

the power of
swarm intelligence

iSDA





introduction:

The best way that I can describe artificial general intelligence (AGI) is to envisage an artificial mind that interacts with external stimuli in the same way that you would expect a human mind to interact with that same stimuli.

However, what powers human interactions is incredibly complex. Consider the way we plan for the future, we set ourselves goals. We can visualize what might happen in a certain situation, and how we will deal with it at the time, and how we will cope with the aftermath. We have emotions and bias that affect our decision making, our ability to solve problems varies from individual to individual. We also have theory of mind, which means that to some degree, we can understand how someone else is feeling and can guess at what they are thinking.

Creating a human like mind inside a machine is an intensely difficult thing to do, but I do not think it is impossible. The computers we have today might be powerful enough already, the issue is with the software.

Let us pause for a moment, why does a problem-solving artificial mind need to mimic a human mind?



other kinds of intelligence:

Dolphins are incredibly intelligent. They are certainly self-aware and can learn new skills quickly. They talk with each other, they play together, they live in family groups and can have arguments. But they are certainly not human and probably do not think in the same way we do. There are lots of other intelligent creatures such as Chimps, Lions and Octopi. I suspect that none of them think like we do.

There is another kind of intelligence which is completely different to ours, swarm intelligence, which is sometimes referred to as a hive mind. The best example of a hive mind that I can think of is the Ant. Many biologists believe that Ants are amongst the most successful species on Earth. It is thought that around 20% of the entire land biomass of the animal kingdom is made up of Ants.

They create cities, they farm, they grow medicines, and they wage global warfare. They seem to have a total lack of self-preservation and live only for the benefit of the colony. A single Ant is not particularly intelligent, but through working together, and using what seems like a relatively simple set of rules, they achieve incredible things.



what have Ants got to do with AI?:

In nature there is a phenomenon called emergence which is the existence of collective behaviours. In other words, what automatus parts of a system can do together that they cannot do alone. The human mind could be described as a product of emergence, your thoughts are complex patterns that are forming on a substrate made up of the cells in your brain.

The behaviour of Ants is a product of emergence. The way they build their complex nests are based in just a few rules. In fact, it is likely that their entire existence is based on just a few rules and yet look how intelligent they are.

What would happen if we created a virtual species of Ant (Dants), then birthed our virtual Dants millions of times and let them loose in a virtual environment? Would emergence kick in, and they collectively become intelligent? Our digital Dants would not have to live out their lives at the same speed as real Ants. Their lives could run thousands of times faster. We would be able to discover their problem-solving abilities far quicker than creating a colony that evolves at natural speed.



the virtual Ant colony:

Trying to mimic an actual Ants would be a good place to start when designing virtual Dants. Their brains are a lot less complex than humans so would be easier to duplicate. We would need to give them the ability to evolve, to change their behaviours in order to both survive and to optimize on the environmental pressures they encounter. They should be able to produce offspring that take on a mixture of the behaviours inherent in their parents.

We also need to give them goals, a purpose for their doing. It could be to solve complex math problems such as route planning, evaluating potential solutions for climate change or designing new drugs. We should also give them the ability to change their environment, if the change makes their goals easier to achieve. Finally, we need to give them the ability to learn from their mistakes. For example; virtual Dants that follow inefficient strategies when compared to their peers, die out and are removed from the environment.

We are currently building a thinking machine using Dants that are powered by emergence in a computational environment. It is called **NEXUS**.



the alignment problem:

The problem for us humans with regards to our virtual Dant colony is whether their interests will align with ours. The problem becomes a real problem if the Dants escape from their environment and enter ours or start to affect us in ways we did not envisage. Currently, I have no idea how they could do that, but to quote those famous words from Dr Ian Malcolm in the film Jurassic Park “Life will find a way”.

In my opinion emergence is the most beautiful phenomenon in nature. It is certainly very powerful. By using Dants we could harness emergence to our advantage, creating technologies that we currently cannot imagine. Blind people might see, cancer might be a disease of the past, quality homes could be built very cheaply, energy could become clean and endlessly abundant, there might be a universal income for all making poverty history.

These aspirations may seem fantastical but consider what we have achieved with mRNA drug design to combat Covid-19. How many lives did that new technology save?

