Dr Zhang Lei is an Associate Professor in the Department of Computing (COMP). He joined the COMP family in 2001 and has spent over 10 years studying and working in the areas of computer vision, image processing and biometrics. Recently some of his interesting works were published in International Conference on Computer Vision (ICCV), Computer Vision and Pattern Recognition (CVPR), and European Conference on Computer Vision (ECCV), the three top international conferences on computer vision research.

INTERVIEW WITH DR ZHANG LEI

Dr Zhang Lei (L) Interviewer : Agnes Kwan (A)

Interest and motivation determine success.

A: What schools did you go to when you were young?

L: Back in my upper secondary days I was interested in physics and I once dreamed I would become a researcher in physics-related areas. Eventually I picked aeronautics during my undergraduate studies in Shenyang Institute of Aeronautical Engineering but I soon discovered I was not really that interested in mechanics. My classmates at that time were able to manipulate different parts and pieces of models and engines with ease but I just messed things up. I realised I did not have the talents to further develop in this area whilst I performed much better in research and making logical sense of abstract theories and concepts especially those related to mathematics and physics. Later I was enrolled on postgraduate master’s degree in Northwestern Polytechnical University in Xi’an and obtained my PhD there, and I was inclined to work in areas related to signal processing and image processing as they captured my interests.

I moved away from aeronautics (my undergraduate programme) and gradually invested myself in the research work of computer vision. This appeared to be a drastic change in the eyes of others. But I didn’t feel that way. I think it is quite common for people to pursue their postgraduate studies or career in areas not directly or totally related to their undergraduate studies. I don’t see a necessary and causal relationship there. Undergraduate programme prepares students for their future by equipping them with appropriate and fundamental skills and knowledge. But if you are determined to pursue a PhD you should know your interest and abilities well and follow the proper track. Without knowing where your interest lies you will lack motivation to proceed and you won’t succeed. Read me as an example. I realised I could do much better in the research of mathematics, data processing and related areas when compared with mechanics and handling engines which I really disliked. Such realisation motivated me to take on a path that I cherish as I could really work out something which manifests my capabilities and match my interests now. I really prefer using my ‘mind’ to using my ‘hands’.
Research brings me enjoyment and fulfillment.

A: What is your research focus and why?

L: My current research focus lies in the broad scope of computer vision and can further be diversified into areas like image processing, image reconstruction and image recognition. Biometrics is another key research area that I am working in. Each of these owns a unique and specific track but they are highly co-related and the research methodologies and tools applied in these subjects are quite similar.

Before I joined the Department of Computing, I had already worked in projects related to image processing for some time. I broadened my scope here and started to engage in projects related to biometrics, computer vision and pattern recognition. As I spend more and more time doing research here, I am able to enrich my experience and explore new direction.

I really enjoy working in these areas and I often come up with new ideas during the course of research. I read widely the works of other researchers too. I believe all researchers have their messages and we all communicate through our work and publications. Researchers may, at a certain point of time, discover something new or valuable and that will bring about a sense of satisfaction and encouragement to move on.

A: Are there any interesting and exciting stories during the course when you are working your research?

L: Yes. I am happy to share one of my stories when I was working on a research project on sparse representation based classification. This has been my focus in the recent three to four years and also a heated subject in computer vision research and a lot of work has been done by other researchers and scientists. In the year 2009, John Wright et al. published a paper on this subject and I was struck by it. They applied some rather simple and straight-forward ideas and tools in their examination yet they led to impressive and influential conclusions. The idea to verify these tests and models came up to my mind and I spent over 2 years to find out that his general interpretation towards certain areas might have been biased in the process though the resulted outcome was logically correct. I published my viewpoints and new arguments later, and received much support from other research fellows. That's probably the reason why I love to do research so much – you can communicate with a pool of intellectuals around the world, no matter you know them personally or not, through your publication and papers. That gives me a lot of stimulation and fun.

