INSTITUTE FOR RESEARCH IN FUNDAMENTAL SCIENCES

IPM

پژوهشگاه دانش‌های بنیادی

ISi

انجمن انفورماتیک ایران

محاسبات و سامانه‌های توزیع شده
Distributed Computing & Distributed System

The Third International Conference on Distributed Computing and High Performance Computing (DCHPC 2024), 14th-15th May 2024, Tehran, Iran.

A b s t r a c t   B o o k

DCHPC 2024

www.iahpc.ir

14th -15th May **Tehran Iran**

Editors:

Shamsollah Ghanbari
Maryam Khosrokhani
Debasish Ghose

IEEE
IRAN SECTION

ISC
Islamic World Science Citation Center

2024 Third International Conference on Distributed Computing and High Performance Computing (DCHPC), 14th–15th May 2024, Tehran, Iran.

Sponsors

School of Computer Science, Institute for Research in Fundamental Sciences (IPM)

Distributed Computing Systems Scientific Group

Informatics Society of Iran

IEEE Iran Section

Organization Committee Members

General chairs:
Mohamed Javad A. Larijani
Director of Institute for Research in Fundamental Sciences (IPM), Tehran, Iran.

Pejman Lotfi-Kamran
Associate Professor of School of Computer Science, Institute for Research in Fundamental Sciences (IPM), Tehran, Iran.

Eslam Nazemi
Associate Professor, Faculty of Computer Science & Engineering, Shahid Beheshti University, Tehran, Iran.

Ebrahim Naghib Zadeh Mashaykh
Assistant Professor, University of Tehran, Iran.

Conference Program Chair:
Shamsollah Ghanbari
Assistant Professor, Islamic Azad University, Ashtian Branch, Iran.

Conference Scientific Chairs:
Shamsollah Ghanbari
Assistant Professor, Islamic Azad University, Ashtian Branch, Iran.

Debasish Ghose
Professor, Indian Institute of Science, India.

Hamidreza Shahrabi
Executive Manager, School of Computer Science, Institute for Research in Fundamental Sciences (IPM), Tehran, Iran.

Chair of International Affairs and Publications:
Maryam Khosrokhani
Informatics Society of Iran, Iran.

Data and Informatics Manager:
Amir Mohammad Ghanbari
Informatics Society of Iran, Iran.

The Third International Conference on Distributed Computing and HighPerformance Computing (DCHPC2024), 14ᵗʰ -15ᵗʰ May 2024,
Tehran, Iran.
Conference Program
Conference web site: www.iahpc.ir

Tuesday, May 14, 2024
Main Session Link: https://ipm.fararoom.ir/ch/main-session/guest

Time*	Event	Venue
09:15-09:45	**Opening**	Main Session
09:45-10:35	Keynote Speaker: **Prof. Behrooz Parhami,** University of California, Santa Barbara, USA **Title:** Fixed-Degree and Constant-Diameter Interconnection Networks for Parallel Supercomputing	Main Session
10:35-10:45	A&Q	▪
10:45-11:45	Workshop: **Dr. Hoshang Kolivand** Impact of AI on mixed Reality.	Main Session
11:45-12:25	Workshop: **Eng. Amir Mohammad Ghanbari** Container and Container Orchestration	Main Session
12:30-13:30	Lunch & Break	▪
13:30-15:30	Online parallel Sessions	▪
15:30-16:20	Keynote Speaker: **Prof. Alex Shafarenco,** University of Hertfordshire, Hatfield, UK **Title:** Towards Efficient High-Throughput Computing: Harnessing Stateless SISO Compnents and Flow Inheritance	Main Session

Wednesday, May 15, 2024

Time*	Event	Venue
9:00-09:50	Workshop: **Dr. Aamar Wali** A Transfer-No-Transfer Learning Approach for Handwritten Pattern Recognition	Main Session
09:50-10:40	Keynote Speaker: **Prof. Satish Narayana Srirama,** School of Computer and Information Sciences, University of Hyderabad, India. Title: A Decade of Research in Fog computing: Relevance, Challenges, and Future Directions	Main Session
10:40-10:50	Break	▪
10:50-12:30	Online parallel Sessions	▪
12:30-13:30	Lunch & break	▪
13:30-14:20	Workshop: **Eng. Niladri Mahapatra** Design Thinking	Main Session
14:20- 14:30	**Closing**	Main Session

Note: Tehran, Iran time is 3:30 hours ahead of Greenwich Mean Time (GMT).

About DCHPC2024

Shamsollah Ghanbari
Conference Program & Scientific Chair

The Third International IEEE Conference on Distributed Computing and High-Performance Computing (DCHPC2024) is scheduled to be held in Tehran from May 14th to 15th, 2024. The conference is jointly organized by the School of Computer Science, Institute for Research in Fundamental Sciences (IPM), and the Informatics Society of Iran (DCS scientific group). Our objective remains focused on providing an interactive platform for researchers and professionals in distributed computing and high-performance computing to exchange ideas and share advancements. Similar to its predecessors, DCHPC2024 has received technical support from IEEE Iran Section and the Islamic World Science Citation Center (ISC). The organizing committee has dedicated significant efforts to ensure the success of this event.

The primary aim of the DCHPC conference series is to gather researchers from industry, academia, and other institutes to share and discuss their latest scientific findings in high-performance computing, distributed systems, and applications. For this conference, we received 80 submissions from 200 authors across 12 countries, including Iran, Iraq, Pakistan, India, Malaysia, Hungary, Poland, Russia, the United States, Brazil, Netherland, and Ireland.

The papers were reviewed by 40 expert committee members and approximately 15 sub-reviewers, so that each paper has been reviewed by two or three reviewers. Subsequently, 21 papers were selected and accepted for oral presentation at the conference and publication in IEEE Explore, and 10 other papers were selected to be indexed by ISC and oral presentation at the conference as well.

We had the honor of hosting three distinguished keynote speakers and four workshop presenters. Furthermore, we organized two Discussion Panels, covering diverse topics including divisible load theory and graph theory.

Additionally, I would like to express my sincere appreciation to all conference participants, with special thanks extended to the main speaker, keynote speakers, and workshop presenters for their warm cooperation. I also appreciate the contributions of the committee members, sub-reviewers, and session chairs for their invaluable assistance in reviewing papers, making decisions, and managing the parallel sessions. I would also like to appreciate the authors for their pivotal contributions to the conference and extend my congratulations to the authors of the accepted papers.

Moreover, I extend my deepest gratitude to the sponsors and the organizing committee, including the general chair, program co-chairs, executive chair, and publication chair. I am also thankful to my colleagues, students, and friends who generously contributed to organizing this event.

Scientific Chair

Prof. Debasish Ghose
Professor, RBCCPS & Department of Aerospace Engineering
Indian Institute of Science, Bangalore 560012, India

Debasish Ghose is a Professor at the Centre of Cyberphysical Systems and the Department of Aerospace Engineering at the Indian Institute of Science, Bangalore, India. His research interests are in parallel and distributed computing, autonomous systems, and AI&ML. He has been associated with the editorial board of many prestigious journals including several IEEE Transactions. He has authored many books in his area of work as well as many publications.

He is a Fellow of several academies (INAE, NASI, INSA) and associate fellow of AIAA.

Welcome Message:

It is my pleasure to welcome you all to the DCHPC 2024. Over the years, this conference has become a flag bearer for some of the best work in the area of distributed and high-performance computing in this region of the world. The technical committee has meticulously gone through all the submissions and arranged paper reviews and evaluations. After this rigorous process, the final selected papers presented at the conference are the best among the submitted papers. I am sure you will enjoy the depth and breadth of the works presented at this conference and will have an enriching experience.

Keynote speakers

Prof. Behrooz Parhami
Department of Electrical and Computer Engineering
University of California

Behrooz Parhami (PhD, UCLA 1973) is Professor of Electrical and Computer Engineering, and former Associate Dean for Academic Personnel, College of Engineering, at University of California, Santa Barbara, where he teaches and does research in computer arithmetic, parallel processing, and dependable computing. A Life Fellow of IEEE, a Fellow of IET and British Computer Society, and recipient of several other awards (including a most-cited paper award from J. Parallel & Distributed Computing), he has written six textbooks and more than 300 peer-reviewed technical papers. Professionally, he is an IEEE Computer Society Distinguished Visitor, serves on journal editorial boards and conference program committees, is passionate about puzzles, outreach efforts, & gender equity, and is active in technical consulting.

Title: Fixed-Degree and Constant-Diameter Interconnection Networks for Parallel Supercomputing

Abstract

Interconnecting multiple processors in a parallel supercomputer constitutes a challenging problem. There are so many different ways to interconnect the computing nodes that the range of options has come to be known as "the sea of interconnection networks." In this talk, I will outline the theoretical underpinnings of interconnection network design in a way that exposes the challenges. I will then review desirable network properties and relate them to various network classes that have been used or proposed. The two extremes of fixed-degree networks and constant-diameter networks will be given special attention.

Keynote Speakers

Prof. Alex shafarenko
Department of Computer Science
Hatfield, England, United Kingdom

Alex Shafarenko received Ph.D. from the Siberian Branch of the Russian Academy of Sciences in 1990. He joined faculty at the University of Surrey, England as a Senior Lecturer within the Department of Electronic and Electrical Engineering and was subsequently made a Reader. He was appointed to his current position as Professor of Software Engineering in 2000 by the University of Hertfordshire as he joined the School of Computer Science. Dr Shafarenko has led several international research projects in the area of advanced signal processing and parallel computing.

Title: Towards Efficient High–Throughput Computing: Harnessing Stateless SISO Components and Flow Inheritance.

Abstract

This keynote will delve into a layer of abstraction centered around a network of stateless, typed Single Input Single Output (SISO) components. We'll explore how interactions between these components are facilitated by SISO–preserving network combinators, enabling both parallel and serial compositions as well as recurrent feedback. A key highlight of this model is its unique type system, featuring flow inheritance, which allows components to pass unused input elements to their output while maintaining SISO consistency. We'll also discuss how the typing of SISO components addresses additional concerns such as security and robustness. Given the stateless nature of these components, they can be safely replicated and executed in parallel. Moreover, with the inclusion of a recurrence combinator, the network can dynamically unfold over time. The system state is managed by built–in synchro cell components, which combine input datasets into joint sets for output, preserving flow inheritance and addressing security and robustness considerations. Practically, this approach offers significant benefits for High–Throughput Computing (HTC) by encapsulating conventional serial code within SISO shells, featuring flexible and context–adaptable interfaces. The remainder of network construction can then be achieved using low–code or graphical methods, promising efficient HTC solutions at reduced cost and complexity.

