

# Review of: "Towards a Comprehensive Theory of Aligned Emergence in AI Systems: Navigating Complexity towards Coherence"

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Potential competing interests: No potential competing interests to declare.

Hi Lucas,

A very interesting and relevant paper, moving into the age of AI with our ever striving efforts to deal with complexity and emergence.

Emergence is a scale from simple, through weak and strong, to spooky. However, physicists don't believe in strong and spooky emergence. We have to be humble when speaking about these higher categories of emergence. I believe we can speak of all categories of emergence confidently when we regard them as subjective, being how an individual perceives things.

I believe AI (ML/RL) is a good way to deal with the types of emergent behavior found in complex systems, because we cannot test complex systems sufficiently. Although, we can reduce this effort by ensuring good test practices within the realm of complicated systems. We can utilize more traditional methods, incorporating Design of Experiments in tandem with appropriate statistical methods (regression and dimensional analysis), to control the part of the system behavior resulting from the known system parameter space.

I find your discussions throughout the paper interesting and helpful to understand these topics, but I find it hard to follow the highly theoretical approach to comprehend the complex dynamics of emergent behavior in AI systems. Being an engineer, not a mathematician, I struggle understanding emergent behavior through means like differential equations. I think the paper will be much more valuable to the industry if you provide more practical case studies to show and confirm how the theory actually works. The latter you also refer to in future work, so I look forward to reading your continuing research.

Best regards,

Rune

