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香港理工大學

Department of Computing
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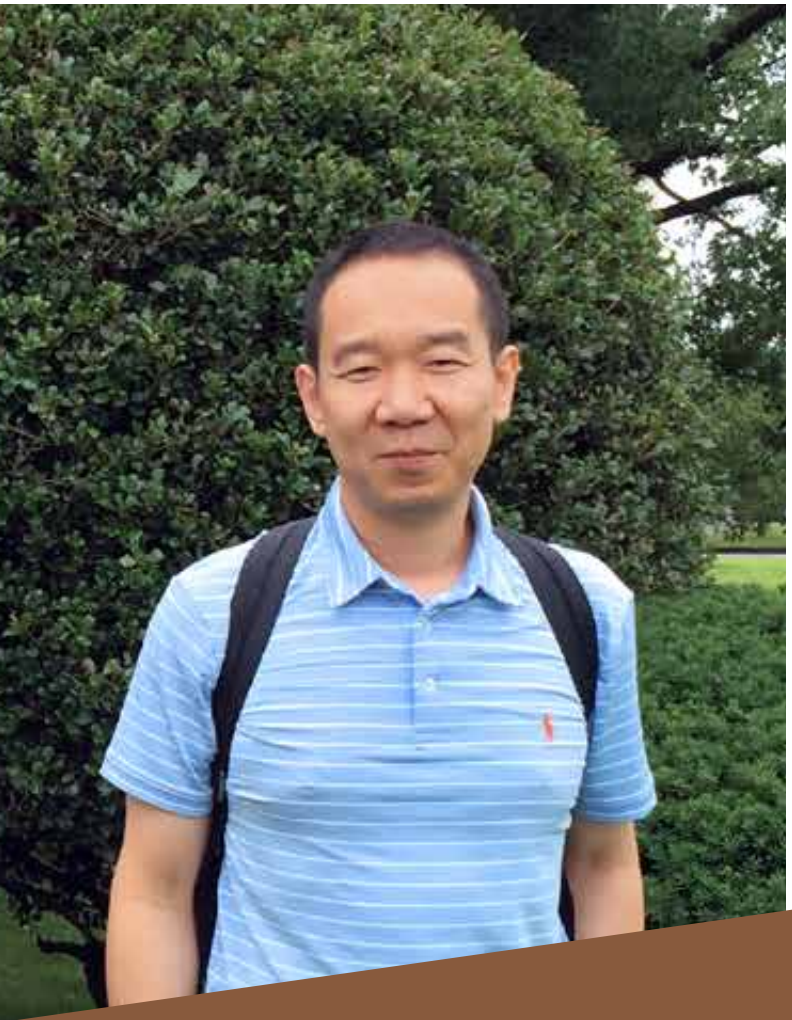