Keynote Speakers

Prof. Satish Narayana Srirama
University of Hyderabad, India.
Email:satish.srirama@uohyd.ac.in

Satish Narayana Srirama is a Professor at the School of Computer and Information Sciences, University of Hyderabad, India. He is also a Visiting Professor and the honorary head of the Mobile & Cloud Lab at the Institute of Computer Science, University of Tartu, Estonia, which he led as a Research Professor until June 2020. His current research focuses on cloud computing, mobile cloud, Internet of Things, fog computing, and migrating scientific and enterprise applications to the cloud. He is IEEE Senior Member, an Editor of 54 year old Wiley Software: Practice and Experience journal, was an Associate Editor of IEEE Transactions in Cloud Computing and a PC member of several international conferences and workshops. Dr. Srirama has co-authored over 190 refereed scientific publications in international conferences and journals.

Title: A Decade of Research in Fog computing: Relevance, Challenges, and Future Directions.

Abstract
To address the latency, network load, and privacy issues of Cloud-centric Internet of Things, Fog Computing was coined by Cisco in 2012, a decade ago, which utilizes proximal computational resources for sensor data processing. Since its proposal, fog computing has attracted significant attention and the research fraternity focused at addressing different challenges such as fog frameworks, simulators, resource management, placement strategies, quality of service aspects, fog economics etc. However, after a decade of research, we still do not see large-scale deployments of public/private fog networks, which can be utilized in realizing interesting IoT applications. In the literature, we only see pilot case studies and small-scale testbeds, and utilization of simulators for demonstrating scale of the specified models addressing the respective technical challenges. This keynote summarizes the technical, non-functional and economic challenges, which have been posing hurdles in adopting fog computing, by consolidating them across different clusters.
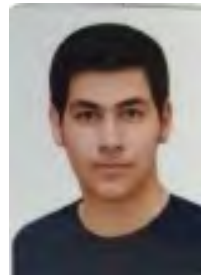
Scientific Program Committee Members

Name	Affiliation
Shamsollah Ghanbari	Assistant Professor, Islamic Azad University, Iran.
Pejman Lotfi Kamran	Associate Professor of School of Computer Science, Institute for Research in Fundamental Sciences (IPM), Iran.
Eslam Nazemi	Associate Professor, Faculty of Computer Science & Engineering, Shahid Behesthi University, Iran
Debasish Ghose	Professor, Indian Institute of Science, India.
Veeravalli Bharadwaj	Professor, Department of Electrical and Computer Engineering, Faculty of Engineering, The National University of Singapore (NUS).
Ebrahim Naghib Zadeh Mashaykh	Assistant Professor, University of Tehran, Iran.
Mohamed Othman	Professor, Universiti Putra Malaysia, Malaysia.
Maciej Drozdowski	Professor, University Of Technology, Poland.
Roman Wyrzykowski	Professor, Institute of Computer and Information, Poland.
Doost Ali Mojdeh	Professor of Mathematics (Graph Theory) at University of Mazandaran, Iran.
Bahram Sadeghi Bigham	Associate Professor, Department of Computer Science and Information Technology Institute for Advanced Studies in Basic Sciences (IASBS), Zanjan, Iran.
Hamid R Arabnia	Professor, Emeritus of Computer Science, University of Georgia.
Pabitra Mitra	Professor, Indian Institute of Technology Kharagpur.
Ali Emrouznejad	Professor, Aston Business School, Aston University, UK.
Mohammad Ganjtabesh	Professor, University of Tehran, Iran.
Ehsan Mousavi Khaneghah	Associate Professor, Shahed University, Iran.
Satyabrata Das	Associate Professor, Veer Surendra Sai University of Technology, Burla.
Parvaneh Asghari	Assistant Professor, Islamic Azad University, Iran.
Muhammad Sharif	Professor, Department of Computer Science, COMSATS University Islamabad, Wah Campus.
Monireh Houshmand	Associate Professor, Imam Reza International University, Mashhad, Iran.
Mahdi Dolati	Associate Professor, Department of Computer Engineering, Sharif University of Technology, Iran.
Mahboobeh Houshmand	Assistant Professor, Islamic Azad University, Mashhad.
Manochehr Kazemi	Associate Professor, Islamic Azad University, Iran.
Habib Izadkhah	Assistant Professor, University of Tabriz.
Hoshang Kolivand	Associate Professor, Liverpool John Moores University, UK.
Mojtaba Kazemi	PhD Lecturer, Islamic Azad University, Qom, Iran.
Seyed Morteza Babamir	Associate Professor, University of Kashan, Iran.
Asefeh Asemi	Associate Professor, Corvinus University of Budapest, Hungary.

Name	Affiliation
Enaul Haq Shaik	Professor, Department of Electronics Engineering, School of Engineering and Technology, Pondicherry University.
Arash Khosravi	Assistant Professor, Mahallat University.
Shamala Subrananiam	Professor, Universiti Putra Malaysia, Malaysia.
Hamidah Ibrahim	Professor, Universiti Putra Malaysia, Malaysia.
Furkan Hassan Saleh Rabee	Professor of Computer Engineering, University of Kufa, Iraq.
Amaya Salazar	Professor, Universidad de Málaga. España.
Jhon Edgar	Professor, Universidad de Málaga. España.
Ordabay Sembiyev	Professor, M.Auezov South Kazakhstan State University, Kazakhstan.
Taghi Javdani Gandomani	Assistant Professor, Shahrekord University, Iran.
Zhalgasbek Iztayev	Professor, South Kazakhstan State University, Kazakhstan.
Amir Masoud Rahmani	Professor, Islamic Azad University, Iran.
Mahdi Hashemzadeh	Associate Professor, Azarbaijan Shahid Madani University, Iran.
Aamir Wali	Professor, National University Pakistan.
Seyed Hamed Rastegar	School of Computer Science, Institute for Research in Fundamental Sciences (IPM), Tehran, Iran.

DCHPC204 Workshops

Title: Impact of AI on Mixed Reality **Presenter:** John Moores Associate Professor, Liverpool University, UK.	**Title:** Container and Container Orchestration. **Presenter:** Amir Mohamad Ghanbari, Qom University, Qom, Iran.
Title: A Transfer-No-Transfer Learning Approach for Handwritten Pattern Recognition. **Presenter:** Aamir Wali Professor, National University Pakistan.	**Title:** Design Thinking . **Presenter:** Niladri Mahapatra Agile Digest, India.

Executive Committee

Name		Affiliation
Hamidreza Shahrabi	Chair of Executive Committee	School of Computer Science, Institute for Research in Fundamental Sciences (IPM).
Mojtaba Kazemi	Coordination Chair	Islamic Azad University, Qom, Iran.
Hossein Ahmadi NajafAbadi	Internal Publication Co–chair	Informatic Society of Iran, Tehran, Iran.
Mohammad Pourbafrani	Certificate Affair	Informatic Society of Iran, Tehran, Iran. Mashhad, Iran.
Mahdi Dolati	Session Chair	Associate Professor, Department of Computer Engineering, Sharif University of Technology, Iran.
Naeimeh Omidvar	Session Chair	School of Computer Science, Institute for Research in Fundamental Sciences (IPM), Tehran, Iran.
Nezam Rohbani	Member of Committee	School of Computer Science, Institute for Research in Fundamental Sciences (IPM), Tehran, Iran.
Armin Ahmadzadeh	Member of Committee	School of Computer Science, Institute for Research in Fundamental Sciences (IPM), Tehran, Iran
Mohammad Akhavan Anvari	Member of Committee	School of Computer Science, Institute for Research in Fundamental Sciences (IPM), Tehran, Iran
Hossein Motamednia	Member of Committee	School of Computer Science, Institute for Research in Fundamental Sciences (IPM), Tehran, Iran
Paria Darbani	Member of Committee	School of Computer Science, Institute for Research in Fundamental Sciences (IPM), Tehran, Iran.
Encieh Bakhtiari	Member of Committee	Islamic Azad University, Qom, Iran.

List of Reviewers

Reviewer Name	Affiliation
Amir Mollanejad	Islamic Azad University, Tabriz, Iran.
Alireza Rouhi	Azarbaijan Shahid Madani University, Tabriz, Iran.
Reza Faraji	Assistant Professor, Parand Islamic Azad University, Tehran, Iran.
Farhang Jaryani	Universiti Teknologi Malaysia, Malaysia.
Maral Kolahkaj	Islamic Azad University, Iran.
Mehdi Gheisari	Islamic Azad University, Iran.
Mehdi Golshan	Sepidan Branch, Islamic Azad University, Sepidan, Iran.
Razieh Shamsi	Islamic Azad University, Iran.
Savarimuthu Robinson	Mount Zion College of Engineering & Technology, Pudukkottai, Tamilnadu, India.
Samaneh Salehi Nasab	School of Engineering Lorestan University Aleshtar Campus Aleshtar, Iran.
Zurina Mohd Hanapi	Universiti Putra Malaysia, Malaysia.
Muhammad Asad Arshed	University of Management and Technology Lahore Pakistan
Zewen Li	Information Networking Carnegie Mellon University.
Mohanad Raheem Hasan AL–Janab	University of Kufa, Iraq.

Table of contents

Accepted Papers for IEEE

Bitcoin Price Prediction based on Financial Data, Technical indicators, and News Headlines Sentiment Analysis Using CNN and GRU Deep Learning Algorithms

Masoud Arjmand[1], Saman Kazeminia[2], Hedieh Sajedi[3]

[1]Department of Computer Engineering University of Tehran, Kish International Campus Kish, Iran
m.arjmand@ut.ac.ir

[2]Department of Computer Vision and Data Science, NHL Stenden University of Applied Science, Leeuwarden, Netherlands
saman.kazeminia@student.nhlstenden.com

[3]Department of Mathematics, Statistics and Computer Science University of Tehran Tehran, Iran
hhsajedi@ut.ac.ir

Keywords	Abstract
Bitcoin CNN GRU BERT	Bitcoin is the leading cryptocurrency with the highest market value among digital currencies. In this paper, we aim to forecast the price of Bitcoin using news headline analysis, technical analysis indicators, and historical financial data. The news headlines used in this study are scraped from the Cointelegraph news website. We employed a transformer pre-trained model called CryptoBERT to analyze textual data. Additionally, a novel hybrid 2DCNN-GRU deep learning model has been applied to predict the price. To fine-tune the parameters of this model, the Taguchi method has been employed. The results show that this model outperformed other models in terms of the MAE criterion.

