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Powering DISCOVERIES!

Partnership With IDA to Drive Cloud Computing As Business Advantage

IHPC researchers will soon get match-made with local companies seeking to tap on cloud computing, thanks to the Infocomm Authority of Singapore (IDA).

It was smiles all around as representatives from IHPC and IDA inked an agreement on the 28th of August to jointly develop world-class cloud computing-powered technological solutions to benefit local ICT companies.

Prof. Alfred Huan, Executive Director of IHPC, signed the Memorandum of Understanding (MOU) with IDA's Assistant Chief Executive, Mr. Khoong Hock Yun.

This partnership seeks to promote the adoption of cloud-based technologies among local infocomm and technology (ICT) companies in the areas of product and service development. It will also spur companies to tap on the power of cloud computing to enhance their business operations in terms of greater productivity and competitiveness.

Through this MOU, both parties aim to develop a vibrant local infocomm sector and hence hone Singapore's overall economic competitiveness on a global scale.

Under the agreement, IDA will match-make IHPC's expertise with companies thjat require assistance to adopt cloud-based technological solutions running on the next generation broadband network.

IHPC will leverage on its research strengths in computational modelling and simulation, and data analysis to offer consultation to these businesses.

A happy moment for IHPC and IDA! Prof. Alfred Huan (left), Executive Director of IHPC, and IDA's Assistant Chief Executive, Mr. Khoong Hock Yun, sealing the agreement.

A quick snapshot after the signing ceremony

Both parties will work hand-in-hand with the infocomm sector, through IDA's extensive industry reach under the Technology Evaluation Programme (TEP) together with IHPC's research & development capabilities to identify and tackle challenges and issues.

IHPC researchers will also ride on IDA's Cloud Computing and Next Generation Nationwide Broadband Network (Next-Gen NBN) infrastructure to power and accelerate the entire solution-creation process.

IHPC and IDA representatives having a fruitful and beneficial discussion.

IHPC researchers present at the signing ceremony included: (from left) Dr. Quek Boon Kiat, Dr. Li Xiaorong, Dr. Erika Fille Legara and Dr. Yang Yinping.

Colleagues from Computing Science helped to give the IDA officials a better idea of the computing capabilities and expertise that IHPC possesses. Dr. Rick Goh gave an insightful overview of CS Department, while Dr. Li Xiaorong, Dr. Erika Fille Legara and Dr. Yang Yinping provided examples of projects that could serve as templates for the technology solutions IHPC will be providing to local companies under this MOU.

Here are three examples of relevant projects that have the potential to help local companies:

• Big Data Analysis: IHPC researchers are developing cloud-based platforms and tools to enable businesses to run various data analytics with better performance and at less cost compared to traditional IT structure . The speed, reliability and feasibility of large scale data processing could be improved by dynamically optimising and scheduling the computational processes on cloud infrastructure such as Amazon EC2, S3, or Windows Azure. Such technologies in turn could be applied to a wide spectrum of areas such as aerospace, transport, surveillance, and healthcare.

• Brand-Centric Social Media Analysis: IHPC scientists are working on a social media analyser to help customer-facing organisations to monitor, track and analyse near-to-real time social media perceptions about their businesses and identify emerging pertinent social media trends. It also allows fine tailoring of these tools and methods for specific organisations to achieve greater accuracy of results.

• Complex Systems Modelling: IHPC scientists have won the top prize from the Institute of Electrical and Electronics Engineers (IEEE) in 2013 for scalable complex modelling, which involves using an analyser of multiple simulated scenarios to enable companies, for example, in the transport or logistic industries, to make faster decisions (such as significantly reducing turnaround time of 9 hours to 30 minutes) so as to achieve lower costs and enhance productivity.

Prof. Alfred Huan (left), Executive Director of IHPC, signing the MOU documents together with IDA's Assistant Chief Executive, Mr. Khoong Hock Yun.

The ceremony ended with an informal discussion, generating new ideas and potential topics for future collaboration between IHPC and IDA.

IHPC Happenings

Scaling Up to First Prize

A team from IHPC made us all proud by walking away with the top prize in the Sixth IEEE International Scalable Computing Challenge (SCALE 2013).

Congratulations to the winning team from the Computing Science (CS) Department, for grabbing top honours at the Sixth IEEE International Scalable Computing Challenge (SCALE 2013), sponsored by the IEEE Computer Society Technical Committee on Scalable Computing (TCSC).

The team that won the first prize with the "Scalable Complex System Modelling for a Sustainable City" project comprises researchers from different groups across the CS Department, led by Dr. Terence Hung and Dr. Christopher Monterola.

The aim of the competition was to highlight and showcase real-world problem solving using computing that scales. The search for effective solutions to many scientific problems require applications that can scale. SCALE 2013 looked at advances in application development and supporting infrastructures that enable scaling.

As the competition brief states, there are different dimensions to application scaling: Some applications can scale-up to large number of cores or compute units, others scale-out to utilize multiple distinct compute units, or even scale-down to release resources that are no longer needed. In order to scale, these applications need the support of tools, middleware, infrastructure, programming systems and so on.