Visual tracking is another subject that I have spent my time on for years and I have derived much satisfaction from it. Many other researchers have published their works and they had a tendency to apply some very sophisticated tools and methods to get the result. I'd rather go the other way – I intentionally picked some very direct and simple methods but I could achieve even better results! That's my 'motto' in research. I favour simplicity and dislike sophistication and I think one should always stick to the 'core' question and find out ways to solve it instead of dragging more complications around it when doing research.

A: What do you think about cross-area research and interdisciplinary research in your own capacity? Do you have any research direction project in mind on this?

L: I am open to all these and I always believe collaborated efforts bring bigger success. Nevertheless, the determining factor lies with the identification of an appropriate trigger point or a subject or a project that people across different disciplines can all leverage on. I see the possibility of generating more value and creativity through integration and synthesis of some of my research tools or methods with others’ practical applications but that should come with more in-depth discussion among the colleagues involved. I have been working with a lot of colleagues in the department like Prof. David Zhang and Dr Simon Shiu on different projects and we frequently exchange, yet in the near future I am still in the process of identifying a suitable interdisciplinary project and a common goal to start with which shall yield the greatest impact. Our department head, Prof. Jiannong Cao, is very positive on this and often encourages us and I think all of us in the department should take a more proactive attitude to identify and initiate collaborative projects instead of working within our own discipline passively.
Research benefits people and businesses.

A: How does your research apply to industries and businesses, and to what extent is it practically applicable?

L: I have a firm belief that my research is widely applicable to industries and businesses. Just to name one, my project on visual tracking can certainly be applied to and utilised in a practical setting. I employ simple tools and techniques which bring about satisfactory outcome efficiently – this is a preferable and workable means to businesses. I was approached by Lenovo Hong Kong recently and they showed very keen interest in my project on visual tracking and we both saw a long-term commercial potential in it. A while ago I had a consultancy project for ASTRI on real-time super-resolution which proved that my research could benefit them in their product development plan.

A: What gives you the strongest sense of achievement in your work?

L: I enjoy doing research and I treasure the way that I can exchange with others intellectually through publications and constructing new experiments. I myself do not have the time to figure out a detailed plan and business model about productising my research results. Nevertheless, I am most willing to share my work with those people or companies who have the same insights and plans of similar nature or the idea to go commercialised. I was approached before and was asked if I could release the code, and I agreed without hesitation. Some of our fellows in China also had the same request as they would like to base on my code to develop their products. By so doing I can contribute to the knowledge base of the subjects that I am working on and I can also bring about advancement within the field. I also encourage my students to follow suit and this may lead to more collaboration opportunities with industries and businesses in product design.

Capability matters, but passion is equally critical in research.

A: What properties should a person possess for being a passionate researcher in your opinion?

L: Well this is complicated. Of course capability matters, but passion is equally critical. Research is all about identifying a problem, setting a direction in investigation and experiments, and discovering ways to solve the problem effectively. By the time you come up with a solution certainly you will derive for yourself a sense of satisfaction and achievement and that are all beyond words to describe. A person doing research should fundamentally be detailed-oriented and possess perspicacity. Yet if he doesn’t and cannot enjoy the process of scientific research then he is doomed to fail since there is no motivation behind.

Zhang with his lovely daughter
Dr Hareton Leung joined Hong Kong Polytechnic University in 1994 and is now Director of the Lab for Software Development and Management. He previously held leading positions at Bell-Northern Research Ltd., Northern Telecom Ltd. and GeneralSoft Ltd. He is also an accomplished industry consultant to large corporations and government departments throughout Hong Kong and China, offering his valuable advice and support on areas like software testing, quality assurance, project management and system development.

INTERVIEW WITH DR HARETON LEUNG

Dr Hareton Leung (H)           Interviewer : Agnes Kwan (A)

I knew my aspiration and my goal clearly. Everyone should do the same.

A: Can you tell us some background on your education?

