11:00 -- 12:00am, August 04 [Zoom Room]

Keynote 1: Themis Palpanas
Session Chair: Prof. Iakilis Varlamis, Harokopio University of Athens, Greece
Title: Complex Analytics on Big Data Series Collections
Speaker: Prof. Themis Palpanas, French University Institute (UFR)

Themis Palpanas is Senior Member of the French University Institute (UFR), a distinction that recognizes excellence across all academic disciplines, and professor of computer science at the University of Paris (France), where he is director of GIRe, the data management group. He received the BS degree from the National Technical University of Athens, Greece, and the MSc and PhD degrees from the University of Toronto, Canada. He has previously held positions at the University of California at Riverside, University of Trento, and at IBM T.J. Watson Research Center, and visited Microsoft Research, and the IBM Almaden Research Center. His interests include problems related to data science (big data analytics and machine learning applications). He is the author of nine US patents, three of which have been implemented in world-leading commercial data management products. He is the recipient of three Best Paper awards, and the IBM Shared University Research (SUR) Award. He is currently serving on the VLDB Endowment Board of Trustees, as an Editor in Chief for the BIR Journal, Associate Editor in the TKDE, and IJA, as well as on the Editorial Advisory Board of the IS journal, and the Editorial Board of the TLDKS Journal. He has served as General Chair for VLDB 2013, Associate Editor for VLDB 2019 and 2017, Research PC Vice Chair for ICDE 2020, and Workshop Chair for EDBT 2016, ADBIS 2013, and ADBS 2014, General Chair for the PDA@IT International Workshop (in conjunction with VLDB 2014), and General Chair for the Event Processing Symposium 2009.

Abstract:
There is an increasingly pressing need, by several applications in diverse domains, for developing techniques able to manage and analyze very large collections of sequences, or data series. Examples of such applications come from cloud and internet service providers, IoT installations, as well as from a multitude of scientific domains that need to apply machine learning techniques for knowledge extraction. It is not unusual for these applications to involve numbers of data series in the order of hundreds of millions to billions, which are often times not analyzed in their full detail due to their sheer size. However, no existing data management solution (such as relational databases, column stores, array databases, and time series management systems) can offer native support for sequences and the corresponding operators necessary for complex analytics. In this talk, we argue for the need to study the theory and foundations for sequence management of big data sequences, and to build corresponding systems that will enable scalable management and analytics of very large collections. We describe recent efforts in designing techniques for indexing and analyzing truly massive collections of data series that will enable scientists to run complex analytics on their data. Finally, we present open research problems in the general area of big sequence management.

14:00 -- 14:50pm, August 04 [Zoom Room]

Keynote 2: Kerstin Eder
Session Chair: Marc Raper
Title: Intelligent Testing: Exploiting the power of AI for testing robots and autonomous systems in simulation
Speaker: Prof. Kerstin Eder, Professor of Computer Science, University of Bristol

Kerstin Eder is Professor of Computer Science at the University of Bristol, UK, where she leads the Trustworthy Systems Laboratory (http://www.bristol.ac.uk/stl). She also leads the Verification and Validation for Safety of Robots (https://vervlab.robots) research theme at the Bristol Robotics Laboratory.

Her expertise is in simulation-based testing and formal methods to gain confidence in the trustworthy aspects of complex systems from semiconductor designs to human-assist robots and autonomous vehicles. The research in her group is focused on specification, verification and analysis techniques to verify or explore a system's behavior in terms of functional correctness, safety, performance, power dissipation and energy efficiency.

Kerstin's most recent contributions include Coverage-Driven Verification for robotic systems that directly interact with humans, intelligent test generation techniques for simulation-based testing of autonomous systems, as well as advanced energy modelling and analysis techniques to predict the energy consumption of code, ideally without running it. She holds a PhD in Computational Logic, an MSc in Artificial Intelligence and an MEng in Informatics. In 2007 she was awarded a Royal Academy of Engineering "Excellence in Engineering" prize.

Abstract:
Robots and autonomous systems are bound to transform the way we work and live. They are expected to react appropriately and safely to complex situations in their operating environment, often involving direct interaction with humans. Such systems present a significant challenge to verification – the process used to gain confidence in a system with respect to its specification.

