Editorial

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Biographical notes: Arun Kumar Sangaiah has received his Master of Engineering degree in Computer Science and Engineering from the Government College of Engineering, Tirunelveli, Anna University, India. He has received his Doctor of Philosophy degree in Computer Science and Engineering from the VIT University, Vellore, India. He is presently working as an Associate Professor in School of Computer Science and Engineering, VIT University, India. His areas of interest include software engineering, computational intelligence, wireless networks, bio-informatics, and embedded systems. He has authored more than 100 publications in different journals and conferences of national and international repute. Also, he has organised a number of special issues for Elsevier, Inderscience, Springer, Hindawi, and IGI publishers, etc. He has acted as a book volume Editor of various publishers for Elsevier, Taylor and Francis, Springer, IGI, etc.

Anil Kumar Verma is currently an Associate Professor in the Department of Computer Science and Engineering at Thapar University, Patiala. He received his BS, MS and Doctorate in 1991, 2001 and 2008, respectively, majoring in Computer Science and Engineering. He has published over 120 papers in referred journals and conferences. His research interests include wireless networks and cloud computing.

Present day networks vary in size, scale and heterogeneity. The ever-decreasing cost of bandwidth and ever-increasing number of users are opening new vistas for applications of computer networks. Problems in integrating heterogeneous wired and wireless technologies, ensuring security and quality of service and reliably operating large-scale systems including cloud computing have all emerged as an important topics. The application of computational intelligence (CI), which includes a set of nature-inspired computational methodologies and population-based methods of optimisation to address the various problems, is relevant when considering these problems. Subsequently, CI techniques applied to optimising the performance of networking systems has received more attention in recently published volumes and related reports. Based on this context,

there is a need for envisioning a key perspective for the current state of practice of CI techniques to address research issues and challenges in network modelling and quality of services.

This special issue have explored novel theoretical developments and bridge the gap between applications of CI and communication networks. It aims to explore the advantages of CI-based solution (e.g., fuzzy systems, neural networks, evolutionary computation, swarm intelligence (SI), cognitive maps, rough sets, granular computing and other emerging learning or optimisation techniques) and how they may be used to handle the challenges associated with modelling and performance issues of communication networks. The increasing demand for CI applications in different fields entails a serious challenge for improving network performance in order to predict and estimate using imprecise and uncertain information. Hence, there is a significant need for sharing research and recent developments in computer networks and CI in conjunction with CI paradigms.

In the paper entitled 'A lightweight mutual authentication protocol based on elliptic curve cryptography for IoT devices', Aakanksha Tewari and B.B. Gupta presented a lightweight authentication protocol for IoT devices using the elliptic curve cryptography. The proposed scheme satisfies mutual authentication, confidentiality, anonymity and forward secrecy and other attacks as mentioned in the analysis. The use of ECC also reduces the computation and communication overhead as compared to the existing asymmetric techniques. The proposed technique is simple, easy to implement with low overhead and can be further extended to other lightweight systems.

The paper by D. Ashok Kumar and S.R. Venugopalan 'Intrusion detection by initial classification-based on protocol type', proposes to classify the dataset initially based on 'protocol type' feature and the performance improvements over traditional way of considering the full data without initial classification. This paper does not advocate any techniques or algorithms, but establishes the fact that by splitting the data based on protocol type feature enhances performance with respect to detection rate and time to build model for intrusion detection. In this study, the well-known KDD Cup 99 Intrusion Dataset has been tested with the proposed approach. The computational study reveals that the initial classification based on protocol type attribute increases the performance with respect to rate of detection and time to build model.

The paper by S. Sarathambekai and K. Umamaheswari entitled 'Performance comparison of discrete particle swarm optimisation and shuffled frog leaping algorithm in multiprocessor task scheduling problem', presents a comparative performance of two recent SI-based optimisation algorithms such as discrete particle swarm optimisation (DPSO) and SFL in task scheduling problem. Task scheduling (TS) is a complex combinatorial optimisation problem and known to be NP-hard. It is an important challenging issue in distributed systems. Make span, mean flow time and reliability cost are performance criteria used to evaluate the efficiency of the DPSO and SFL algorithms for scheduling independent tasks in distributed systems. Computational simulations are done based on a set of benchmark instances to assess the performance of the algorithms.

