2012 QS World University Rankings by Subject (Computer Science): NUS School of Computing is TOP in Asia and 9th Worldwide

<table>
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Professor Ooi Beng Chin Lauded for Pioneering Research in Distributed Data Base Management

The IEEE Computer Society conferred on Professor Ooi Beng Chin the 2012 Tsutomu Kanai Award for 2012. The announcement was made in a news release issued in mid January 2012. The Society’s Tsutomu Kanai Award was established in 1997 to recognise major contributions to the state-of-the-art distributed computing systems and their applications. It is named in honour of Hitachi Limited’s long-serving president Dr Tsutomu Kanai. Prof Ooi won the Award for his pioneering research in distributed database management and peer-to-peer-based enterprise quality management.

Recognition for Computing Science Faculty Members at University Awards 2012

A number of Computer Science faculty members were recognised for their excellence in their work at University Awards 2012. Assistant Professor Rahul Jain was presented the Young Researcher Award for his breakthrough contributions to the understanding of proofs and computation. Three other faculty members were recognised at University Awards 2012 for their excellence in teaching: Dr Soo Yuen Jien, Associate Professor Tan Sun Teck and Dr Damith Rajapakse. Dr Soo Yuen Jien was also inducted as Fellow in the NUS Teaching Academy.

NGS Excellent Mentor Award 2012

Professor Tan Kian Lee received the Award which is conferred on faculty who seeks to continuously unlock and develop latent potentials, talents and capacities in students, broaden and challenge them in taking on fresh research challenges, and be an unfailing source of counsel, support and encouragement.

TKKYIA Merit Award for Assistant Professor Sim Khe Chai

Assistant Professor Sim Khe Chai won a Merit Award in the Open Category of the Tan Kah Kee Young Inventors’ Award (TKKYIA) for 2012. The award comes in recognition of Dr Sim’s work in voice input perfection. The work focuses on improving the efficiency and accuracy of text entry on mobile devices by combining voice and touch inputs. It is entitled “Perfecting Voice Input with a Magic Touch”. Although typing on a touchscreen display using a soft keyboard remains the most common text input method for many mobile device users, this process can be frustratingly slow, especially on smartphones with a much smaller screen. Voice input offers an attractive alternative that completely eliminates the need for typing. However, voice input relies on automatic speech recognition technology and its performance degrades significantly in noisy environment. This motivates the invention of a novel multimodal interface that seamlessly combines voice and touch inputs to enhance the usability and reliability of text entry on mobile devices. This invention is called Haptic Voice Recognition (HVR). This invention offers two ways of generating the initial letter sequence. The first way uses an onscreen virtual keyboard where haptic events are generated by simply tapping on the appropriate keys. The second way allows users to use handwriting gestures to generate the letters.
Web Browser Security & Automatic Attack Diagnosis
Led by Dr LIANG Zhenkai

Browsers have evolved from a simple document viewer into a complex execution environment to support feature-rich web applications. However, the security mechanisms in browsers do not evolve at the same pace, resulting in attacks such as cross-site scripting and malicious mashup code. Many recent solutions retrofit browsers with various security mechanisms designed for particular attacks. Dr Liang’s research investigates the general security needs from browsers, and aims to design a general security framework into browsers to enable flexible and efficient response to new web attacks. This framework has a wide range of applications, from web attack diagnosis to browser access control experiments. Another direction of Dr Liang’s ongoing research is automatic remote exploit diagnosis and classification. Recent remote attacks involve sophisticated memory-error exploiting techniques, which usually consist of multiple steps. Traditional solutions in automatic attack diagnosis usually focus on a single step, and thus are not effective in diagnosing such attacks. Dr Liang’s team has developed a tool called PointerScope, which uses assembly-level type inference to identify the key steps of sophisticated attacks and build characterization graphs for them. His team is exploring solutions to use the characterization graphs to automatically classify attacks and identify emerging attack techniques. This solution aims to help security companies to prioritize tasking of analyzing the overwhelming incident reports they receive daily.

Reliable Cyber-Infrastructure
Led by A/P Abhik Roychoudhury

Can you spot the differences in the two pictures?
Possibly yes, if you look carefully enough. Now imagine the amount of changes or modifications a software system goes through. As software changes, the semantic impact of the changes can be enormous – previously working code may be broken, and software vulnerabilities may appear which are then exploited by malicious users. In today’s world, embedded software controls critical devices and functionalities like automobiles, as well as daily-used devices like smart-phones, or even toothbrush. It is estimated that more than 90% of the cost of a software project is due to the task of managing its evolution. A/P Roychoudhury is pursuing research on testing, analysis and even automated repair of embedded software to guard against such vulnerabilities. His group has built various program analysis methods to provide a wide range of guarantees about software functionality, performance, energy usage and security. Apart from winning research awards such as best paper award at ACM SIGSOFT, the analysis methods his group developed have been translated into widely used program analysis tools applicable to popular programming languages. One of the current focuses of Abhik’s research is to develop software testing and analysis methods which are evolution aware. By leveraging on past program versions, there exists the possibility of largely systematizing somewhat ad-hoc software development processes like debugging, an activity that developers currently spend most of their time and energy in!