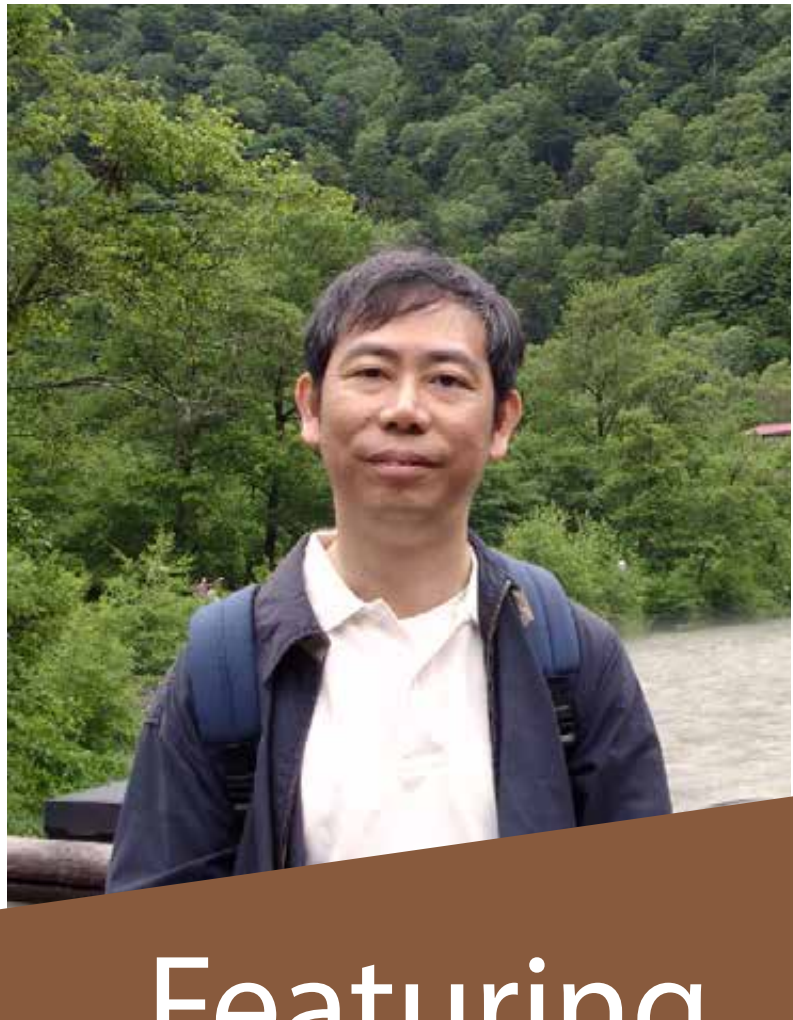

Featuring
Prof. Song Guo & Dr Hong-va Leong

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SMART COMPUTING
Drives Innovation

Interview with Prof. Song Guo

Could you brief us about your education background and work experience?

I received my Bachelor's degree from Huazhong University of Science and Technology in 1995 and my Master's degree from Beijing University of Posts and Telecommunications in 1998, both in Computer Engineering. After two-year industry work in Beijing, I joined the School of Information Technology and Engineering at University of Ottawa and obtained my PhD in Computer Science in 2006. Then I was awarded a Natural Sciences and Engineering Research Council of Canada (NSERC) Postdoctoral Fellowship by the Department of Electrical and Computer Engineering, University of British Columbia.

I started my first academic job in September 2006 as an Assistant Professor of the Department of Computer Science at University of Northern British Columbia. One year later, I moved to work for the School of Computer Science and Engineering, the University of Aizu, Japan, where I was promoted to Associate Professor and Full Professor in 2011 and 2014 respectively. Then, I joined PolyU in August 2016.

What are your main research areas? Please highlight your major contributions.

My research interests are mainly in the areas of cloud computing, big data, green computing and communications, mobile and wireless networks, and cyber-physical systems. The research has been sponsored by National Natural Science Foundation of China (NSFC), Japan Society for the Promotion of Science (JSPS), Japan Science and Technology Agency (JST), Ministry of Internal Affairs and Communications (MIC), National Science Foundation (NSF), and industrial companies. In these areas, I have co-authored 2 monographs, edited/co-edited 5 books, published over 300 conference and journal papers, and received multiple best paper awards from IEEE/ACM conferences.

My recent recognised contributions are in several important areas; they are related to cloud computing, big data, and disaster management that had impacts on academia as well as the industrial community. The paper "Cross-cloud MapReduce for Big Data" was published in IEEE Transactions on Cloud Computing, it extended the existing MapReduce model on single data centre by proposing an optimisation framework that minimised both computation and communication cost for running a set of MapReduce jobs in geo-distributed clouds. The work sponsored by Japan central government and Fukushima government has led to the development of Resilient Information Management (RIM) system that has been integrated with cloudlets - the NTT Movable ICT Units for disaster recovery.

I have served as an editor of several journals, including IEEE Transactions on Parallel and Distributed Systems, IEEE Transactions on Emerging Topics in Computing, IEEE Transactions on Green Communications and Networking, IEEE Communications Magazine, and Wireless Networks. I have also been actively participating in international conferences and workshops, serving as general/programme chair and keynote speaker. I am a senior member of IEEE, a senior member of ACM, and an IEEE Communications Society Distinguished Lecturer.

Cloud computing and big data are hot research topics nowadays, could you share insights or the major trends in these areas?

One of the interesting topics is "Intelligence in the Cloud". Artificial Intelligence (AI), since its birth in the 1950s, has been heralded as the key to our civilisation's brightest future. To pursue the vision of AI, various machine learning approaches, e.g. deep learning, supervised learning, unsupervised learning and reinforcement learning have been proposed, but few of them have been developed and deployed in the market. The recent hype around big data has enthusiastically renewed the call and focus for advanced machine learning technologies to extract knowledge from large data pools. With its rich resource provisioning, cloud computing is widely regarded as an ideal platform to facilitate resource-intensive machine learning so as to enable intelligence in the cloud. Integrating intelligence into the cloud is undoubtedly a promising development trend to both cloud computing and AI.