Conclusion

In this article, we utilized historical financial data, news headlines, and technical indicators to make predictions on the price of Bitcoin. Having Extracted the financial data of Bitcoin from the Yahoo financial website, we gathered relevant news articles concerning Bitcoin within this timeframe by scraping the Cointelegraph financial news website. Additionally, we calculated several widely recognized technical indicators. To reduce dimensions, we constructed a correlation matrix. In assessing the sentiment of the news headlines, we applied the CryptoBERT model, a transformer model based on the FinBERT model. Moreover, to enhance the efficiency of the proposed model, we utilized the Taguchi parameter tuning method based on orthogonal arrays. The obtained results demonstrate that the proposed model outperforms previously discussed models by other researchers in terms of the MAE criterion, while it achieves a considerably favorable performance regarding other criteria.

Enhanced Gray Wolf Optimizer For Exploring Social Network Communities

Arash Khosravi[1], Ahmad Azarnik [1], Mohammad Kalhor[2], Maliheh Ghasemzadeh[3]

[1]Faculty of Engineering, Mahallat Institute of Higher Education, Mahallat, IRAN
ahmad.azarnik@gmail.com
Khosravi.280@gmail.com

[2]2Department of Computer Engineering, Shahab Danesh University, Qom, IRAN
mohammadkalhor1370@gmail.com

[3]3Department of Engineering, Islamic Azad University, Karaj, IRAN
gh_mavad@yahoo.com

Keywords	Abstract
Community Detection Gray Wolf Optimization Label Propagation Local Search	The identification of communities within social networks holds paramount importance in scientific investigations and social network analyses. Communities refer to compact clusters of nodes that exhibit stronger interconnections with each other rather than with nodes outside their community. By accurately detecting and understanding these communities, we can achieve profound insights into the structure and functionality of social networks. In this research, we introduce an innovative and improved meta-heuristic algorithm specifically designed for detecting community in social networks. Leveraging the powerful gray wolf algorithm as its foundation, our proposed algorithm employs a combination of mutation, combination, and local search operators to significantly enhance its performance. Moreover, to further refine the outcomes, we have integrated the label propagation algorithm into our approach. To measure the efficacy of our proposed algorithm, extensive evaluations were conducted on various social network datasets. The findings consistently validate our algorithm's ability to converge towards optimal results, thanks to its exceptional accuracy and precision. By introducing this advanced meta-heuristic algorithm, we make contributions to the field of social network analysis by providing a robust and efficient solution for community detection. Our algorithm empowers researchers and analysts to acquire a more profound comprehension of social network structures and functions, thereby facilitating improved decision-making and problem-solving.

Conclusion

Numerous algorithms have been introduced thus far for community detection; however, a majority of them suffer from issues such as unstable results, limited scalability, and prolonged execution time. In our research, we have developed an enhanced gray wolf algorithm for community detection. Furthermore, we have incorporated the label propagation algorithm, known for its swiftness, to refine the solutions acquired from the gray wolf algorithm. Subsequently, we applied our proposed method to three datasets and conducted a comparative analysis against five renowned algorithms in this domain. Through our experimentation, we have demonstrated that the proposed method has achieved a notably higher modularity than its counterparts.

Promoting Cybersecurity Knowledge via Gamification: An Innovative Intervention Design

Fatokun Faith B[1], Zalizah Awang Long[1], Suraya Hamid[2]

[1]Malaysian Institute of Information Technology, University of Kuala Lumpur, Kuala Lumpur, Malaysia

evangfatoks@gmail.com

zalizah@unikl.edu.my

[2]Department of Information Systems, Faculty of Computer Science & IT, University of Malaya, Kuala Lumpur, Malaysia

suraya_hamid@um.edu.my

Keywords	*Abstract*
Cybersecurity Gamification Cybersecurity Knowledge Online Safety Cybersecurity Gamification	Cybersecurity is becoming a critical challenge as technology thrives with novel innovations. The increase in cyber threats is quite alarming. Several security approaches are relinquished to limited impact due to a lack of compliance with security guidelines by end-users deficient in basic cybersecurity knowledge. This paper, via an experimental/qualitative approach, proposes a comprehensive cybersecurity gamification design based on established gamification theories to ensure the validity of the cybersecurity gamification tool. The cybersecurity gamification tool is aimed at promoting the cybersecurity knowledge of end-users. Gamification, if implemented properly, can impact beyond just learning and boost knowledge, learning experience and engagement of the targeted audience through motivation by the game elements.

Conclusion

Cybersecurity is a challenging interesting research area that keeps evolving globally. This is due to the rapid cyber-attacks, resulting in a high risk of victimisation. This paper presented an innovative intervention design via gamification to promote cybersecurity knowledge among general Internet users. The comprehensive cybersecurity gamification, comprising three levels, social engineering, network security, and password security, provides an inclusive motivational learning engagement for participants to be equipped with substantive cybersecurity knowledge. Future work will test gamification and propose a cybersecurity knowledge behavioural model which will guide researchers and stakeholders to build more accelerated interventions to promote cybersecurity awareness and knowledge, respectively.

Modeling and Verification of the Causal Broadcast Algorithm Using Colored Petri Nets

Leila NamvariTazehkand[1], Saied Pashazadeh[1]

[1]Department of Computer Engineering, Faculty of Electrical and Computer Engineering,
University of Tabriz, Tabriz, Iran
l.namvari@tabrizu.ac.ir
pashazadeh@tabrizu.ac.ir

Keywords	*Abstract*
Modeling Verification Colored Petri Nets Reliable Communication Causal Broadcast	The Causal Broadcast (CB) algorithms are presented for message passing between processes of distributed systems (DSs). These algorithms play an essential role in distributed computing. Therefore, the correctness of their performance is a high priority. Recently, researchers used the theorem-proving technique to verify causal consistency algorithms. To our knowledge, no CB algorithm presented for message-passing has been modelled and verified by a mechanical proof method. For the first time, this paper models and verifies one of the most basic CB algorithms using one of the formal methods called colored Petri nets because this algorithm has been used as the base algorithm in developing the most recent algorithms. We first model this algorithm hierarchically at the application and protocol layers using the CPN tool. Then, by analyzing the state space, we verify the properties of the CB, namely integrity, causal delivery, validity, and termination. The novelty of this paper lies in its pioneering use of colored Petri nets to model and verify a CB algorithm for the first time. This modeling method can potentially serve as a guiding method for future endeavors in modeling distributed algorithms.

Conclusion

The Causal broadcast algorithms are applicable in many areas, such as consistency in distributed shared memory, managing databases, mutual exclusion, snapshot recording, and message delivery in distributed communication systems. This is the first time a CB algorithm has been modelled and verified with Colored Petri Nets. This paper uses the CPN tool to model a recently presented CB algorithm. First, we model hierarchically at two top and low-levels to better implement algorithm details. Thus, the top and low-levels present the application and protocol layers of algorithm CB, respectively. Then, we analyze the state space in the CPN model and verify the validity, termination, integrity, and causality properties. In future research, we will develop this algorithm for distributed systems with unreliable communications. Moreover, we will model the developed algorithm using the TCPN (Timed Color Petri Nets) tool to analyze the number of lost messages and the latency rate in delivering messages.

GPU–based Parallel Technique for Solving the N–Similarity Problem in Textual Data Mining

Mahmood Fazlali[1], Mina Mirhosseini[2], Mahyar Shahsavari[3], Alex Shafarenko[1], Mashallah Mashinchi[4]

[1]1Department of Computer Science, Cyber Security and Computing Research Group, University of Hertfordshire, Hertfordshire, UK
m.fazlali@herts.ac.uk
a.shafarenko@herts.ac.uk

[2]Department of Computer and Data Sciences, Faculty of Mathematical Sciences, Shahid Beheshti University, Tehran, Iran
mi_mirhosseini@sbu.ac.ir

[3]AI Department, Donders Institute for Brain, Cognition and Behaviour, Radboud University, Nijmegen, The Netherlands
mahyar.shahsavari@donders.ru.nl

[4]Department of Statistics, Faculty of Mathematics and Computer, Shahid Bahonar University of Kerman, Kerman, Iran
mashinchi@uk.ac.ir

Keywords	Abstract
multiple similarity n–similarity parallel programming text document similarity	An important issue in data mining and information retrieval is the problem of multiple similarity or n–similarity. This problem entails finding a group of n data points with the highest similarity within a large dataset. Exact methods to solve this problem exist but come with high time and space complexities. Additionally, various meta–heuristic algorithms have been proposed, including genetic algorithms, gravitational search algorithms, particle swarm optimization, imperialist competitive algorithms, and fuzzy imperialist competitive algorithms. These metaheuristics are capable of finding near–optimal solutions within a reasonable timeframe, although there is no guarantee of achieving exact results. In this paper, we employ a parallelization technique using CUDA to expedite the exact method. We conduct experiments on textual datasets to identify a group of n textual documents with the highest similarity to each other. The experimental results demonstrate that the proposed parallel exact method significantly reduces execution time compared to the best sequential approach and CPU multi–core implementation. Furthermore, it is evident that the proposed method requires less memory space than the exact method.

Conclusion

In this paper, we have introduced a parallelized version of an exact method for solving the n–similarity problem within a practically feasible timeframe. Furthermore, our proposed method requires less memory space compared to the previous exact approach. To validate our approach, we conducted experiments using a dataset consisting of 1,504 newspaper articles, 2,886 keywords, and 31 classes, focusing on text document similarity. Our results were obtained by varying the dataset size and the number of textual documents used for both 3–similarity and 4–similarity problems. The results indicate that our CUDA–based parallelization achieves an average speedup of 22.0858X for 3–similarity problems and 15.9554X for 4–similarity problems. In future work, we plan to further optimize memory usage and explore opportunities for enhancing speed even more.