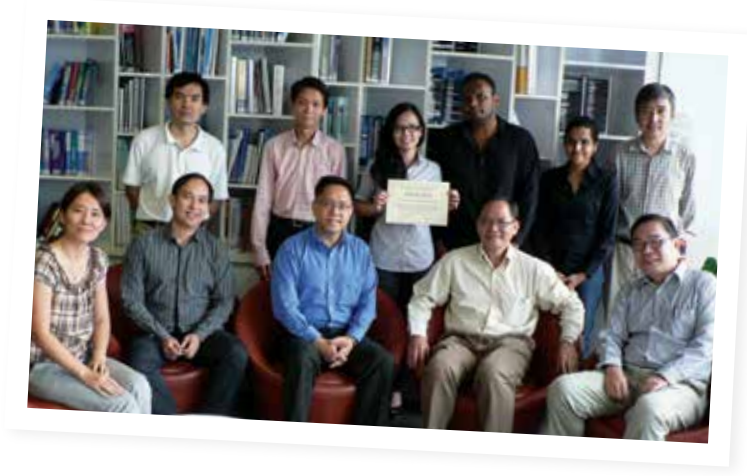
Dr. Erika Legara represented IHPC during the presentation phase at the 13th IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing (13th CCGrid) in the Netherlands in May. The venue was the Aula of Delft University of Technology.

The project took an in-depth look at the local rail transport in Singapore.

Erika said: "We presented a scaled-up version of the agent-based model (ABM) of the Singapore Mass Rapid Transit System (RTS) that we have set up by merging capabilities within IHPC: Distributed Computing and Complex Systems Modelling. The platform allows us to dynamically change certain parameters of the RTS such as population of commuters, dispatch rates of trains, disruptions at certain stations, and directly gain foresight on a range of possible scenarios by employing the said changes."

When asked about the cross-disciplinary nature of the team, she added: "Interesting and significant researches are most likely brewed whenever there is a crossing-over between boundaries of knowledge like what we have substantiated in this project. It was not an easy feat as it required openness and sustained zeal among the researchers involved, given the differing backgrounds we come from."

This photo of Dr. Erika Legara courtesy of CCG2013 official website



The winning team behind the 'Scalable Complex System Modelling for a Sustainable City' project.

The first prize win has given the team greater motivation to break new ground by working together.

Said Erika: "We are very happy and proud of this achievement! Aside from bagging the first prize in a tier-1 competition in the field of distributed computing, we have successfully shown what collaboration and teamwork are all about, which to me is more important than actually winning the competition."

MND Urban Sustainability R&D Congress

It was a dream come true for the Fluid Dynamics researchers who exhibited at the recent 2nd MND Urban Sustainability R&D Congress. IHPC's Gr-BEST software, developed in-house, was proudly showcased at the A*STAR exhibition booth.

Organised by the Ministry for National Development, the two-day Congress was held in late June at The Matrix building in Biopolis. The Congress is a national platform for government agencies, research institutes and private sector companies to come together to discuss R&D responses to national urban sustainability challenges.

Gr-BEST was designed as an easy-to-use and cost-effective airflow modelling software to analyse designs prior to submission to the Building and Construction Authority (BCA) for the Green Mark certification. The software also seeks to allow architects to easily assess designs that promote good natural airflow during the building massing stage.

Colleagues from FD department helped to answer questions from visitors at the booth. Several companies expressed interest in the software and its capabilities.

Tay Meow Win was one of several FD colleagues who manned the booth on both days of the Congress. He said: "Overall it was a pleasant experience. We had adequate space to showcase our technology, and our booth was situated at a prime location. During the course of the Congress, we were also able to explore the projects and works of other research organizations. In addition, we felt a sense of pride and satisfaction in showcasing our hard work and effort throughout the months spent on this project."

Dr. Poh Hee Joo made a presentation on the second day of the Congress, titled 'Airflow Simulation Software Development for Natural Ventilation Analysis in Green Building Design'.

Hee Joo said: "I felt it's a great honour and also an excellent opportunity for me to use this platform to reach out to industry practitioners, government agencies, peer researchers as well as university academia, and also to share what we had done for Green Building program in IHPC." From the presentation, both JTC and URA expressed immense interest to work with IHPC on the software development front.

Hee Joo said: "We felt privileged that our GrBEST research effort gained significant attention from the Green Building industry players, but nonetheless, we reckon that much more research work needs to be done before this software can be deployed in the commercial usage." One highlight was the Guest of Honour, Mr Lee Yi Shyan, Senior Minister of State, Ministry of National Development & Ministry of Trade and Industry.

Hee Joo said: "He visited our showcase and expressed strong interest in this first-of-its-kind software to be adopted in the market. This shows that our applied research for GrBEST software development is well aligned with industry demand."

GrBEST working team members: (front row, from left) Petrina Tay Shu Hui and Dr. Bud FOX (back row, from left): Tay Meow Win, Dr. Nguyen Hoang Huy, Dr. Kang Chang Wei and Dr. Poh Hee Joo

Lab Launch!

