Featuring
Dr Allen Au & Dr Yixin Cao

ISSUE APRIL 2015
Interview with Dr Allen Au

Dr Allen Au joined COMP as an Assistant Professor in 2014. He spent more than eight years at University of Wollongong in Australia for PhD study, teaching and doing research before returning to Hong Kong. He is very keen in doing research and his interests include Information Security and Privacy, Applied Cryptography, Accountable Anonymity and Cloud Computing.

I had great learning and teaching experiences at University of Wollongong in Australia.

Could you share with us your education background?

I received my Bachelor of Engineering in Information Engineering and Master of Philosophy in Information Engineering from The Chinese University of Hong Kong in 2003 and 2005 respectively. My MPhil supervisor was Professor Victor Wei. After getting the Master’s degree, I worked as a Research Assistant at the Center for Information Security and Cryptography, The University of Hong Kong under the supervision of the center’s directors, Ir Dr Lucas Hui and Dr Siu-Ming Yiu.

Then I went to Australia for my PhD study in 2006 at the School of Computer Science and Software Engineering, University of Wollongong. I got my PhD there in 2009 under the supervision of Professor Willy Susilo and Professor Yi Mu.

After that, I stayed in Wollongong as a postdoctoral researcher and later I joined the school as a lecturer. I have stayed in Australia for a total of eight and a half years before returning to Hong Kong in 2014 to join PolyU.
Could you share some of your memorable and remarkable learning, teaching and research experiences at University of Wollongong?

Honestly speaking, my student life in Australia was one of the happiest period in my life so far. When you were a student, you would always be very happy. Maybe this is a kind of illusion that as people grow older, they have more things to worry about than they have in childhood.

I am thankful for the generous support from my PhD supervisors Professor Willy Susilo and Professor Yi Mu for giving me ample opportunities to work with people from other universities when I was just a student at that time. They also supported me to attend international conferences. When I worked as their postdoctoral researcher, they assigned research students under my supervision. These experiences definitely broadened my network and enhanced my supervisory skill.

I have also benefitted greatly from the productive learning environment at the University of Wollongong. I am a believer in peer learning and the School of Computer Science, University of Wollongong provided me with an excellent environment to benefit from this mode. At that time, we had a large group of seven to eight research students and several postdoctoral research fellows working together in Information Security, and we had a spacious office providing an excellent area to facilitate our peer discussion. I love the way that students working in the same area would be seated in the same room. This is an excellent way to facilitate student interactions. Looking back at those old days, the informal interactions among us was the source of our research ideas and motivations. We could approach each other easily when we encounter problems.

Teaching is always enjoyable for me. The days in Wollongong witnessed my changes and development as a lecturer. I still remember I was very frightened, scared and trembled in my first lecture when I was standing in front of the whole class. But eventually my teaching was quite received by my students. In Australia, the students are very clever and also have a very clear mind. Despite the fact that I failed about thirty five percent of the students in that semester, they still gave me a very high evaluation score. And at the end of the first teaching year, I was so fortunate that I had been nominated for the University Teaching Award. So this is a proof that students had noticed and appreciated the efforts that I had paid to prepare the teaching materials and the time that I had spent to go through the materials with them. Appreciations from students are my driving force to work harder as a teacher. For example, I still remember students’ encouraging emails, saying “Allen, I really enjoyed your lecture. Now I can appreciate what you have told us. I am developing an app based on what you have told me.” and “I still missed those days when you were teaching us!”.
We learn that your research areas lie in Information Security and Privacy, Applied Cryptography, Accountable Anonymity, Cloud Computing. Are there any incidents or people which/who inspire you to invest yourself in these areas?

