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KEYNOTE PRESENTATIONS

Naveed Ahmed Azam
Graduate School of Informatics, Kyoto University, Japan

Inferring Chemical Compounds Based on Neural Networks and Integer Programming

Inferring chemical compounds with desired properties is a hot topic in the field of cheminformatics, bioinformatics, and material informatics with several applications. Methods based on machine learning tools have significantly reduced the time and cost of the discovery of new chemical compounds. An inference model is good for real-time usage if it (i) guarantee that the inferred chemical compounds inferred have the closest value of the desired property; (ii) does not output feature vectors that do not correspond to any chemical compound with the desired property; and (iii) generate structurally different chemical compound efficiently. Although the existing methods showed promising results in discovering novel compounds, they cannot guarantee the optimality of the generated compounds and output invalid solutions since almost all of them are based on some statistical and heuristic approaches. We developed a novel inference method that satisfies conditions (i)-(iii). In this method, we first construct a prediction function based on some machine learning algorithms such as artificial neural network, decision tree, and lasso regression, which are represented as a system of linear equations to guarantee the optimality of the solution. To infer a valid compound, we designed mixed integer linear programming formulations; and designed a graph generation algorithm based on dynamic programming to efficiently generate large chemical compounds. We have tested our method on several chemical properties and it is evident from the computational results that the proposed method can generate desired chemical compounds with up to around 50 atoms efficiently.

Biography

Naveed Ahmed Azam is currently a postdoctoral researcher at the Department of Applied Mathematics and Physics, Kyoto University, Japan. He completed his Ph.D. from Kyoto University as a JSPS (Japan Society for the Promotion of Science) research fellow in 2021. He received M.Sc. and M.Phil. degrees in 2011 and 2013 from Quaid-i-Azam University, respectively. He is a recipient of the Chancellor Gold Medal and Vice-Chancellor Gold Medal in M.Sc. and M.Phil. from Quaid-i-Azam University. His research interests include Combinatorial algorithms, Applied mathematics, Combinatorial optimization.

Noor Zaman Jhanjhi

[1]School of Computer Science, SCS, Subang Jaya, Selangor, Malaysia.

Emerging Metaverse and Future Opportunities

Metaverse term has different aspects and concepts for the readers. The easy understanding of a reader's metaverse is a new way of hue cyberspace. Metaverse does not refer to any specific technology but several cutting-edge technologies, and how those will be used under specific conditions. Mainly it fo cuses on the social networks in 3D virtual reality mode. It creates a virtual space by the combination of virtually enhanced physical and digital reality. This virtual world provides a lot within its virtual cyberspace, including digital currency, digital and virtual economy, and can be owned by multiple owners. Users can be able to buy and sell their goods and properties, and even users can sell and purchase other livelihood items including, cars, clothes, and other living items. Metaverse claims even more at the next level to use the NFTs technology for the digital assets. We are expecting a lot of opportunities from the Metaverse and its related technologies in near future.

Biography

Prof. Dr Noor Zaman Jhanjhi (NZ Jhanjhi) is currently working as Associate Professor, Director Center for Smart society 5.0 [CSS5], and Cluster Head for Cybersecurity cluster, at the School of Computer Science, Taylor's University, Malaysia. Dr Jhanjhi serves as Associate Editor and Editorial Assistant Board for several reputable journals, such as PeerJ Computer Science, and Frontier in Communication and Networks. He received Outstanding Associate Editor for IEEE ACCESS for **2020**, PC member for several IEEE conferences worldwide, and guest editor for several reputed indexed journals. Active reviewer for a series of top-tier journals has been awarded globally as a top 1% reviewer by Publons (Web of Science). He has high indexed publications in WoS/ISI/SCI/Scopus, and his collective research Impact factor is more than **700** points. He has several international Patents on his account, including **Australian, German, Japan**, etc. edited/authored more than **35** research books published by world-class publishers, including **Springer, Taylors and Frances, Willeys, Intech Open, IGI Global USA**, etc.

