



Viksit Bharat @ 2047: AI with Vedic Mathematics and Cryptography

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Abstract

In this chapter we see how India's ancient knowledge system, and mathematical systems like Vedic mathematics and Sanskrit based cryptographic systems can contribute in building a more secure, digitally advanced as well as still culturally rooted future. We see how Vedic mathematics helps in our mental agility and problem-solving skills and how India also has its own ancient Sanskrit cryptographic methods like Katayapadi system, Bhutasankhya system and Pingala's binary system which shows India's historical depth in logic and computation. We also see how these systems can be combined with Artificial Intelligence to be used in cybersecurity, military operations, steganography, etc. to make India more secure and digitally advanced. The chapter also talks about some scientific studies highlighting how Sanskrit can enhance brain structure and function which can eventually help in fighting against disorders like Alzheimer disease which is also known as the Sanskrit effect. We also give some insights on how to use modern technology and AI with Sanskrit to make this Sanskrit effect known globally. We see how our ancient systems and Sanskrit have immense potential and need to be taught from early years to build strong foundations, enhance logical thinking and to prevent our culture from dying out which can be seen from some initiatives like National Education Policy 2020 and integrating machine learning in the school curricula and much more. Early education can help shape sharper minds, better problem-solvers and make responsible citizens who are rooted in tradition yet ready to lead in a tech-driven world. Ultimately, the chapter envisions a Viksit Bharat that leads the world in culture, security as well as science, where AI models are inspired by Sanskrit, and cryptographic systems are

built on Vedic principles, creating a society that is both intellectually sovereign and spiritually awakened. Hence, "From the roots of Rishi traditions to the frontiers of AI—Bharat shall rise, secure, sovereign, and supreme by 2047."

Keywords: Cryptography, technology, Katapayadi System, Interdisciplinary AI, Viksit Bharat.

Introduction

As India moves toward the goal of Viksit Bharat@2047, a future gets envisioned with technological advancements, economically self-reliant and culturally rooted, it becomes imperative to look inward, to rediscover and reimagine the intellectual wealth of our own civilization. True development lies not merely in adopting global innovations, but in harmonizing them with the time-tested wisdom of our heritage. A nation can only be truly Viksit (developed) when its progress stems from its own soil, values and traditions. Nowadays, due to several technological advancements in cryptography and related fields, the security while data transmission has significantly improved. However, most of these techniques are based on foreign frameworks and methodologies. While these techniques have proven to be quite effective especially in security, military, etc., we shouldn't forget that our own country, India also possesses its own systems of encryption, mathematics and data representation; systems that existed long before similar methods emerged in the West and predate many Western inventions by centuries. It is our misfortune that many links of the past are buried in the sands of time. For the last 70 years, we have been trying to imitate the West, often neglecting the rich scientific traditions of our own civilization. Whereas, on the other hand, our ancient Indian knowledge systems such as the Katayapadi system, Bhutasankhya system, Pingala's binary system and Vedic mathematics are not only capable of encoding complex data into poetic forms but could also handle enormous numbers, naming values as high as uppala(10^{98}), padma(10^{119}) and beyond, which is found in Buddhist text Lalita-Vistara, around 400 AD, long before modern numeral systems evolved and when most societies had difficulty handling numbers beyond 1000. Many may dismiss ancient wisdom as old irrelevant history, because we now live in the age of science and technology but this is, however, being naive.

These ancient and cryptographic techniques, deeply embedded in linguistic and poetic traditions, offer a culturally rooted, efficient alternative to the technologies that come by diffusion, when integrated with AI can prove to be much more effective by creating more robust, context-aware and culturally resilient security systems. These systems offer not just historical insights but functional tools for the digital age. Integrating these systems with AI can help India assert technological leadership rooted in its own civilizational wisdom. This will help to redefine modern cryptography

and make India more secure and developed and shape the vision for ViksitBharat@2047. In this context, the words of Nobel laureate C. V. Raman from 1969 resonates deeply:

“We have, I think, developed an inferiority complex. I think what is needed in India today is the destruction of that defeatist spirit. We need a spirit of victory, a spirit that will carry us to our rightful place under the sun; a spirit which will recognize that we, as inheritors of a proud civilization, are entitled to our rightful place on the planet. If that indomitable spirit were to arise, nothing can hold us back from achieving our rightful destiny.”

It is with this spirit that this chapter explores how India's ancient cryptographic and mathematical traditions can shape the future of secure digital communication and contribute meaningfully to a globally recognized, technologically sovereign India.

Vedic Mathematics

Vedic Mathematics is a system of easy techniques and quicker methods to do mathematics more quickly based on some ancient Indian scriptures which was rediscovered and compiled by Bharati Krishna Tirtha ji in the early 20th century. It contains 16 sutras and 13 sub-sutras (Joshi et al., 2025). If we can integrate Vedic Mathematics with AI, it can significantly enhance efficiency, speed up data encryption process and can even offer new perspectives in coding techniques such as Urdhva Tiryagbhyam.