By Lim Sien Koon
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Dozens of excited staff from Lloyd's Register (LR) and A*STAR witnessed the official opening of the IHPC-LR Joint Lab located at level 17 of the Connexis North tower of Fusionopolis on April 22.

With cheers and applause from A*STAR and LR researchers at the strike of the gong, the joint lab was ceremonially opened by Dr. Claus Myllerup, Senior Vice President of Energy Technology and Managing Director of LR's Singapore GTC, and Professor Alfred Huan, Executive Director of IHPC.

The Joint Lab is part of LR's USD35 million investment in its Global Technology Centre (GTC) set up in Singapore in 2012.

The close proximity creates a more conducive collaborative environment, with closer proximity between LR and IHPC researchers.

The Joint Lab allows LR researchers to tap on HPC resources and also leverage on IHPC's capabilities in computational fluid dynamics and engineering mechanics. It also promotes R&D activities in the marine and offshore sector.

The researchers from both sides were excited about working with one another on groundbreaking projects through this partnership.

Students having a blast using laser pointers to play Windows 8 games on a projection screen.

Another happy visitor at the IHPC booth!

Dr. Claus Myllerup (left) from LR and Prof. Alfred Huan getting ready to cut the ribbon to mark the official opening.

Researchers from the Joint Lab posing with Dr. Lou Jing (left), Director of IHPC's Fluid Dynamics Department.

X-Periment Excitement

IHPC's Light Touch technology grabbed the spotlight at X-periment 2013, as many visitors had their first experience with using a laser pointer to play games like Fruit Ninja on a projection screen.

X-periment 2013 was the opening salvo of the annual Singapore Science Festival, that drew tens of thousands of visitors. The event was held at Marina Square Central Atrium from 19 to 21 July. IHPC, joining several SERC and BMRC RIs, took up a booth at X-periment to publicise the institute's R&D capabilities to members of the public.

Light Touch is an enhanced version of the Lightdraw software, now upgraded to work seamlessly with the Windows 8 operating system. With the Light Touch application running on a notebook computer, all that is required is a web camera to turn any projected screen into a touch interface – with the laser pointers replacing human fingers.

As visitors to the IHPC booth discovered, Light Touch can add interactivity to projection screens in locations such as a classroom or a lecture hall. Aside from slashing fruits in the Fruit Ninja game, users can use the laser pointer to 'drag' menu items or to click on menu options on the Windows 8 interface projected on a screen.

The IHPC Corporate Communications team set up a running slideshow projected on a HDTV to display interesting information about IHPC. A team of volunteer researchers from IHPC manned the booths during the three-day event, helping to give away collaterals and demonstrate the Light Touch software.

A big 'Thank You' goes out to the energetic and enthusiastic IHPC booth volunteer researchers, who made a big impact by reaching out to the public at large:

IHPC researchers were on hand to handle institute-related queries from the public.

Social Systems Are Her Business

Dr. Yang Yinping has been with IHPC since 2007, working in the Computing Science Department. She found a window in her busy schedule to chat with Powering Discoveries about her work in social-technical systems and research experience.

Q: What are your research interests?

In the broad sense, my research interest is in social-technical systems. This covers a spectrum of technologies that are aim at improving the efficiency and effectiveness of business and social processes. My core area of expertise is on e-negotiations, particularly on computational technologies that can support and/or automate negotiation of business contracts. I have also studied other topics such as social networking services, cloud computing, and technology adoption.

Q: How did you end up in this field?

My first research exposure started from my honours-year thesis back in 2002. Among a variety of topics posted by the professors, what caught my attention was the use of videoconferencing and decision-support tools to conduct international trade negotiations. Upon the completion of this project, the SARS outbreak occurred and was followed by an economic downturn in 2003.

The infeasibility of extensive business travels for executives to meet face-to-face highlighted the value of e-negotiations: the use of technologies to effectively support business contract establishment, without the need for face-to-face encounters.

Motivated by the technology and the potential real-world value, and a deep interest in how technologies can transform business processes, I decided to pursue a PhD to continue this line of research.

My PhD thesis covers the examination of a number of technologies, including videoconferencing, multilingual support, decision support, and intelligent agent based automation, that can enhance negotiation processes and outcomes. Besides technologies, because negotiation is a multi-faceted social and business process, I have also read broadly social sciences literature including social psychology, economics, conflict resolution, communication, management science, organization behaviour, labour law- to under this specific complex business process with greater substance.

My multi-disciplinary exposure to cross social sciences and computer science has equipped me with a unique and useful skillset to kick start my career in IHPC.

Q: You have a joint patent filing in 'System and Method for Negotiating a Sale' filed in the U.S. What can you share about the patent experience?

The patent filing is a valuable fruit from a big collaboration between IHPC and HP on "Shared Service Platform" established in late 2006. When I joined IHPC in 2007, this project was my first and primary project working within a big context, and with a large team of over 30 scientists and engineers across HP and IHPC. It was a very eye-opening experience for a junior scientist like me to be involved in such a world-class team.

