The College of Engineering has grown from strength to strength over the years. Through the holistic nurturing and stimulating environment we offer, we have seen continual ENGINEERING EXCELLENCE from the SHINING TALENTS among our students, alumni and faculty. Moving forward, we will intensify our efforts in the Five Peaks of Excellence in the NTU 2020 plan to realise our aim of becoming a global engineering leader in education, research and innovation.

VISION

A great global engineering college for education, research and innovation

MISSION

To nurture creative and entrepreneurial leaders through broad-based, research-infused engineering education and to advance knowledge and create innovative and sustainable solutions for the benefit of industry and society

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25  Education: Nurturing Holistically, Stoking Passion
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The richness of knowledge, expertise and diversity of experience in our faculty are an immense asset to the college that not only allows us to pioneer in research and innovation, but also helps in our mission to nurture and develop the next generation of entrepreneurial leaders.

All these achievements have helped to preserve the high reputation the college has earned over the years, making us an internationally recognised leader in engineering research and education. This is reflected in us being consistently ranked among the best in various international ranking tables.

Our pursuits in research are aligned to the Five Peaks of Excellence stated in NTU 2020 Plan which are Sustainable Earth, Future Learning, Healthy Society, Secure Community and Global Asia. These peaks are well dovetailed into the national Research, Innovation and Enterprise 2020 (RIE2020) plan of the Singapore Government.

Boosting our intention to be industry-relevant in research and education, we inaugurated several joint research centres this year with major industry partners such as ST Engineering, Hyundai Engineering & Construction, NXP Semiconductors N.V. and AIA Group Limited. These new partnerships will reinforce our existing research collaborations with industry giants such as Rolls Royce, BMW and Lockheed Martin. Such joint research centres are the result of our strong intention to work closely with industry. They also reflect the strengths and expertise of our faculty, researchers and facilities and that past records in bringing research outcome to applications at a faster pace.

With these new strategic alliances and exciting developments, I am confident that the college will continue to push new frontiers in research.

In the education arena, we continue to make improvements to remain relevant to the fast changing demands of the world. We introduced two new programmes in response to national demands and societal needs. Collaborating with our College of Humanities, Arts and Social Sciences, we launched a new Second Major in Society and Urban Systems for engineering undergraduates to impart the knowledge and skills required for confronting the multifaceted challenges of complex urban systems. A new specialisation track in International Trading Programme was also introduced under our existing Engineering with a Second Major in Business programme for engineering undergraduates. These new programmes are aligned with our focus on a broad-based and multidisciplinary curriculum, and would offer our engineering graduates flexibility in career options. In graduate education, we partnered with leading peer institutions such as Technical University of Munich (TUM) and Sorbonne University to offer new graduate programmes.

People are key to the success of any institution. The richness of knowledge, expertise and diversity of experience in our faculty are an immense asset to the college that not only allows us to pioneer in research and innovation, but also helps in our mission to nurture and develop the next generation of entrepreneurial leaders. I would like to thank all our faculty, staff, students and alumni for their collective effort in contributing to the success of the college in 2015.

This is my first Annual Report since assuming duties as the Dean of the College of Engineering in NTU. It has been an exhilarating and fulfilling year for the college and myself. I am optimistic that with everyone’s dedication, commitment and passion, the College of Engineering will scale even greater heights in engineering research and education in the years to come.

Professor CHEN Tsuhan
Dean, College of Engineering
College of Engineering

The college has progressed much over the years, making great strides in education, research and services. Our relentless pursuit of excellence in research and education has contributed to the stellar performance of the college in many international rankings of world universities.

Renowned Individually and As One

Our six engineering schools, identified by their disciplinary focus, are internationally renowned for their individual achievements, as well as for successes they have attained for the college as a whole through close collaboration across disciplines.