The epiC Project on Cloud Data Management
Led by Professor Ooi Beng Chin

epiC (elastic power-aware data intensive Cloud) is designed to support two major types of database workload, OLTP and OLAP. It consists of two layers: the underlying elastic storage system (ES²) and the up-layer elastic execution engine (E¹). The two layers are loosely connected and can be independently deployed in different clusters. To facilitate the development of epiC applications, epiC provides various interfaces, including E¹ script, Java APIs and a subset of SQL. Many existing database applications can be migrated to epiC by extending the SQL interface. epiC can be deployed on top of a pool of virtual machines to provide 24x7 service. All epiC data are maintained by the ES², an enhanced key-value store on top of the DFS. It creates secondary indices to facilitate the non-key access. The secondary indices are distributed in the cluster via the Cayley graph protocol. In ES², all schema information is stored in the meta-store and asynchronously replicated in all processing nodes. ES² can process most OLTP requests, while OLAP queries will be handled by the E¹. E¹ organizes the operators into an acyclic directed graph. Each operator is processed by multiple compute nodes in parallel. Users are allowed to create their customized operators by extending the E¹’s Java APIs. In E¹, the complex query can be processed by a single job, whereas in MapReduce, we need multiple MR jobs. E¹ is a more flexible parallel processing model and can support graph-based processing efficiently such as some data mining algorithms. Inside the E¹, epiC provides a query optimizer, which translates the user’s requests into E¹ jobs. The optimizer exploits the statistics of data distribution to generate a processing plan that minimizes the estimated costs.

Analysis and Visualization of Infectious Disease System
Led by Professor Wynne Hsu and A/P Lee Mong Li

In today’s highly globalized environment, traditional disease reporting mechanisms (e.g. mandatory notification of diseases) are no longer sufficient for rapid response to new emerging threats such as SARS. The AVIDS project, in collaboration with the Center for Infectious Disease Epidemiology and Research (CIDER), aims to build a disease surveillance system by developing geo-visualization techniques that will allow interactive exploration of spatial-temporal patterns and trends of diseases in Singapore. Advanced spatio-temporal data mining techniques will be designed and customized to highlight disease hot spots and predict the likely spread patterns. AVIDS will form a critical part of the pipeline of biosurveillance and disease modeling programs in CIDER to complement as well as to strengthen Singapore’s capability of biosurveillance and outbreak prediction.
FYP Innovation Award
The final year project (FYP) aims to deliver a federated cloud management platform called SkyBoxz. Inspired by the difficulty for developers to take advantage of emerging cloud computing technology, we develop SkyBoxz to simplify the provisioning process and provide task-oriented cloud resources. SkyBoxz serves a brokerage services between cloud consumers and resource providers and both parties can use our system to manage their resources. Unlike the traditional approach, we make the whole SkyBoxz service available online and users can access SkyBoxz with any modern web browser in their PC and mobile devices. I would like to thank my supervisor Associate Professor Teo Yong Meng and Dr Marian Mihailescu, for insightful guidance and the support to participate in the FYP Innovation Award competition. by Zhao Cong

Winner of the NCS Medal and Prize
At 20 years old, Carmen Cheh became the youngest graduate in computer science. Her father introduced her to computer science when she was in Primary 5. Her frustration for not being to win the computer in the tit-tat-toe game drove her to succeed in computer science. Carmen had her last laugh when she received her computing degree at the NUS Commencement 2012 with a First Class Honours! She will pursue her PhD in Computer Science at the University of Illinois at Urbana-Champaign.

Grand Prize at Bank of America Campus Challenge
Four CS graduate students won the Bank of America Global Campus Challenge. The Challenge, a competition seeking innovative solutions to real-world banking scenarios involving technology issues and business considerations, targeted technology and business students in a number of universities around the world. The winning team members are: Cao Nannan, Zeng Yong. Nannan is a machine learning while his students specializing in data management and databases. The Challenge also hosted teams from Carnegie Mellon University and Georgia Institute of Technology in the United States, University College Cork in Ireland, Indian Institute of Technology Madras and the National University of Singapore. The NUS Computing students received the highest scores from the judging panel, and took home cash prizes of US$3,500 each for themselves. In addition, Bank of America presented NUS with a generous cash prize for its role in sponsoring the winning team. The individual cash prizes won by the students in the finals were in addition to the US$1,500 that each of them had already won in the first round of the competition.