With the support from the IHPC Principal Investigator, Terence Hung (IHPC's Deputy Executive Director), and the project leads Chan Hoong Maeng and Li Xiaorong, I had opportunities to work closely with a senior leader in the team, Dr. Sharad Singhal, a Distinguished Technologist at HP Labs Palo Alto, who later become the my key collaborator and co-Inventor of the patent.

We worked closely to examine how we can translate and transform social psychological theories in negotiation in computational models such that a machine negotiator can be equipped with a good level of cognitive and social intelligence that an experienced human negotiator can have. Furthermore, we've carried out a behavioural experiment in which human users interacted with the machine negotiator. This added the 'realism' of the artefact to make sense for the online business context. The idea gained support from HP's CTO office, which eventually supported the joint patent filing.

Q: What is the Strategic Social Systems programme all about?

The Strategic Social Systems Programme is a research programme initiative in the Computing Science Department of IHPC formally established in October 2012. We focus on translational research and computational social sciences R&D. The programme aims to transform big social and behavioural data into actionable insights that enhance human-centric sustainable public, social, business, and urban success.

To achieve this vision, we are dedicated in applying our know-how of social and behavioural sciences, advanced data analysis and computational technologies to address business and management needs in the big data era.

The programme currently has three key project initiatives: SPICE (Strategic Public Information Communication Enhancement Systems), which is our 'flagship' project, SMILE (Social Marketing Intelligence Enhancement) and SHINE (Social Health Intelligence Enhancement).

Each project initiative focuses on a target domain industry and partner.

Q: How did your team come up with the SMILE, SPICE and SHINE concepts?

The credit goes to our academic collaborator, advisor, and a good friend, Professor Rob Kaffuman at SMU.

The original name underlying the SPICE project is called ProComm, in which the value proposition is to enhance public communication with advanced analytics and support system. Rob suggested we need a more unique name to grab people's attention. We came out with SPICE. In the development, we realize that the underlying techniques and method are also applicable for the business and consumer domains, as well as health domain.

I've hence come out with SMILE and SHINE. (The two initiatives have now been translated into active collaborations with Analisya Pte Ltd. and Public Health Intelligence, at Ministry of Health, Singapore, respectively.)

So you can see a good name is half the battle won, when it comes to a successful start. It's all about the art and science of branding solid ideas.

Q: What else is keeping you busy?

I've been involved in a number of committees. I was appointed the chairperson of IHPC's Web Committee soon after I joined, and led a successful project to revamp IHPC's website in 2008 which was recognized one of the first research institute websites that utilized multi-user content management systems. I am still actively involved with this committee today.

I'm also involved in the Career Development Committee and the A*STAR Corporate Website Revamp Taskforce. I also teach students as an adjunct faculty lecturer in SMU.

Most recently, I was recruited as a debate team member for the forthcoming A*STAR Scientific Conference in October 2013. We will debate over "Research will strive better without KPIs". A very interesting discussion to look forward to!

Q: How do you juggle your R&D projects, your other commitments and being a working mother?

Frankly speaking, it was not easy-or actually way too challenging during the first few months when I became a new mother.

Besides the well-known lack-of-sleep, lack-of-experience, and other physical changes after giving birth, another big accident also happened in my life during that period, as my father needed to have a major operation.

For nearly two months, I spent half my time in hospitals. It was also the biggest transition in my career, as I started thinking about how I can transform my research findings and social-technical systems knowledge to create more value for the industry and consumers.

After been through this tough period of life, I now deeply believe being a mother makes me a more mature and stronger career woman. My parents and parent-in-laws gave me the utmost support to take care of my son, so I can fully focus on my work. My husband greatly encouraged me to pursue career achievements. He assured me that my value to my family and society goes far beyond just doing house work! (laughs)

Q: What do you enjoy most about working in IHPC?

I definitely enjoy the friendly setting in which inter-disciplinary dialogue and intellectual exchange between researchers from different departments are facilitated naturally. It's a very collegial environment here. And the visionary leadership and strong support from the management makes it possible for us to do well in our research projects.

Yinping at Fujitsu Limited at Kawasaki, Japan in March 2013 with IHPC colleagues Ms Amy Foo, Dr. Terence Hung, and Dr. Rick Goh (left to right)

Yinping with her baby son, Steve, at Sentosa

A Comprehensive Search for Stable Pt–Pd Nanoalloy Configurations and Their Use as Tunable Catalyst

By Tan Teck Leong
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IHPC researchers from the Material Science and Engineering (MSE) department are researching nanoparticles and nanoalloys, and finding efficient solutions to predict nanoalloy structures and properties using First Principles Computation.

Nanoparticles have found use in a number of applications. Because of their high surface to volume ratio, they are effective catalysts and in particular, Pt (platinum) nanoparticles are commonly used as electro-catalysts in fuel cells. However, very small Pt nanoparticles of 1 nm in size may not be optimal electro-catalysts. As we show, the nanoparticle catalytic performance is enhanced by mixing/alloying with Pd (palladium) to create nanoalloys. The performance of the nanoalloys is directly related to their structures and atomic configurations—i.e., how the Pt and Pd atoms arrange with respect to one another in the nanoalloy. The structures of such small nanoalloys however, are difficult to establish experimentally. Therefore, we employ accurate first-principles computation to predict the stable nanoalloy structures. In first-principles calculations, material properties are evaluated via the solving of the Schrödinger's equation within a set of approximations.

