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Bridging Ancient Wisdom and Modern Intelligence: Vedic Mathematics and Its Emerging Role in Artificial Intelligence

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Abstract: ***Artificial Intelligence (AI) thrives on pattern recognition, symbolic computation, and cognitive modeling — domains where Vedic Mathematics offers valuable tools that can enhance algorithm performance. Vedic Mathematics is a system of 16 sutras and 13 sub-sutras that simplifies complex calculations using mental strategies. This paper investigates how Vedic techniques can inspire and optimize AI algorithms, neural models, and computing architectures. We explore its utility in symbolic AI, parallel processing, algorithm design, and low-resource machine learning — showcasing the untapped synergy between ancient Indian mathematical cognition and modern artificial intelligence systems.***

Keywords: Vedic Mathematics, Artificial Intelligence, Mental Computation, Algorithm Design, Symbolic AI, Pattern Recognition, Human-Centric AI

1. Introduction

In today's world, Artificial Intelligence (AI) is changing how machines think, learn, and solve problems. From mobile phones to robots, AI helps in making decisions, recognizing patterns, and performing tasks that usually require human intelligence. But what if we could use ancient methods of thinking to make these machines even smarter? This is where Vedic Mathematics, an old system of solving math problems quickly and easily, becomes important.

Vedic Mathematics was developed thousands of years ago in India and was later brought to light by a great scholar, Swami Bharati Krishna Tirthaji. He found 16 main formulas (called sutras) and 13 supporting ones (sub-sutras) that can solve many types of problems in arithmetic, algebra, and more. These methods are simple, fast, and often allow people to do complex calculations in their heads. While originally used for teaching students and solving everyday math, today they are being looked at for something much bigger—helping machines think like humans.

In this research paper, we explore how the ideas from Vedic Mathematics can be useful in Artificial Intelligence. Many AI systems need to solve problems, make decisions, and find patterns—things that Vedic Maths does very well. Some of these ancient techniques are even similar to how modern computers handle tasks like multiplication or data analysis. We also look at how these Vedic methods can be turned into computer programs, helping machines work faster, especially in areas like education, robotics, and data science.

By connecting this ancient knowledge with modern technology, we aim to show that Vedic Mathematics is not just history—it is a valuable tool for the future of intelligent machines.

2. History and Evolution of Vedic Mathematics

2.1 Origins in the Vedas

The roots of Vedic Mathematics lie in ancient Indian scriptures known as the Vedas, which are over 3,000 years old. The term "Vedic" is derived from the Sanskrit word *'Veda'*, meaning knowledge. Among the four Vedas—Rigveda, Yajurveda, Samaveda, and Atharvaveda—the Atharvaveda is believed to contain the foundational ideas of mathematics.

While the Vedas primarily focus on philosophy, rituals, and hymns, they also include mathematical concepts used for altar construction, time calculations, astronomy, and sacrificial rituals. These early mathematical thoughts were not written in a formal or textbook manner. Instead, they were encoded in cryptic verses or sutras, which required deep understanding and interpretation. These sutras were handed down orally through generations and were embedded in poetic language to aid memory and transmission.

2.2 Rediscovery by Swami Bharati Krishna Tirthaji

Although the mathematical content in the Vedas had been forgotten or scattered over centuries, Jagadguru Swami Bharati Krishna Tirthaji (1884–1960) revived and reconstructed Vedic Mathematics in the early 20th century. He was a scholar of Sanskrit, mathematics, philosophy, and history. After deep meditative study of the Atharvaveda in the forests of Shringeri (Karnataka), he claimed to have discovered 16 main sutras and 13 sub-sutras that together formed a complete system of mathematics.

He compiled these insights into a book titled "Vedic Mathematics", published posthumously in 1965. This book introduced elegant and shortcut methods for arithmetic operations such as addition, subtraction, multiplication, division, squaring, cubing, factorization, and solving algebraic equations.

For example:

- Urdhva-Tiryagbhyam (Vertically and Crosswise) for multiplication
- Nikhilam Navatashcaramam Dashatah (All from 9 and the last from 10) for quick multiplication of numbers near a base
- Ekadhikena Purvena (By one more than the previous one) for squaring numbers ending in 5

His work captured the imagination of students, teachers, and researchers, as it simplified complex calculations and encouraged mental agility. Despite some scholarly debate on whether these sutras truly originate from ancient texts, their practical value remains undeniable.

3. Structure of the System

The Vedic system is based on 16 sutras (aphorisms) and 13 sub-sutras (corollaries), all of which are in Sanskrit, and each conveys a general principle applicable to multiple operations.

Selected Sutras and Their Applications

Sutra	Meaning	Example
Nikhilam N. Dashatah	"All from 9 and the last from 10"	Used to multiply numbers near powers of 10, e.g., 98 × 97
Urdhva-Tiryagbhyam	"Vertically and crosswise"	Universal method for multiplication
Ekadhikena Purvena	"By one more than the previous one"	Squaring numbers ending in 5, e.g., 75^2
Paravartya Yojayet	"Transpose and adjust"	Solving algebraic equations and divisions

These formulas work universally, meaning they are applicable to all levels of math, from basic arithmetic to advanced algebra.