Best PhD Thesis
Quoc Trung Tran’s Ph.D. dissertation, entitled “Query by Output”, focuses on enhancing database system usability and contributed three key enhancements in this direction: providing additional insights on query results with alternative characterizations of the results, providing a new approach to explain why-not questions on query results with refined queries, and providing a query analysis tool to reverse-engineer queries from query results. With the increasing complexity of managing big data, novel data analytical tools that provide insights to data querying and analysis will become even more important.

Merit Award – myprize Global Developer Challenge
GeoVid: Sensor-rich Video Management
Team: Ma He, Zhang Ying, Beomjoo Seo, Ma Haiyang, Shen Zhijie, Roger Zimmermann, Min Min Htoon, Wang Guanfeng, Hao Jia, Yin Yifang, and Cui Weiwei
Mobile devices such as smartphones and tablet computers are increasingly popular for the versatile capture and delivery of video content. The GeoVid system leverages this phenomenon and introduces the concept of sensor-rich videos where sensors embedded in mobile devices, such as GPS, digital compass and accelerometer units, collect a continuous stream of contextual properties simultaneously with the recorded video. These additional meta-data describe the camera scene in detail from start to end of a recording. The contextual sensor information allows for a number of advanced and efficient manipulations of user provided videos. A basic, but important function is the visualization of large repositories of videos on a map interface. Another function is the automatic annotation of videos with textual tags. This project is supported under the Interactive and Digital Media Institute’s (IDMI) COSMIC centre and in collaboration with Prof. Seon Ho Kim from the Integrated Media Systems Center (IMSC) at the University of Southern California. The GeoVid Android app received a Merit Award in the myprize Global Developer Challenge by YTL Communications, Malaysia and it has been used by the School of Media Arts, Columbia College Chicago, during the NATO Summit in Chicago on 21/22 May 2012.
"What doesn't kill you make you stronger"

When I joined CVWO, my first challenge was a technical one — I had trouble picking up the Drupal Framework. Furthermore, being a foreign student, the English language was also a barrier. That first summer, I spent many hours coding, living and learning with my team mates, eventually delivering the completed product at the end of the vacation. It was hard and tiring work, but extremely rewarding. For the first time, I felt connected to the school and the local community.

"The reward for good work is more work"

After the first year, I was offered the chance to lead a project to build a Volunteer Management System for Lions Befrienders. My excitement was equally daunted by the awesome responsibility. Unlike the programming problem set done in school, the problem was not clearly defined and explained to us. Instead, there is a need to apply common sense and a tinge of imagination. We also had to ask the right questions. In the process, we learnt that the best way for clients to make a decision was to see an actual working prototype.

"Finishing Strong"

As a student interest group, we only provide support for what is absolutely necessary. However, our systems are designed as much as possible to allow the clients to deal with common and basic requirement changes themselves. As organizations change, the needs also evolve. We still get new requests from time to time. We work hard to ensure that the system continues to support the organizations’ needs and hand the baton over to subsequent batches of CVWO students. For our efforts, CVWO was awarded the distinguished “Friend of Lions Befrienders” award at the Lions Befrienders Appreciation and Award Ceremony.

Just when I thought my CVWO journey has come to an end, I was elected to be the president of CVWO. After being a member and a team leader, I now take a more managerial role in ensuring that CVWO continues to be able to serve the needs of our community, while empowering others to embark on journeys just like mine. Today, as I intern at a high-tech startup in Israel, I fully appreciate the lessons I’ve learnt from my time at CVWO. Many of these lessons are relevant and important to the workplace. Yet, these lessons are very difficult to learn in a normal classroom setting. It has been my honor and privilege to serve the Singapore community and a great joy to work with Dr Ben Leong and the talented members in CVWO. If possible, I wish that every School of Computing student could learn the lessons I’ve learnt from CVWO and make a contribution to their community at large with their skills.

"There is a need to educate the clients too"

There were many occasions where we could not take a client’s request at face value, as often, the clients were not able to articulate the underlying problem. Our clients were too used to doing things their "old" way, which was often a workaround. This led us to realize that we had to educate them to ensure they accept the new way of doing things; otherwise, our system risked becoming a white elephant. As such, our team set aside a large amount of time to convince and train the clients.