The challenge with predicting nanoalloy structures and properties from first-principles is the computational processing power it requires. For the 55-atom nanoalloy particle used in this work, where each site is filled by either a Pt or Pd atom, there are billions of possible atomic configurations. By evaluating the formation energies of all possible configurations, one could theoretically search for stable configurations with low formation energies. However, it is computationally intractable to do so using first-principles calculations alone.

To make the process manageable, we utilize the cluster expansion method as implemented in our C++ code package. The method breaks the nanoalloy into smaller geometric subunits called "clusters" and utilizes about 30 or so clusters to reliably model the formation energies of the nanoalloys. Using the cluster expansion model and Monte Carlo simulations, we rapidly search through the huge configuration space for low-energy structures. The lowest energy ones, also called the ground states, represent the stable nanoalloy configurations that should exist experimentally.

The ground states at various Pt-Pd ratios are shown in Figure 1. The ground states exhibit core-shell arrangements in general, where Pd atoms (green) prefer to occupy the shell/surface sites while Pt atom (grey) prefers to occupy the core/interior sites of the nanoparticle, in agreement with experiment observations [1]. The preference for Pt in the core can be attributed to its higher cohesive energy than Pd while having similar atomic radius [2]. The formation energies of the ground states are shown in Figure 2 (circled in red) and together they form the lower bound of the formation energies of the Pd-Pt nanoalloy configurations. For Pt-rich compositions, one observes that the initial preferred site for Pd is at the surface edge. These sites are populated with Pd (see GS_{47-54} in Figure 1) on two of the facets before face-center sites are populated ($GS_{41, 45}$). At Pd-rich compositions, Pt first occupies the central core site (GS_1) followed by the second inner shell (GS_{2-13}), and the formation energy decreases with the addition of each Pt. As it turns out, the perfect core-shell structure (labeled GS_{13} in Figure 1) has the lowest formation energy. When Pt atoms are added beyond GS_{13}, Pt starts to occupy the surface edge sites (GS_{14-19}), and the formation energy increases.

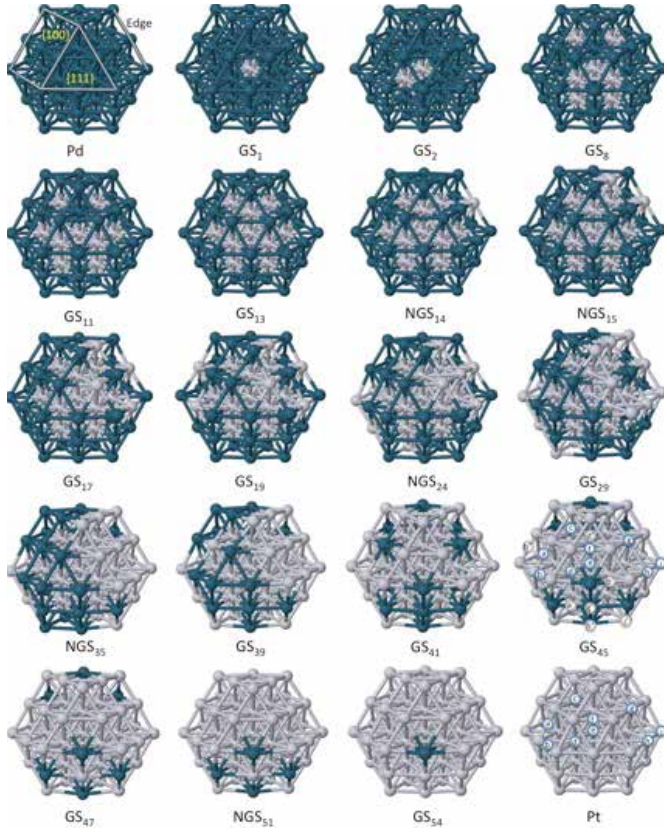

Figure 1: Selected ground states (GS_n) and near ground states (NGS_n) configurations for the Pd–Pt 55-atom nanoalloy, where n is the number of Pt (grey) atoms. The perfect core–shell structure, GS_{13}, has all 13 core atomic sites occupied by Pt.

