

Analysis of “The Computational Limits of Deep Learning”

Preamble

It is really interesting what can qualify for a research paper. I don't know why but I always thought of research papers and articles as showing or discovering or revealing to the world some new thing or some new shiny that is the current bleeding edge of knowledge and innovation. Lately however, especially with the papers that I have read from this class, it is often the case that it is sufficient to just bring to light problems and inherent difficulties with AI as much as it is important to show and describe some new bleeding edge technology.

A brief statement of the problems addressed in the paper in my own words.

As mentioned in the preamble above it isn't as much a problem as it is “reading the writing on the wall”. The authors are simply pointing out and addressing some problems that we are already experiencing and problems that will continue to come down the pipe with regards to deep learning. Namely computational limits and cost of running said computations and training.

What I agree with/like in the paper and why.

I like this paper for a number of reasons. First, it was easy to read and understand what was being said. For the more part they did not stray from using simple and easily comprehensible jargon. I really liked how they didn't just say “Hey this stuff is computationally expensive...” but they went into the history and discussed how **“...deep learning is not computationally expensive by accident, but by design.”** I have personally noticed how “enough is never enough”. Even with my project where I am using genetic algorithms to breed models, I am severely constrained by RAM limits, Hard Drive Space, CPU speed, number of CPU's, GPU speed, number of GPU's etc... It may be that we will never be satisfied and we are always going to want to be able to do more with less.

I also really like how they discuss what is needed to achieve a linear improvement in performance. **“...since the amount of training data must scale much faster than linearly in order to get a linear improvement in performance.”**

I also want to discuss a bit about one of the major problems they encountered. I really like how they don't treat “computational power” as some unknowable black box that crunches numbers all day long and then produces some result. For example they mention how **“...few papers... provide sufficient information to analyze the computation needed per network pass. More widely reported, however, is the computational hardware burden of running models. This also estimates the computation needed, but is less precise since it depends on hardware implementation efficiency.”** There seems to be a trend in this field as well as in much of the emerging technology of the day to not say what it is running or doing or what it's components are. Rather the focus is on how much better it looks, and what it can do for you rather than what it is running under the hood. To quote an extreme example from intro to Computer Science, an automobile user does not need to know how a car engine works, from the pistons, valves and rotary motion, they just need to know how to operate the steering wheel, brakes, gears, and accelerator.

The details become less and less important when compared with the goal to sell or publish your new shiny idea/invention.

What I disagree with/dislike in the paper and why.

Nope, no disagreements or dislikes. I really enjoyed this paper. It is up there with “Deep convolutional networks are easy to fool” I like how they didn’t have to report on some new shiny thing, but rather just plainly and succinctly describe some major issues that will need to be compensated for in some way or another as time goes on in the field of Intelligent Systems.

Any inspirations I found in the paper.

Yes, I am inspired to drastically increase the number of grains of salt that I take in new ideas and technology with. The veil of “Wow this is awesome and amazing!” is slowly getting turned into “What!? That is all that you are doing?!”. I really appreciate how eye opening this class has been! Thanks for the homework and the great articles!