There are so many people who have inspired me. The first one I’ve to mention is Professor Victor Wei, who’s my MPhil supervisor. I’d also like to acknowledge Dr Duncan Wong for his inspiring teaching. They were both the professors at The Chinese University of Hong Kong who led me into the world of Cryptography when I took their courses for my undergraduate study. I was really attracted by the beauty of modern Cryptography. For instance, the well-known RSA encryption algorithms described in Mathematics can easily be apprehended by high school students. So I started to investigate the beautiful relationship between this area and Mathematics. I was also impressed by the smart Cryptographers who came up with beautiful models and formal mathematical proof to demonstrate that the RSA encryption algorithms are secure. At first, I didn’t know how I could do this. Under the supervision of Professor Wei and Dr Wong, I learned how they defined the models and how they provided evidence to convince people. Since then I realized Cryptography is the area that I should devote myself to.

I would also like to mention one of my classmates Mr Patrick Tsang with whom I had so many fruitful discussions on topics of Cryptography during our master study. This supportive learning experience has helped me to understand some important concepts in the modern Cryptography.

The academic life in Hong Kong is quite different from Australia’s. However, I am on the right track to get used to it.

Could you name some difficulties/difficult occasions that you might have encountered when you join the department and adapt yourself to the academic life in Hong Kong? How do you compare it with that in Australia?

Before talking about the difficulties I’ve encountered here, I have to say that this department is excellent. I am so thankful to have the opportunity to join this department. It seems to me that there are more opportunities here in Hong Kong compared with Australia. Taking the seminar arrangement as an example, this department often hosts several seminars per week, and even several seminars on the same day, while in Australia we have one per week only. I was really amazed by the exposure I could have here. There are also more funding opportunities in Hong Kong, such as GRF, ITF, internal grants as well as access to the PolyU Shenzhen Base for applying grants funded by the Chinese government.

On the other hand, the working style here is different from Australia’s. The faculty members of local tertiary institutions have to deal with many different kinds of activities concurrently, such as teaching, research, and administrative work. So, we have to prioritize our tasks to ensure work efficiency. This is an area that I am still trying hard to improve. But at the moment, I am on the track, and will make good use of my time to embrace those opportunities.
Another issue that I am trying to get used to is the difference between students in Hong Kong and Australia. This actually gives me a little bit of trouble at the beginning of teaching here. In Australia, I applied an active approach for teaching. Before I worked as a lecturer there, they offered me an introduction to university teaching course and plenty of training to be an active teacher. Students were encouraged to ask questions during class or even stopped me at a particular point that they didn’t understand. Apart from asking questions, they would challenge me during the class. If the slide was not clear enough, they would ask me to go back to that slide for further explanation. The students in Hong Kong are quite different from their Australian counterparts. Most of them just passively take whatever we give to them and they seldom ask questions during class even if they have something unclear. They prefer asking us questions after the lecture instead of during the class. To cope with the differences in students’ learning style, I need to adjust my teaching approach and use more tricks to get instant feedback.

Could you describe your relationship with your students in this department?

My relationship with the students here is both friendly and professional. I have established a positive rapport with my students. In fact, I would go further to say I have a wonderful time interacting with my students here. For example, I was assigned to teach master’s students on database last semester. Although the class was quite large, the students had a strong motivation to learn. I am still in touch with them. We discuss the possibility of organizing some programming courses for improving their programming skills. The workshops also fit my undergraduate students who have got the necessary programming skills like Python or C and so forth. I am happy to offer the workshops benefitting both undergraduate and postgraduate students because I have taught programming courses in Australia for two years.

Nowadays, Cloud Computing appears to become the indispensable part of our daily life. Therefore, I wish to make significant contributions in this field for the betterment of the mankind.
Could you share one of your recent/current research projects and what are your expected deliverables?

My current research project relates to Cloud Computing. Nowadays Cloud Computing technology becomes so popular that people are used to storing their data to various cloud platforms such as Dropbox, Google Drive and iCloud. A closer look to the service agreement reveals that, however, the cloud service providers have the right to read our data. Even though we pay for the service, they still have the right to read our data. In this way, they can benefit from reading our data without our prior consent. People may think we can always encrypt our data before putting them into the cloud. The problem is that if we do this, the data will become much less usable. Encryption alone is not the effective solution to address the problem. For example, if we wish to access our data from another computer, we have to memorize the key for decryption. It is also difficult to search the encrypted data without giving the storage provider the decryption key. This problem will become more complicated if we wish to share our data with other parties. Tackling such a problem is definitely a big challenge for me. Yet, I am willing to spend time solving this problem.

