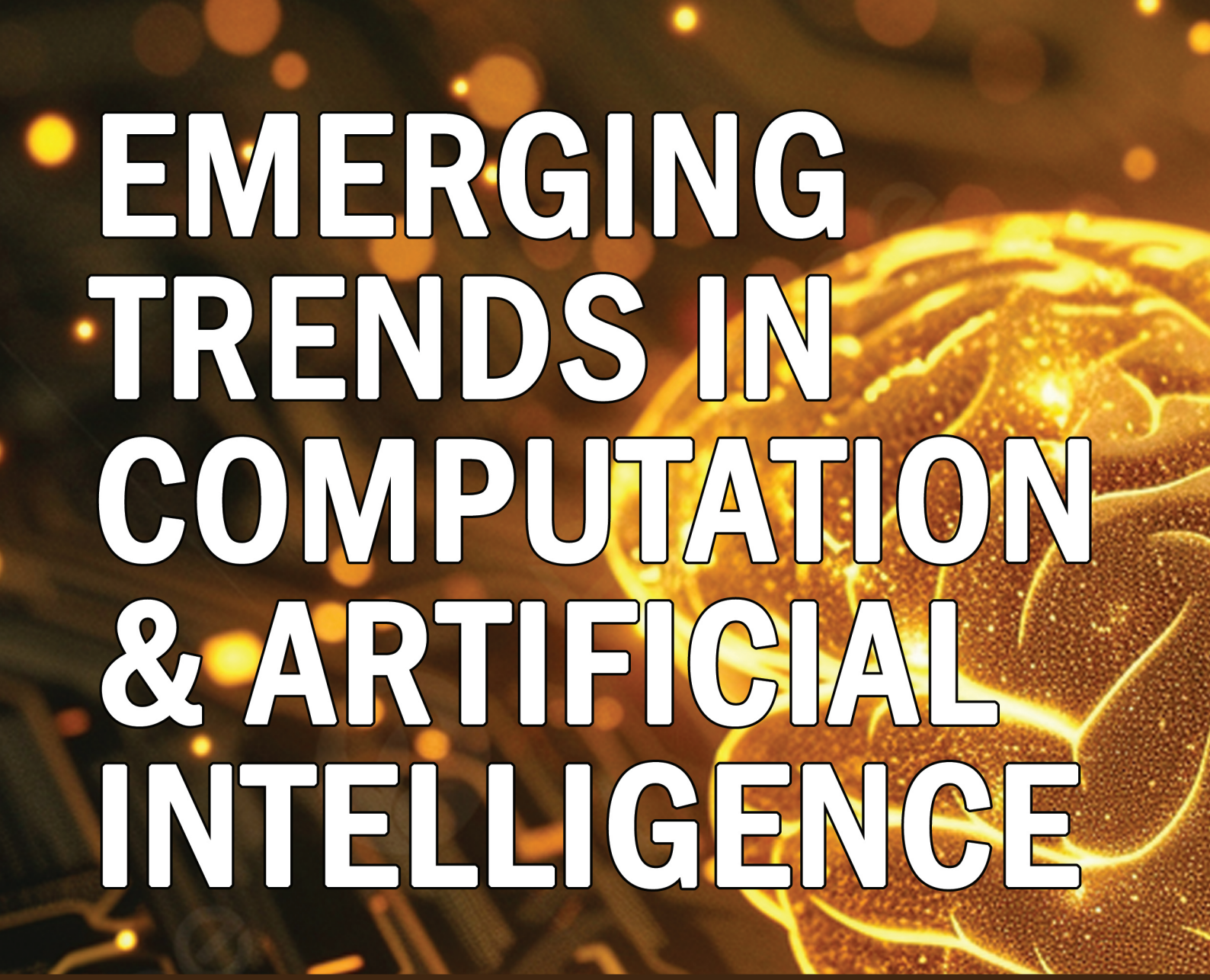

EMERGING TRENDS IN COMPUTATION & ARTIFICIAL INTELLIGENCE

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Dr. K. Santhosh Kumar

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Mrs. L. Sankara Maheswari

CiiT

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24	NUTRITION LABEL ANALYSIS AND PERSONALIZED DIETARY RECOMMENDATIONS USING TINYML R. Deepa and Harini S	151
25	EXPLORING THE POTENTIAL OF GENERATIVE ARTIFICIAL INTELLIGENCE TOOLS IN REDUCING SHADOW EDUCATION GROWTH Sachin Kumar, Poonam Pandita, Dr. Kiran	156
26	SAFEGUARDING HEALTH DATA: STRATEGIES FOR AI-DRIVEN PRIVACY L. Sankara Maheswari, M. Malini	166
27	GUARDIANS OF THE CYBER FRONTIER: UNDERSTANDING AND DEFENDING AGAINST MODERN CYBERSECURITY THREATS S. Sophiya, Mrs. G. Krishnaveni	173
28	IOT AND DEEP LEARNING-DRIVEN SMART HEALTH SOLUTIONS FOR TRIBAL WOMEN IN INDIA: A COMPREHENSIVE REVIEW Dr. T. Sumadhi	179
29	AI-POWERED FARMING: REDEFINING EFFICIENCY AND SUSTAINABILITY Mrs. P. Vanitha and Mrs. I. Razul Beevi	186
30	AGRICULTURAL MARKETING HUB FOR FARMERS Mayil .P	190
31	SECURE DIGITAL IMAGE TRANSMISSION USING LAMPORT BLUM-SHUB SIGNCRYPTIVE EXTREME LEARNING MACHINE Ms. V. Prabavathi	193
32	GENERATIVE AI AND LARGE LANGUAGE MODELS (LLMS) Dr. M. Rathamani	203
33	DATA SCIENCE IN HEALTH AND MEDICAL RESEARCH Dr. D. V. Chandrashekar, K. Suneetha	210

CHAPTER - 31

SECURE DIGITAL IMAGE TRANSMISSION USING LAMPORT-BLUM-SHUB SIGNCRYPTIVE EXTREME LEARNING MACHINE

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ABSTRACT

Image transmission refers to the process of sending or transferring digital images from one location to another, typically over a network or communication channel. This is widely used across various domains, including telecommunications, multimedia messaging, surveillance systems, medical imaging, remote sensing, and more. However, with the growing use of digital technologies, ensuring the security and integrity of transmitted images has become a critical concern. To address this, machine learning and cryptographic techniques have been explored to enhance the security of image encryption systems. Despite these advancements, ensuring confidentiality during image transmission still poses significant challenges. In this paper, we introduce a novel approach called Lamport-Blum-Shub Signcryptive Extreme Learning (LBSSEL) method for secure image transmission with