H: My first degree was in astronomy and physics. I did a double-degree in University of British Columbia as I was too amazed about the sky and the myths of galaxy. Not many institutions offered such programme in Canada at that time. When it came to the fourth year of my study, I helped my professor write some very basic computer programs in modeling and that sparked off my interest in computing. I could recall that I learned and tried all by myself!

After graduation I realised that getting a PhD in astronomy and physics was a ‘pre-requisite’ if I wanted to pursue this further and get a good job – but that was unyielding. So out of pragmatic reasons I decided to turn to computer science. With this determination I moved to Simon Fraser University and started my Master in Computer Science there with a focus in numerical analysis. I gradually became interested in testing as I realised that it was difficult to ascertain the workability of a program if no testing was conducted. Nevertheless, doing research in testing was too new in that era and there were not many techniques available. Even the now-famous subject of software engineering was in its infancy around that time. By then a Canadian professor William Howden inspired me with his work in software testing and my determination to move towards this direction was much strengthened. I ended up reaching Prof. Lee White at University of Alberta (who chaired the Computing Department) and he agreed to be my supervisor upon my PhD research and I had a really good time working and concentrating on my research work in software testing there. I would also give credit to the environment there as no one could stand hanging out in the severely cold weather – so I always stayed consciously focused!

Others may think that I have gone through some really drastic changes along my academic path. Well, I just moved on, naturally, as I knew my aspiration and my goal along with practical considerations. That’s important. My keen interest in software testing and the natural thirst for mastering it drives me forward through it. I know my decision is right.
I take pride in my research work in software testing and I am lucky to have met a good supervisor and worked with reliable partners, and have liberated myself in a right environment.

A: You selected software testing, software maintenance and quality improvement as your core research areas. Could you share with us on your work and achievements around them?

H: At the very beginning I was captured by the challenges of software testing. I started looking for problems and I read through nearly all the papers relevant and central to this subject, though not many at that time. I hit upon the idea “regression testing” – if you have made some changes to the software, how will that impact the testing? This subject fascinated me for a while as there was hardly any work ever done on it. My PhD research filled me with great satisfaction and I took pride in being one among those very few people who first worked on it.

After my PhD I joined Bell-Northern Research Ltd. (BNR) and I was employed under a strategic group with 4 other staff with similar educational attainment (PhD or Master) whose assignment was about examining ways to improve the reliability and quality of all the software within Northern Telecom Ltd (Nortel). Our mission was to explore into the feasibility of introducing various testing and analysis techniques in order to bring about high quality software. Later I moved to Nortel where I was made aware of the significance of process improvement and quality, and to my benefit I acquired much knowledge on Capability Maturity Model (CMM) there. Looking back at those few years working in BNR and Nortel, I was given a chance to really get involved in the practical side of computing and I learned how companies operated in ways so different from what academic institutions spent time working on.

A: Could you name a person that influenced you a lot in your study or research?

H: I was lucky to have worked with and learned from Prof. Lee White at University of Alberta, a leader and innovator in our field. Being my supervisor for my PhD research, he didn’t exert any pressure on me and he gave me a free hand in my research. We did not see each other often and I only approached him whenever I got some results to show him. Guess he was too busy with his work of “domain testing” too! I also benefited much from his loose supervision as I was trained to discipline myself in order to finish my work and be held fully responsible of what I did. I was inclined to take a similar approach now with my own students too.

A: Having spent a few years at BNR and Nortel you suddenly decided to return to Hong Kong in 1984. Are there any strong reasons behind?

H: A structural change in the management in Nortel altered the nature of my work and I felt restrained though I had been there for four and a half years. I started to look for the right environment where I could advance and achieve my goal in research. Some of my former classmates at Simon Fraser University brought me the news that they were returning to Hong Kong from Canada – they saw a precious opportunity as all universities in Hong Kong were on the turning point to become more research-oriented. That appeared attractive and I decided to follow suit – eventually I joined Hong Kong Polytechnic University in 1994 and I was confident that I finally found a great workplace that cherished research and my efforts.