I aim to set up a system that can protect our data privacy while we are searching the data and sharing the data with others, without sacrificing the benefits of the cloud. I believe such a system will be very useful for the healthcare professions. I can envision in one day that when we go to visit a doctor, we do not need to bring together our past medical reports with us and that the doctor would have access to our medical history given our consent. And whenever the doctor does the prescription or update our medical records, our records are simultaneously stored in the cloud. And if we go to visit another medical provider next time, they can directly access our data with our consent. Once we remove our consent, they are no longer be able to access our data. This is what I hope I can deliver in the foreseeable future.
How will you see your career develop in 5 years’ time? What kind of supports do you hope/expect to get from the department? How would you make contributions to the Department?

My career goal is to establish an active research team with graduate students, postdoctoral fellows and faculty members which produce high-impact research outcomes. My mid-term goal, say in 5 years, is that when researchers talk about recent development in Information Security, they will mention that there is an emerging group at PolyU.

In my opinion, the department is very supportive to our staff, especially the new staff like me. And it has done a great job in terms of attracting high quality research students and supporting them, for example, the students from the Hong Kong PhD Fellowship Scheme. In addition, our department’s PRA system is really great to encourage our colleagues for more participation in scholarly activities. I know not all the departments at PolyU have this system.

I think the department should continue its support on research student quota and the PRA system to attract and retain top research students and researchers. Added to these current practices, what the department can do to appeal to the high quality candidates is to allocate more space for undertaking research activities and set up some mechanisms to attract young researchers at the postdoctoral level.

I am more than happy to contribute my experience and expertise to any departmental activities. For example, I’ve just joined the Working Group on Department-Driven Initiatives in Big Data Computing and Human-Centered Computing. I believe with my expertise in Information Security, which plays an important role in any computer system development, I am able to look into security issues about the system, especially in the area of Big Data Computing. In terms of teaching, I hope I could contribute to the development of new subjects for new programmes.
Interview with Dr Yixin Cao

Dr Yixin Cao joined COMP as a Research Assistant Professor in 2014. Before joining COMP, he was a Research Fellow at the Institute for Computer Science and Control, Hungarian Academy of Sciences. His research interests include Algorithmic Graph Theory, Combinatorial Optimization, Social Networks, and Bioinformatics.

Could you share with us your education background?

I received the Bachelor of Engineering in Automation from Harbin Engineering University, China in 2000, the Master of Science in Computer Science from Beihang University, China in 2003, and the PhD in Computer Science from Texas A&M University, USA in 2012. After completing my PhD study, I spent two years working as a Postdoctoral Research Fellow in Hungarian Academy of Sciences. I met my wife in Europe and got married. We chose to come back to Hong Kong to pursue our own career because she studied a PhD in Finance, and Hong Kong is definitely the best place for her to further develop her career. The second reason is that I had talked to some professors who had visited COMP and are very familiar with Hong Kong universities. They told me that COMP is expanding and it is a very good place for me to continue my academic pursuit.

The beauty of Mathematics and Algorithms has made me change my research directions.
Your research interests lie in Algorithmic Graph Theory, Combinatorial Optimization, Social Networks, and Bioinformatics. What inspired you to start working in these areas?

When I started my PhD study in Texas A&M University, my original research direction did not include either one of them, and it was programming languages. However, I later on realized that Mathematics and Algorithms are my real interests and they are the areas that I can make significant impacts, so I changed my research areas. I always prefer abstract thinking to practical activities. Mathematics is the only interest of mine when I was a boy. But since I graduated with a master degree in Computer Science, it seemed programming is the ideal job for me. And I made a living by programming for five years before I started my PhD study. The inventor of C++ was at Texas A&M University, so I ended up studying programming languages in his group. Fortunately, according to the U.S. system, Computer Science is still a sub-area of Mathematics.