Contribution & Power of Virtual Reality in Corporate World: A Conceptual Review

Asefeh Asemi[1], Andrea Ko[1]

[1]Corvinus University of Budapest, Fovam Ter 8, Budapest 1093, Budapest Hungary

asemi.asefeh@uni-corvinus.hu

andrea.ko@uni-corvinus.hu

Keywords	Abstract
Virtual Corporate Reality (VCR) Augmented Reality Companies Metaverse Business Education business	Virtual Corporate Reality (VCR) has been receiving more attention as a groundbreaking technology that could revolutionize industries. In this paper we will initially explore the components and functions of the brain in the context of VR. This paper first deals with the biological aspects and operations of the human brain in VR. After reviewing the ability of VR in increasing the effectiveness of user experiences in this environment, presents a conceptual review that examines the current state of knowledge regarding VCR across a range of disciplines. Through a comprehensive analysis of existing literature, this review explores the fundamental components and applications associated with VCR. The systematic review highlights the importance of understanding the basic components of VCR, including human resources, management, information and communication technology, products, services, and finance. Furthermore, the review explores the application of VCR in pioneering industries such as business, education, healthcare, entertainment, applied sciences such as military science, and engineering. It tries to mention the challenges and opportunities related to VCR in business. The review concludes by proposing potential directions for future research and identifying areas where further investigation is needed to advance the understanding and application of VCR.

Conclusion

Virtual reality (VR) technology offers users the opportunity to explore and engage with realistic three-dimensional worlds. When designing VR experiences, simplicity, feedback, and personalized options are crucial to optimize its potential. Businesses can leverage VR to enhance operations, such as by providing immersive product examinations to boost sales and customer satisfaction. VR can also be utilized in the design and development stages to evaluate and improve product quality while reducing costs. Education, training, and entertainment industries can benefit from thrilling VR experiences in areas like travel, tourism, museums, concerts, and sports events. Embracing VR allows companies to enhance customer experiences, improve product quality, and provide training opportunities, positioning themselves as industry leaders. However, responsible use of VR technology requires careful assessment of its limitations and challenges before implementation. When approached with caution, VR has incredible potential to reshape the digital landscape and revolutionize how companies interact with their customers.

Enhancing Software Effort Estimation with Ant Colony Optimization Algorithm and Fuzzy-Neural Networks

Mahnaz Afshari[1], Taghi Javdani Gandomani[2]

[1]Data Science Research Group, Shahrekord University, Shahrekord, Iran
afshari.mhz@gmail.com

[2]Department of Computer Science, Shahrekord University, Shahrekord, Iran
javdani@sku.ac.ir

Keywords	Abstract
Software cost estimation Ant colony optimization algorithm Fuzzy neural networks ANFIS	Software effort estimation remains a persistent challenge and requires serious attention in the early stages of software project management. Inherent uncertainties arising from incomplete and inaccurate requirements pose a significant barrier to reliable estimations. Despite numerous efforts and various techniques proposed for cost estimation, the pursuit of improving estimation accuracy remains essential. In response to this challenge, this study introduces a novel model that integrates an Adaptive Neuro-Fuzzy Inference System with the Ant Colony Optimization algorithm. The model is further compared with well-known evolutionary algorithms such as Differential Evolution, Genetic Algorithm, Artificial Neural Network, and Particle Swarm Optimization. Applying the proposed model to popular software effort estimation datasets, including Albrecht, Desharnais, and Kemerer, demonstrates its superiority over the mentioned algorithms. The improved estimation provided by this model can assist software project managers in better project cost estimation.

Conclusion

The pursuit of reliable and accurate software effort estimation remains a primary concern for software development teams and organizations. In the dynamic and often uncertain landscape of software development, providing a method that consistently delivers accurate estimates of software development effort is essential. A solution integrating ANFIS model with ACO algorithms seems to lead to an improvement in the accuracy of software effort estimation. In this study, we proposed the ANFIS-ACO model, demonstrating its capabilities in enhancing the accuracy of software effort estimation. The ANFIS-ACO model, evaluated against well-known algorithms such as GA, DE, PSO, and a Fuzzy Neural Network-based approach, showed superior performance. Conducting experiments on three datasets Albrecht, Desharnais, and Kemerer revealed that the ANFIS-ACO model outperforms in cost estimation accuracy for software development effort.

A Novel Approach for Specification and Verification of Symmetric Distributed Algorithms Using SPIN

Leila NamvariTazehkand[1], Ali Ebnenasir[2]

[1]Department of Computer Engineering, Faculty of Electrical and Computer Engineering,
University of Tabriz, Tabriz, Iran
l.namvari@tabrizu.ac.ir

[2]Department of Computer Science, Michigan Technological University, Houghton, MI 49931,
USA
aebnenas@mtu.edu

Keywords	*Abstract*
Model Checking Promela SPIN Distributed Algorithm Symmetric Point-to-Point Bidirectional Channels	This paper focuses on the challenges of modeling and verifying symmetric distributed algorithms with point-to-point and bidirectional communications using the SPIN model checker. In this paper, we first state the problems of implementing the model of such algorithms in the Promela language. Then, we present a solution for each of these problems, where these solutions present a hybrid data structure that facilitates the definition of any set of variables or channels as a matrix. Also, we model and verify one of the valuable and practical algorithms called the causal broadcast (CB) algorithm as a case study using the proposed method. In addition, we specify the main properties of the CB algorithm, namely validity, integrity, causal delivery, and termination, in Linear Temporal Logic (LTL) and then verify them using the SPIN model checker.

Conclusion

We discussed the problems of implementing point-to-point and bidirectional channels using the Promela language for symmetric distributed algorithms. We also explained the problem of defining different variables for each modeled process. Then, we presented matrix-based channels and variables, and afterwards, we modeled the Causal Broadcast (CB) algorithm as a case study. Also, we specified the properties of CB in LTL. The Promela code to implement the proposed methods is available at https://data.mendeley.com/datasets/ptznpn848p/1. If we were to utilize matrix-based approaches for specifying a symmetric distributed algorithms with point-to-point and bidirectional communications in the Promela language, it would result in a reduction in the number of lines of code in the Promela model. Additionally, when intending to upgrade a model with N processes to a model with N+1 processes, the use of matrix-based techniques required fewer modifications and updates compared to an array-based approach. For future research, we will study other methods that can reduce the cost of verification for the symmetric distributed algorithms with point-to-point and bidirectional communication.

Optimizing Geophysical Workloads in High-Performance Computing: Leveraging Machine Learning and Transformer Models for Enhanced Parallelism and Processor Allocation

André Brasil Vieira Wyzykowski[1], Breno Spinelli Coelho[1], Darlan Anschau[1] Gabriel Mascarenhas Costa de Sousa[1], Lucas Batista Santos[1],

[1]1Department of High Performance Computing, Senai Cimatec, Salvador, Brazil

andre.wyzykowski@fieb.org.br
breno.coelho@fieb.org.br
darlan.anschau@fbter.org.br
gabriel.sousa@fbest.org.br
lucas.bs@fieb.org.br

Keywords	Abstract
HPC AI Workloads Parallelism	High-performance computing (HPC) is essential in processing complex models, a necessity particularly emphasized in geophysics imaging. Its superiority over personal computing lies in its ability to implement parallelism by distributing workloads across supercomputer clusters. However, users often face challenges in selecting the most effective machine configuration for their specific computational tasks, which is crucial for optimizing speed and efficiency. This paper addresses this issue and presents a machine learning-based toolkit specifically tailored for geophysics workloads as a solution. The focus in this domain ensures that the toolkit's recommendations are highly relevant for applications within this field. The toolkit pre-emptively evaluates various machine configurations, offering users personalized recommendations for their geophysics computational tasks.

Conclusion

This study successfully demonstrated the design and implementation of an innovative system comprising two neural networks, tailored for performance prediction and recommendation in high-performance computing (HPC), particularly for geophysics imaging. The first architecture, Architecture A, excelled in predicting processor placements and classifying processors, exhibiting promising results with high precision in certain processor types. The second architecture, based on the Transformer model, showed adeptness in predicting parallel processing times and speedup, providing critical insights for optimizing computational tasks in geophysics. The combination of these architectures into an integrated system marks a significant advancement in the field, offering a more comprehensive and nuanced tool for end-users in HPC. Throughout the experiments, the models demonstrated a strong capacity to learn and validate effectively, as evidenced by the close alignment of training and validation results and the rapid convergence to performance plateaus. Particularly notable were the results for speedup prediction, where the Transformer architecture effectively captured the essence of speedup factors, and the processor classification model achieved an overall accuracy of 70%. The exploration of additional features, alternative modeling strategies, and techniques like data augmentation could contribute to the advancement of these neural network models. Moreover, the potential to extend this research to new domains and applications presents an exciting avenue for future work.

Rational Jacobi Kernel Functions: A novel massively parallelizable orthogonal kernel for support vector machines

Mahdi Movahedian Moghaddam[1], Alireza Afzal Aghaei[1], Kourosh Parand[1,2]

[1]Department of Computer and Data Sciences, Shahid Beheshti University, Tehran, Iran

m_movahedian@sbu.ac.ir

alirezaafzalaghaei@gmail.com

[2]Institute for Cognitive and Brain Sciences, Shahid Beheshti University, Tehran, Iran

k_parand@sbu.ac.ir

Keywords	Abstract
Support Vector Machines Orthogonal Functions Heterogeneous Systems Data Parallelism	Among the array of machine learning techniques, the support vector machine (SVM) has emerged as a powerful method. To enhance the SVM's precision, the adoption of kernel methods has become commonplace. Notably, the integration of orthogonal functions as the SVM's kernel has led to substantial improvements in accuracy. However, it is essential to note that the use of these functions also introduces heightened time complexity to the SVM along with imposing some limitations on data. Next, we develop a data-parallel technique implemented on heterogeneous computing systems to accelerate the computation of kernel matrix. The ensuing experimental results, conducted on the benchmark datasets, were founded on three distinctive rational mappings: algebraic, exponential, and logarithmic. Spanning data sizes from 700 to 3800, these mappings exhibited remarkable speedup factors of 3.967, 4.599, and 2.807, respectively.

