MAGAZINE

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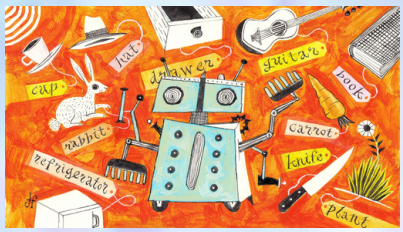
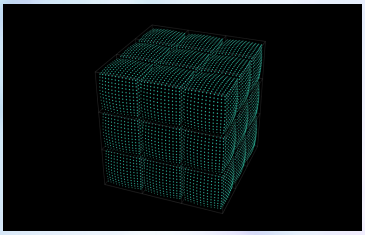
Byte Quest

Department of CSE



MACHINES LEARN BETTER IF WE TEACH THEM THE BASICS

RESEARCHERS DISCOVER A MORE FLEXIBLE APPROACH TO MACHINE LEARNING



MATHEMATICIANS COMPLETE QUEST TO BUILD 'SPHERICAL CUBES'

THE JOY OF ASKING ABOUT INFINITY, JELLYFISH AND THE END OF THE UNIVERSE

Department Vision

To be a center for academic excellence in the field of Computer Science and Engineering education to enable graduates to be ethical and competent professionals.

Department Mission

To enable students to develop logic and problem solving approach that will help build their careers in the innovative field of computing and provide creative solutions for the benefit of society.

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SPOORTHI (3/4) CSE C

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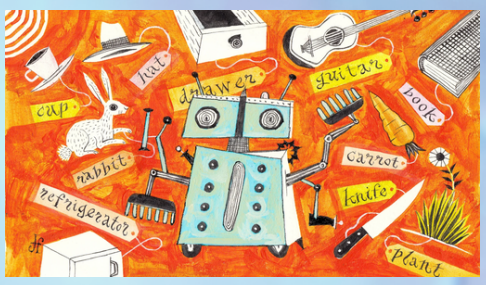
MACHINES LEARN BETTER IF WE TEACH THEM THE BASICS



AI's struggle with generalized tasks due to limited foundational knowledge prompted researchers to enhance learning methods. Traditional reinforcement learning excels in specific environments but fails in new ones due to the lack of foundational concepts. To combat this, scientists introduced pre-training, teaching machines basic concepts before deployment.

This approach utilizes language and image comprehension, allowing machines to understand and generalize knowledge. Through simulations and practical applications like online shopping, pre-trained models exhibited significant improvements. These AI agents, akin to humans consulting manuals before using new software, grasp fundamental concepts, enabling quicker learning and better performance across varied environments. By amalgamating the learning-by-doing approach with foundational knowledge, machines can navigate diverse scenarios with enhanced adaptability, marking a significant leap in AI development. This method, surpassing traditional trial and error, equips AI with a foundational understanding essential for tackling complex real-world tasks beyond predefined actions, mirroring human-like comprehension and adaptation.

RESEARCHERS DISCOVER A MORE FLEXIBLE APPROACH TO MACHINE LEARNING

In 2020, MIT researchers devised liquid neural networks inspired by the C. elegans roundworm. Unlike traditional neural nets, these "liquid" models adapt and predict behavior continuously, mimicking the worm's resilience to change. Their equations interlink, allowing real-time characterizations—a departure from discrete snapshots in conventional networks. Liquid nets treat synapses probabilistically, introducing variability, enhancing adaptability.

These networks learn from observed inputs, adjusting equations for responsiveness. In autonomous car tests, a 19-neuron liquid net reacted faster but faced speed issues due to nonlinear equation complexities. A breakthrough by researcher Hasani introduced a closed-form solution, drastically reducing computational load without compromising accuracy.

MIT's latest liquid nets showcase stability and speed, being tested on drones for urban navigation. Future iterations aim to optimize neuron numbers and connections, mirroring C. elegans' selective synapses.

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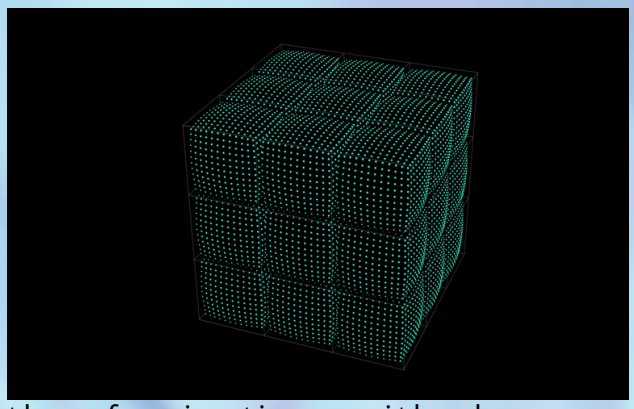
MATHEMATICIANS COMPLETE QUEST TO BUILD 'SPHERICAL CUBES'

The pursuit of understanding the foam problem led to unexpected connections with theoretical computer science. The relationship between unique games conjecture and geometric optimization unfolds, showing the interconnectedness of disparate mathematical problems.



In the realm of geometry, the fascination with honeycomb structures dates back to Pappus of Alexandria in the fourth century. He admired bees for their seemingly optimal use of space with hexagonal cells. For centuries, the hexagon's efficiency remained a hypothesis until 1999, when Thomas Hales proved its optimality. Yet, the question of ideal shapes for tiling in three or more dimensions remains unsolved.

This puzzle has wide-reaching applications, from understanding soap bubble behavior and crystal structures to exploring data processing techniques. The confluence of geometry and computational complexity has unveiled intriguing connections. In the mid-2000s, computer scientists stumbled upon a link between the foam problem and a key issue in their field, culminating in the discovery of a high-dimensional shape with minimal surface area.

However, this optimal shape lacked a geometric foundation. Recent work by Assaf Naor and Oded Regev aimed to rectify this by proving the existence of convex spherical cubes. Their approach deviated from prior work, navigating around the constraints posed by the integer lattice to create a shape close to a sphere but with less surface area.

While this breakthrough carries implications for cryptography and various applications, the quest to connect the foam problem to complex computer science conundrums continues. Recent endeavors explore symmetries and other angles, hinting at potential breakthroughs in geometry's intersection with computational theory.

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THE JOY OF ASKING ABOUT INFINITY, JELLYFISH AND THE END OF THE UNIVERSE

The second season of The Joy of Why, hosted by a curious soul initially kicked out of ballet class for too many questions, embarks on thrilling scientific inquiries. Led by mathematician Steven Strogatz and Quanta Magazine, the podcast explores diverse topics like different infinities, category theory's applications, and jellyfish propulsion's surprising lessons. Featuring guests like cosmologist Katie Mack and fluid dynamics expert John Dabiri, the podcast dives into speculative cosmic endings and the wonders of nature. Strogatz's conversational style and eagerness to learn shine, aiming to ignite curiosity in every listener. With episodes dropping every other Thursday, the podcast promises an engaging journey through the enigmatic realms of science and mathematics, encouraging exploration of the unknown and the joy of asking profound questions.

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