same way, but it has different capabilities. The main difference between deep and machine learning is, machine learning models become well progressively, but the model still needs some guidance. If a machine learning model returns an inaccurate prediction, then the programmer needs to fix that problem explicitly, but in the case of deep learning, the model does it by itself. Automatic car driving system is a good example of deep learning. On other hand, Artificial Intelligence is a different thing from machine learning and deep learning. Deep learning and machine learning both are the subsets of AI.

INTRODUCTION

Artificial Intelligence (AI) has gained significant attention in recent years, particularly in the context of improving health and well-being. Artificial Intelligence can help transform healthcare by improving diagnosis, treatment, and the delivery of patient care. Machine Learning (ML) is a subset of AI, and Deep Learning(DL) is a further subset of Machine Learning. Deep Learning is the process by which algorithms can learn to identify hierarchies within data that allow for truly complex understandings of data. Machine Learning for health care is a rapidly growing interdisciplinary field gaining interest in academia and practice. The purpose of this chapter was to perform quantitative and qualitative evaluations of the state of Artificial Intelligence, Machine Learning and Deep Learning for health research. As the field evolves, analyses can elucidate research trends, behaviors, and future opportunities.

A broad scientific discipline with its roots in philosophy, mathematics and computer science that aims to understand and develop systems that display properties of intelligence. A sub discipline of AI, where computers programs (algorithms) learn associations of predictive power from examples in data. Machine Learning is most simply the application of statistical models to data using computers. Machine Learning uses a broader set of statistical techniques than those typically used in medicine. Newer techniques such as Deep Learning are based on models with less assumption about the underlying data and are therefore able to handle more complex data. Trends in Machine Learning for health research indicate the importance of well-annotated, easily accessed data and the benefit from greater clinician involvement in the development of translational applications.

Deep Learning methods allow a machine to be fed with large quantities of raw data and to discover the representations necessary for detection or classification. Deep Learning methods rely on multiple layers of representation of the data with successive transformations that amplify aspects of the input that are important for discrimination and suppress irrelevant variations. Deep Learning may be supervised or unsupervised. Deep Learning methods have been responsible for many of the recent foundational advances in Machine Learning.

ARTIFICIAL INTELLIGENCE

Artificial Intelligence consists of two words Artificial and Intelligence, where Artificial defines "man-made" and Intelligence defines "thinking power," therefore AI means "man-made thinking power." Artificial Intelligence exists when a machine can have human-based skills such as learning, reasoning, and problem-solving. Holding an Artificial Intelligence is known to be a computer with the ability to

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