A: Can you name some difficulties that you have encountered while working on your research? What were your measures taken to overcome them?

H: The lack of human resources was definitely a predicament to me ten years ago. Very few students devoted themselves in software engineering and I could barely get talented students to work with me. I was left with no choice and I handled most of the work myself. I solicited with companies myself and had discussions with them to find out if my knowledge and skills could translate into solid assistance to them. Luckily I managed to get financial support from the department and I could hire my own team. Then I met a very dedicated and brilliant research associate, Dr. Zhou Yuming, who joined me in my work and together we achieved many good results.
A: Have you ever used your research results in teaching?

H: I used some case examples in process improvement and I tried to bring in some practical examples and data. I tried to cite as much real-life data and statistics as possible. I also employed a lot of industrial data that I read before and brought before the eyes of my students, especially the Master students. Well they have more room to absorb and the heart to appreciate than the undergraduates.

A: What are your current research projects and do you have plans for future?

H: My research areas include software testing, processes, metrics and software project management. One of my current projects is on risk management. One of my past students worked with me on constructing a new model to investigate the relationship among different risks (risk dependency), i.e. if one risk may impact another and may bring about a high chance of occurrence. We built some framework to model the dependence and then we investigated whether it exists in real-life projects. Attempts have been made in building and running a simulation model and we count in factors like different time of occurrence of risks and resource required for risk mitigation. We also use probability to predict the occurrence of risks or the appearance of new risks. I am confident to say we have discovered something new and interesting there and we will keep working on it further. If this is mature enough I see there will be tools to be designed and used by project managers, which they can employ to perform analysis, to understand conditions leading to different risks, and be more assured of risks that may happen so that precautions can be made earlier. I am also interested in medical related areas and that may be my next research area.

Learning is fun when one acknowledges the enjoyment and motivation in learning.

A: You suggested that “Learning should be fun” as one of your central elements of your philosophy of education. What are the funny and interesting parts in learning that you have discovered and can share with us?

H: Motivation and initiative should dominate in one’s learning. Being their supervisor, I don’t put too much pressure on my students as I feel they should be motivated themselves. I am happy with my role in providing them with the assistance, guidance and knowledge when they need me. They should take the initiative to learn. The funny part in the course I guess is I try to show my students there are always two sides to every story. They have to be careful and critical as the information before them or conclusions made by their predecessors might be biased or incorrect! This is vital in software engineering and testing as so many people just blindly follow the widespread beliefs without getting to the real problem!

Being a supervisor I also asked my students to form small groups and work together and I assigned them certain group work and also group assignment. They have a tendency to stay in the same group and work together when they have derived a sense of team work and the same interests in learning.

A: What would be the advice you may give to young people who also wish to follow your example and focus on research in similar areas?

H: The very first rule is that they have to be very familiar with the subject and read up as many papers and reports related to it as they could. Success won’t come if their foundation is not firm. Next, they should see themselves as ‘innovators’ and ‘pioneers’. It will be good if they can pick a ‘good’ and ‘new’ problem to work on so in the long run they can make a bigger contribution and have more citations in the future. I always believe that students should discover for themselves a brand new world instead of walking on the same old paths as their supervisors did.
Knowledge transfer can happen across disciplines and industries.

A: We learnt that you worked in companies like Nortel and GeneralSoft Limited before. How would you integrate such experience with your research and teaching profession here at PolyU?

H: The way that commercial people do presentations really impressed me. I did try to bring in the same techniques or style in my teaching slides – less wordy, always stay focused with just a tagline, and to state the objective clearly. I think this can be one form of knowledge transfer. From another angle I see another opportunity of knowledge transfer between the academia and the commercial sector through positive and active communication. As academia we should not prison ourselves behind the bars of theoretical work that may have impact in twenty years’ time. We better talk to the industry and find out what problems they are now facing, use our knowledge to help and solve their upfront problems and I am sure they need our hands. This is a higher and constructive form of knowledge transfer.

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