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# Model of Models (MOM)

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## Introduction

This short editorial is based on a draft of "Model of Models" [1] parts of which were contained within a recent paper [2].

Artificial Intelligence (AI) approaches to handling data in complex systems has greatly benefited from methods of Deep Learning (DL). Several decades ago, concerns developed that Neural Net AI approaches when they offered too little nformation to explain the "why" or "how" they worked to process data. This was considered to be very important to deal with future events, outliers, etc.

Unfortunately, these concerns have been overshadowed by the successes of DL. Especially if such systems may affect lives and Human concerns, that should not diminish their importance. Humans ultimately must be responsible for anything they build.

Model of Models (MOM) is an approach that addresses these concerns. For over thousands of years Humans have developed models of reality across many disciplines, including Physics, Biology, Mathematics, Economics, etc. These models are important to our understanding of reality.

### Use of deep learning

DL can be to process data for a given system, considered as a collection of models, ultimately delivering a robust MOM. DL (quantum) machines could process large databases, now considered as instances of models generated across disciplines, thereby finding the best MOM for a given system.

Note that this approach is quite orthogonal to the current push to develop machines to solve problems with intuition similar to Humans, starting with solving problems typically given to children. If such a process were applied to selecting the most important book ever written, the likely winner would be "Lord of the Flies"! This current approach clearly wants short-term projects that will deliver quick gains, at the expense of damaging losses to be suffered later. Note that is a reactive approach, instead of a proactive approach. For example, a machine may well duplicate "common sense" by algorithms not fathomable by Humans. Then, in an out-of-sample scenario, the machine could deliver horrible decisions. There is no audit trail back to models Humans use to understand the world.

## Background

A similar project was proposed as Ideas by Statistical Mechanics (ISM) [3-5]. Adaptive Simulated Annealing (ASA) [6-8] is an example of an algorithm suitable to fit parameters of generic nonlinear multivariate colored-noise Gaussian-Markovian short-time conditional probability distribution to data.

Models developed using ASA have been applied across many systems [9], including neural networks [10].

### Development process

ASA can be used as a first step in any new discipline using MOM to develop a range of parameters for DL, as DL used alone may get stuck in non-ideal local minima of an importance-sampled space. Once a range of models is found, DL can permit more accurate development of MOM.

## Bibliography

1. Ingber L. "Model of Models (MOM)". Report 2018: MOM. Lester Ingber Research (2018a).

2. Ingber L. "Quantum calcium-ion interactions with EEG". Science 1.7 (2018b): 1-21.

3. Ingber L. Ideas by statistical mechanics (ISM). Report 2006: ISM. Lester Ingber Research (2006).

4. Ingber L. "Ideas by Statistical Mechanics (ISM)". *Journal Integrated Systems Design and Process Science* 11 (2007): 31-54.

5. Ingber L. "AI and Ideas by Statistical Mechanics (ISM)". In: Encyclopedia of Artificial Intelligence, ed. J.R. Rabunal, J. Dorado & A.P. Pazos. Information Science Reference (2008): 58-64.

6. Ingber L. "Very fast simulated re-annealing". *Mathematical Computer Modelling* 12.8 (1989): 967-973.

7. Ingber L. "Adaptive Simulated Annealing (ASA)". Global optimization C-code. Caltech Alumni Association (1993a).

8. Ingber L. "Adaptive Simulated Annealing, In: Stochastic global optimization and its applications with fuzzy adaptive simulated annealing". ed. H.A. Oliveira, Jr., A. Petraglia, L. Ingber, M.A.S. Machado and M.R. Petraglia Springer (2012): 33-61.

9. Ingber L. "Simulated annealing: Practice versus theory". Mathematical Computer Modelling 18.11 (1993b): 29-57.

10. Atiya AF., *et al*. "A reinforcement learning method based on adaptive simulated annealing". In: Proceedings International Midwest Symposium on Circuits and Systems (MWCAS), IEEE CAS (2003).