In the paper entitled 'A hybrid fruit fly optimisation algorithm to solve the flow shop scheduling problems with multi-objectives', M.K. Marichelvam et al. present a relatively new meta-heuristic algorithm called as hybrid fruit fly optimisation algorithm to solve the multi-objective flow shop scheduling problems. Two constructive heuristics and a dispatching rule are incorporated with the fruit fly optimisation algorithm and hence the solution quality is improved. The proposed algorithm is tested on random problem

instances and the results are compared with many other meta-heuristic algorithms. The results show that the proposed algorithm is more effective and better than other meta-heuristic algorithms.

The paper by Chinu Singla and Sakshi Kaushal 'An efficient game theoretic based computation offloading framework for network optimisation in mobile cloud IoT systems', proposes a mobile cloud IoT (MCIoT) environment in a nested game theory to optimise computationally intensive applications. It has been shown that game always leads to a unique Nash equilibrium. The proposed framework consists of a network selection game, application partitioning and cloud selection game based on different game theory models. Numerical results show that the proposed method is reliable, efficient and can scale well as the size of system data increases in order to maximise the performance of MCIoT systems.

In the paper entitled 'Ant colony-based load balancing and fault recovery for cloud computing environment', Balamurugan Balusamy et al investigates an algorithm named ant colony-based load balancing and fault recovery (ACB-LBR) is proposed that achieve well-balanced load across VM, activates recovery process at the time of VM failure and reduces power consumption among VMs. This algorithm uses foraging behaviour of ant colony for balancing the tasks in overloaded VM that leads to high throughput. The ACB-LBR algorithm recovers the lost resource at failure time and manages less power consumption. The experimental result show that the proposed algorithm has been more effective compared to existing load balancing, recovery and power consumption algorithm.

The paper by Adarsh Kumar et al., 'A novel lightweight key management scheme for RFID-sensor integrated hierarchical MANET based on internet of things', overcomes the weakness of Teo and Tan's protocol. In proposed mechanism lightweight primitives and protocols are integrated for security and results show that it provides strong authentication, confidentiality, forward and backward secrecies. The comparative analysis shows that the proposed mechanism is having lesser cost in terms of number of messages exchange and there is an improvement of 6.6% for gate equivalents (GEs) as compared to Teo and Tan's protocol. Further, a comparative numerical and simulation analysis of proposed mechanism has been made with Teo and Tan, Wen-Lin-Hwang's (WLH) and Tseng's group key agreement approach. The analysis shows that the proposed mechanism is secure, efficient and lightweight for resource constraint devices in MANET. The proposed mechanism provides high maximum throughput and minimum delay.

The paper by Nishu Gupta et al., 'Mobility dependent clustering-based data transmission under variable data rate for different node densities in vehicular ad hoc network', evaluated the performance of the IEEE 802.11p standard. Comparisons have been made for single-hop and multi-hop wireless network in terms of throughput, delivery ratio and end-to-end delay with respect to varying data rates. Apart from that, clustering mechanism is implemented in order to increase the message delivery range. Clustering is based upon node mobility. Mobility aware clustering mechanism opens avenues for further comparison under different QoS metrics. The obtained results indicate that the inherent architecture of IEEE 802.11p standard poses stringent limitations on the reliability of safety message delivery, mainly originated from the uncoordinated medium access scheme.

The paper by Varun Kohli et al., 'Modified fitness-based swarm intelligence approach for routing in wireless sensor networks', authors have presented a SI-based approach which serves as an apt model on the grounds that they comprise of moderate, self-organising and cooperative behaviours to deliver long lasting adaptively to changes in pervasive environments. Moreover, this have investigated modified multi path routing using artificial bee colony (ABC).

The paper by Sumit Kumar et al., 'A novel approach to automate test data generation for data flow testing based on hybrid adaptive PSO-GA algorithm', have presented hybrid adaptive particle swarm optimisation (PSO)-genetic algorithm (GA). The proposed approach is then compared with GA, PSO, ACO, DE and hybrid GA-PSO on the basis of two performance parameters, average number of generations and average coverage achieved. The results show that Hybrid Adaptive PSO-GA gives better results as compared to other algorithms that are used in the field of test data generation.

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