

The Zave-Jackson Validation Formula Explains the Instability of ML

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The ZJVF is

D, S I- R

DomainAssumptions and SpecificationOfSystem entails
Requirements

That is, the System is designed so that in an environment in which DomainAssumptions holds, an implementation that satisfies SpecificationOfSystem will make the Requirements hold.

So in ML,

the ML algorithm is specified by S,

the training data are specified by D, and

the resulting LM is specified by (D and S).

We hope it meets R.

Whether it does is an empirical question, because the correctness of D and R as models of the environment is empirical, not logical.

However the behavior of "D and S" is logical and is as discontinuous as is any discrete mathematical system.

So the slightest changes to either the learning data or the ML algorithm can result in LARGE (to the human's perception) changes in the behavior of LM in the environment.

It's hard to get a LM to behave repeatably in the human sense of the word, while it is repeatedly following its logic :-(.