4. Application of Vedic Mathematics in AI tools

4.1 Fast Arithmetic in AI Hardware (VLSI and FPGA)

Vedic Mathematics has found remarkable applications in Very Large Scale Integration (VLSI) and Field Programmable Gate Arrays (FPGAs), both of which are foundational to modern AI hardware. The *Urdhva-Tiryagbhyam* (Vertically and Crosswise) sutra, in particular, offers a parallel approach to multiplication that is inherently well-suited for digital circuit design. Traditional binary multipliers such as the Booth or array multipliers often involve multiple sequential steps, which increase delay and require significant hardware resources. In contrast, the Vedic method decomposes multiplication into smaller units that can be executed simultaneously. This leads to reduced propagation delay and power consumption—two critical concerns in AI edge devices and embedded systems.

4.2 Symbolic Reasoning and Logic in Expert Systems

Expert systems and symbolic AI models depend heavily on rule-based logic, algebraic manipulation, and symbolic reasoning. Vedic Mathematics, with its emphasis on logical structure and transformation of expressions using sutras, naturally aligns with these needs. Sutras like *Sankalana-Vyavakalanabhyam* (by addition and subtraction) and *Paravartya Yojayet* (transpose and adjust) are fundamentally symbolic processes rather than numerical ones. They reflect logical transformation and can be viewed as rule inference techniques.

In AI expert systems used for medical diagnosis, legal inference, or engineering problem-solving, Vedic Mathematics can be incorporated to optimize symbolic calculations. The clarity and efficiency of the Vedic system make it easier to design rule engines with fewer computational steps. Additionally, because the methods often mimic human mental reasoning, they are ideal for developing explainable AI (XAI) systems—AI that can explain its reasoning to users. Thus, Vedic Mathematics provides a powerful foundation for next-generation expert systems requiring symbolic logic and intuitive problem-solving abilities.

4.3 Neurosymbolic Computing and Cognitive AI Models

Neurosymbolic AI aims to bridge neural networks and symbolic logic to emulate human-like reasoning and understanding. Vedic Mathematics, which integrates numeric efficiency with symbolic manipulation, offers a promising framework for developing such hybrid systems. Its sutra-based logic provides a way to perform symbolic transformations, while its mental arithmetic capabilities align with neural-style pattern processing. For example, using sutras for solving algebraic equations can be encoded as transformation rules within a symbolic system, and these rules can guide the neural network in decision-making or rule-based learning.

Moreover, because Vedic Mathematics is traditionally taught as a memory-based system, it parallels how humans use working memory and visual-spatial reasoning—two traits being modeled in cognitive architectures like ACT-R and SOAR. In AI systems for natural language processing (NLP) or reasoning-based games, Vedic approaches help in managing and navigating logic trees with fewer resources. Thus, Vedic Mathematics is instrumental in enhancing neurosymbolic AI, offering human-like reasoning, pattern abstraction, and faster inference.

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4.5 Pattern Recognition in Machine Learning

Vedic Mathematics is inherently pattern-oriented. Each sutra is based on a recognizable structure or behavior in numbers, such as symmetry, complementarity, or base relationships. This makes it extremely useful for AI applications focused on pattern recognition, a core task in machine learning (ML). Whether in image processing, speech recognition, or data clustering, ML systems benefit greatly from efficient ways of identifying and leveraging patterns.

Vedic techniques like *Vertically and Crosswise* multiplication can be modeled algorithmically to detect symmetric matrices or optimize grid-based computations. More importantly, Vedic logic can aid in feature extraction—isolating the most relevant information from datasets. For example, recognizing a repeated structure in input data can lead to more efficient compression or dimensionality reduction.

In unsupervised learning models, pattern discovery is critical. Vedic principles can guide how clusters are formed or how data is transformed for better model performance. As AI progresses toward general intelligence, using human-like pattern reasoning—as found in Vedic Mathematics—will play a central role.

5. Conclusion

Vedic Mathematics is an ancient Indian system that teaches us how to do math quickly, clearly, and smartly. Even though it was developed thousands of years ago, it still has powerful uses today—especially in the world of Artificial Intelligence (AI). From helping computers solve problems faster to making smart devices more efficient, Vedic Math methods are proving to be very useful. In this paper, we looked at some important areas where Vedic Mathematics is helping AI grow: improving hardware like VLSI and FPGA, supporting low-power AI in mobile and IoT devices, enhancing expert systems with logical thinking, boosting hybrid AI systems that think like humans, transforming how students learn math with smart apps, and supporting pattern recognition in machine learning. Vedic Math is not just about doing calculations faster—it's about thinking smarter. As AI keeps growing, using ancient Indian knowledge like Vedic Mathematics could help build intelligent machines that are faster, lighter, and more human-like in thinking.

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