Pascal Lorenz

University of Haute-Alsace, France, France

Advanced architectures of Next Generation Wireless Networks

Internet Quality of Service (QoS) mechanisms are expected to enable wide spread use of real time services. New standards and new communication architectures allowing guaranteed QoS services are now developed. We will cover the issues of QoS provisioning in heterogeneous networks, Internet access over 5G networks and discusses most emerging technologies in the area of networks and telecommunications such as IoT, SDN, Edge Computing and MEC networking. We will also present routing, security, baseline architectures of the inter-networking protocols and end-to-end traffic management issues

Biography

Pascal Lorenz (lorenz@ieee.org) received his M.Sc. (1990) and Ph.D. (1994) from the University of Nancy, France. Between 1990 and 1995 he was a research engineer at WorldFIP Europe and at Alcatel-Alsthom. He is a professor at the University of Haute-Alsace, France, since 1995. His research interests include QoS, wireless networks and high-speed networks. He is the author/co-author of 3 books, 3 patents and 200 international publications in refereed journals and conferences. He was Technical Editor of the IEEE Communications Magazine Editorial Board (2000-2006), IEEE Networks Magazine since 2015, IEEE Transactions on Vehicular Technology since 2017, Chair of IEEE ComSoc France (2014-2020), Financial chair of IEEE France (2017-2022), Chair of Vertical Issues in Communication Systems Technical Committee Cluster (2008-2009), Chair of the Communications Systems Integration and Modeling Technical Committee (2003-2009), Chair of the Communications Software Technical Committee (2008-2010) and Chair of the Technical Committee on Information Infrastructure and Networking (2016-2017). He has served as Co-Program Chair of IEEE WCNC'2012 and ICC'2004, Executive Vice-Chair of ICC'2017, TPC Vice Chair of Globecom'2018, Panel sessions co-chair for Globecom'16, tutorial chair of VTC'2013 Spring and WCNC'2010, track chair of PIMRC'2012 and WCNC'2014, symposium Co-Chair at Globecom 2007-2011, Globecom'2019, ICC 2008-2010, ICC'2014 and '2016.

Andrea Švob and Dean Crnković

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Applications of tolerance graphs

Tolerance graphs were introduced in 1982 by M. C. Golumbic and C. L. Monma as a generalization of interval graphs. In this talk we will focus on several applications of tolerance graphs in fighting covid-19. These applications include finding cliques of a certain size and calculating the chromatic number of a graph, the problems that are in general NP-complete but for tolerance graphs can be solved in polynomial time.

Biography

Andrea Švob has completed her PhD in Mathematics from University of Zagreb, Croatia under the supervision of Professor Dean Crnković. Currently, she is an Associate Professor at the Faculty of Mathematics, University of Rijeka. She has published more than 30 papers in reputed journals and has gave more than 20 conference talks.

Ervin Gubin Moung[1], Maisarah Mohd Sufian[1], Mohd Hanafi Ahmad Hijazi[1], Farashazillah Yahya[1], Jamal Ahmad Dargham[2] and Sigeru Omatu[3]

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COVID19 Classification through Deep Learning Models using a Three-Channels (Grayscale+Grayscale applied with Histogram Equalization+Grayscale applied with CLAHE) Grayscale Computerized Tomography Images

COVID-19, an infectious coronavirus disease, caused a pandemic with countless deaths. From the outset, clinical institutes have explored computed tomography as an effective and complementary screening tool alongside the reverse transcriptase-polymerase chain reaction. Because of the limited CT dataset dataset available on COVID, transfer learning-based models became the go-to solu-tions for automatic COVID19 detection. However, most medical images are available in grey-scale, which leads to the artefacts whereby the one-channel grey-scale image needs to be pre-processed to match the structure of the pre-trained models. This paper introduces a novel three-channel grey-scale image through parallel pre-processing steps and utilizing two en-hancement methods, Histogram Equalization (HE) and Contrast Limited Adaptive Histogram Equalization (CLAHE). Through a comprehensive experimental analysis using six different pre-trained models (i.e., InceptionV3, MobileNet, ResNet50, VGG16, ViT-B16, and ViT-B32), this study demonstrates the effectiveness of the proposed image representation in improving the models' classification performance.

