

## Machine Learning and Logic: Fast and Slow Thinking



**Prof. Moshe Y. Vardi**

Rice University

<http://www.cs.rice.edu/~vardi>

### **Abstract**

Computer science seems to be undergoing a paradigm shift. Much of earlier research was conducted in the framework of well-understood formal models. In contrast, some of the hottest trends today shun formal models and rely on massive data sets and machine learning.

A canonical example of this change is the shift in AI from logic programming to deep learning. I will argue that the correct metaphor for this development is not paradigm shift, but paradigm expansion. Just as General Relativity augments Newtonian Mechanics, rather than replace it -- we went to the moon, after all, using Newtonian Mechanics -- data-driven computing augments model-driven computing. In the context of Artificial Intelligence, machine learning and logic correspond to the two modes of human thinking: fast thinking and slow thinking.

The challenge today is to integrate the model-driven and data-driven paradigms. I will describe one approach to such an integration -- making logic more quantitative.

### **Short Bio**

Moshe Y. Vardi is University Professor and the George Distinguished Service Professor in Computational Engineering at Rice University. He is the recipient of several awards, including the ACM SIGACT Goedel Prize, the ACM Kanellakis Award, the ACM SIGMOD Codd Award, the Knuth Prize, the IEEE Computer Society Goode Award, and the EATCS Distinguished Achievements Award. He is the author and co-author of over 700 papers, as well as two books. He is a Guggenheim Fellow as well as fellow of several societies, and a member of several academies, including the US National Academy of Engineering and National Academy of Science. He holds eight honorary doctorates. He is a Senior Editor of the Communications of the ACM, the premier publication in computing.