



ASONAM 2017



Proceedings of the 2017 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining FAB 2017, FOSINT-SI 2017, HI-BI-BI 2017

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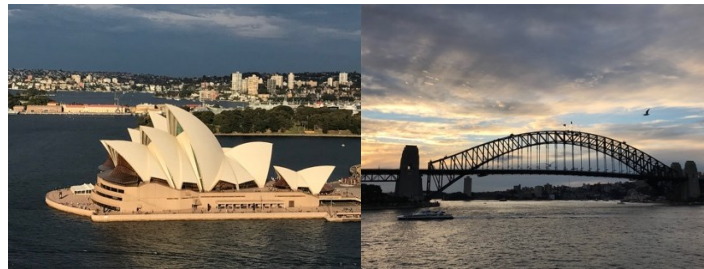
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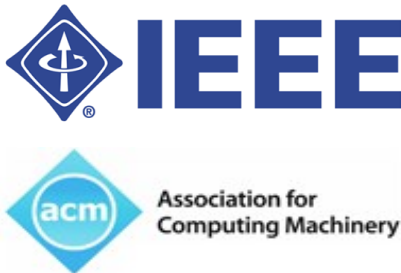
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ASONAM 2017

Message from Steering Chair

This year, the conference on advances in social network analysis and mining (ASONAM) is organized for first time in Australia. It is another successful edition of ASONAM which has established itself as the flagship, premier and leading venue in the rapidly growing domain of social network analysis and mining since it was financially sponsored by IEEE Computer Society and ACM. We heartedly thank both societies for their support over the past years. We are delighted to see ASONAM community growing with many returning participants in addition to the new faces joining every year. The size of the conference is steady growing. Regardless of the location, every year we see most participants coming from all continents and the trend continued this year. This shows the increased interest in ASONAM as a class A conference with acceptance rate maintained below 15%. More important is keeping the high quality of the papers presented in three parallel sessions for three full days. I know that some researchers hesitate to submit to ASONAM due to this lower acceptance rate. Researchers are strongly encouraged to continue to submit their high quality papers to ASONAM for several reasons. ASONAM is characterized by consistent and sustainable success. This has been well realized by leading institutions who rank ASONAM papers high. Every year, authors of all papers presented at ASONAM and the co-located events are invited to submit expanded versions of their manuscripts to the prestigious SNAM journal, NetMAHIB journal, or the LNSN series which are characterized by their high visibility and fast processing of submissions. Special thanks to Springer Nature for having their venues which have been well integrated with ASONAM to the benefit of both parties.

We gather over four days to witness interesting and exciting research achievements by various authors who present full, short, poster, or demo papers. However, a large team of dedicated and motivated research leaders work closely together for twelve months to put together the attractive and intensive scientific program. Their great achievements contribute much to the visibility of ASONAM. I would like to heartedly thank them all. Not to forget in particular the generous support received from the operational organizing team who have spent considerable time and effort handling daily issues and activities, answering emails, updating the Websites, etc. Special thanks to Min-Yuh Day, Panagiotis Karampelas, Tansel Ozyer, Mehmet Kaya, Diaylo Steiman, Jalal Kawash, Ziad Daoud, Chadi Nejim, Ertan Bütün and Ahmet Anil Müngen who have worked hard to produce the proceedings, communicate with participants/authors, and handle the registration, budget and logistics. Indeed, their effort is highly appreciated because it has been really very hard to maintain a balanced budget and keep the trend of providing rich lunches and breaks despite the associated extremely high cost. Thank you to the two sponsors Springer Nature and Gemalto. Thank you to all organizers including general chairs and the chairs of various tracks and workshops, to participants, to authors who submitted papers and to PC members and the reviewers who invested their valuable time and effort to provide timely and comprehensive reviews. Hard luck to authors who could not get their papers accepted this year. They are strongly encouraged to submit again and try to get the opportunity and privilege to present their work at ASONAM in the coming years. Next year ASONAM 2018 will be held in Barcelona, Spain which is one of the most popular touristic destination. We expect a larger gathering and more success especially with the increased interest to analyze social media data for better homeland security. The latest deadly terror attacks that hit in Barcelona, France, United Kingdom, Turkey, etc. should motivate researchers to develop better techniques capable of identifying suspects before they cause damage and casualties. We look forward to having such techniques and results presented in future editions of ASONAM.