minimal time consumption. The Extreme Learning Machine (ELM) architecture used in this method consists of one input layer, three hidden layers, and one output layer. Initially, a set of natural images is collected from a dataset and input into the system for secure transmission. The proposed cryptographic method involves three key processes: key generation, signcryption, and unsigncryption. In the first hidden layer, the Lamport One-Time Digital Signature method generates a pair of private and public keys using the Blum-Shub Pseudorandom Number Generator. In the second hidden layer, signcryption is performed, combining both encryption and digital signature techniques. The encrypted image (cipher image) along with the signature is then sent to the receiver to ensure the security of the transmitted image. The third hidden layer executes the unsigncryption process, where the authorized receiver verifies the signature and decrypts the image to retrieve the original content. At the output layer, the confidentiality of the transmitted image is enhanced. Experimental evaluation is conducted based on factors such as Peak Signal-to-Noise Ratio (PSNR), confidentiality level, integrity rate, and transmission time with respect to the number of images. The results demonstrate the superior performance of the proposed LBSSEL model, achieving higher PSNR, enhanced confidentiality, and better integrity during transmission, with minimal time consumption, when compared to existing methods.

Keywords---Image Transmission, Security, Signcryption, Extreme Learning, Lamport One-Time Digital Signature Method, Blum Shub Pseudorandom Number Generator.

1. INTRODUCTION

Digital images are electronic representations of visual information, such as photographs, graphics, or illustrations, during different fields namely photography, art, medicine, science, and communication. Digital image transmission refers to the process of sending images from one location to another over wireless networks. Due to the nature of wireless communication transmission, ensuring security is a challenging task, aiming to guarantee confidentiality, integrity, and authenticity while mitigating the risk of unauthorized access.

For secret sharing between users, modified Robust Reversible Watermarking in Encrypted Images by Secure Multi-party (RRWEI-SM) scheme was developed [1]. However, the lightweight encryption did not enhance safety.