Artificial Intelligence and Why We Are Still Smarter… Well, Some of Us?

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Abstract

Two main aspects are hindering Artificial Intelligence, AI, to perform as effective as the human brain.

A) The current AI-core is based on linearity
B) AI does not correctly handle statistics

While the first problem would require a complete exchange of the internal workings of the artificial neuronal networks (still feasible with a math fix), the second problem can be corrected by an incorporation of a dimensionally based (quantum gravity derived) statistical framework. In this paper we are considering only the effects of the latter problem.

Introduction

In variety of previous publications (e.g. [1 - 5]) we have worked out that every system can be described as an ensemble of properties (attributes, degrees of freedom and so on). We have also shown that this is the most general description for a system… any system. Consequently following this approach leads to non-linear field equations with respect to the inner workings of such system (which can be anything, an atom, a problem in game-theory, a market, a socio-economic space-time/society or even a whole universe). Current AI-systems simply cannot deal with this type of math as they are internally set up and programmed in a completely different, linear algebraic way. There are significant attempts to compensate for the corresponding error via artificially introduced (subsequent) non-linearity, either by a so-called Softmax operation or by simulated annealing. Both "corrections" are only treatments of symptoms and no cure. We have the cure in form of a metric neuronal framework [1 – 4, 6 - 13] and it has astounding properties compared to the linear math currently in use, but this shall not be the topic of this paper.

In addition to this problem, current AI faces a statistical problem due to its lack of a proper incorporation of the dimensional size of the system it analyzes [5]. Recent investigations of the scaling behavior of so-called Large Language Models or LLMs have shown an interesting dependency on the dimensions of the internal (information containing) manifold of the data set (see references given in [5]) and we have shown that the reason for this "line AI cannot cross" is caused by an incomplete mathematical (statistical) set-up within the training environment for the LLMs. In [14 - 17] we have shown how this statistical error needs to be corrected.

The Effect of a Wrong Statistic

We have shown in a rigorous derivation of the Dunning and Kruger effect [6, 7, 8, 18, 19, 20, 21] that the human brain applies two fundamental thought processes. One is more or less linear, while the other – the reflective one – is highly non-linear. Only with the two working together

things like the Dunning and Kruger effect [18, 19], innovation and creativity and Kahneman's System I and System II thought processes [22] can be mathematically explained.

While the effect of an imperfect (non-metrical and non-dimensional) statistic is small (see figure 1) in the case of the System I or linear thinking, it can dramatically increase in the reflective or system II mode (figure 2).

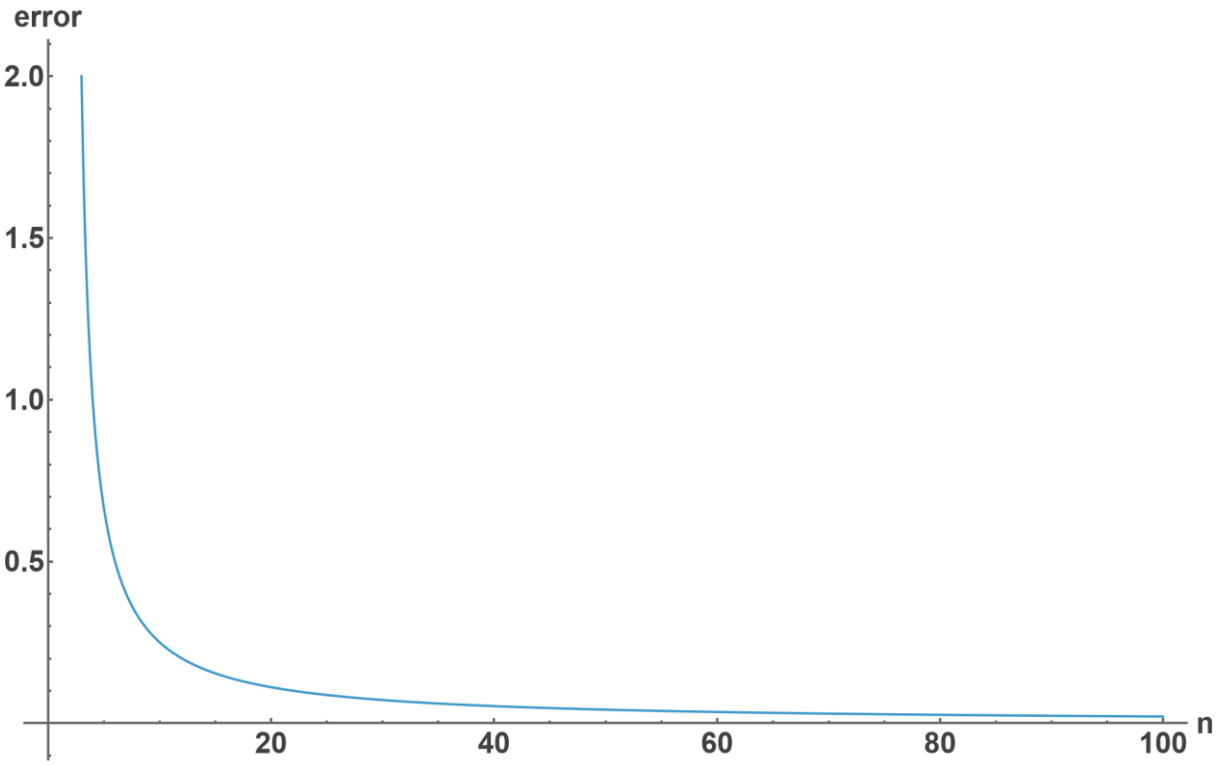

Fig. 1: System I or zombi-mode thinking; Absolute error for non-dimensional averaging (like in training of an LLM) in dependence on the system's dimensionality (note: here is meant the dimensionality of the system concerning the information being evaluated about and not the system of the LLM).