Enjoy ASONAM 2017 and Sydney. We look forward to receiving your new submissions and seeing you next year in Barcelona, Spain for ASONAM 2018.

Reda Alhadj,
Steering Chair

IEEE/ACM ASONAM 2017

Message from the General Chairs

We are delighted to welcome you to ASONAM 2017 in Sydney, the ninth annual conference in the successful ASONAM conferences series. Previous ASONAM conferences were held in Athens (2009), Odense (2010), Kaohsiung (2011), Istanbul (2012), Niagara Falls (2013), Beijing (2014), Paris (2015), San Francisco (2016). Both the previous locations of the conference and the current location in Sydney have been chosen to provide attendees with the ability to enjoy various cultural and natural experiences in addition to the exciting technical program of the conference. In Sydney one of the main attractions is the Opera House. A walk across the Harbour Bridge and an outing to Katoomba are further interesting possibilities.

The conference has an exciting technical program and four distinguished keynote speakers that form the core of a varied and interesting program of talks, poster presentations and workshops:

- Philippa Pattison, The University of Sydney, Australia will discuss the modeling of social interactions,
- Xing Xie, Microsoft Inc., China is looking at deep user understanding for building intelligent bots,
- Meeyoung Cha, Korea Advanced Institute of Science and Technology, South Korea will explore the important topic of detecting rumors and fake news online and
- Jian Pei Simon, Fraser University, Canada will discuss the enabling of AI applications by network analysis and mining with the aim to connect algorithms to systems, and academia to industry.

The strong focus of the conference on social networks and mining also provides ample opportunities for attendees to meet and discuss research ideas and form collaborations that might extend beyond the narrow confines of the four days of the conference, i.e. potentially form new social networks of researchers.

The organizing and managing of the conference requires dedication and hard work by the organizers. We are extremely grateful for the dedicated work of the following Organizing Committee members:

Program Committee Chairs: Jana Diesner, Elena Ferrari, Guandong Xu

Industry-Track Chairs: Qi He, Gang LiDeakin, Jiabin Zhao

Workshops Chairs: Martin Atzmueller, Siddharth KazaTowson, I-Hsien TingNational

Multidisciplinary Track Chairs: Rosa Benito, Suheil Khoury, Giancarlo Ragozini

PhD Forum and Posters Track Chairs: Nitin Agarwal, Jeffery Chan, Nima Dokoohaki

Demos and Exhibitions Chairs: Keivan Kianmehr, Tansel Ozyer, Eric Pardede

Tutorial Chairs: Hady Wirawan Lauw, Katina Michael, Katharina Zweig

Sponsorship Chairs: Jalal Kawash, Mehmet Kaya

Publicity Chairs: Ahmad Kassem, Buket Kaya, Keivan Kianmehr, Panagiotis Karampelas, Shang Gao, Wei Wang, Xiaohui (Daniel) Tao

Publication Chairs: Min-Yuh Day, Panagiotis Karampelas,

Registration Chairs: Mehmet Kaya, Jalal Kawash

Web Chair: Tansel Ozyer

Enjoy Sydney and plan to attend ASONAM 2018 in Barcelona, Spain

ASONAM 2017 General Co-Chairs

Michael Blumenstein

Jon Rokne

Jaideep Srivastava

Welcome from the ASONAM 2017 Program Chairs

On behalf of the members of the organizing committee and members of the technical program committee we welcome you to ASONAM 2017.

The ASONAM conference series bring together researchers from around the world to share the latest advances in the attractive field of Social Networks Analysis and Mining. The conference was initiated in 2009 at the Hellenic American University in Athens, Greece. ASONAM 2010 was held at the University of Southern Denmark in Odense, Denmark, followed by next editions at the National University of Kaohsiung (Taiwan), and in Istanbul (Turkey), Niagara Falls (Canada), Beijing (China), Paris (France), and San Francisco (USA).

