

Origin of Machine Learning (ML)

Zoologists and psychologists study learning in animals and humans. There are several parallels between animal and machine learning.

Certainly, many techniques in ML derived from the efforts of psychologists to make more precise their theories of animal and human learning through computational models.

It seems likely also that the concepts and techniques being explored by researchers in ML may illuminate certain aspects of biological learning.

As regards to machines, we might say, very broadly, that a machine learns whenever it changes its structure, program, or data in such a manner that its expected future performance improves.

Some of these changes, such as the addition of a record to a database, fall comfortably within the province of other disciplines and are not necessarily better understood for being called learning.

Machine learning usually refers to the changes in systems that perform tasks associated with artificial intelligence. Such tasks involve recognition, diagnosis, planning, robot control, prediction, etc.

Why should machines have to learn? Why not design machines to perform as desired in the first place?

There are several reasons why machine learning is important. Of course, as I have already mentioned that the achievement of learning in machines might help us understand how animals and humans learn.

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But there are important engineering reasons as well. Some of these are:

- Some tasks cannot be defined well except by example; that is, we might be able to specify input/output pairs but not a concise relationship between inputs and desired outputs.
- We would like machines to be able to adjust their internal structure to produce correct outputs for a large number of sample inputs and thus suitably constrain their input/output function to approximate the relationship implicit in the examples.
- It is possible that hidden among large piles of data are important relationships and correlations. Machine learning methods can often be used to extract these relationships (data mining).
- Human designers often produce machines that do not work as well as desired in the environments in which they are used. In fact, certain characteristics of the working environment might not be completely known at design time. Machine learning methods can be used for the on-the-job improvement of existing machine designs.
- The amount of knowledge available about certain tasks might be too large for explicit encoding by humans. Machines that learn this knowledge gradually might be able to capture more of it than humans would want to write down.
- Environments change over time. Machines that can adapt to a changing environment would reduce the need for constant redesign.
- New knowledge about tasks is constantly being discovered by humans. Vocabulary changes. There is a constant stream of new events in the world. Continuing redesign of AI systems to conform to new knowledge is impractical, but machine learning methods might be able to track much of it.