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**From:** Joscha Bach <[REDACTED]>  
**Sent:** Saturday, March 10, 2018 1:52 AM  
**To:** Jeffrey Epstein  
**Subject:** Re:  
**Attachments:** signature.asc

Hmm. I'd say that there is a multidimensional space in which =nderstanding is projected. Understanding is the creation of a mapping =between the features of a domain and a function that I already know how =o compute, so I can simulate the domain. Shallow understanding involves =apping of a particular feature configuration, deeper understanding =explores the latent variables of the feature set. There is usually more =han one way of creating such a mapping, and when we have found several, =e can also identify relationships between the mappings. Category theory =systematizes that.

When you describe your understandings (such as the path of light through =pace), it seems to me that your perspective is descriptive, i.e. you =ook at the emergent pattern that is generated by your understanding, =ithout looking at the structure of the generator itself. I try to =nderstand that generator, i.e. how to create a structure that can =roduce the desired pattern. This constructive perspective is what =omputationalism is all about.

Btw, Google has just announced that they think they might be getting =loser to quantum supremacy:  
<https://www.technologyreview.com/s/610274/google-thinks-its-close-to-quantum-supremacy-heres-what-that-really-means/>

If they ever get there, I will be forced to revise a part of my current =reliminary model of how the world works, which would be very exciting. =t would probably mean that digital physics must be wrong, and finite =utomaton computationalism must be only treated as a theory about models =uilt on constructionist formal languages, and I might get converted to =cott Aaronson's views.

> On Mar 9, 2018, at 12:08, jeffrey E. <jeevacation@gmail.com> wrote:

>

> understanding is a multi dimensional space the language is a =projection in that space. or an arrow in category theory. the =ocal point has history. so like the play appears different from =every seat in the theatre the integragation over each point projects =is understanding on the language.

>

> On Fri, Mar 9, 2018 at 5:33 PM, Joscha Bach <[REDACTED]> =rote:

> What do you think of as space/field effects? The universe or learning?

>

> Btw., did you ever come across Schmidhuber's idea of a Goedel Machine?

>

>

>> On Mar 9, 2018, at 05:39, jeffrey E. <jeevacation@gmail.com> wrote:

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>> I would think of it more of a space / field effects , Not =ecursive algorithm s

>>

>> On Fri, Mar 9, 2018 at 6:06 AM Joscha Bach <[REDACTED]> =rote:

>> Last week I got to know Steve Hyman, Daniel Kahneman and Bob  
>> =orvitz. Telefonica invited all of us to a two day workshop with Pablo =odriguez, Ken Morse and a few others, where we were meant to advise =hem on how to use AI for health applications. I told them that I think =he goal of therapeutic invention is not to increase happiness, but =integrity. Happiness is merely an indicator, not the benchmark. Current =pps tend to subvert the motivation of people, but I don't think that =his is necessary or the best strategy. Humans are meant to be =programmable, not subverted. They perceive their programming as "higher =purpose". If we can come from the top, supporting purpose, instead of =rom the bottom, subverting attention, we might be more successful. =Downside might be that we create cults.) Of the bunch, Hyman managed to be the most interesting (Kahneman was =ery charismatic but mostly tried to see if he could identify an =pplication for his system one/system two theory). Gary Marcus was =here, too, but annoyed everyone by being too insecure to deal with his =ncompetence.

>>

>> Did I tell you that I discovered that Deep Learning might be best =nderstood as Second order AI?

>>

>> First order AI was the classical AI that was started by Marvin =insky in the 1950ies, and it worked by figuring out how we (or an =bstract system) can perform a task that requires intelligence, and then =mplementing that algorithm directly. It yielded most of the progress we =aw until recently: chess programs, data bases, language parsers etc.

>> Second order AI does not implement the functionality directly, but =e write the algorithms that figure out the functionality by themselves. =econd order AI is automated function approximation. Learning has =xisted for a long time in AI of course, but Deep Learning means =ompositional function approximation.

>> Our current approximator paradigm is mostly the neural network, i.e. =hained normalized weighted sums of real values that we adapt by =hanging the weights with stochastic gradient descent, using the chain =ule. This works well for linear algebra and the fat end of compact =olynomials, but it does not work well for conditional loops, recursion =nd many other constructs that we might want to learn. Ultimately, we =ant to learn any kind of algorithm that runs efficiently on the =available hardware.

>> Neural network learning is very slow. The different learning =gorithms are quite similar in the amount of structure they can squeeze =ut of the same training data, but they need far more passes over the =ata than our nervous system.

>> The solution might be meta learning: we write algorithms that learn =ow to create learning algorithms. Evolution is meta learning. Meta =earning is going to be third order AI and perhaps trigger a similar =ave as deep learning.

>>

>> I intend to visit NYC for a workshop at NYU on the weekend of the =6th.

>>

>> We just moved into a new apartment; the previous one had only two =edrooms and this one has three, so I can have a study. It seems that we =re as lucky with the new landlords as with the previous ones.

>>

>> Bests, and thank you for everything!

>>

>> Joscha

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>>

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>>> On Mar 8, 2018, at 16:37, jeffrey E. <jeevacation@gmail.com> =rote:

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>>> progress?

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