This year, we received 193 submissions for the main conference. Each paper was reviewed by at least three program committee members who provided detailed and thorough reviews that helped us to finalize the decisions. We thank all PC members and the external reviewers for their hard work! After a discussion phase, we selected 33 submissions as full papers (acceptance rate ~17%), 50 submissions as short papers (acceptance rate ~26%), and 13 submissions as posters. Full and short papers were allocated 30 and 20 minutes oral presentation slots in the program; poster papers were assigned into a poster madness session.

In addition to the accepted papers, the main conference includes keynote speeches by Philippa Pattison (University of Sydney, Australia), Meeyoung Cha (Korea Advanced Institute of Science and Technology, South Korea), Jian Pei (Simon Fraser University, Canada), and Xing Xie (Microsoft Research Asia, China). Three tutorials have been selected for presentation during the first day: (1) Network Inference for Cyber Security in Online Social Networks, by Chee Wei Tan from the City University of Hong Kong, (2) Methodological Approaches to Location-Based Social Networking Research, by Roba Abbas and Katina Michael from the University of Wollongong (Australia), and (3) Adversarial Analytics, by David Skillicorn from the Queen's University in Kingston, Canada.

Besides the main conference program, the four-day ASONAM event includes five workshops. There are also three co-located events, the International Symposium on Foundation of Open Source Intelligence and Security Informatics (FOSINT-SI 2017), the International Symposium on Network Enabled Health Informatics, Biomedicine and Bioinformatics (HI-BI-BI 2017), and the International Symposium on Foundations and Applications of Big Data Analytics (FAB 2017).

We would like to thank all chairs, especially the publication chairs, Min-Yuh Day from Tamkang University, Taiwan, and Panagiotis Karampelas from the Hellenic Air Force Academy, Greece, and the web chair Tansel Ozyer (University of Calgary, Canada, and TOBB University of Economics and Technology, Turkey) for coordinating the logistics. Finally, we would like to thank the authors for submitting their work to ASONAM.

Program Co-Chairs:

Jana Diesner, University of Illinois at Urbana-Champaign, USA

Elena Ferrari, University of Insubria, Italy

Guandong Xu, University of Technology Sydney, Australia

Message from FOSINT-SI 2017 Chairs

**2017 International Symposium on Foundations of Open Source Intelligence
and Security Informatics – FOSINT-SI 2017**

In line with the previous FOSINT-SI events held in 2012, 2013, 2014, 2015, and 2016 in Istanbul, Turkey, in Niagara Falls, Canada, in Beijing, China, in Paris, France, and in San Francisco, USA, FOSINT-SI 2017 held in Sydney (August 01-02, 2017) provided a unique international forum for academic researchers, government professionals and industrial practitioners to socialize, share their ideas, and exchange their data, knowledge, and expertise. Terrorism and crime threaten the international community and our society more than ever before. Criminal networks and terrorist groups that often operate globally try to hide their illegal activities by using advanced information and communications technology. They communicate easier and form global communities that are hard to track. Fortunately, resources like social media, event logs, phone call logs, web logs, and other time series data, constitute a rich source for knowledge discovery. There is a serious need for innovative techniques and tools capable of achieving the ultimate goal of early warning to help detecting, identifying and neutralizing the source of a threat. Motivated by this need with high social impact, research related to open source intelligence and security informatics is gaining momentum in academia, industry, law enforcement and intelligence agencies. Developing effective knowledge discovery methods, techniques and tools to combat crime and terrorism requires coordinated and intensified collaborations across these communities.

After careful review of all submitted papers by the Technical Program Committee members, seven full-length research papers and two short research papers as well as a number of posters were finally accepted. Further highlights in the program were the keynote presentation by Dr. James Martin, Macquarie University as well as a tutorial on Adversarial Analytics by Dr. David Skillicorn.

