Byte Quest
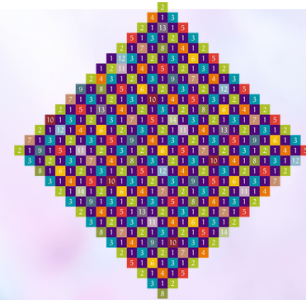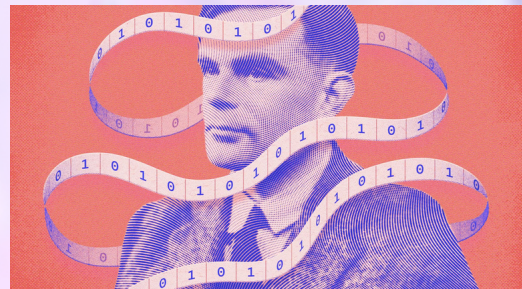
Department of
CSE

HYPERDIMENSIONAL COMPUTING REVOLUTION

PACKING PUZZLE

TRANSPARENT AI REVOLUTION

TURING'S COMPUTATIONAL LEGACY

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.

FACULTY COORDINATORS

DR. BHARGAVI PEDDIREDDY
(ASSOCIATE PROFESSOR)
S. KOMAL KAUR
(ASST. PROFESSOR)

STUDENT COORDINATORS

VAMSI (3/4) CSE C
SPOORTHI (3/4) CSE C

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HYPERDIMENSIONAL COMPUTING REVOLUTION

The article introduces hyperdimensional computing, challenging traditional artificial neural networks (ANNs) like those in ChatGPT.Criticizing ANNs for high power consumption and lack of transparency, hyperdimensional computing employs hypervectors, ordered arrays of numbers, for efficient symbolic reasoning.
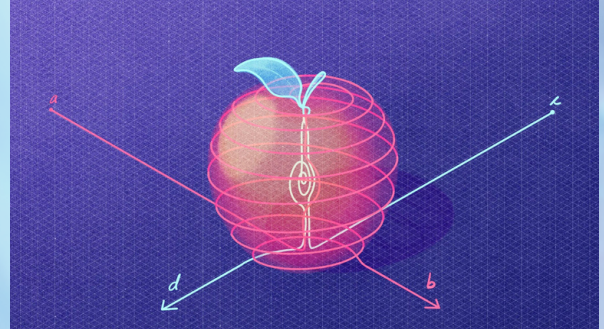
It utilizes operations like multiplication, addition, and permutation, enabling transparent, error-tolerant computation. Demonstrations include outperforming traditional methods in abstract visual reasoning. Hyperdimensional computing shows promise for low-power, resilient hardware, but its early stage necessitates further testing against real-world challenges, marking the beginning of a transformative era in computing with high-dimensional spaces.

PACKING PUZZLE

A collaborative effort between mathematicians Bernardo Subercaseaux and Marijn Heule has resolved a long-standing problem in combinatorics known as the "packing coloring" problem. The challenge involves filling an infinite grid with numbers, ensuring that the distance between occurrences of the same number exceeds the number itself.
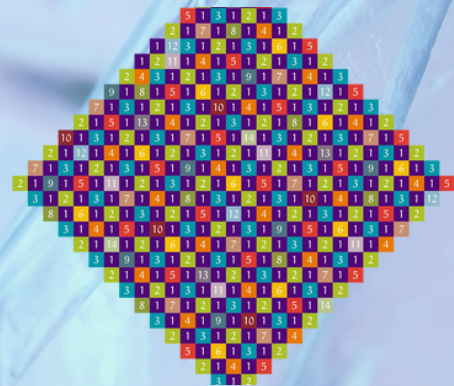
Previous research had determined the problem's solution lay between 13 and 15 numbers. Subercaseaux and Heule, leveraging computer-assisted proofs, successfully ruled out 13 as a solution through advanced computational techniques, leaving them with two potential answers: 14 or 15. To enhance computational efficiency, they employed strategies like treating symmetric combinations as equivalent and using a cube and conquer technique. Ultimately, by redefining their Boolean formula to focus on plus-shaped regions rather than individual cells, they conclusively ruled out 14. The groundbreaking resolution, achieved in November 2022, marks a significant advancement in understanding the constraints of the problem, demonstrating the intellectual rewards of their collaborative research.

TRANSPARENT AI REVOLUTION

Cynthia Rudin challenges the prevailing opacity of machine learning models, advocating for interpretability in high-stakes scenarios like medical AI. Her research transforms complex neural networks into interpretable "glass boxes" for transparent decision-making.

Concerned about non-transparent AI in medicine, Rudin's team developed interpretable models, using case-based reasoning akin to Dr. House's diagnostic approach. Rudin emphasizes interpretability's crucial role in building trust, cautioning against relying solely on "explainability" methods due to potential inaccuracies and ethical concerns. Despite training challenges, she sees a growing shift towards interpretability, even in low-stakes applications like natural language processing. Rudin's work extends to computer-generated poetry and music, showcasing the aesthetic value of interpretable algorithms beyond critical decision-making.

Cynthia Rudin's interdisciplinary work underscores the beauty of interpretable algorithms, offering creative insights and trust-building applications across diverse domains..

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TURING'S COMPUTATIONAL LEGACY

The article delves into the pivotal role of Alan Turing's Turing machine in shaping modern computing and theoretical computer science. Originating from Turing's response to the Entscheidungsproblem in 1936, the Turing machine serves as an abstract model demonstrating computability through the manipulation of symbols on an infinite tape based on predefined rules.
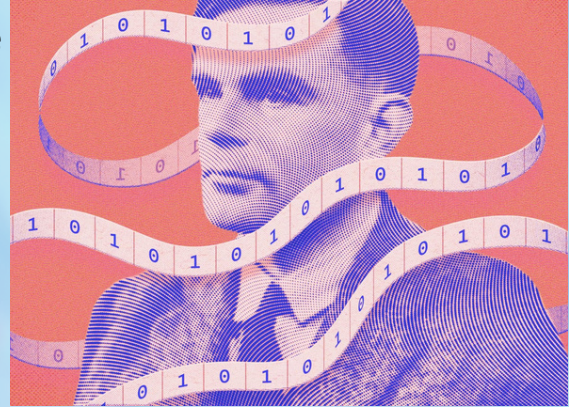
Turing's work not only tackles fundamental questions about computation but also establishes the undecidability of certain problems, like those in John Conway's Game of Life. The Church-Turing thesis asserts that the informal concept of an algorithm aligns with any "reasonable" computational model.

The article underscores the Turing machine's contribution to modern computers, particularly through the universal Turing machine and its influence on the von Neumann architecture. It also notes the practical applications of variations like probabilistic Turing machines in areas such as cryptography and machine learning. Overall, Turing's abstract machines continue to play a vital role in addressing fundamental scientific questions.

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