Conclusion

Upon introducing the orthogonal rational Jacobi kernel function as the kernel function for support vector machines, it became evident that the computational demands for calculating the kernel function escalated. While this led to an enhancement in classification accuracy, especially in high-input scenarios, it introduced a notable time complexity in the computation of these functions. To address the escalating time complexity associated with orthogonal rational Jacobi kernel functions (RJKFs), a parallel method grounded in heterogeneous systems, specifically GPUs, was proposed. The experimental results derived from the implementation of the proposed parallel method revealed insightful patterns. These findings underscore the nuanced relationship between the input size, computational challenges, and the efficacy of the proposed parallel method. The exploration of different mappings and their specific challenges contributes to a more informed decision-making process regarding the application of parallelization techniques in the context of support vector machines.

Enhancing Energy Efficiency of Underwater Sensor Network Routing Aiming to Achieve Reliability

Mehran Tarif[1], Mehdi Effatparvar [1], Babak Nouri Moghadam [1]

[1]Department of Computer Engineering, Ardabil Branch, Islamic Azad University, Ardabil, Iran
Babaknouriit85@gmail.com

Keywords	Abstract
Underwater Internet of Things Sensor Networks QoS Energy Reliability	To facilitate wireless communication, ocean exploration, and various environmental and research applications, the underwater Internet of Things has been developed with an infrastructure of acoustic sensor networks. There has been a significant increase in failures and a decrease in the efficiency of the network due to the fluid and challenging underwater environment. Consequently, achieving quality of service (QoS) in underwater networks remains a research area. Supporting QoS in underwater sensor networks is challenging due to resource limitations such as processing power, memory, bandwidth, and power sources. The purpose of this study was to examine the service quality requirements as well as protocols that have been implemented in recent years. Finally, based on quality criteria, we have presented a routing solution based on fuzzy logic, which is more efficient than other recent methods regarding energy consumption rate, JFI, efficiency, and reliability.

Conclusion

In this research, considering the importance of service quality in the underwater Internet of Things, we proposed a hierarchical protocol based on audio sensors. In this method, two clustering structures and inter-cluster communication were created in the network graph, which was done according to the effective metrics in increasing the network efficiency. Finally, after performing the simulation, we concluded that the proposed method has performed well compared to other recent methods in energy consumption efficiency and the justice of using links in the network.

Image Thresholding Based on Sailfish Optimizer Algorithm

Najma Soltani[1], Nasrin Aghaee Maybodi[1]

[1]Department of Computer Engineering, Maybod Branch, Islamic Azad University, Maybod, Iran

Najmasoltani@yahoo.com

aghaee.meybodi@maybodiau.ac.ir

Keywords	Abstract
Sailfish algorithm Image segmentation Objective function Thresholding	Image segmentation plays a crucial role in various computer vision applications, and thresholding is a commonly used technique. An image can be effectively segmented into distinct regions by selecting appropriate threshold levels. Evolutionary algorithms have been widely employed to automate the process of determining optimal thresholds. This paper proposes a novel approach utilizing the Sailfish algorithm to select suitable thresholds by defining an objective function tailored for image segmentation tasks. Random threshold values within the image are considered members of the initial population in this algorithm. The objective is to iteratively refine and extract optimal threshold values through the execution of the Sailfish algorithm. Experimental results demonstrate that this proposed method achieves higher accuracy and performance than traditional approaches in detecting object edges and boundaries.

Conclusion

An important challenge in image processing is detecting the edges and boundaries of the objects in the image. Until now, various methods have been presented for this purpose. Thresholding is a common edge detection method in image processing that has different types. It employs the difference of the light intensities on both sides of the thresholds to find the best threshold values for accurate edge detection. The objective function of this thresholding has better quality in edge detection when it is maximized. In the proposed method of this paper, the Sailfish optimizer algorithm has been used to select the optimum values of threshold levels. Implementation and analysis of the proposed algorithm show that this algorithm has higher accuracy in extracting the edges of the objects in the image in comparison to the Bat and Firefly algorithms.

Multi–hop Attention–based Graph Pooling: A Personalized PageRank Perspective

Parsa Haddadian [1], Roya Booryaee [1], Rooholah Abedian [2], Ali Moeini [2]

[1]Department of Engineering Science, College of Engineering, University of Tehran, Iran
p.haddadian@ut.ac.ir
roya.boryaee@ut.ac.ir

[2]Faculty of Engineering Science, College of Engineering, University of Tehran, Iran
rabedian@ut.ac.ir
moeini@ut.ac.ir

Keywords	*Abstract*
Graph Representation Learning Graph Pooling Attention Mechanism Personalized	Graph representation learning has surged in popularity due to its efficiency and applicability across diverse graph–structured datasets. Graph pooling stands as a key method for deriving effective graph representations. The fusion of graph neural networks and self–attention mechanisms has enabled significant progress in graph representation tasks. However, traditional attention mechanisms overlook nodes lacking direct edges, limiting their utilization of crucial network context. This paper introduces a novel graph pooling approach integrating Personalized PageRank and self–attention, enhancing the model's ability to capture both node properties and graph structure. Experimental results demonstrate that, with optimal parameter tuning, the MAGPool method outperforms existing techniques, yielding higher accuracy across benchmark datasets.

Conclusion

The MAGPool technique, integrating Personalized PageRank and self–attention, offers a hierarchical approach capable of capturing node attributes and hierarchical graph structures. Notably, it maintains reasonable complexity $(O(|E|))$ and robustness across various graph structures, using a consistent parameter set regardless of input graph size. Future research avenues could explore MAGPool's resilience across different hop numbers or optimize the model's hyperparameters.

Analyzing Complex Contagion Effects in Donation Diffusion: A Hybrid Network Science and Neural Network Approach

Parham Ghanemipour[1], Ali Kamandi[1]
[1]Department of Engineering Science, University of Tehran, Tehran, Iran
p.ghanemiopour@ut.ac.ir
kamandi@ut.ac.ir

Keywords	Abstract
Complex Contagion Information Diffusion Network Science Neural Network Political Science	Complex contagion is a phenomenon to analyze diffusions in types of behaviors or actions. In contrast to simple contagion, which is associated with the transmission of viruses, complex contagion involves a more intricate process of influence, making multiple exposures to certain behaviors or actions necessary before an individual adopts them. In this context, the dynamics of complex contagion are in the domain of financial contribution to presidential campaigns from 2000 to 2012 cycles. The study uncovers the factors shaping the decision-making process of potential donors. The number of exposures to donors exhibits an unexpected negative correlation with the likelihood of an individual contributing to a presidential campaign. On the other hand, the amount of money the connected donors to potential contributions made seems to influence predicting their chance to donate.

Conclusion

The donation diffusion study has shown that it is not a typical complex contagion or information diffusion process. Donating has ethical and materialist impacts on people, especially in the presidential race. The increment of contagion does not depend on the increment of infected degree because of the mentioned intuition. In this case study, the factor that has more influence on individuals is the amount of money donated by the connections of each individual. The infected degree tends to be ineffective for an individual to donate based on the observations in the simulations for each cycle based on the intuition that enough individuals have donated. In graph theory, further studies can be done with different properties and more insight into individuals to analyze their reasons for donation. Weighted graphs can give us more information on how a diffusion process can occur, and more analysis in terms of social science can be relied on to spread donations between people in specific periods.

Enhancing the Performance of Photonic Crystal AND Gates with Machine Learning Optimization

Fariborz Parandin[1], Alireza Mohammadi[2]

[1]Department of Electrical Engineering, Islamic Azad University Kermanshah Branch, Iran

fa.parandin@iau.ac.ir

[2]Department of Computer Engineering, Islamic Azad University Kermanshah Branch, Iran

alireza.mohamadi.ml@gmail.com

Keywords	Abstract
Optical AND gate photonic crystal Extra Trees Regressor Optimization Techniques	Recent advances in photonic crystals offer new possibilities for high-speed, low-power optical devices, including AND gates crucial in digital logic. This paper proposes a machine learning-based approach to optimize AND gate performance. Using the Extra Trees Regressor model, we train on simulation data to predict output power accurately, achieving an RMSE of 0.18. Optimal parameters for rod radius and lattice constant, determined as R=0.05 um and x=0.12 um, are identified. Examination of parameter impact on gate functionality underscores their role in achieving desired output states. Simulation results demonstrate the efficacy of optimized parameters in realizing AND gate behavior within the photonic crystal framework.

Conclusion

This paper presents a novel approach to optimizing AND gate performance using machine learning techniques, notably the Extra Trees Regressor. By harnessing this model, we significantly enhance the accuracy and efficiency of optical gate simulation software, enabling rapid identification of optimal parameter settings. Meticulous optimization of rod radius and lattice constant reveals their profound influence on gate functionality, with specific configurations yielding desired output states akin to an AND gate. Our findings highlight the Extra Trees Regressor as a valuable tool for optimizing optical gate performance and accelerating processing while enhancing output quality. This research underscores the efficacy of machine learning in augmenting photonic crystal-based circuits, facilitating advancements in information transmission and logical operations within electronic systems.

Small Intestine Cancer Prediction using Deep Learning: A Comparative Study of CNNs and RNNs

L Sherin Beevi[1], Dr. Joe Prathap P M [2],Pulimi Hanith Sai Kumar Reddy[3],Gomasani Bhanu Sai Priya[3]

[1]1Assistant Professor, Department of Computer Science and Engineering, R.M.D. Engineering College, Kavaraipettai, INDIA
lsb.cse@rmd.ac.in

[2]Professor & IEEE Senior Member, Department of Computer Science and Engineering, R.M.D. Engineering College, Kavaraipettai, INDIA
drjoeprathap@rmd.ac.in

[3]3Student, Department of Computer Science and Engineering, R.M.D. Engineering College, Kavaraipettai, INDIA.
hanithpulimi@gmail.com
bhanugomasani@gmail.com

Keywords	Abstract
Image Processing Intestine Cancer Machine Learning Prediction Model Normalization	Small bowel cancer is one of the rare tumors that often stays untreated until it has spread to a more advanced stage. Early detection is critical for successful treatment, and ML algorithms have showed promise in detecting cancer at its early stages. Here we offer a deep learning-based technique to predicting small intestinal cancer that employs CNN and RNN. We used a dataset of clinical characteristics and biomarkers from small intestinal cancer patients to train and evaluate our models. Our findings reveal that the proposed models were highly accurate in predicting small intestinal cancer, with the CNN slightly outperforming the RNN. We also compared our approach to other cutting-edge methodologies, and discovered that the proposed models surpassed them in terms of accuracy. Our study indicates the potential of deep learning-based approaches for predicting cancer and provides information on the relative efficacy of CNNs and RNNs. Our findings can help design more accurate and efficient cancer prediction models for small intestinal cancer.