Special thanks to the conference organizers and the FOSINT-SI 2017 organizing committee. Many months of hard work go into organizing such an event and coordinating multiple complex tasks with busy people residing in different parts of the world. We also express our sincere gratitude to the many reviewers whose hard work provided the foundation of the success of this symposium.

Sincerely,

Mohammad A. Tayebi, Lisa Kaati, David Skillicorn, and Uwe Glässer
FOSINT-SI Chairs

Welcome from FAB 2017 Chairs

Big Data is an emerging research trend in many disciplines. The Big Data research includes challenges like analysis, capture, curation, search, sharing, storage, transfer, visualization, and privacy violations. The trend to larger data sets equates to additional information that could be derived from analysis of a single large set of related data, as well as comparing and correlating information from more than one datasets that allow correlations to be found to spot business trends, prevent diseases, combat crime, customer behavior patterns and many more. To build and enable infrastructures to handle and process Big Data may need to focus on velocity, variety, volume, variability, veracity and complexity of large-scale datasets.

The symposium focused on various aspects of Big Data including its foundation, applications and industrial tools. Big Data foundations included algorithms, methodology, infrastructure, platforms, models, analytics, mining, management, storage, querying and consistency towards storage and retrieval of Big Data. Applications of Big Data included Government sector, Scientific research, Industry, Education and Individual users. Industrial tools and techniques include handling, management, querying, storage, visualization and optimization of Big Data.

The symposium has received 65 submissions covering various aspects in the said fields. After a rigorous peer review process, 20 submissions were accepted as regular papers and 2 submissions were accepted as short papers. We would like to express our sincere gratitude to the numerous reviewers whose voluntary work was the foundation of the success of this conference. We would also hope to give special thanks to the IEEE/ACM ASONAM 2017 conference organizers who coordinated the event. We hope you enjoyed the FAB 2017 symposium in Sydney and we look forward to seeing you next year in Europe for FAB 2018.

Jamal Jida, Mehmet Kaya, Keivan Kianmehr
On behalf of all FAB 2017 Chairs

ASONAM 2017 Organizing Committee

Steering Chair:

Reda Alhajj, University of Calgary, Calgary, Canada

Honorary Chairs

Ahmed K. Elmagarmid, Qatar Foundation, Qatar

Leon Wang, National University of Kaohsiung, Taiwan

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Jaideep Srivastava, University of Minnesota, USA and Qatar Foundation, Qatar

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Jana Diesner, University of Illinois at Urbana-Champaign, USA

Elena Ferrari, University of Insubria, Italy

Guandong Xu, University of Technology Sydney, Australia

Industry-Track Chairs

Qi He, LinkedIn Inc., USA

Gang Li, Deakin University, Australia

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**International Symposium on Network Enabled Health Informatics,
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International Symposium on Foundations and Applications of Big Data Analytics (FAB 2017)

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**The 8th International Workshop on Mining and Analyzing
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**ASONAM Workshop on Teaching, Learning, and Social Networks
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Workshop on Social Influence (SI 2017)

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**The 7th International Workshop on Social Network Analysis in Applications
(SNAA 2017)**

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ASONAM 2017 Keynotes

Modelling social interactions

Philippa Pattison

The University of Sydney, Australia

Abstract

In this talk, I discuss the application of relational event models (REMs) to the analysis of time-stamped interactions in both small and large populations (Butts, 2008). The relational event framework provides a flexible capacity to model an unfolding sequence of interactions as a function of cognitive, behavioural, social and other contextual processes. In this framework, the prior history of learning-related interactions creates the context for future learning interactions and leads to differential propensities for the occurrence of specific future interactions (Butts, 2008). In practice, the history of interactions is represented by indicators of relevant exogenous and endogenous influences, with the latter informed by the now extensive body of work on modelling social networks as the outcome of endogenous ‘local’ network processes (e.g. Snijders et al, 2006; Pattison & Snijders, 2013). Here we review this framework and its application, and present two distinctive applications: interactions among cattle and learning interactions in MOOCs.