It is also referred to as the “vertically and crosswise” method. This method helps in calculating multiplication faster by breaking them into smaller components and calculating in parallel (Goda,2013). We can integrate this sutra with deep learning where matrix multiplication is a core operation. This will reduce intermediate steps, improve speed and give parallel computation.

By incorporating these principles and our traditional knowledge with AI and computational technology, India can develop its own efficient algorithm which will reduce dependence on foreign countries and help make India Viksit Bharat.

Sanskrit Effect

Modern neuroscience has been focusing more on old traditions that have preserved memorization and mental discipline practices for generations in an effort to unleash the potential of human memory. Sanskrit, the traditional Indian language, is one of the most notable examples of these traditions. The "Sanskrit Effect," a term used to characterize the remarkable cognitive advantages shown in those who have diligently studied and committed Sanskrit texts to memory, has been clarified by recent scientific investigations. In addition to validating traditional Indian teaching methods, these findings pave the way for the use of artificial intelligence to reproduce, scale, and reinvent these approaches for contemporary cognitive health, especially in the fight against illnesses like Alzheimer.

Some of the important studies in this area include the findings of Dr. James Hartzell who is a neuroscientist at the University of Toronto, Italy. He has worked on the effects of Sanskrit on the brain and while learning Sanskrit himself, he noticed that his own memory started improving. After this personal experience, he conducted more such experiments.

In one such major experiment, he and his team used Magnetic resonance imaging (MRI) scans to examine the brains of professional Sanskrit scholars or people who are proficient at Sanskrit. The results were really surprising. The test results showed that the people who studied Sanskrit for a long time had 10% more grey matter across the brain compared to normal people. Their brains also have more thickness in the cortex, the part which is linked to memory, attention and thinking skills (Sharma,2025). Hence, if we regularly practice Sanskrit, it can change our brain positively and can make our retention power stronger.

One of the most important use of this experiment is against diseases like Alzheimer disease which affects memory by causing gradual loss of neurons and synapses in the brain (Daly, 2025). By regularly practicing Sanskrit, the patient can build up cognitive reserve and retain his memory in the same way as if going to a gym makes your body stronger, learning Sanskrit will make your mind stronger.

Nowadays, with the rise of AI and other technologies, we can integrate it with Sanskrit by making AI powered apps or devices that gives users daily Sanskrit recitation exercises. The app can also track the person's progress and offer more challenges on exercises as they improve. Also, we can use Natural Language Processing and AI to guide people how to pronounce Sanskrit terms correctly which is very important since a small mistake in pronunciation can change the whole meaning. With voice recognition and speech tools, it can help non-native speakers learn correct their pronunciation. We can also use virtual reality environments so that they can take part in debates and rituals which will make the experience more fun and engaging.

This will help bring Sanskrit to global audience. As the world is becoming more concerned about mental health, these AI based Sanskrit tools will become very useful and trending. We can work together with institutions and global universities to turn Sanskrit into a modern therapy method with ancient roots. By combining our past wisdom with modern AI, we will move towards the vision of ViksitBharat@2047 and make our future more secure, both mentally and culturally.

Sanskrit and Cryptography

Other nations have made several contributions to the area of cryptography, including the Rivest-Shamir-Adleman (RSA), Advanced Encryption Standard (AES), and Elliptic Curve Cryptography (ECC) algorithms, which are currently utilized all around the world to secure communication. Despite their widespread use and undeniable power, these methods are based on Western mathematical frameworks.

However, India also has its own diverse systems of cryptography in the form of Sanskrit verses and texts like Katayapadi system, Bhutasankhya system, Pingala's binary system, etc. which when integrated with modern day technology hold vast potential through which we can also make our own innovative and indigenous security system that is secure as well as culturally unique. Let us see some of these techniques and how we can combine them with AI to make India achieve digital sovereignty.

Katayapadi System

This system was found in around 6th century CE and was used by scholars in literature, music, mathematics as well as astronomy, particularly in the southern states. In this system, consonants are generally assigned values from 0-9 and vowels are generally ignored and are inserted freely during coding to make meaningful verses or texts (SriSivaRamayya,2024). Also, the digits are interpreted in reverse order of how the syllables appeared in the verse.

Some famous examples include:

"गोपीभाग्यमधुनात-शृङ्गिशोदधिसन्धिगः।

खलजीवितखातावगलहालारसंधरः॥" (Sarma,2001)

which decodes to 3.1415926535897932384626433832792, value of pi upto 31 decimal places.