5

th

in the world

Essential Science Indicators

2016 by Thomson Reuters

5th

most-cited university globally with engineering research output ranked among the top 7 universities in the world

Quacquarelli Symonds (QS) 2015/2016 World University Rankings for Engineering and Technology Faculty

6th

in the world

Academic Ranking of World Universities in Engineering/ Technology and Computer Sciences 2015 by Shanghai Jiao Tong University

11th

in the world

2015-2016 Times Higher Education World University Rankings for Industry Income and Innovation

7th

in the world

1st

in Singapore

School of Chemical and Biomedical Engineering

18th

in Chemical Engineering

School of Civil and Environmental Engineering

18th

in Civil Engineering

School of Computer Science and Engineering

14th

in Computer Science and Information Systems

School of Electrical and Electronic Engineering

8th

in Electrical and Electronic Engineering

School of Materials Science and Engineering

6th

in Materials Science

School of Mechanical and Aerospace Engineering

13th

in Mechanical, Aeronautical and Manufacturing Engineering

Source: QS 2016 World University Rankings by Subject
We have achieved much in our journey of continuous excellence with exciting breakthroughs and discoveries at the college. It is the efforts of our people that have helped propel the college into the next epoch of engineering wonders.
**FACTS AT A GLANCE**

**Faculty, Staff and Student Population**

**Undergraduate and Graduate Student Population**

<table>
<thead>
<tr>
<th>Programme Type</th>
<th>Full-time</th>
<th>Part-time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate Students</td>
<td>9,817</td>
<td>2,000</td>
</tr>
<tr>
<td>Graduate Students</td>
<td>2,192</td>
<td>1,011</td>
</tr>
</tbody>
</table>

**Breakdown of Undergraduate Student Population by Programme Type**

- Civil Engineering
- Environmental Engineering
- Marine Studies
- Engineering
- Mechanical and Materials Engineering
- Aerospace Engineering
- Architecture Engineering
- Mechanical Engineering
- Materials Engineering
- Biomedical Engineering
- Chemical and Biomolecular Engineering
- Computer Engineering
- Computer Science
- Renaissance Engineering Programme

**Total Undergraduate Students**

- Total: 3,373
- Environmental Engineering: 702
- Maritime Studies: 356
- Civil Engineering: 352
- Electrical and Electronic Engineering: 341
- Information Engineering and Media Engineering: 280
- Environmental Engineering: 232
- Mechanical Engineering: 243
- Materials Engineering: 150
- Biomedical Engineering: 124

**Breakdown of Graduate Student Population by Programme Type**

- Research Programme (M.Eng.): 453
- Coursework Programme (M.Sc.): 362
- Research Programme (Ph.D.): 306

**Total Graduate Students**

- Total: 10,582
- Research Programme (M.Eng.): 562
- Coursework Programme (M.Sc.): 1,187
- Research Programme (Ph.D.): 1,097

**Faculty and Staff Population**

- Faculty*: 2,287
- Research Staff: 1,376
- Professional, Administrative, Technical and Support Staff: 443

**Total Faculty and Staff**

- Total: 4,106
- Faculty*: 2,287
- Research Staff: 1,376
- Professional, Administrative, Technical and Support Staff: 443

*Note: Includes adjunct and visiting professors

**Research Funding FY2015**

- Total Funding: S$182.47 million
- Ministry of Education (MOE): 31%
- A*Star: 29%
- National Research Foundation (NRF): 10%
- Industry and Foundation: 12%
- Other Local Government Agencies: 3%
- Others: 1%

**Engineering Citations**

- Total Citations
- Total: 129,513
- 5-Year Intervals
- '11-'15: 77,295
- '10-'14: 100,634
- '09-'13: 125,013
- '08-'12: 155,675

- Average Citations Per Paper (5-Year Intervals)
- '11-'15: 11.02
- '10-'14: 9.63
- '09-'13: 8.02
- '08-'12: 6.58

*Note: Includes adjunct and visiting professors
By nurturing students holistically and stoking their passions in their fields of specialty, we successfully cultivate a community of motivated young talents that could serve the society to its full potential.
The College of Engineering currently nurtures more than 10,000 undergraduates with an industry-relevant, broad-based and flexible curriculum. At our six schools, students take ownership of their learning, based on their interests and strengths. This is one of the hallmarks of our rounded and holistic engineering education.