We are still at an early stage of integrating intelligence into the cloud. Towards the exciting future, the path still entangles many critical challenges in different aspects. First, at the application layer, cloud-based efficient and powerful AI techniques are in high demand, targeting at various applications such as natural language processing, stock analysis, medical diagnosis, intelligent industry control, intelligent transportation, and scientific discovery. Second, at the platform layer, while intelligence has been deployed such as Spark's scalable machine learning (MLlib) and Google's cloud machine learning framework (TensorFlow), new machine learning engines are highly expected for emerging computing frameworks such as dataflow computing model HAMR. Third, at the infrastructure layer, new cloud computing architecture and resource scheduling strategies are required to support computation-intensive, IO-intensive machine learning algorithms, or both. How to cater the cloud computation, storage and networking resources towards fast, efficient, and scalable machine learning is worth being intensely explored.

You were a professor at the University of Aizu in Japan before joining our Department, could you share with us some of your remarkable teaching and research experiences there?

Since the 2011 Tohoku earthquake and tsunami, my research has been closely lined up with the strategic research of the University of Aizu on developing ICT for Disaster Management, including prevention, preparedness, relief and recovery. The first effort led to the development of RIM that could be set up immediately after a disaster happened. It served as an information collection and distribution system, regardless of the Internet availability. People thus could obtain services such as disaster monitoring, resource management, rescue decision support, triage management from cloudlets distributed in the disaster area via their mobile devices like smartphones. The system has been deployed in Japan and was demonstrated to the public at AIZU IT AKI Forum 2014, Japan.

In the deployment of our system, we noticed the ability to

provide necessary communications as the disaster unfolds varies in ad-hoc links between mutually reachable smartphones, unfailed portions of the cellular network, and the communication capabilities provided by specially deployed emergency equipment. Therefore, it was essential to monitor continuously and "tune" the network to provide the best possible coverage and communications capability. We envisioned the network evolution to be based on both automated data collections from the smartphones via specially designed emergency apps (e.g. sounds, pictures, weather conditions, vibrations, etc.) and human-directed communication such as phone calls and social media (e.g. the Twitter-based information). This big data approach obtained a global view of the situation and thus helped network evolution. Such research has been sponsored by a JST-NSF joint project on Big Data and Disaster Management.

Could you describe your teaching philosophy?

Keeping up-to-date with the latest work in my research field and maintaining the passion for teaching are crucial. I enjoy working in an academic environment that nourishes creativity and allows many interactions with students as well as fellow researchers. I believe that my dedication to teaching will push my thinking and my students' thinking towards quality learning.

Among many teaching philosophies like fostering curiosity, developing self-learning ability, and training independent research ability, I put cultivating self-confident and self-disciplined people as the highest priority. From my teaching and supervising experience, building trust with students and giving commendation for students' achievements will help them accomplish more than expected, especially when they make progress after navigating tough times. I like taking the time to interact with students to understand their background, strength and needs, and provide opportunities, even small ones, to help them unfold their potentials. It is also essential that tutors should be a positive role model for students of being enthusiastic and persistent in pursuing what they want.

Looking forward, what do you want to achieve in your career?

I am stepping into my middle career stage, and it becomes critical to make good balance in tackling the ever-increasing tasks in teaching, research, and service, each of which is challenging and fun to me in this new environment at COMP. Thanks to its good tradition and excellent colleagues, it provides me opportunities to achieve the goal of excelling in all aspects. I am also keen on supporting and contributing to the bold innovation initiatives of COMP in the years ahead.

Interview with Dr Hong-Va Leong

Could you highlight your education background?

I graduated from Department of Computer Science, The Chinese University of Hong Kong (CUHK). When I was an undergraduate student, Computer Science was an emerging field, and I witnessed a surge in society demand and popularity among students in selecting this discipline for their undergraduate studies. In a few years, the public examination results of Computer Science students caught up with that of Medical School students. At that time, university students were quite active in learning; the bookstores were always swarmed with students, and most of the textbooks were out of stock. On the contrary, computer systems fell behind which took an hour to compile a program, making patience a norm than exception.

I chose to continue my PhD study in the United States since it had long been a research leader in Computer Science. Being not particularly keen on cold weather, I ended up stayed on the sunny West Coast of California, with the best overall State University system. I spent five years at the University of California at Santa Barbara and stayed in a research laboratory that was already typical in the States. I was surprised that nearly half of the people in the laboratory were Chinese including Hong Kong, Mainland and Taiwan, and another half of them were from different parts of the world, such as Spain, Brazil, Iceland, India, and Turkey, with only one representative from the States. It had been quite a memorable moment throughout those years.

What are your research areas? Please tell us how did you get into these areas and your major contributions.