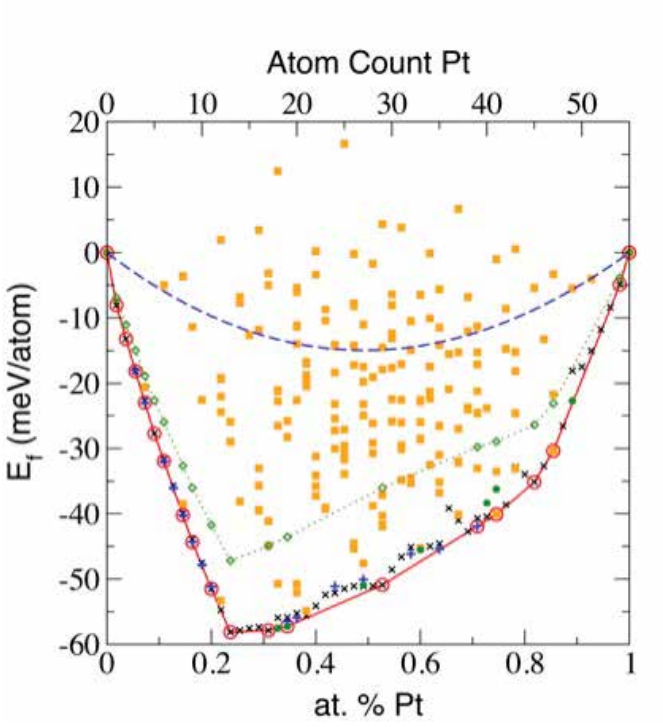

Figure 2: Formation energies, E_f, of Pd-Pt nanoalloy configurations versus Pd-Pt ratio. Energies are bounded below by a ground state hull (red line) that connects the ground state energies (circles). Energies from each search iteration are labeled: 1st (filled squares), 2nd (X), 3rd (+), and 4th (filled circles). Also shown are the formation energies of the random solutions (dashed line) and energy differences (diamonds) between each ground state and its corresponding random solution.

Using the calculated stable configurations, we next predict how alloying with different Pt-Pd ratios affect the particle's performance as a catalyst. As a model reaction, we examined the hydrogen evolution reaction (HER): $(1/2)H_2 \leftrightarrow H^* \leftrightarrow H^+ + e^-$. Here, H* is the adsorbed hydrogen atom on the nanoalloy. Using the hydrogen adsorption energy as the descriptor [3], we show in Figure 3 how nanoparticle catalytic activity increases as more Pd is added. According to the Sabatier principle, the optimal catalyst for a reaction should interact neither too weakly nor too strongly with the reaction intermediate.

Essentially, we show in Figure 3 that the hydrogen adsorption energy is overly strengthened on the {100} facet and overly weakened at the {111} facet of the Pt nanoparticle, reducing its effectiveness as a catalyst. By plotting the adsorption energy trends exhibited by the ground states, we show that the addition of Pd appropriately tunes the adsorption energy to a level optimal for catalyzing the HER.

In summary, from energies calculated from first-principles, we use the cluster expansion method together with Monte Carlo simulations to conduct a comprehensive search for stable configurations on a 1 nm Pt-Pd nanoalloy. The ground states exhibit core-shell structures across all compositions with Pt occupying the core sites. We next calculate the hydrogen adsorption energies for these ground states and show how the addition of Pd improves the nanoalloy catalytic performance. Such information will be useful for guiding the synthesis of new nanocatalysts. We would next utilize the methodology to study other alloy catalysts of great interest.

The full details of this work is found in: Tan, T. L., Wang, L. -L., Johnson, D. D. & Bai, K. A comprehensive search for stable Pt–Pd nanoalloy configurations and their use as tunable catalysts. Nano Letters **12**, 4875–4880 (2012). This work is led by IHPC researchers Dr. Tan Teck Leong and Dr. Bai Kewu, in collaboration with Prof. Duane Johnson and Dr. Wang Lin-Lin from Ames Laboratory (USA).

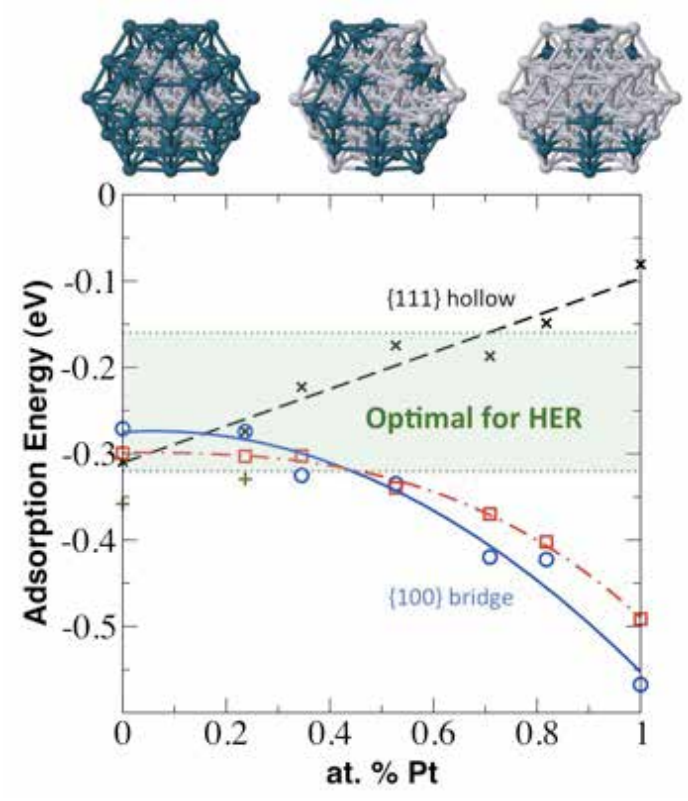

Figure 3: H-adsorption energy of Pd-Pt nanoalloy groundstates as a function of composition. Adsorption trends for {111} hollow, {100} bridge and edge-bridge sites are denoted by crosses, open circles and squares respectively. Lines are best-fit curves. Adsorption energies in the region shaded green are optimal for the hydrogen evolution reaction.