Conclusion

Based on the research, we have developed and evaluated deep learning models for small intestine cancer prediction using CT scan images. Both CNN and RNN models were implemented and compared, with the CNN model using VGG16 architecture and the RNN model using LSTM cells. The findings revealed that the CNN model beat the RNN model in terms of classification accuracy, AUC, F1-score, and sensitivity. The proposed method has the potential to be employed as a non-invasive and cost-effective tool for small intestine cancer screening and detection. However, additional validation on diverse datasets is required to establish the generalizability and robustness of the suggested models. Investigating the use of additional deep learning models, such as transformer-based models or convolutional neural networks with attention processes, for the prediction of small intestine cancer is one possible research direction. Additionally, adding more varied data sources, may enhance model functionality. Future research may also look into explainable AI methods to learn more about the characteristics and factors that are most crucial for predicting small intestinal cancer.

IoT–Based Intelligent Transportation System for Passenger–Shuttle Taxi Matchmaking

Mohammadreza Zamani[1], Amir Kalbasi[1]

[1]Department of Computer Engineering, Amirkabir University of Technology, Tehran, Iran

mrzzamani76@gmail.com

kalbasi@aut.ac.ir

Keywords	Abstract
Intelligent Transportation System Shuttle Taxi Share Taxi Passenger–Taxi Match-making IoT Traffic Reduction	As cities continue to grow in population, the demand for public transportation, particularly shuttle taxis, has increased. Taxi drivers often have to stop frequently to find passengers by inquiring about their destination. To address this issue, a matchmaking system between passengers and shuttle taxis called Shuttle Taxi with Targeted Stops (STTS) is proposed. Passengers can choose their taxi lines and get matched with a shuttle taxi based on their source and destination locations. Based on simulation results, the STTS method increases average speed of non–taxi cars and taxis up to 9.3% and 51.7%, respectively, while decreasing the average travel time of passengers by up to 20%.

Conclusion

Currently, shuttle taxis are one of the popular methods of public transportation in several countries. Shuttle taxis frequently stop, causing traffic disturbance, congestion and taxi wear and tear. These stops are often unnecessary due to the mismatch between taxi routes and passenger destinations. To address these issues, we propose a new system called Shuttle Taxi with Targeted Stops (STTS). Passengers can select their desired route and send requests. Drivers can decide whether to accept without stopping. This system reduces the number of stops and minimizing passenger travel time. Based on the simulation results, the STTS method yielded a remarkable improvement in the average speed of non–taxi cars by up to 9% and taxis by up to 52%. Additionally, the average travel time for passengers was reduced by up to 20%.

Neural Network–Driven Optimization of Photonic Crystal–Based All–Optical NOT Gate Design

Alireza Mohammadi[1], Fariborz Parandin [2], Hosna Ghahramani[3]

[1]Department of Computer Engineering, Islamic Azad University –Kermanshah Branch, Iran
alireza.mohamadi.ml@gmail.com

[2]Department of Electrical Engineering, Islamic Azad University –Kermanshah Branch, Iran
fa.parandin@iau.ac.ir

[3]Department of Computer Engineering Islamic Azad University– North Tehran Branch, Iran
hosna.ghahramani@gmail.com

Keywords	Abstract
Photonic Crystals Optical Computing Neural Networks Deep Learning Optimization Photonic Integrated Circuits	This study uses neural networks to optimize an all–optical NOT gate using photonic crystals. The network predicts parameters for the gate's operation, accurately determining the optimal radius of the rods. The results show a Mean Absolute Error of 0.005 for 'R0' and 0.0006 for 'R1'. The research demonstrates the potential of deep learning in optimizing and predicting the performance of all–optical NOT gates. This leads to improved efficiency and performance of optical logic circuits.

Conclusion

In conclusion, this study presents a compelling exploration of employing neural networks to optimize and predict the behavior of an all–optical NOT gate based on photonic crystals. Leveraging deep learning techniques, particularly a sequential neural network architecture, the research successfully identifies the optimal radius of the rods for efficient gate operation. The systematic analysis and simulation results demonstrate the neural network's remarkable accuracy in predicting gate behavior for different input configurations. The alignment between predicted and actual outputs signifies the model's precision in emulating the NOT gate's functionality. Overall, the findings highlight the promising role of deep learning in advancing the design and optimization of photonic–based logical circuits, paving the way for enhanced optical computing systems with significant applications in diverse technological domains. By leveraging the power of deep learning, researchers can unlock the full potential of all–optical computing and usher in a new era of high–performance information processing systems.

An Adaptive Task Scheduling Approach for Cloud Computing Using Deep Reinforcement Learning

Pedram Amini[1], Amir Kalbasi[1]

[1]Department of Computer Engineering, Amirkabir University of Technology, Tehran, Iran

pamini@aut.ac.ir

kalbasi@aut.ac.ir

Keywords	Abstract
cloud computing load balancing algorithms deep reinforcement learning task scheduling makespan	This paper proposes a novel deep reinforcement learning–based approach for task scheduling in cloud computing environments. The objective of the proposed approach is to minimize the makespan. The proposed approach utilizes a deep Q–learning algorithm to learn effective task allocation strategies based on the current state of the system. The task scheduling performance of the proposed algorithm is compared with the Min–Min, Min–Max, FCFS and GA algorithms based on three criteria: makespan, algorithm execution time, and computational complexity. Simulation results demonstrate that the proposed approach results in great reduction of makespan, while demonstrating significantly low algorithm execution time and computational complexity.

Conclusion

In this paper, we presented an approach based on deep reinforcement learning and compared it with several well–known static and dynamic load balancing algorithms. The proposed approach significantly reduces the makespan compared to the heuristic methods and provides results close to the genetic algorithm, while it has an excellent performance based on the execution time and computational complexity. Although the genetic algorithm's achieved makespans are slightly better than that of the proposed approach, it takes up to 125 times longer to run the genetic algorithm. This makes the proposed algorithm suitable for realistic scenarios and much more scalable.

Design and Simulation of a NAND Gate based on 2D Photonic Crystals

Mehdi Bagheri[1], Gholamreza Karimi [1]

[1]Department of Electrical Engineering, Razi University, Kermanshah, Iran

m.bagheri@stu.razi.ac.ir

ghkarimi@razi.ac.ir

Keywords	Abstract
Photonic crystals NAND gate All-optical-logic-gates High-speed computing Ring resonators	In this paper, we attempt to design and simulate an all-optical NAND gate using 2D photonic crystals. The proposed struc-ture has 3 inputs and 1 output based on ring resonators. One of the in-puts is used for the bias and 2 other inputs are the main inputs of the gate. We used line and point defects to guide the light from the in-puts to the output. This structure is simple and small and consists of 19*19 silicon rods on an air substrate. This gate has a high accuracy because of the large difference between"1" and "0" logic, which is defined by the amount of power transferred from the inputs to the output. The contrast ratio (CR) for the proposed gate has been de-termined to be 7.14 dB. Calculations are performed out in the TM mode using the Plane Wave Expansion (PWE) and Finite Difference Time Domain (FDTD) methods to solve Maxwell's equations.

Conclusion

In this paper, we proposed a novel design for an optical NAND gate with 2D PhCs. After an-alyzing the simulation results, it can be concluded that the proposed gate functions properly in all states and delivers accurate outputs. There is a good distance between the"0" and "1" at the outputs. The size of the proposed structure is small and the structure is simple and not complex. Therefore, the proposed NAND gate is a suitable structure for fabrication and use in optical devices.

A Blockchain Mining Proof of Work Approach Based on Fog Computing Virtualization for Mobile CrowdSensing

Abbas Fadhil Mahdi [1], Furkan Rabee1[1]

[1]1Computer Science Department, Faculty of Computer Science and Mathematics, University of Kufa, Najaf, Iraq
abbassf.wahab@uokufa.edu.iq
furqan.rabee@uokufa.edu.iq

Keywords	*Abstract*
Blockchain Mobile crowdsensing Fog computing Consensus algorithm Scalability proof of work	Proof-of-Work (PoW) is the most common consensus mechanism in the blockchain. It requires a lot of energy and time from miners to solve the hard puzzle of appending a new block to the blockchain, and transaction throughput is low. The paper suggested using mobile crowdsensing (MCS) and fog computing virtualization to split the encryption hash range SHA256 into many subranges to speed up mining using proof of work. Fog virtualization-based Proof of Work (FV-PoW) outperformed other methods and was useful for mining difficult targets. To test this, testing involved increasing mining difficulty by 9 levels to find a hard target. Mining at level 8 took 81.6 sec, while the conventional method took 6221 sec. The solution was novel at level 9. Within 2043.1 sec, this solution guarantees substantial scalability.

Conclusion

The paper used parallel computing to minimize the duration of the mining process and therefore raise the number of confirmed transactions for generating a new block and appending it to the blockchain. This is done by leveraging virtualization technology on the fog environment, which is contingent upon the tasks received from the MCS layer. The K-means method was employed to allocate the suitable fog VM with a unique subrange for every task carried out in the PoW mining process on the fog server, relying on the nearest geographical coordinates between them. The proposed FV-PoW mining method aims to improve sequential or traditional mining. The findings at level 7 indicate that the FV-20 VMs, with a mining time of 16.1 sec, outperforms the FV-8 VMs, which took around 170.10 sec. Additionally, the sequential mining approach took 4086.8 sec. Similar trends were observed at levels 8 and 9. Consequently, a greater number of participants in the MCS leads to an increased quantity of virtual machines on the FC layer, resulting in faster and more efficient mining.