Rounded and Holistic Nurturing

A highlight of our engineering education is the mandatory Professional Internship programme which places students in the industry for a significant period to experience real-world, professional exposure even before they graduate. Besides, Global Immersion programmes offer students regional and international exposure that in turn imparts global-mindedness and intercultural competency. This turns out confident, global-minded and multiculturally attuned graduates ready to contribute to their fields of specialisation.

EDUCATION: NURTURING HOLISTICALLY, STOKING PASSION

At the College of Engineering, we offer holistic undergraduate and graduate education to groom students to their full potential for the benefit of themselves and the society. We constantly refine our curriculum and stay abreast of industry trends to ensure our graduates will be future-ready.

At our six schools, students take ownership of their learning, based on their interests and strengths. This is one of the hallmarks of our rounded and holistic engineering education.

Students 3D print a prototype using a selective laser melting machine at NTU’s Singapore Centre for 3D Printing – A case of experiential learning in cutting-edge research facilities.
Students choose from 11 accredited single-degree Bachelor of Engineering programmes and a Bachelor of Science in Maritime Studies programme. With increased importance on interdisciplinary knowledge, the exceptionally driven and talented ones get to take multidisciplinary programmes such as second majors, double degrees and integrated Bachelor of Engineering Science and Master of Science in Technology Management programme. These programmes are often organised in partnership with renowned education institutions such as London’s Imperial College, University of California Berkeley and the Netherlands’ Wageningen University, as well as with public agencies and industry.

Exciting and fun campus life

Learning from passionate, top-notch faculty members

With increased importance on interdisciplinary knowledge, the exceptionally driven and talented ones take multidisciplinary programmes such as second majors, double degrees and integrated Bachelor of Engineering Science and Master of Science in Technology Management programme.

Cultivating Yen for Research and Innovation
Top students get the opportunity to experience research at a level unmatched elsewhere. They do this through our university-wide Undergraduate Research Experience on Campus or URECA programme. Outstanding second and third-year undergraduates are invited to participate in this and they will be given the coveted title of NTU President Research Scholar (NTU PRS).

Our Repertoire
The list of degree programmes offered in 2015:

Bachelor of Engineering (B.Eng.) Programmes
• Aerospace Engineering
• Bioengineering
• Chemical and Biomolecular Engineering
• Civil Engineering
• Computer Engineering
• Computer Science
• Electrical and Electronic Engineering
• Environmental Engineering
• Information Engineering and Media
• Materials Engineering
• Mechanical Engineering

Bachelor of Science (B.Sc.) Programmes
• Maritime Studies

Double Degree Programmes
• Computer Engineering and Business
• Computer Sciences and Business
• Engineering* and Economics

Second Majors
• Bachelor of Engineering in Civil Engineering / Electrical and Electronic Engineering / Environmental Engineering / Mechanical Engineering with a Second Major in Society and Urban Systems
• Bachelor of Engineering in your chosen major with a Second Major in Business
• Bachelor of Engineering in Chemical and Biomolecular Engineering with a Second Major in Food Science and Technology

Integrated Programme
• Renaissance Engineering Programme

* In a chosen major
1 All Bachelor of Engineering programmes are accredited by The Institution of Engineers Singapore, the Singapore signatory of the Washington Accord, through its Engineering Accreditation Board. The Washington Accord is an international agreement for mutual recognition of the substantial equivalence of the academic requirements for the practice of engineering at the professional level.
Undergraduate Studies

Making A Debut
Bachelor of Engineering with a Second Major in Society and Urban Systems

This new programme is for undergraduates in Bachelor of Engineering in Civil Engineering, Electrical and Electronic Engineering, Environmental Engineering and Mechanical Engineering degrees.