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Data Value Chain In Focus

By Henry Kasim
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The DVCAAS TSRP Workshop certainly provided plenty of data and value-added insights for researchers and industry partners alike.

It was a value-filled day packed with presentations and demonstrations, at the recent Data Value Chain as a Service (DVCaaS) Thematic Strategic Research Programme (TSRP) Workshop held in July.

Some background on the Programme: It was established by A*STAR back in 2010 to develop technologies and capabilities to address some key challenges related to big data. In particular, it aims to increase the efficiency of using the Cloud to handle big, distributed, real-time and complex data, and to investigate different approaches to ensure security and privacy of the data.

In July 2013, the DVCaaS TSRP team organized a full-day workshop entitled "Data Value Chain as a Service, A*STAR Thematic Strategic Research Programme". The venue was the cozy Infuse Theatre at Fusionopolis.

This workshop brought researchers and industry players together for a dynamic dialogue to explore collaboration and business opportunities. In particular, the research teams shared the insightful outcomes of the projects within the research programme.

Dr Terence Hung, Deputy Executive Director of IHPC and the Programme Manager, gave the opening address.

Showcased at the event were numerous real-world use cases, some of whose research and demonstrators have won awards at international conferences. The workshop also featured invited speakers from the industry and academia to give the audience a broader perspective of new trends, challenges and experiences.

An interesting element was the Elevator pitch section, in which representatives of the various demo booths had just five minutes to 'sell' their offerings – and entice the audience members to visit their booths during the tea breaks and lunchtime.

Analysing Feedback

This workshop attracted a large audience from industry players and government agencies, with more than 50 participants from the industry and several government agencies. There were also 50 participants from various academic institutions and research institutes.

There were some interesting trends that can be derived from an analysis of the feedback forms.

Feedback from the participants indicated that more than 72% of them agreed that data analytics is a key thrust within their organization.

More than 45% of the participants lamented that out of the four 'Vs' of big data, Volume and Variety ranks foremost in terms of the challenges that they face.

(The other challenges include Veracity and Velocity.)

On cloud computing technology adoption, 50% of participants have utilized cloud computing technology to handle big complex data.

60% of the participants who have not adopted cloud computing technology indicated that security was their main concern.

Overall, the participants concurred that the topics covered by this workshop were very relevant to them, and commended that the talks were well presented.

Dr Terence Hung (LEFT), Deputy Executive Director of IHPC, presenting a token of appreciation to one of the invited speakers, Mr. Laurence Liew, General Manager for Asia Pacific, Revolution Analytics.

High Performance Computing For High Finance

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The A*STAR Computational Resource Centre (A*CRC) jointly organised a workshop that provided an overview of the HPC technologies that are transforming the world of Finance.

It was a workshop that went beyond dollars and cents. The two-day workshop on 'High Performance Computing (HPC) Technologies in Finance', jointly organised by A*CRC and Nanyang Technological University (NTU), was an opportunity to understand the impact and transformation wrought by HPC in the world of high finance.

Held in July, the Workshop provided opportunities to analyze the current state-of-the-art of HPC modelling, analysis and applications in financial industry. It aimed to demonstrate how HPC technologies are being absorbed in daily practices within the financial industry, and also sought collaboration with the industry to solve problems in financial analysis and big data processing.

The guest of honour was Mr Leong Sing Chiong, Executive Director of Financial Centre Development of Monetary Authority of Singapore (MAS). The keynote speaker was Prof. Mark Salmon of Cambridge University & Imperial College of London. He presented on "The Critical Role of Modelling Trading Intensity in Algorithmic Trading", and highlighted the pivotal role that the modelling trading intensity known as the Hawkes Processes has had in developing algorithmic trading models. High frequency algorithmic trading now accounts for a very large proportion of all volume in equity and FX (foreign exchange) markets, and significant gains could be made by exploiting recent advances in high frequency research -- in terms of more efficient volume estimators for better signal generation and position sizing, and in designing execution strategies to minimise costs.

Other workshop highlights:

- A talk by the Chief Technology Officer of SGI, Dr. Goh Eng Lim on "Big Data and Analytics in Finance" highlighted that competitive financial market data has grown exponentially in volume, velocity and complexity over the last few years, which has led to the sector leveraging HPC, Big Data methods and social networks

- Dr. Hideyuki Torii, managing director of Numerical Technologies spoke on "Computational Finance, Portfolio management, and HPC". He discussed the Scalability challenge of calculating the entire market and credit risk of a commercial bank on Tsubame 1.2, the supercomputer deployed at the Tokyo Institute of Technology highlighted the need to have a model that can simultaneously calculate most of the financial indicators required for the bank's management.