Accepted Papers for ISC

A Method To Predict Academic Performance With Combination Of XGBoost And Random Forest

Ahmad Azarnik [1], Arash Khosravi[1]

[1]Faculty of Engineering, Mahallat Institute of Higher Education, Mahallat, IRAN

ahmad.azarnik@gmail.com

Khosravi.280@gmail.com

Keywords	Abstract
Academic performance prediction machine learning random forest XGBoost PCA	Universities and educational institutions are accumulating and storing substantial amounts of data that include the personal and educational information of students. There is an ongoing debate regarding the most crucial factors for predicting students' academic achievement, as well as determining the most suitable algorithm to employ. Furthermore, if these results are achieved, administrators need to develop better planning strategies. Educational Data Mining (EDM) is a technique used to extract specific data types from an educational system, aiding in a comprehensive understanding of students and the system itself. EDM involves transforming raw data obtained from training systems into valuable data that can facilitate data-driven decision-making. In comparison to other fields, the development of data mining and analysis in education has been relatively slow. However, mining educational data on the web presents unique challenges due to specific characteristics of the data. Although various data types possess sequential aspects, the distribution of training data over time exhibits remarkable properties. In this research, we propose a method that utilizes XGboost and Random Forest algorithms to identify the significant factors influencing prediction accuracy.

Conclusion

Educational data mining (EDM) is a field of research related to the application of data mining, machine learning, and statistics to information generated in educational settings (eg, universities and intelligent educational systems). At a high level, the discipline seeks to develop and improve methods for exploring this data, which often has multiple levels of meaningful hierarchies, to uncover new insights into how people learn in such settings. We propose a method to predict academic achievements by XGboost and Random Forest. XGboost helps not only to find important features but also to reduce the dimension of the dataset. Then, we use the pre-processed data to train random forest. In the end, a comparison, including accuracy, F1-score, and precision, indicates that our model outperforms other algorithms.

An Evaluation of Collaborative-Filtering Algorithms for Job Recommender Systems

Arash Khosravi[1], Ahmad Azarnik [1]

[1]Faculty of Engineering, Mahallat Institute of Higher Education, Mahallat, IRAN

ahmad.azarnik@gmail.com

Khosravi.280@gmail.com

Keywords	Abstract
Recommender system e-recruitment job machine learning Collaborative-Filtering	At present, there has been a significant increase in job opportunities in the business sector. In order to adapt to the current societal and international conditions, these jobs need to transition towards digitalization in the online realm. The progression of technology indicates that businesses without an online presence are destined to fail or experience limited growth. As a result, this issue has given rise to the field of data mining and the study of job recommender systems utilizing the latest algorithms. In this study, we assess four collaborative filtering algorithms for a job recommender system. The findings reveal that the Cocluster method exhibits the least amount of error, while NMF(Non-negative matrix factorization) demonstrates the most efficient training time compared to the other algorithms.

Conclusion

This research investigates various collaborative filtering algorithms using a jobs dataset. The findings indicate that, compared to the other algorithms studied, NMF and cocluster produce the most favorable outcomes in terms of training time when the number of epochs and cross-validation's folds are increased. Conversely, SVD++ (SVDPP) requires the longest training time. On the other hand, cocluster yields the lowest error rate. Thus, if prioritizing training time is essential, NMF and cocluster is the preferred choice, whereas, for accuracy considerations, cocluster is recommended.

High Performance Computing (HPC) System Security: Threats and Vulnerabilities, Challenges and Solutions

Sara Koleini [1], Bahareh Pahlevanzadeh[2]

[1]Department of Hardware and Infrastructure Islamic World Science & Technology Monitoring and Citation Institute (ISC) Shiraz, IRAN
Corresponding Author
koleini@isc.ac https://orcid.org/0000-0002-8554-9224
[2]School of Information and Cybersecurity Technology University Dublin Dublin, Ireland
Bahareh.Pahlevanzadeh@tudublin.ie

Keywords	Abstract
Attacks Detection and Protection Mechanisms HPC Security Vulnerabilities Threats	The escalating demand for High-Performance Computing (HPC) systems and data analysis across diverse scientific domains has amplified network security issues. This study provides an in-depth exploration of security, threats, and vulnerabilities in HPC systems, presenting a comprehensive taxonomy of HPC vulnerabilities along with their respective security strategies. The study also reviews various scientific contributions and case studies to enhance understanding of security issues.

Conclusion

Soaring adoption of supercomputers and HPC across diverse domains necessitates a heightened focus on their security aspects. This study meticulously dissects security challenges impacting HPC infrastructure, threats, and vulnerabilities from hardware, software, and hybrid viewpoints. We present a comprehensive taxonomy of HPC vulnerabilities mapped to corresponding mitigation strategies and solutions. Furthermore, we conduct a robust review of case studies encompassing diverse regions/perspectives (hardware, software, and hybrid) to offer insights into practical security implementations. To secure HPC systems from possible security threats and vulnerabilities, we need to consider the main security aims of Confidentiality, Integrity, and Availability (CIA). This study and review could provide a better understanding of implementing appropriate and practical solutions to prevent security threats and vulnerabilities in the HPC system. It is worth promoting the creation of a national, regional, or even international standard security working group on HPC systems.

A Generalization of 2–Rainbow Domination In Graphs

Gholam hasan Shirdel[1], Mojtaba Ghanbari [2], and Mitra Ramezani [3]

[1] Department of Mathematics and Computer Sciences Faculty of Scince, University of Qom,
Qom, Iran
shirdel81math@gmail.com

[2]Department of Mathematics, Farahan Branch, Islamic Azad University, Farahan, IRAN
Ghanbari543@yahoo.com

[3]Department of Mathematics, Faculty of Sciences, University of Qom, Qom, IRAN
Radin_1394@outlook.com

Keywords	Abstract
Generalized 2- rainbow domination Honeycomb network Petersen graph	Assume we have a set of 2 colors and to each vertex of a graph G we assign an arbitrary of these colors. If we require that each vertex to set is assigned has in its closed neighborhood all 2 colors, then this is called the generalized 2–rainbow dominating function of a graph G. The corresponding γ_{g2r} which is the minimum sum of numbers of assigned colors over all vertices of G, is called the g2–rainbow domination number of G. In this paper we introduce this new concept and we present a linear algorithm for determining a minimum generalized 2–rainbow dominating set of $P_n C_n K_{1,n} GP(n,2)$, and Honeycomb network ($HC(n)$).

Conclusion

In this paper based on the concept of usability 2–rainbow domination applicability, we generalized it to be more evident in the field of application and at the same time reduce costs. For this purpose, we remove one of the conditions of 2–rainbow domination function. We calculated the generalized 2–rainbow domination number for simple graphs, $GP(n,2)$ and the honeycomb networks. According to the above process, for future works, we can expand total generalized k–rainbow domination for Petersen graphs and the honeycomb networks.

Improved Model of Secure Data Transmission in Blockchain-Based Supply Chain by Integrating Merkel Tree and Neural Networks

Fatemeh Zarrin Bin [1], Ahmad Sharif[1], Mohammad Saeid Safaei[1]
[1]Faculty of Engineering, Mahallat Institute of Higher Education, Mahallat, IRAN
f.zarrin1376@gmail.com
ah.sharif@iau.ac.ir
SaeidSafaei@gmail.com

Keywords	Abstract
Supply_chain Blockchain Merkle_Tree Neural_Network Distributed_Systems	The competition pattern among companies is changing due to the morning and evening production and services. The material flow in the supply chain is getting attention, making management and control more difficult due to globalization. Traditional supply, production, and planning approaches increase costs in the entire supply chain. Traditional supply chain systems have significant shortcomings like lack of traceability, difficulty in maintaining product safety and quality, lack of monitoring and control of inventory, increasing supply chain costs, etc. Blockchain technology promises to reduce these problems by ensuring transparency, traceability, and security through a distributed digital ledger that uses cryptographic methods for transaction security. We explore how Blockchain can contribute to supply chain sustainability. Our proposed solution combines the Merkel tree and neural networks to reduce the complexity of this technology. It provides insight about adopting Blockchain for supply chain management.

Conclusion

This research presented a new blockchain-based method based on Merkle tree integration and neural networks to improve blockchain-based supply chain data transmission. As we have seen in the previous part of this article, the proposed method reduces n layers compared to the traditional structure. Gives, and the number of data is reduced by $(2^{\wedge}(n+1)-2)/3$. Also, the hash calculation is reduced by $(2^{\wedge}(n+1)-2)/3$, which is a significant amount. Therefore, with the improved Merkel tree structure, the storage space and the amount of computation are both less than those of the traditional Merkel tree structure. This method is helpful for extensive input data in blockchain-based distributed data storage and transmission. The achievements of this research include providing a secure data transmission model in the blockchain-based supply chain by integrating the Merkel tree and neural networks. The evaluations carried out in this research show that the number of layers and nodes in this type of Merkel tree has been improved, reduced and as a result, leads to a reduction. We found the amount of Hash traffic.

A review of Energy Efficient Routing Protocols in Underwater Internet of Things

Mehran Tarif[1], Mehdi Effatparvar[1], Babak Nouri Moghadam[1]

[1]Department of Computer Engineering, Ardabil Branch, Islamic Azad University, Ardabil, Iran

Babaknouriit85@gmail.com

Keywords	Abstract
Internet of things Underwater Routing QoS Energy	Oceans, covering 70% of Earth's surface, are largely unexplored, with about 95% remaining a mystery. Underwater wireless communication is pivotal in various domains, such as real-time aquatic data collection, marine surveillance, disaster prevention, archaeological exploration, and environmental monitoring. The Internet of Things has opened new avenues in underwater exploration through the underwater Internet of Things concept. This innovative technology facilitates smart ocean research, from small case studies to large-scale operations. UIoT networks utilise underwater equipment and sensors to gather and transmit data in aquatic environments. However, the dynamic nature of these environments poses challenges to the network's structure and communication, necessitating efficient routing solutions. Quality-of-service-aware routing is vital as it minimises energy usage, extends battery life, and enhances network performance. This paper delves into the challenges and limitations of UIoT networks, highlighting recent routing methodologies. It also proposes a comparison framework for routing methods, focusing on the quality of service in underwater IoT networks, to foster more optimal route selection and better resource management.

Conclusion

Underwater Internet of Things technology is one of the famous research topics today, which could change industrial projects and scientific and commercial research. An essential component to enable IoT is the underwater wireless sensor network. However, currently, this technology faces challenges such as limited reliability, long propagation delay, high energy consumption, dynamic topology, and limited bandwidth. This study conducted a literature review on the UIoT to pinpoint potential challenges and risks and to propose solutions to mitigate them. The results of this study show that the essential elements available to meet future IoT challenges include underwater communications, energy storage, latency, mobility, lack of standardisation, transmission media, transmission range, and energy limitations. In addition, in this study, an overview of recent methods and their comparison based on service quality criteria has been presented in the form of a table, which can pave the way for other researchers in this field.