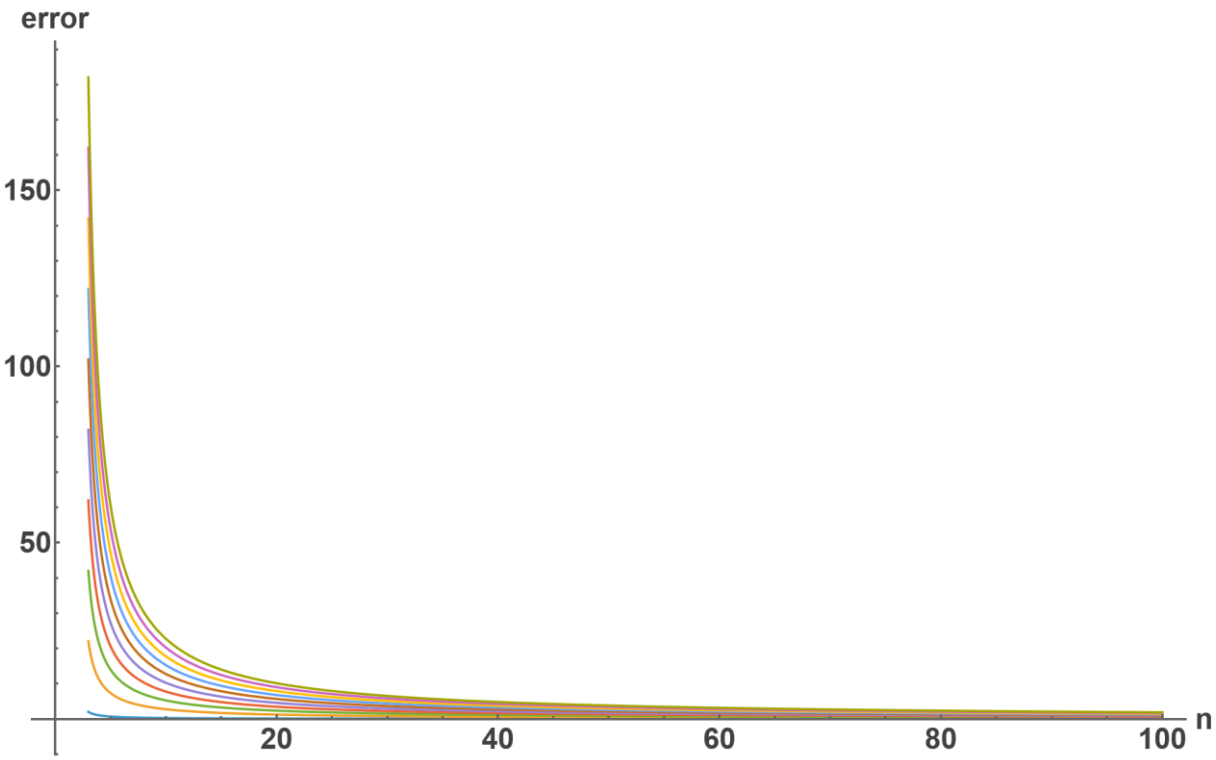

Fig. 2: System II or creative thinking; Absolute error for non-dimensional averaging (like in training of an LLM) in dependence on the system's dimensionality (note: here is meant the dimensionality of the system concerning the information being evaluated about and not the system of the LLM) for a variety of iterations (reflections – the higher the reflection number the bigger the potential error).

We easily see why in the reflective thought process the non-dimensional statistic can produce quite dramatic effective errors (and uncertainties [17]) even in systems with high dimensionality where otherwise – meaning when not needing any iterations - the dimensional error would be negligible. Even low numbers of iterations (<100) give dramatic absolute errors for systems of dimensionality below 100... which already is quite a lot.

This explains why current AI systems are still producing strange - wrong – results when being forced into a reflective mode with higher numbers of iterations. It dramatically depends on the problem to be solved how the error behaves, but there is always a huge – unknown (!) - uncertainty [17].

It also shows us that a correct (dimensionally complete) statistic can overcome that problem.

And What is our Finding Good For? Some Keywords

- AI-race
- Key ingredient for smartly deflating the AI-bubble and harvesting the 136 trillion in there
- Dramatic cost-reduction for LLM training (currently over 100 million US$)
- Increase of energy-efficiency
- Path towards a Natural – Artificial – Intelligence
- Lower error number
- Higher artificial creativity
- ...

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