Biography

ERVIN GUBIN MOUNG is a senior lecturer in the Faculty of Computing and Informatics and the deputy director of the research management center at Universiti Malaysia Sabah. He received his Bachelor of Computer Engineering, Master of (Computer) Engineering, and Ph.D. in Computer Engineering from Universiti Malaysia Sabah (UMS) in 2008, 2013, and 2018, respectively. His research interest generally falls under Computer Vision & Pattern Recognition, such as image processing, image segmentation, image classification, object detection, vision-based learning, and big data analytics.

Aydin Abadi and Steven J. Murdoch
University College London. UK

Payment with Dispute Resolution: A Protocol For Reimbursing Frauds Victims

An "Authorised Push Payment" (APP) fraud refers to a case where fraudsters deceive a victim to make payments to bank accounts controlled by them. The total amount of money stolen via APP frauds is swiftly growing. Although regulators have provided guidelines to improve victims' protection, the implementation is lacking in transparency, and the victims are not receiving sufficient protection. To facilitate victims' reimbursement, in this work, we propose a protocol called "Payment with Dispute Resolution" (PwDR) and formally define it. The protocol lets an honest victim prove its innocence to a third-party dispute resolver while preserving the protocol participants' privacy. It makes black-box use of a standard online banking system. We evaluate its asymptotic cost and runtime via a prototype implementation. Our evaluation indicates that the protocol is efficient. It imposes very low overheads on the customer and bank. Moreover, it takes a dispute resolver only 0.09 milliseconds to settle a dispute between the two parties.

Biography

Aydin Abadi is a Senior Research Fellow at University College London (UCL). His main research interests include information security, privacy, and cryptography, with a focus on Bank and Payment Fraud, Developing Privacy Enhancing Technologies (PETs), and Verifiable Computation. Before joining UCL, he was a Lecturer at the University of Gloucestershire and before that, he was a Research Associate at the University of Edinburgh.

Vinayak Elangovan

Computer Science program, Division of Science and Engineering, Penn State Abington University, Abington, Pennsylvania. USA.

Group Activity Recognition in Persistent Surveillance Systems

Understanding of Group Activities (GA) can be valuable for surveillance applications. A commonly practiced approach for understanding of GA is that of spatiotemporal analysis of video imagery data. However, constructing mindful evidence out of video imagery is a real challenge since the associated data may contain fragmented information, which complicates data processing, data association and correlation, and data fusion. A cognitive processing model is, therefore, required to assist in analyzing imagery data with varying degree of contextual details, extract and inference spatiotemporal information pertaining to correlated GA observations, and generate a summary annotation of occurred GA events. This talk will provide an overview of a typical group activity recognition in persistent surveillance systems.

Biography

Vinayak Elangovan is the Program Chair of Computer Science at Penn State University Abington. He earned his Ph.D. in Computer Information Systems Engineering at Tennessee State University. His research interest includes computer vision, machine vision, robotics, multi-sensor data fusion and sequential data analysis. He has published more than 20 peer-reviewed scientific articles in field of Artificial Intelligence (AI). He is active in the scientific community as a peer reviewer for highly acclaimed journals. He also served as review board member, editorial board member, program committee member for number of AI journals and conferences.

Sikha Bagui

Department of Computer Science, University of West Florida, Pensacola, FL, USA

Future Directions in Cybersecurity Data

Over the past decade, Internet of Things (IoT) traffic has increased exponentially. As more devices transfer data across networks in different sectors of the economy and society, network traffic is expected to increase exponentially, and it is predicted that by 2023, there will be at least 43 billion devices. Hence, being able to monitor and recognize malicious activity and cyberattacks has become imperative. Contemporary research on Intrusion Detection Systems focuses on applying machine learning classifiers to labeled network intrusion datasets, but these datasets need be relevant with respect to the currency of network intrusions. Hence, to develop strong and robust automated network risk detection and mitigation solutions, the first necessity is to have a labeled modern network traffic dataset. In this work, in addition to discussing the present state of Cybersecurity data, directions will be presented for creating a modern labeled network attack data repository. An example network architecture will be presented where Zeek log data is collected and labeled using the MITRE ATT&CK framework. Zeek targets high-speed, high-volume network monitoring, and an increasing number of sites, including supercomputing centers, major corporations, government agencies, etc., are now using Zeek to monitor their 10GE networks. The MITRE ATT&CK knowledge base provides a foundation for the development of specific threat models and methodologies in the private sector, government, and in the cybersecurity product and service community.