A hybrid method–based Support Vector Machine Algorithm and Naïve Bayesian Algorithm for Authorship Identification

Narmin Ghader[1], Farhad Soleimanian Gharehchopogh[1]

[1]Department of Computer Engineering, Urmia Branch, Islamic Azad University Urmia, Iran

0009–0005–5954–3231

0000–0003–1588–1659

Keywords	Abstract
Authorship Identification Support Vector Machine Algorithm Naïve Bayesian Algorithm Natural Language Processing	Authorship identification is the challenge of identifying the writers of anonymous writings based on examples of the authors' writing. The growing volume of anonymous writing on the Internet emphasizes the critical yet urgent need for authorship identification. In this paper, we proposed a hybrid method–based Support Vector Machine (SVM) algorithm and a Naïve Bayesian Algorithm for Authorship Identification. The proposed method is designed to handle longer textual passages and analyze the semantic and metaphorical nuances of words to enhance the accuracy of authorship identification tasks. The experimental result shows that this algorithm is suitable for Authorship identification.

Conclusion

This paper presents a fresh method for author identification in texts, incorporating machine learning algorithms. In this method for extracting the effective features in identification, characteristics like lexical features, syntactic features, structural features, function words, and content words have been used. Also, Reuter_50_50 has been used as the dataset. In the proposed method which is a hybrid algorithm including SVM and NB the extracted data have identified the authors of the texts. After identifying the authors, results have been evaluated according to criteria including correctly classified data, incorrectly classified data, precision, and recall. The assessment results reveal superior performance of the proposed method compared to both Support Vector and NB algorithms. Precision and Recall were equal to 0.9996 percent in the proposed method while they were equal to 0.9746 and 0.974 for the SVM algorithm and 0.6567 and 0.6072 for the NB algorithm.

Modeling and Verifying a Fully Anonymous Mutual Exclusion Algorithm Using Colored Petri Nets

Leila NamvariTazehkand[1], Saied Pashazadeh[1]

[1]Department of Computer Engineering, Faculty of Electrical and Computer Engineering,
University of Tabriz, Tabriz, Iran
l.namvari@tabrizu.ac.ir
pashazadeh@tabrizu.ac.ir

Keywords	Abstract
Modeling Verification Colored Petri Nets Mutual Exclusion Anonymous Memory Anonymous Processes	This paper models and verifies the fully anonymous Mutual Exclusion (ME) algorithm. The ME algorithms have an essential role in distributed systems. Ensuring these algorithms are correct and satisfy the expected properties is necessary. Fully anonymous means that processes and memory are anonymous. It is impossible to distinguish one process from other processes. In this paper, we model a recently presented ME algorithm by Colored Petri Nets (CPN). This modeling is done hierarchically in two levels, called the low level and the top level. Then, by analyzing the state space diagram, we prove that except for one particular case, only one process enters the critical section at any moment, and the others wait. Afterwards, we show that different processes recognize an arbitrary in-memory register with different identifiers. Moreover, by analyzing the state space, we show that the ME algorithm is prone to deadlock when two processes obtain an equal number of registers simultaneously, neither releases the owned registers, and both try to acquire other registers. As a result, the algorithm faces a deadlock. To our knowledge, no fully anonymous mutual exclusion algorithm has been modeled and verified by a mechanical proof method. The novelty of this paper is the use of colored Petri nets for the modeling and verification of a fundamental ME algorithm for the first time. Given that the algorithm is fully anonymous, the presented model encapsulates this crucial property. This model can serve as a guiding framework for modeling other distributed algorithms that share similar properties, establishing its utility as a reference for such endeavors.

Conclusion

We modeled and verified a fully anonymous mutual exclusion algorithm using colored Petri nets. We defined this model hierarchically in two levels, low level and top level. Then, by analyzing the state space, we explored different scenarios and proved that if two processes in the competition to acquire registers simultaneously own the same number of registers, the algorithm will face a deadlock, but if a process is in a higher round than its competitors. Only the same process owns all the desired registers and enters the critical section. We will develop this algorithm for a system with Byzantine processes, and then we will model and verify it using one of the formal methods.

Microservice Testing Speed-up Using Test Parallelization and Mocking

Mohammad Moein Nasr Khademli[1], Amir Kalbasi[1]

[1]Department of Computer Engineering, Amirkabir University of Technology, Tehran, Iran

m.moein.nasr.kh@gmail.com

kalbasi@aut.ac.ir

Keywords	Abstract
Microservice Testing Test Execution Performance Test Parallelization Mocking	In professional software development settings, establishing a testing and deployment platform is essential, as it allows developers and testers to concentrate more effectively on the product itself and accelerates the delivery of successive versions to the market. With each change, such a platform should conduct tests and deploy the software once verified. Given the high frequency of changes in a professional team development environment, regression tests must be run repeatedly, slowing the software testing and deployment. Therefore, exploring ways to reduce the time required to execute tests is very beneficial. This project focuses on the aggregated impact of mocking and parallelization on test execution for systems with inter-service communications, specifically within microservices architectures. Experimental results indicate that the integration of the proposed methods, although not without challenges that will be addressed, effectively tripling the testing speed compared to the baseline measurements.

Conclusion

The study concludes that if there is sufficient experience with distributed database systems and the organization can benefit from multiple hardware nodes with adequate computational power, using parallelization and mocking methods do not seem to face a major obstacle. In that case, a significant improvement of over 65% in test execution times would be achieved. Such enhancement can have a substantial and vital impact in an industrial environment, where organizations are in constant competition to release their products.

مقالات پذیرفته شده فارسی

اخگر : مدیریت هزینه آگاه شروع سرد توابع زنجیره ای در مدل تابع به عنوان خدمت در رایانش ابری

سبحان کیانی[۱]، امیر کلباسی[۱]

[۱]دانشکده مهندسی کامپیوتر دانشگاه صنعتی امیر کبیر، ایران، تهران

sobhankiani@aut.ac.ir

kalbasi@aut.ac.ir

کلمات کلیدی	چکیده
تابع به عنوان خدمت، جریان‌های کاری بدون کارساز، شروع سرد زنجیره‌ای، زمان‌بندی، گرم کردن توابع	مدل تابع به عنوان خدمت، از جدیدترین راهکارهای رایانش ابری، امکان اجرای توابع را بدون نیاز به مدیریت زیرساخت و به صورت پرداخت هزینه به میزان مصرف فراهم می کند. از ویژگی‌های این مدل اختصاص منابع فقط در صورت وجود درخواست برای یک تابع، جهت کاهش مصرف بیهوده منابع است. در هنگام ورود درخواست، زمان زیادی صرف اختصاص منابع و آماده‌سازی محیط اجرای تابع می‌شود که از آن به عنوان چالش شروع سرد یاد می‌شود. نشر زنجیره‌ای شروع سرد در جریان‌های کاری منجر به افزایش زمان اجرا و هزینه می‌شود. در این مقاله الگوریتمی تحت عنوان اخگر معرفی می‌شود که میان زمان اجرای و هزینه جریان‌های کاری تعادل ایجاد می‌کند. این الگوریتم تلاش می‌کند با ورود درخواست برای یک جریان کاری، توابع ارزشمندتر را انتخاب نموده و دقیقا پیش از اجرا، محیط اجرای آن‌ها را آماده نماید. نتایج شبیه‌سازی نشان می‌دهد که اخگر میزان هزینه نسبی گرم کردن را تا ۳۷٪ و ۶۰٪ نسبت به استراتژی‌های انتخاب محتمل‌ترین مسیر و استراتژی گرم کردن همه توابع بهبود می‌دهد.

نتیجه گیری

در مدل تابع به عنوان خدمت در رایانش ابری وجود مشکل شروع سرد زنجیره‌ای در جریان‌های کاری منجر به افزایش هزینه و زمان اجرای آن‌ها خواهد شد. در این مقاله استراتژی نوینی برای انتخاب و گرم نمودن توابع پیش از اجرای آن‌ها برای مقابله با این چالش ارائه شده است. این استراتژی تلاش می‌کند که برای مقابله با شروع سرد از طریق گرم کردن، توابع را به گونه‌ای انتخاب کند که میزان هزینه نسبی گرم کردن با توجه به هزینه نسبت به استراتژی‌های موجود به صرفه‌تر باشد. نتایج ارزیابی الگوریتم نمایش‌دهنده تاثیر قابل توجه آن بر این موضوع نسبت به روش‌های انتخاب گره‌های محتمل‌ترین مسیر و استراتژی گرم کردن همه توابع است. از اقدامات پیش رو برای این پژوهش، یافتن روشی کارا جهت انتخاب مناسب پارامترهای بهینه الگوریتم برای جریان‌های کاری مختلف است.

مقالات پذیرفته شده فارسی

The Third International Conference on Distributed Computing and High Performance Computing (DCHPC 2024)

INSTITUTE FOR RESEARCH IN FUNDAMENTAL SCIENCES
IPM
پژوهشگاه دانش‌های بنیادی

محاسبات وسامانه‌های توزیع‌شده
Distributed Computing & Distributed Systems

ISi
انجمن انفورماتیک ایران

IEEE
IRAN SECTION
03230-21603

DCHPC 2024
14th-15th May - Tehran - Iran
www.iahpc.ir

Conference Topics:

. Topics of interest include, but are not limited to:

. High Performance Computing
. Distributed Systems
. Distributed Computing
. Cloud Computing
. Grid Computing
. Fog Computing
. Edge Computing
. Internet of Things
. Industrial Internet of Things
. Scheduling
. Parallel Algorithms
. Parallel Processing
. Security of Distributed Computing
. Performance Analysis
. Information Science
. Big Data
. Data Science

. Graph Theory and Routing
. Block-Chain
. Distributed and Parallel Storage
. Database Systems
. Divisible Load Theory(DLT)
. Large Language Model(LLM)
. Middlewares
. Container Orchestration
. Networking and Network Science
. Software - defined Network
. Pervasive Computing
. Ubiquitous Computing
. Microservices
. Virtualization Technology

www.iahpc.ir

dchpc@ipm.ir
dchpc2024@gmail.com
+989100856079

Organizers:
Institute for Research in Fundamental Sciences (IPM)
Informatics Society of Iran
Distributed Computing Systems Scientific Group (DCS)

DCHPC
2024