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Creativity in Artificial Intelligence: Can Machines Dream?

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Abstract

Dreams. Creation. Awareness. The window through to the subconscious experience. The process of organizing memories and analysing their emotional content, this is dreaming. What happens when AI is thrown into the mix? As technology advances and machines increase in complexity, all of what makes a human, human, will be under the microscope of artificially intelligent systems. Most interestingly, our capacity to create and imagine will have to undergo serious meditation and inquiry. If machines were to ever have their own dreams, what would their dreams tell us about ourselves, our wants, our desires, or what of the nature of being itself? What implications will this have for the privacy of the mind? Maybe machines will one day have minds of their own.

1 The Nature of Creation

There is something in the nature of being that demands the condition that, 'things within things' be infinitely present. Creation creates creation! Recursion seems fundamental to *qualia*, the subjective experience of phenomena. The driving property of imagination is analogous to Russian Dolls, in that to imagine is to create an excess of boxes within boxes within boxes, ideas within ideas. And what is a more apt parallel to computational intelligence than that of boxy *things within things?* Dreaming up new worlds and new directions, is seemingly integral to consciousness and this thing we call *reality*.

Descartes gave us, "I think, therefore I am." (*Discourse on the Method,* 1637). Though, the organisation of nature has a hard-working employee next to recursive thought, namely, mimicry. Environments feeding off each other, *copying* and producing, replicating, and reproducing. This back-and-forth, create-consume phenomena of evolution is a positive feedback loop that iterates upon itself (Robertson, 1991). Nature eats itself and inside itself it goes. These inner worlds within worlds provide the avenue to an ever-increasing introspection. As nature's 'creation', we humans mimic its creative force, will our creations (AI) share in this mimicry? Aiming our sights towards the mystery of dreaming, what do today's machines promise?

2 Virtual Worlds and Dreaming

Imagine the ability to relive your dreams via a virtual world. Imagine the psychological and philosophical consequences both positive and negative of such a technology. Or consider *influencing* your dreams through VR tech? A study featured in Consciousness and Cognition's special issue on Dream Engineering, (Picard-Deland, 2020) sought to examine the influence virtual reality could have over dreams. Participants (N = 137) of the study were exposed to VR-flying simulations to determine if dreams of flying could be induced. Via dream journals and contrasted with a control group; it was found that these virtual experiences did have notable success in producing flying dreams.

This study clues us into the substantial effect that our physical day to day experiences have on our dreams, specifically the things we see and the impression they leave on our memory, even when simulated. Marrying this susceptibility to visual influence with AI assisted data science will net incredible benefits, unlocking both human and machine creativity. We can see burgeoning frameworks that will act as rudimentary playgrounds for machines to *create,* present in the field of data science.

3 Manipulating Dreams with Big Data

Dreamcatcher, an automatic analysis project out of Nokia Bell labs, Cambridge; has been putting today's AI to the test. Armed with data sets containing thousands of dreams, the Social Dynamics group developed a Natural Language Processing tool to decode dream reports. Artificial intelligence can provide insight into large sets of data when illuminated by the techniques of natural language processing. Dreamcatcher makes use of the Hall-Van De Castle scale by taking the recounts of dreams and cross referencing them with the analytic framework of the scale.

"The images of a dream are the concrete embodiments of the dreamer's thoughts…" (Hall, 1966), juxtapose this with Descartes' quote and let your mind wander.

Imagery and perception are pillars of creativity, to perceive with distortion is to create new experiences within a new iteration of the previously existing conception, (Blaise Agüera y Arcas, 2016).

AI can process big data, it can sort through and organise datum into information, finding connections and clustering points that potentially relate and filing away into meaningful buckets. Even if the data used is something as ambiguous and abstract as natural languages, machine learning algorithms are more than capable of working in tandem with humans to derive new knowledge. This process of organisation sounds an awful lot like dreaming and it is the beginning of machine perception and thus, creativity. It is not that absurd to imagine artificially intelligent systems providing their *own* interpretation on the input, their own perception, distortion, etc. As demonstrated by Google's Deep Dream AI (Mordvinstev, A., 2015) and its ability to backpropagate an original output after being trained on some set of images.

Source: Blaise Agüera y Arcas, 2016

A neural network producing this distorted image of birds is one example of the creative potential of AI. A specific type of network known as the Convolutional Neural Network serves this application well. The advantage of a CNN is in its non-linearity and the multiple layers that makeup its deep network (Albawi S., 2017). Adjusting this potential to account for future discoveries, we can imagine an advanced neural network trained on dream imagery, eventually *producing* dreams to be experienced by humans in a virtual environment. Given the findings of Picard-Deland's study, experiencing these AI generated dreams in a virtual world may influence our own dreams, adding another feedback loop to nature's bag of tricks. As such, the creative output of machines could one day, quite literally be governing the collective unconscious of humanity.

4 Modern Systems and Future Responsibilities

The future holds many possibilities, some may be terrified by them, others enthralled by them. Whatever the case may be humanity has the responsibility to come to grips with these eventual horizons to ensure a smooth landing for these new worlds. Technology is rapidly approaching the bounds of our control.

Therefore, it is vital that we look deep within ourselves, within our psyches and our dreams, to understand these patterns so that we have the knowledge and the wisdom to guide these future AI systems. We have acknowledged the potential for the scope of data science to be extended and tackle the analysis of dreams and we have seen the effects even virtual experiences can have on our dreams. With this in mind, we can envision a future world of dreaming machines in communication with human dreams, feedbacking together, which could be Nature's most fascinating collaboration yet. Our future dreams may become the realities of the AI experience that we unleash. What will *we* dream up next?

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