- "Transforming Uncertainty into Strategy using Hardware" was presented by Dr Stephen Weston, Chief Development Officer, Maxeler. He highlighted that the increasing volume and velocity of data in financial markets has led to the application of an increasingly wide variety of estimation methods to high frequency data in an effort to forecast prices in financial markets.

- Dr Oliver Chen from NUS Risk Management Institute talked on "GPUs for Computational Finance: Credit Risk Applications". The institute had embarked on a Credit Rating Research Initiative which covers 35,000 listed companies from around the world. He illustrated Monte Carlo-based Estimation of Value-at-Risk Estimation on GPUs. The study of the Probability of Default (PD) of these companies is available at www.rmicri.org

On the demo front, YarcData presented its solution which enables financial institutions to leverage supercomputing power to address the largest and most complex analytical challenges, and help them to improve compliance, exploit hidden communities to expand revenues and markets, and to potentially spot unfolding threats and attacks to their infrastructure and critical systems.

There were parallel afternoon hands-on workshops on both days.

On the first day, the workshops were "Accelerating Results Using Dataflow Computing" by Maxeler, and "Deployment scenarios of Symphony" for Parallel Computing in Finance by IBM. On the second day, attendees could enjoy"Applying Graph theoretic approaches to Analytics" by YarcData or "Experience the Intel Xeon Phi Co-processor" by Intel.

Close to 100 participants from both the private and public sectors attended the workshop, demonstrating the industry-wide interest in the subject matter.

More importantly, the workshop also brought together researchers and industry players to create a better awareness of the potential development in these areas and applications.

Dr. Marek Michalewicz, Senior Director of A*CRC and Prof. Tan Tin Wee, Chairman of A*CRC, discussing HPC technologies with Mr. Leong Sing Chiong, the Guest of Honour.

*(Photo courtesy of A*CRC)*

A look back at the Robotics Invasion of Fusionopolis

Robots grabbed the spotlight in the Genexis Theatre at Fusionopolis as the stars of the IHPC Student Seminar on Robotics.

It was a full house of human beings that greeted several robotic entities at the IHPC student seminar in March 2013. The theme of 'Robotics: Beyond Human Imagination' had managed to attract upper secondary and junior college students who wanted to understand the reality of robotics beyond what popular culture and science fiction had shown them.

In total, 341 students and 36 teachers from 24 schools turned up at the Genesix Theatre at Fusionopolis to understand more about the robots and the science behind robotics. And they were not disappointed.

Dr Martin Saerbeck and Dr Pramod Kumar Pisharady from IHPC presented their cat-like robotic tutor, and went on to showcase how the robot can be trained to interact with students and as a tutor, help them to learn. They shared some insights about the A.I. (artificial intelligence) programming and even the gesture recognition system that helps the robot to better 'understand' human behavior.

Dr Han Boon Siew from the Institute For Infocomm Research (I^2R) brought along Hubo the dancing robot with tai chi skills, and discussed the history of robotics – and also shared his thoughts on how robots will play an increasingly important role in future.

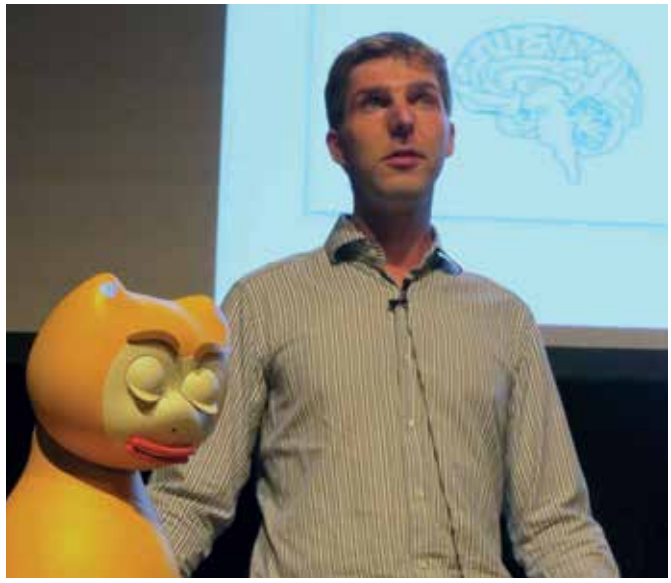
Rounding up the presentations was Dr Zhou Changjiu from the Advanced Robotics and Intelligent Control Centre of Singapore Polytechnic.

He brought along several soccer-playing robots to illustrate the "Humanoid Robot: Design Challenge", and shared some insights in the physics behind bipedal robots.

The speakers also joined a panel discussion to handle questions from the students.

The questions were compiled using the Pigeonhole Live service that allowed the audience to post their queries via their smart phones and mobile devices. Thankfully, the students rose to the challenge by posing several questions relating to robotic technologies and trends.

The presenters gamely answered to the best of their expertise, giving insightful replies that were, of course, far from robotic.



Dr. Martin Saerbeck from IHPC presenting the next generation of robot tutors for children.

Dr Han Boon Siew from I^2R brought along Hubo the dancing robot.

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