My research focus is on Graph Algorithms, which is used in Combinatorial Optimization, Social Networks, Bioinformatics, and many others. For example, what Google does is to treat the Internet as a huge graph, and Social Networks is nothing but big graphs. Nowadays, people prefer the fancy phrase “big data,” but what they don’t know is that most of the time they are in fact simply playing with the big graphs. So, I consider spending time and effort investigating these fields are worthwhile.

Could you highlight the impacts of your research?

The impacts of our research are the open problems we have solved. For example, one of our recent papers resolves a twenty-year old open problem, which is highlighted in http://fpt.wikidot.com/fpt-papers-on-arxiv, and there are only six such papers published in the past five years. These problems may not have any foreseeable applications, so I cannot claim they have any direct impact on our life.

All of us were born curious, but most become more and more practical when we grow up. Some of us may be fortunate to be able to retain the innate curiosity, and my research is for them, who are more interested in “why” than “how”? For example, our research question is why people think some problems are difficult while some similar problems are easy? Most of these questions people would ask are still beyond our knowledge to answer, so we are still far from uncovering the theories. For example, my baby girl is now ten months old, and she’s still not able to speak. Even so you can see her strong curiosity on everything. Wherever
we go, she watches the surroundings eagerly, and for any new material, she touches it by hands and tongue. My wife and I are expecting her endless why-questions, purely out of curiosity instead of any practical purpose. Trying to answer them is similar to the original motivation for early research. In the eyes of average people, researchers endeavor to make inventions based on people’s needs. But that’s not true according to the human history, as the motivation for early research is curiosity. My favorite example is the GPS, which is used by most of us nowadays. But not many of us know that GPS is the first (and probably the only) major application of Albert Einstein’s theory of relativity. Even fewer of them know that the theory behind the theory of relativity is the even weirder non-Euclidian geometry. Mathematicians invented non-Euclidian geometry not for practical reason but just out of their curiosity, and so was Einstein when he formulated the theory of relativity. If they had insisted on developing the immediately usable research only, then we would have to hold a map for every new place we go.

Many other fellow scientists also work in similar areas. How will you consider yourself/your work outstanding among them/their?

I’m proud that my research was hallmarked with its striking simplicity. My research area in Algorithms can make complicated Algorithms simple and can be imparted to undergraduates clearly and easily. I’m a loyal follower of G. H. Hardy, a British Mathematician, who had famously said “Beauty is the first test: there is no permanent place in this world for ugly Mathematics.” If I get a result that is not beautiful enough, I would not publish it. I can either figure out its hidden beauty later, or I have to discard it.
This is your first time you teach, how do you prepare yourself and what’s your feeling so far?

Yes, this is my first time teaching in Hong Kong and I taught a subject for the Department of Applied Mathematics last semester. However, the experience was not a good one as most of the students had no motivation to learn and they had no idea on why Mathematics students have to learn programming. Hong Kong students are generally shy. In addition, there was a significant communication problem. I don’t understand Cantonese, while most the Year 1 students don’t speak English well, so they were not very willing to answer my questions or talk to me.

I am now teaching a PhD subject in COMP and the teaching experience seems better than last semester’s. I think I have to adjust my teaching style to cater for different students’ needs. For example, local and Mainland Chinese students come from different backgrounds and culture, so I need to customize my teaching materials to maximize their learning experience. And I need to learn Cantonese to communicate better with the local students after class.

Collaborating with different scholars and researchers can allow us to explore interesting research topics.

What is your research plan for the next five years?

I wish to concentrate my research on two areas in the next five years. The first is of course to continue my study on some unresolved problems. There are so many naively simple questions haunting people for decades, and some of them captivate me for years. I always enjoy the process of solving a hard problem, when I’m completely immersed in it. The second is to solve real-life problems. I would like to have more collaboration with different faculty members and researchers within and outside PolyU to discover interesting problems to work on.
For contributions and enquiries, please contact:
Ms Bonny Yeung
Tel: 3400 3736

Editorial Board:
Prof. Jiannong Cao
Ms Vienna Lam
Ms Bonny Yeung

Design:
Mr Anson Kwan

Special thanks to:
Miss Yi Dou