Another famous example include:

"राजमार्तण्डजयिनांसमयः

भूतार्थानांक्षयकारीजनानाम्।

शुद्धिदायादवःपदप्रथयतु

भद्रंभवार्थसिद्धयेख्यातम्॥" (Sarma,2001)

which decodes to the value of sine function at intervals of 3.75 ° from 0° - 90° (in 24 equal parts).

From this we can see that this system acts like substitution cipher but it has its own unique advantages such as its language being Sanskrit is hard to understand by people who don't know the language and even if they do know the language, still the code being in poetic form make it less suspicious and easy to transmit. We can integrate this system with modern AI and can even use it to send number passwords or codes in the form of Sanskrit poems during secret missions and military operations.

For example: Use AI to generate a Sanskrit poetic verse like

"कविगीतरसार्णवकदलीमधुरारवम्"

which poetically translates to

"The sound or melody of the poet's song, an ocean of aesthetic essence, sweet as a banana."

can be decoded using programs made specifically for this and using the Katayapadi system to give the password "56361". We can also make CAPTCHA systems that require decoding Katayapadi verses which will make it difficult to decode for chat bots or foreign users.

Bhutasankhya System

In this system, numbers are assigned to well-known objects which are generally countable like one for Chandra(moon) or Bhumi(earth), two for netra(eye) or pada(feet), three for loka (heaven, earth and hell) or kala(time-past, present and future) and so on (Joseph,2000).

Therefore, if we want to hide a number code or message, we can just use objects or symbols related to it.

For example: If I want to hide my mobile password, which is suppose, 3104, then I can just relate the individual numbers like:

Shunya is the Sanskrit term for 0.

Chandra can be used for 1 since Earth has only one moon.

Loka can be used for 3 since it is normally said that there are three realms which are heaven(Swarga), earth(Bhuloka) and hell(Naraka).

And lastly, Veda can be used for 4 because in Hinduism we have four Vedas, i.e., Rigveda, Samaveda, Yajurveda and Atharvaveda.

Hence, we get the code "कालचंद्रशुन्यवेद"

This can be helpful in cryptography because through this we can encode numbers into metaphors and can easily represent it as a Sanskrit verse.

It also has some of its own unique advantages like it hides the code in Sanskrit metaphor so for an untrained person or machine, it would just look like a normal phrase in Sanskrit making it undetectable. Also, there can be different codes for the same password since there can be multiple metaphors for the same number making it harder to crack.

Therefore, we can train AI models to recognize these patterns based on a custom-made dictionary, then we can also use it in steganography, making this system culturally unique and resistant to machine detection or brute attacks without the required knowledge.

Pingala's Binary System

This system was found in around 200 BCE by Pingala who was an ancient Indian scholar and wrote the book *Chandashastra* based on it. In this system, guru(long) and laghu(short) syllables are used to describe poetic meters which correspond to 1 and 0 respectively and is similar to binary notation. This shows that

Pingala coincidentally introduced a form of binary system long before Leibniz developed the modern binary system in the 17th century(Kulkarni,2007).

Pingala also described a method called “Meru-prastaara”, which is essentially the Pascal’s Triangle and is used to enumerate the possible combinations of syllables in a meter (Kulkarni,2007). For example, for 3 syllables, the total possible combinations are:

GGG, GGL, GLG, LGG, GLL, LGL, LLG, LLL.

This corresponds to $2^3 = 8$ combinations which is the same as modern binary math would dictate. His system is naturally recursive, which is fundamental to programming languages and algorithm design. In cryptography, binary sequences are generally used for hashing, encryption and data security. Therefore, Pingala’s insights can inspire Sanskrit-based encoding frameworks.

We can design a multi-factor authentication system where instead of numerical one time passwords (OTPs), the system sends a Sanskrit metrical pattern (based on Pingala’s binary system) as a verse challenge.

Let us suppose the system generates a random binary string for authentication, like 1101, which will correspond to Guru (1), Guru (1), Laghu (0), Guru (1).

Hence, the pattern will be: Guru-Guru-Laghu-Guru.

Now, an AI tool trained on Sanskrit vocabulary can construct a line of Sanskrit poetry that fits the pattern G-G-L-G, such as:

“Rāmo rājeti rāmeti rame rāme manorame”

Then, the user must identify this metrical pattern and input the correct pattern code back into the system, which is: 1101.

We can also add a voice challenge where the user has to recite the Sanskrit verse combined with facial or gesture recognition for higher level of confidentiality. This approach not only adds a layer of security but it also revives the art of our culture, making authentication more beautiful and intelligent. This type of authentication is also highly unlikely to be guessed or broken with brute force and can also be extended to military grade security after much more modifications.