In this presentation I will focus on automation in the context of simulation-based verification of robots and autonomous systems. In particular, I will first introduce Coverage-Driven Verification (CDV), a systematic, goal-directed verification method that offers a high level of automation and is capable of exploring systems or realistic detail under a broad range of environment conditions. On the example of a Human-Robot Interaction (HRI) scenario from collaborative manufacturing, I will illustrate the basic structure of a CDV testbench, including test generation, checking and coverage collection, I will then turn to advanced test generation towards intelligent testing.

One aspect that makes robots and autonomous systems so challenging to verify is that they need to be both powerful and smart to be truly useful. Artificial Intelligence (AI) and Machine Learning (ML) are now commonly used to make robots increasingly "smarter", yet testing these smart systems still relies on conventional test generation techniques. In this context the previously introduced Human-Robot Interaction scenario, will show how the planning native to multi-agent systems can be exploited to automatically generate tests that achieve a high level of coverage as part of a CDV testbench.

I will conclude with insights from transferring these techniques to autonomous vehicle testing in simulation, concentrating on the use of agency-directed test generation as a step towards the development of novel AI-based test automation techniques. Finally, I will briefly outline the challenges of verifying robotic and autonomous systems, including specification, (more) automation, creatively combining techniques and exploring AI and ML for verification.

11:00 -- 11:50am, August 05 [Zoom Room]

Keynote 3: Hongji Yang
Session Chair: Satoshi Hiyoshi, University of Tokyo, Japan
Title: Artificial Creativity vs Artificial Intelligence
Speaker: Prof. Hongji Yang, University of Leicester, UK.

Prof. HONGJI YANG received the B.Sc. and M.Sc. degrees in computer science from the Jilin University, China in 1982 and 1983, respectively, and the Ph.D. degree in computer science from Durham University, UK in 1986. He was a faculty member at Jilin University, China in 1983, at De Montfort University, UK in 1993, and at Bath Spa University, UK in 2015. Currently, Dr. Yang is a professor at the School of Informatics at the University of Leicester, UK. He has published over 400 refereed journal and conference papers. His research interests include software engineering, creative computing, internet computing. He became IEEE Computer Society Golden Core member in 2010. He is a member of EPSRC Peer Review College since 2003 and the editor-in-chief of International Journal of Creative Computing.

Abstract:
The term of artificial creativity has been around for some time. Wikipedia suggested that it means the same as computational creativity; mechanical creativity, creative computing or creative computation, though its etymology was decided to be disputed. Following the way of understanding the term of artificial intelligence, it is expected that products/outputs/results generated by artificial creativity will be useful to society. So, what is the difference between artificial creativity and artificial intelligence? If not so, i.e., a possible reason can be that artificial creativity does always produce useful products/outputs/results while artificial intelligence does not. How to define artificial creativity? And ultimately, how to achieve artificial creativity?

Attempts have been made to approach the above issues in recent years from the angle of whether artificial creativity can be a separate discipline from artificial intelligence. Relevant thoughts have been summarized and are to be shared here. These include how observations and experiments were conducted, what possible theoretical supports could be obtained from other knowledge disciplines, whether new processes of completing tasks were regarded as creative outputs, how and what types of rules and algorithms could be developed, what example applications were and what speculations are made for future research.
14:00 — 14:50pm, August 06 [Zoom Room]
Keynote 5: Wei-Tek Tsai
Session Chair: Jie Xu
Title: ChainNet: A New Approach for Structuring System Architecture and Applications
Speaker: Prof. Wei-Tek Tsai, Digital Society & Blockchain Laboratory, Beihang University, Beijing, China

Wei-Tek Tsai received his Ph.D. in Computer Science from University of California at Berkeley, and has taught at University of Minnesota and Arizona State University for over 30 years before joining Beihang University in 2014. He has filed more than 50 patents in blockchain, and developed many new protocols.

Abstract:
Blockchains have received significant attention as it has significant impacts on currency (such as the Bitcoin Digital Currency), financial markets, search (regulation technology), database, and lawtech. In this talk we will present another important direction that blockchains will have significant impact in the future, that is system architecture.