I wandered into the area of distributed computing both by chance and by choice. In the States, most students developed standalone programs at that time, but I was fascinated by the concurrency and unexpected execution outcomes when

several programs were running together in the Operating Systems course. The teacher who taught me Operating Systems during my university life is the best teacher I have ever had, who always gave me many fun challenges. I also took a Networking course to build a distributed application with load balancing ability to attain decent speedup, however, not much emphasis was given to this concept owing to the stronger focus on the actual hardware-dependent networking protocol in the project. At the same time, my relatively fair experience in the Database Systems course with an IS flavour made me shy away from database research initially.

I regained my interest in distributed databases when I presented the concurrency control protocols as a branch in distributed systems. Finally, I developed my research in the areas of distributed computing and distributed databases, with some focus on parallel computing. My work on semantics-based performance improvement in distributed computing had earned me a good number of citations during that era. My work was also referenced by a textbook in distributed computing. After graduation, I would like to search for a sustainable research area. Thanks to the arising wireless communication technology, mobile computing was an ideal research area that connected my research background with an upcoming field.

Do you have research collaborations with others/colleagues? Please brief us your experiences.

After my PhD graduation, I collaborated with my classmates across universities to carry on the research topics we had been working. We were among the first in Hong Kong to publish a paper bearing Hong Kong affiliations in a top conference. Later on, I met Antonio Si, from University of Southern California in PolyU for research collaboration. Both of us graduated from California; we possessed similar research background in distributed databases, and we worked together in a seamless manner. We understood each other; when it came to writing research papers, we knew what the other would like to write, and our writing style was quite similar, therefore achieving a highly synergistic result. Unfortunately, Antonio returned to the States before we could establish our names.

Since then, I have been working with several groups of faculty members in COMP, achieving a certain degree of success. The research groups in COMP always share and contribute by working together. It is not necessary that every member in a research group thinks alike, as it may limit the research vision. However, it is important that they possess a strong mutual understanding and automatic load balancing when it comes closer to the deadlines. Though the degree of synchrony in thinking and writing may not be at an extremely high level, we have been working well throughout the years.

Could you share some of your memorable and remarkable learning and teaching experiences? How do you define good teaching?

The most memorable moment is seeing a student being transformed completely. I think a good teacher should not only "teach" students, but also help them to learn by themselves through transferring meta-knowledge and influencing them.

I received my first MPhil student, Boris, one year after joining PolyU. Boris was a local fresh graduate; he took my class as his final year course on Real-time Systems. Although Boris ranked only about one-third in the class, I was impressed by his learning attitude in classroom; he was active in asking good questions, and he always initiated other students to join discussions.

After Boris's graduation, he worked closely with Antonio and me throughout the next few years to address database caching issues in mobile environments. Through his extremely hard working and highly positive attitude, he attained a good publication record and produced good research results. As Boris's supervisor, I witnessed his transformation. His strong problem-solving ability was acquired through the MPhil drilling. Finally, Boris took on a startup challenge in the Science Park.

Since then, I admitted a few more MPhil students, some of them even had stronger academic performance. Two of them pursued PhD study in the States afterwards and published excellent research papers in top venues. The most rewarding moment is to see my students doing well.

Please tell us your view on the relationship between research and education.

Research ability will improve the way of teaching. By knowing the newest trend, the information would be carried back to the lecture context. It is not necessary that the most advanced algorithms or technologies are covered in lectures. Instead, the ideas behind those advancements would serve as good examples in various parts of the lecture materials. Very often, we would draw an analogy between concepts that we covered during lectures, the actual systems, and reality, stressing the strong foundation built upon lecture materials. For instance, Internet-of-Things being a research topic could be explained based on concepts in distributed computing, where the processes are autonomous objects, with their physical wireless communication based on whatever newest technologies (e.g. pico-cells, MIMO, 4G LTE, or forthcoming 5G) being modeled as a simple "channel". That will facilitate education and knowledge assimilation. Students should learn to break down large problems, look into the interdependency, identify reasons for their integration and interaction afterwards, as well as implications brought around with different assumptions.

Could you share with us your contributions of professional services to local industries in Hong Kong?

Being an academic, I have worked with local professional bodies, notably ACM Hong Kong, in organising and hosting the ACM Collegiate Programming Competition for several times. I have also served various posts in the competition, ranging from coach, judge, organiser, and chair. I have arranged and hosted several "Postgraduate Research Days" in bringing research students together from various Computer Science departments in Hong Kong to share their research findings so as to enhance interactions between universities. Moreover, I have worked extensively with academics to organise many international conferences. I have also served on the programme committee and organising committee of numerous international conferences including VLDB, SIGMOD, EDBT, ICDCS, CIKM. These valuable experiences have enabled me to meet people from different backgrounds, cultures, and connect with people around the world.

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