Hence, we can use all these systems and our ancient knowledge to make India grow and become more secure, then ViksitBharat@2047 will not remain merely a slogan, it will transform India into a leading economy and knowledge superpower. For this we need to integrate this idea into education and governance. India has excelled in mathematics for so long, from the invention of zero by Aryabhatta, infinity by Brahmagupta to the mathematical genius Ramanujan. We shouldn't leave this legacy to die, we need to evolve in areas like cybersecurity, AI, quantum computing and should not forget our ancient roots by combining ancient systems with these

modern systems. To redefine our national identity in this digital age and make Bharat Viksit, we need to start from the base like integrating machine and cryptographic learning with Sanskrit verses from school days. As Swami Vivekananda had said,

“Education is the process by which character is formed, strength of mind is increased, and intellect is sharpened, as a result of which one can stand on one's own feet. And a teacher's sacred duty is to invoke a spirit of inquiry in his pupils.”

Therefore, such learning and values must be inculcated in the minds of children early on, shaping not just competent individuals but conscious citizens. This vision is not something new but has been with us from several centuries and is gradually being lost, that we need to revive. Universities in Bharat (Past: 250–1200 AD) like Nalanda University during the Gupta and Pal empires, with 1500 teachers and 8500 students conducting 100 lectures a day, were global centers of excellence, where even foreign scholars like Yijing and Hieun Tsang came to study Yoga, Nyaya and Sanskrit. Though destroyed by Bakhtiyar Khilji in 1193 CE, Nalanda left behind a legacy. Similarly, Pushpagiri, and Vikramshila University (under the Dharmapala Empire), Ujjain School, Temple Universities, Forest Universities like Shaunaka's formed the backbone of a thriving Indian knowledge system in all branches of science and their applications, besides developing the great spiritual culture of Bharat. Unfortunately, many were destroyed by invaders or undermined later by colonial control over temples and donations. Still, this heritage forms the intellectual foundation of a truly Viksit Bharat.

Nowadays, all the digital systems and encryption processes rely mainly on multiplication and other mathematical techniques which are quite large and time consuming. But this can be tackled by using Vedic mathematics sutras like the Urdhva-Tiryagbhyam Sutra (Vertically and Crosswise) which is a general multiplication formula that works on all numbers and has been proven effective in speeding up calculations. Also, Nikhilam sutra can be used to improve matrix multiplications due to its simple steps and logic and also because it skips all the unnecessary intermediate steps.

We should encourage more start-ups who use these types of methods because it will help us in designing our own culture not only unique but a powerful system as well. Some of this approach can already be found like in Very large-scale integration (VLSI) design and field programmable gate array (FPGA) based arithmetic processors. We can also collaborate with institutions like Indian Institute of Technology (IIT) or defence research & development organisation (DRDO) to create our own unique culture based technologically driven systems. Also, we should slowly but steadily start integrating these types of methods or systems to make codes and use them in military operations. This will give us a slight upper hand. Since, all types of advancements need to start from some base, therefore, government has also

initiated some new policies that inculcate ancient knowledge from early days like National Education Policy 2020 which integrate traditional knowledge into formal education by introducing subjects like Vedic mathematics and Sanskrit which are now essential part of curricula. Also, the government has introduced teaching about AI and machine learning from early school days.

This will contribute to the vision for ViksitBharat@2047 where India will become more secure, technologically advanced, gain global recognition and AI will not only become secure but also Sanskritik.

Conclusion

In this chapter, we learnt how ancient Indian knowledge systems like Katayapadi system, Bhutasankhya system, Pingala's binary system and Vedic mathematics have been around long before western methods for cryptography, science and technology came and these can be combined with our modern technology to make the existing systems or technology even better, more secure and culturally unique.

The Katayapadi system turns numbers into letters and words similar to our modern substitution cryptography method but in the form of poems and verses. Similarly, the Bhutasankhya system uses metaphors instead of numbers, Pingala's binary system has guru-laghu method similar to modern day binary system and Vedic mathematics is full of tricks that can make calculations much quicker and easier. Our ancient books also have verses in Sanskrit that even store the values of pi and trigonometric functions and Sanskrit is not just a language, it helps in improving our memory, focus, and clarity of thought which can be seen from several experiments by Dr. James Hartzell. This shows that our ancient texts were written in Sanskrit not only for their beauty but also to make learning easier and longer lasting. Even today, chanting or reading Sanskrit can boost memory retention and brain activity.

Therefore, we can see that our modern-day cryptography methods, encoding systems have already existed from time immemorial in our ancient scriptures but just in different forms and these can be integrated with AI to make systems more efficient and creative. This can help create AI that understands language and culture, not just facts.

This shows that India has its own smart ideas and we don't have to copy others, we can grow using our own roots and ancient knowledge. If we bring these old systems into our schools, our technology and our policies, we can build a future that is both modern and connected to our culture. Hence, we need to work together because a truly advanced nation doesn't forget where it came from. It remembers, adapts and leads.

Let India rise, not just as a tech hub, but as a civilization whose wisdom powers the world's next big leap.

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