

Is Artificial Intelligence *viz* M and D Learning could be the Solution Promising Alternative to Animals: A Learning-based Toxicity Recitation?

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ABSTRACT

Similar to animal and human studies, the data show that when many animal models are extrapolated to humans, reliability is limited when it comes to predicting drug effects. This leads to an unbalanced waste of time and money and nightmares during drug development because the drug works well in animals or pre-clinical models and therefore fails in clinical studies or clinical trials, or *vice versa*. In this technique, machine and deep learning (M and D) is a subset of artificial intelligence. We hope this will eliminate the need for lengthy searches, reduce the number of animals sacrificed in the strategy, and reduce the cost and time required for testing. We recognize that full replacement of animals in toxicological or pre-clinical studies and tests remains a challenge - we acknowledge M and D learning-based animal toxicity prediction can be the key.

Keywords: Artificial intelligence, Animal toxicity, Alternative to animals, Machine and deep learning (M and D), Pre-clinical studies.

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INTRODUCTION

Deep learning is a type of machine learning, or M and D learning (machine and deep learning), which is part of artificial intelligence (AI). Machine learning (ML) is a feature of computers that think and act with less human intervention.^{1,2,8} Deep learning (DL) is learning to think about how structures are represented by the human brain.³

The use of animals in scientific experiments is a two-edged sword like metaplasia. This perspective has saved many lives and expanded our knowledge,⁴ but at the same time has brought great harm to the animals involved. Without animal testing, life-changing clinical innovations such as antibiotics, vaccines, and people with diabetes like Humulin are difficult to predict. The advent of GE (Genetic engineering) has taught humans to better model diseases⁵ and disorders such as Alzheimer's disease, Parkinson's disease, diabetes, and various types of cancer. This is important from the point of view of modern medicine and research, but in recent years many animals are used in laboratories every year in Asian countries. This fact is problematic and leads to further discussion of the ethical consequences of suffering in these animals, with many initiatives against animal experimentation and helping others. In addition to the complex ethical issues introduced, there are also concerns about the accuracy of the animal paradigm for mimicking what typical drugs can do in the human body^{6,8} especially when it comes to emulating animal toxicology.

This fact shows that the extrapolation of many animal models to humans has changed the confidence in predicting the effects of drugs. This demonstrates the waste of time, money, and disease need to find a cure because it works well in animal or pre-clinical models and then fails in clinical trials or *vice versa*. It is becoming increasingly difficult to ignore animal testing when testing the toxicity of new

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chemicals and drugs on animals. It bodes well if we accept the interpretation that there is a balance between our evolution and commitment to our planetary stewardship agenda. One answer is to use existing data using computer models, a field that has grown rapidly in recent years, including the perspectives^{3,6} of pharmacologists, neuroscientists, toxicologists, statisticians, biologists, mathematicians and engineers to view and make accurate predictions.

METHODS AND DISCUSSION

With major advances toward artificial intelligence (AI) and its applications in various fields, such as medicine and

medicinal chemistry, this animal model is changing with increasing potential. A new standalone study approach that demonstrates how a new drug or substance works in humans, using data from millions of known drugs or compounds, and the number of freely available databases continues to increase, particularly noticeable in living humans or the environment, has provided the resources.

However, it is a research or database investigation to identify potential similarities and drug candidates and to solve persistent real-world problems without first conducting pre-clinical or animal studies.³ The example is interesting of course, this model does not completely ignore animal requirements. Anti-OCD has been tested in such models before being used to treat OCD and depression, but we hope to get there one day. These explorative applications are simply the start, and with QC (Quantum computing) now creating waves with current breakthroughs and improved computational credentials.^{5,7} DL applications will evolve better and more useful, permitting us to drive away from a complex technique. With this technique, we expect to counteract the need for longer investigations and in the strategy, reduce the number of animals sacrificed, as well as the expenditure and the time needed for testing. The entire replacement of animals in toxicological investigation and testing remains a difficult assignment– we acknowledge M and D learning-based animal toxicity prediction can be the key.^{5,8,9}

CONCLUSION

Conclusively, the attributes that are directly pertinent to the result being predicted tend to drive the predictive interpretation insensitive to the choice of algorithm. Consequently, automatically extracting predictive markers from 'raw' data is the prominent theme of a unique set of approaches in a dynamic area of investigation, called DL. Instead of using hand-crafted features (as we did in the behavioral study using Elevated Plus Maze (EPM) or Marble-burying Behavior (MBB) or other behavioral identification problems), deep learning automatically discovers characteristics amenable for prognosis by recursively applying easy but nonlinear transformations to the data. We envisage that these approaches will become widely adopted by the animal toxicity cum pre-clinical, including behavior studies community, once packaged in

an uncomplicated-to-use state. We acknowledge that M and D learning will recreate a central position in translating data into scientific learning and evolve a useful complement to the pre-clinical analytical toolkit.

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