Biography

Dr. Sikha Bagui is Distinguished University Professor and Askew Fellow in the Department of Computer Science, at The University West Florida, Pensacola, Florida. Dr. Bagui is active in publishing peer reviewed journal articles in the areas of database design, data mining, Big Data analytics, machine learning and AI. Dr. Bagui has worked on funded as well unfunded research projects and has 100+ peer reviewed publications, some in highly selected journals and conferences. She has also co-authored several books on database and SQL. Bagui also serves as Associate Editor and is on the editorial board of several journals.

Ian James Taylor

CTO, SIMBA Chain, South Bend, IN, USA, Full research professor, Notre Dame, IN (on leave) Research Fellow, AIRC, Stevens Institute, NY, USA.

Supporting the Lifecycle of Web3 Applications

The core theme for this talk is on the lifecycle of Web3 applications, focusing on how applications are orchestrated, curated, executed and how the data is analysed. I'll cover the complexities of reading data from a blockchain, both in terms of the encoding through smart contract interfaces and interrelationships between Smart Contracts. I'll then provide some AI/ML and graph-bases experiments we performed at Notre Dame to provide practical examples of crawling and analysing such data in cryptocurrency. I'll then discuss more general approaches for indexing Web3 Data and compare with SIMBA Chain's approach. SIMBA Chain takes a more proactive approach by curating Smart Contracts with data relationships that can be used to dynamically provide GraphQL scheme for analysis. I will then show two real-world use cases demonstrating this approach in the traceability of coffee beans and complex NFT interactions involved in the management of car titles and registrations.

Biography

Ian is CTO of SIMBA Chain, a research professor (on leave) at Notre Dame and a research fellow at AIRC in the Stevens Institute. Taylor obtained a degree and Ph.D in computing science, and researched in distributed computing for >20 years, now focusing on blockchain. He has published ~200 papers, 3 books (11000 citations, h-index 48) and won the NRL ALAN Berman best research paper award in 2010, 2011 and 2015. Taylor is general chair for the anual WORKS workflows workshop and, in 2018, he was on ICO Alert's list of "Top 40 Blockchain Influencers."

Huda Alrammah and Yi Gu
Department of Computer Science, Middle Tennessee State University, USA.

Tri-Objective Optimization for Scientific Workflow Scheduling in Distributed Network Environments

Distributed computing is a suitable computing paradigm that delivers scalable resources for big data sciences to support ever-increasing scientific applications. Cloud is a typical application in this paradigm. However, it has become more challenging with a massive and heterogeneous pool of resources, which calls for an efficient and effective resource provisioning strategy to decide the number and type of resources in order to meet certain quality of service (QoS) requirements. Moreover, when to lease or release the resources in the network is also crucial for maximizing overall resource utilization, reducing energy consumption as well as monetary cost. In this work, we have studied two novel GA-based heuristic algorithms to efficiently assign scientific workflows with intricate inter-task dependencies to network resources to reduce total execution time, monetary cost, and energy consumption. The proposed solutions are evaluated by an extensive set of different workflow applications and network environments, and compared with other existing methods in the literature to show the performance stability and superiority.

Biography

Dr. Yi Gu is an associate professor in the Department of Computer Science at Middle Tennessee State University (MTSU). She received her M.S. and Ph.D. degrees in Computer Science from University of Memphis in 2008 and 2011, respectively, and the B.S. degree in Computer Science from Jiangsu University, P.R. China in 2005. She had worked as an assistant professor of Computer Science at University of Tennessee Martin from 2011 to 2013 before she joined MTSU. Her research interests include parallel and distributed computing, workflow scheduling and optimization, Cloud/Green computing, wireless sensor networks, and cyber security.