While initial blockchain applications such as cryptocurrencies focus on censorship resistance, a new system architecture is emerging. Instead of avoiding regulation supervision, a reputable blockchain architecture has been proposed that directly support regulation compliance, such as IIBC and AML. This is motivated by recent events, and one important example is Facebook’s Libra 2.0 project. It will try the least to comply various regulation roles, and provide an embedded supervision protocol for support regulators. Also Facebook is developing a new operating system, possibly to run Libra 2.0 applications. These points to a new direction in system architecture where regulation compliance mechanisms are incorporated into the computing and communicating systems including OS, database, blockchain, and application systems. For example, file systems, process management, storage management in OS will be structurally changed, and systems will be orchestrated by cooperating blockchain systems to ensure rapid regulation compliance. This means that current systems from OS kernels to applications with vastly different features will merge. Furthermore, these cooperating blockchain systems form a new network architecture ChainNet with new communication protocols and security mechanisms.

15:00 — 15:50pm, August 06 [Zoom Room]
Keynote 6: Rajiv Ranjan
Session Chair: Prof. Jie Xu, University of Leeds, UK
Title: New Horizons in IoT Workflows Provisioning in Edge and Cloud Datacentres for Fast Data Analytics
Speaker: Prof. Rajiv Ranjan, Newcastle University, UK

Professor Rajiv Ranjan is an Australian- British computer scientist, of Indian origin, known for his research in Distributed Systems (Cloud Computing, Big Data, and the Internet of Things). He is University Chair Professor for the Internet of Things research in the School of Computing at Newcastle University, United Kingdom. He is an internationally established scientist in the area of Distributed Systems (having published about 300 scientific papers). He has secured more than £12 million AUD ($5 million +) in EPSRC and industry research grants from both public and private agencies. He is an innovator with strong and sustained academic and industrial impact and a globally recognized IoT leader with a proven track record. He serves on the editorial boards of top quality international journals including IEEE Transactions on Computers (2014-2016), IEEE Transactions on Cloud Computing, ACM Transactions on the Internet of Things, The Computer (Oxford University), The Computing (Springer), and Future Generation Computer Systems. He led the Blue Skies section (Department, 2014-2016) of IEEE Cloud Computing, where his principal role was to identify and write about most important, cutting-edge research issues at the intersection of multiple, inter-disciplinary research fields within distributed systems research area including Internet of Things, Big Data Analytics, Cloud Computing, and Edge Computing. He is one of the highly cited authors in computer science and software engineering worldwide (h-index = 32, g-index = 100, and 15800+ google scholar citations, h-index=38 and 8000+ acsus citations).

Abstract
Supporting Internet of Things (IoT) workflows enactment/execution on a combination of computational resources at the network edge and at a datacentre remain a challenge. Increasing volumes of data being generated through smart phones, IoT (Internet of Things) devices (which can vary significantly in scope and capability), need to be processed in a timely manner. Current practice involves using edge nodes (e.g. sensors or other low-capacity devices) as a means to acquire/collect data (i.e., an "observatory" mechanism). Subsequently, this data is transmitted to a datacentre/cloud for analysis/ insight. Increasingly, the limitation with this large-scale, centralised datacentre is being realised (such as speed of response for latency-sensitive applications), with the emergence of a number of paradigms to address this concern — such as fog computing, edge computing, Cloud-of-Things, etc. All of these propose the use of dedicated servers (with varying capacity and capability) within micro/nano datacentres at the network edge, to overcome latency constraints associated with moving data to a central facility, and lack of use of increasing computational capability within edge devices. These paradigms also closely align with work in content distribution networks (e.g. from Akamai CDN), which attempt to place data servers within one to a small number off hop of end users (certainly 65% of users are supported is this way, with >15% Akamai servers).

A key objective of this keynote talk is to understand how such emerging paradigms can be used to enable cloud systems (supported through large scale computational facilities) to be "stretched" to the network edge, to enable data-driven IoT workflows to be executed efficiently over such combined infrastructure. We propose the combined use of "stretched" capability at the network edge (referred to as an "Edge Datacentre" (EDC)) with capability within a Cloud Datacentre (CDC). Collectively, IoT devices and edge resources, like gateways (Raspberry Pi 3), software-defined networking (Huawei CloudEngine 6000) and smart phones equipped with sensors, constitute a new set of computing resources — and as potential components of an EDC. The keynote talk will have the following outline: 1) Overview of the research challenges involved in computing and orchestrating complex IoT workflows in cloud-edge continuum infrastructure. 2) Discuss two case studies in healthcare and smart cities domain to understand how data-driven workflows can be applied to create/improve next-generation IoT applications. 3) Discuss our experience with running United Kingdom’s largest IoT infrastructure, namely, the Urban Observatory (http://www.urbanobservatory.ac.uk/)