Short Bio



Prof Pip Pattison is Deputy Vice-Chancellor (Education), University of Sydney. As DVC (Education), Pip is responsible for the University’s strategy and vision for teaching and learning and students’ educational experience. She oversees institution-wide development of better support for student learning, including the University’s approach to curriculum renewal, new thinking in pedagogy, learning and teaching analytics, e-learning and quality assurance for learning and teaching. Pip is a quantitative psychologist by background, whose primary focus of research is the development and application of mathematical and statistical models for social networks and network processes. Her work has broad application and has most recently focussed on the transmission of infectious diseases and the recovery of communities following the 2009 Victorian bushfires.

Detecting rumors and fake news online

Meeyoung Cha

Korea Advanced Institute of Science and Technology, South Korea

Abstract

Social platforms are an ideal place for spreading rumors and fake news. As more people seek information and read news online, automatically debunking such false claims has become an urgent problem. Recent years have seen great advances in data-driven rumor research. This talk will review some of its major developments, including how a comprehensive set of user, structural, linguistic, and temporal features help us better understand their propagation processes. In detecting rumors and fake news in the wild, time becomes a critical factor. This talk will present how the significance of features changes by time and which features are prominent for early detection. I will also highlight the latest detection studies with deep learning techniques.

Short Bio



Meeyoung Cha is an associate professor at Graduate School of Culture Technology in KAIST. Her research interests are in the analysis of complex network systems including online social networks with emphasis the spread of information, moods, and user influence. She received the best paper awards at ACM IMC 2007 for analyzing long-tail videos in YouTube and at ICWSM 2012 for studying social conventions in Twitter. Her research has been published in leading journals and conferences including PLoS One, Information Sciences, IJCAI, WWW, and ICWSM, and has been featured at the popular media outlets including the New York Times websites, Harvard Business Review's research blog, the Washington Post, the New Scientist. Dr. Cha has worked at Facebook's Data Science Team as a Visiting Professor for a year.

Enabling AI Applications by Network Analysis and Mining: from Algorithms to Systems and from Academia to Industry

Jian Pei

Simon Fraser University, Canada
Springer SNAM Journal Keynote

Abstract

Unprecedentedly more and more AI applications are enabled by network analysis and mining. Many new algorithms have been proposed, partly by academic research, and are adopted actively by industry. Those algorithms extract knowledge at the macro and micro levels. When applying those algorithms to problems in practice, a series of challenges ranging from algorithms to systems need to be addressed. In this talk, I will conduct a random walk and present a few anecdotes about related topics on algorithm and system aspects and from academia and industry angles, such as implementability of network analysis algorithms, building industry scale cloud-based graph computing engines, integration and exchange of graph data, and driving business actions using network analysis and mining.

Short Bio



Jian Pei is a Canada Research Chair (Tier 1) in Big Data Science and a Professor in the School of Computing Science at Simon Fraser University. He is also an associate member of the Department of Statistics and Actuarial Science, Faculty of Science, and Faculty of Health Sciences. During his current sabbatical leave, he is acting as the Chief Data Scientist and a Technical VP of Huawei Technologies. He is a well known leading researcher in the general areas of data science, big data, data mining, and database systems. His expertise is on developing effective and efficient data analysis techniques for novel data intensive applications. At the same time, he is also renowned for his professional leadership. He is one of the most cited authors in data mining, database systems, and information retrieval. Since 2000, he, with H-index 73, has published one textbook, two monographs and over 200 research papers in refereed journals and conferences, which have been cited by more than 67,000 in literature. His research has generated remarkable impact substantially beyond academia. For example, his algorithms have been adopted by industry in production and by popular open source software suites. He is the recipient of several prestigious awards, such as the IEEE ICDM Research Contributions Award and the ACM SIGKDD Service Award. He is an ACM Fellow and an IEEE Fellow.

Deep User Understanding for Building Intelligent Bots

Xing Xie

Microsoft Inc., China

Abstract

With the rapid development of positioning, sensing and social networking technologies, large quantities of human behavioral data are now readily available. They reflect various aspects of human mobility and activities in the physical world. The availability of this data presents an unprecedented opportunity to gain an in depth understanding of users. In this talk, I will first introduce why understanding user demographic and personality attributes is important for building intelligent bots. Then I will show the predictive power of human mobility data for inferring users' demographics. Afterwards I will present our work on understanding different types of user personality traits based on heterogeneous user data. Finally, I will describe the application of our technologies in Microsoft XiaoIce, on profiling XiaoIce users, recommendation in conversations, and personalized conversation generation.