Hernan Dario Hernandez

Dean of Engineering, Universidad Popular Autonoma del Estado de Puebla, Puebla, Puebla, Mexico.

Scrum framework to evaluate the traceability of cocoa for small producers in Soconusco, Chiapas

Agile methodologies are management techniques that allow to adapt the way of working to the nature and context of the project, based on the flexibility and demands of the market and the client, teamwork and collaboration are a fundamental part. Agile methodology emerged as a response to previous more traditi traditional methods, seeking greater interaction of individuals in the processes, as well as greater collaboration with the client. In this sense, agile management is based on the development of projects characterized by their ability to adapt to client's needs, due to their speed and flexibility, and by a methodology that is always oriented towards obtaining results. Some benefits are cost reduction, speed in delivery, work and commitment of team members, and increase in the quality of work and the final product or service. Scrum is an agile framework that brings transparency and speed to the project. This type of method can be a great choice on complex and unpredictable projects. For the present research, applying Scrum in the traceability of the first mile of the cocoa value chain for small producers in Soconusco, Chiapas should positively impact while integrating it in an unpredictable environment and demand for close collaboration among different actors in the process; helping the team to work better with the aim of aligning expectations and increasing the value of the product delivered. Through applying Scrum, partial and prioritized deliveries are established according to the goals defined, providing visibility to stakeholders and where competitiveness, flexibility and productivity are essential.

Biography

Hernan Dario Hernandez has completed his master's degree from Instituto Tecnologico de Estudios Superiores de Monterrey, Mexico and is currently part of the program of Doctor of Information Technology and Electronic Business from Universidad Popular Autonoma del Estado de Puebla, Mexico. He is the International PMO and Governance manager of Hershey Mexico, a leader chocolate and snack manufacturer organization.

INVITED PRESENTATIONS

Angelina Gašpar

Angelina Gaspar, University of Split, Croatia

Human-Machine Interaction in Building a Reference Annotated Dataset

Rich in information and annotated instances, the reference annotated dataset is a prerequisite for training and evaluating Natural Language Processing (NLP) tools. However, creating such linguistic resources is a tedious and time-consuming task that includes lexical, syntactic, and semantic annotations, typically at the sentence level. *Assuming that we can* speed up the human annotation workload, we used pre-trained models (spaCy and AlenNLP) for automatic annotation of 664 sentences (6853 tokens, including 1598 predicates) taken from grammar books. Several types of annotation tasks have been performed: lemmatization (LEM); part-of-speech tagging (UPOS, XPOS); named entity recognition (NER); dependency parsing (DEP, HEAD); coreference resolution (COREF); semantic role labeling (SRL); predicate sense disambiguation (PSD). Three annotators (linguist and NLP experts) post-edited noisy automatic annotations, and their average Inter-annotator agreement (IAA) on a token level was 0.806. We used performance metrics (Accuracy, Precision, Recall, F1) to calculate the difference between machine and human annotations and correlations between machine annotations on a token and sentence level. The annotators measured the post-editing time and the time required for manual annotation of the same subset of sentences. The validation of pre-annotations required less time than doing manual annotation from scratch. Despite human and machine biases, we demonstrated that human-machine interaction is an efficient and reliable method for building the reference dataset. Such an approach allowed us to detect which instances were easily labelled by the system and which were bottlenecks.

Biography

ANGELINA GAŠPAR is a computational linguist. She got a PhD degree in Information and Communication Sciences from the University of Zagreb and an M.A. in English and French Languages and Literature (the University of Zadar). She is an assistant professor and a part-time lecturer in Theological English at the Catholic Faculty of Theology, University of Split. She has published research papers in natural language processing, computer-assisted translation, corpus linguistics, and computer-assisted terminology extraction. She has participated in the projects funded by the USA Office of Naval Research (ONR) Grant N00014-15-1-2789 (ongoing, 2020-2024) and ONR Grant N00014-15-1- 2789 (2015-2019).