NEXUS might help design the next lifesaving drug.



what AI thinks:

I asked the rock star of generative AI, ChatGPT, what it thought about the digital Dant idea. See the response I got below:

“It is certainly possible for a colony of digital ants living in a virtual environment in a supercomputer to interact and allow emergence to occur, leading to the creation of collective intelligence. Ant colonies in the real world are known for their complex social structures and efficient division of labour, which is achieved through decentralized decision-making processes and communication between individual ants.

If a similar virtual environment is created for digital ants, they may also exhibit similar behaviours and collectively solve problems that are too complex for individual ants to solve alone. The emergent behaviour of the colony could lead to the creation of collective intelligence, which could be used to solve a variety of problems.

However, the success of such a project would depend on many factors, including the design of the virtual environment, the algorithms used to simulate the behaviour of the ants, and the computational resources available to the supercomputer. Additionally, the extent to which collective intelligence emerges would depend on the level of complexity and diversity of the tasks assigned to the colony, as well as the degree of interaction between individual ants in the colony.”



in conclusion:

I believe that **NEXUS** will develop into a complex math engine that will deliver 100% accuracy. Even with the computers we have today, I think the issue is the design of the Dants and the virtual environment, not the available processing power. This approach will be much easier than trying to replicate the human mind, which current generative models seem to be doing.

ISDA is currently fund raising to support the building of **NEXUS**.

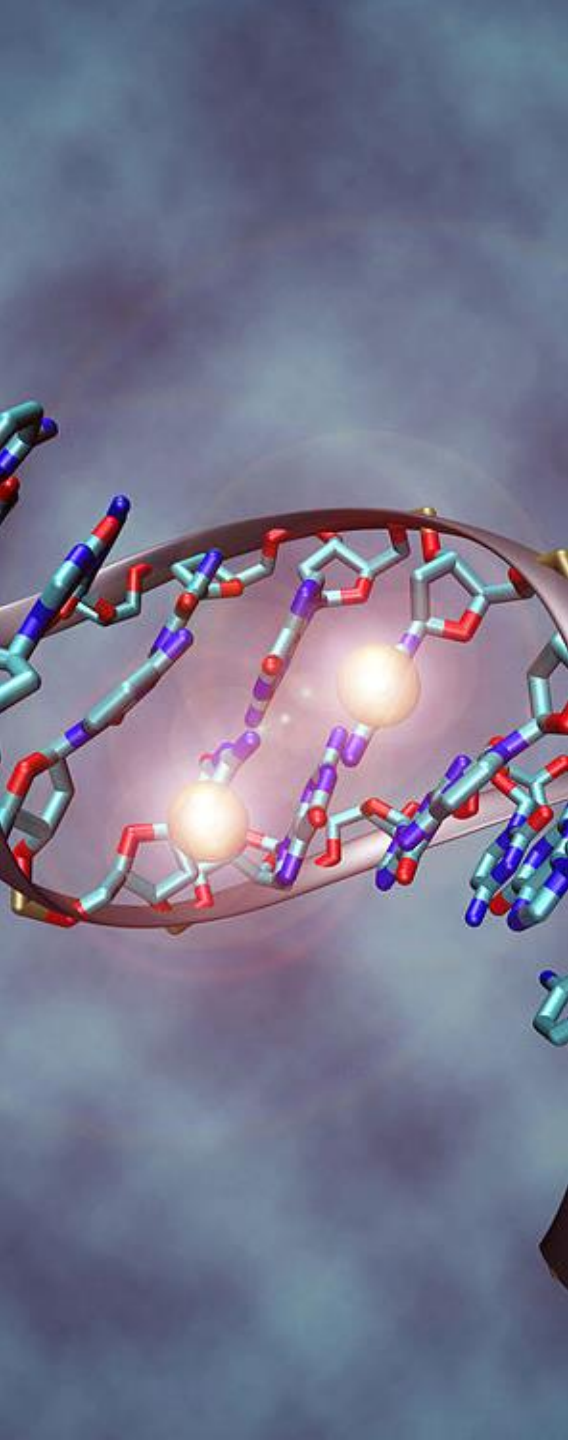
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Thank you for your time.

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