Short Bio



Dr. Xing Xie is currently a senior research manager in Microsoft Research Asia, and a guest Ph.D. advisor for the University of Science and Technology of China. He received his B.S. and Ph.D. degrees in Computer Science from the University of Science and Technology of China in 1996 and 2001, respectively. He joined Microsoft Research Asia in July 2001, working on data mining, social computing and ubiquitous computing. During the past years, he has published over 200 referred journal and conference papers. He has more than 50 patents filed or granted. He has been invited to give keynote speeches at MobiQuitous 2016, SocInfo 2015, Socialinformatics 2015, GbR 2015, W2GIS 2011, HotDB 2012, SRSM 2012, etc. He currently serves on the editorial boards of ACM Transactions on Intelligent Systems and Technology (TIST), Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT), Springer GeoInformatica, Elsevier Pervasive and Mobile Computing. In recent years, he was involved in the program or organizing committees of over 70 conferences and workshops. Especially, he served as program co-chair of ACM Ubicomp 2011, the 8th Chinese Pervasive Computing Conference (PCC 2012) and the 12th International Conference on Ubiquitous Intelligence and Computing (UIC 2015). In Oct. 2009, he founded the SIGSPATIAL China chapter which was the first regional chapter of ACM SIGSPATIAL. He is a senior member of ACM and IEEE, and a distinguished member of China Computer Federation (CCF).

ASONAM 2017 Tutorials

Tutorial 1

Network Inference for Cyber Security in Online Social Networks

Professor Chee Wei Tan

City University of Hong Kong

Bio: Chee Wei Tan is an Associate Professor of Computer Science at City University of Hong Kong. He received his M.A. and Ph.D. degrees from Princeton University in Electrical Engineering. He was a Postdoctoral Scholar at the California Institute of Technology (Caltech). His industrial experience includes corporate research at Fraser Research Lab in Princeton and Qualcomm R&D in San Diego. Dr. Tan was the recipient of the Princeton University Gordon Wu Prize for Excellence and was twice selected to participate at the US National Academy of Engineering China-America Frontiers of Engineering Symposium in 2013 and 2015. He received the IEEE Information Theory Society Chapter of the Year Award in 2015 for the promotion of information theory education and research as the Hong Kong Chapter Chairman. He currently serves as an Editor of the IEEE/ACM Transactions on Networking and the IEEE Transactions on Communications. His research interests include networks, statistical inference in data analytics, cyber-security, information theory, optimization theory and its applications. He is the author of the monograph “Network Optimization by Perron-Frobenius Theory” in the Foundations and Trends in Networking series published by Now Publishers in 2015 and a forthcoming book “Network Inference for Cyber Security in Complex Networks” published by Springer in 2018.

Tutorial 2

Methodological Approaches to Location-Based Social Networking (LBSN) Research

Dr Roba Abbas, Prof Katina Michael

University of Wollongong

Bio:

Dr Katina Michael is a professor in the Faculty of Engineering and Information Sciences at the University of Wollongong, Australia. Katina is the IEEE Technology and Society Magazine editor-in-chief, and IEEE Consumer Electronics Magazine senior editor. Since 2008 she has been a board member of the Australian Privacy Foundation. Michael researches on the socio-ethical implications of emerging technologies, including Location-Based Social Networking Applications. She has written and edited six books, guest edited numerous special issue journals on themes related to radio-frequency identification (RFID) tags, supply chain management, location-based services, location-based social networking, innovation and surveillance/uberveillance. Among them is a 2009 reference volume on Innovative Automatic Identification and Location Based Services. Katina has an industry background on the application of geographic information systems in telecommunications engineering with Nortel Networks.

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Tutorial 3

Adversarial Analytics

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