Jointly offered with NTU’s College of Humanities, Arts and Social Sciences, the programme gives students insights into contemporary urban systems. It also helps them understand and appreciate how the urban-built environment grew and evolved from the natural environment. On top of engineering and technological aspects, they study social, political, economic and cultural facets of urban systems planning and policy-making.

With this programme, students will be able to integrate, synthesise and develop perspectives and solutions for a sustainable urban-built environment.

Bachelor of Engineering in a Chosen Major with a Second Major in Business (International Trading Programme)

Offered in collaboration with the Nanyang Business School, this programme started in 2014.

Since 2015, we have offered the International Trading Programme (ITP) as one of the specialisation tracks under the second major in Business. ITP, a joint effort of NTU, International Enterprise Singapore and industry partners, aims to develop a widening pool of talent for the trading sector.

As Asia’s largest commodities trading hub, Singapore has attracted most of the world’s biggest commodities trading companies. Students in this programme acquire the foundation to build a career in this lucrative sector and value chain.

Cultivating Diversity
The college collaborates with several top overseas partners to offer dual or joint-degree programmes which provide exciting opportunities for our graduate students to interact with world-class faculty and researchers. This allows them to experience and undertake energising and challenging assignments.

Graduate Studies

Home to more than 3,000 graduate students from all parts of the world, the College of Engineering has a graduate student population forming a culturally diverse community. About 60 per cent are research students, while the remaining 40 per cent are pursuing graduate degrees through coursework.

Cultivating Diversity
The college collaborates with several top overseas partners to offer dual or joint-degree programmes which provide exciting opportunities for our graduate students to interact with world-class faculty and researchers. This allows them to experience and undertake energising and challenging assignments.

The list of graduate programmes that we offered in 2015 includes:

Coursework Programmes
Programmes by coursework lead to Master of Science (M.Sc.) degrees.

School of Chemical and Biomedical Engineering
• M.Sc. (Biomedical Engineering)

School of Civil and Environmental Engineering
• M.Sc. (Civil Engineering)
• M.Sc. (Environmental Engineering)
• M.Sc. (International Construction Management)
• M.Sc. (Maritime Studies)

Society and Urban Systems

Graduate Studies
All our engineering schools offer research degree programmes that lead to Master of Engineering (M.Eng.) or Doctor of Philosophy (Ph.D.) degrees.

Research Programmes
All our engineering schools offer research degree programmes that lead to Master of Engineering (M.Eng.) or Doctor of Philosophy (Ph.D.) degrees.

New Graduate Programmes
NTU-UPMC/Sorbonne Dual Ph.D. Programme
Students in this programme will be registered at both NTU and Sorbonne University with supervisors from both sides.

Currently, our School of Materials Science and Engineering and School of Electrical and Electronic Engineering offer this dual Ph.D. programme which will focus on areas such as materials science and energy, modelling and engineering, health and medicine.

NTU-TUM M.Sc. (Green Electronics)
Developed in response to a need by the electronics and clean energy industry, this M.Sc. programme by coursework is jointly offered by our School of Electrical and Electronic Engineering and the Technical University of Munich (TUM), Germany.

Students will complete their coursework in nine months. Both NTU and TUM will offer core and elective courses in the M.Sc. (Green Electronics) programme.

After completing the coursework, they will do a three-month internship in the industry either in Singapore or Europe, followed by another six months on a M.Sc. dissertation, supervised by either a NTU or TUM faculty.

The college collaborates with several top overseas partners to offer dual or joint-degree programmes which provide exciting opportunities for our graduate students to interact with world-class faculty and researchers.
Our talented faculty, students and researchers are never content with current knowledge and technologies, but are continually pushing the boundaries of possibilities. Their active engagement in advanced, interdisciplinary research has enabled us to think outside the box, and develop innovative and sustainable solutions that make a positive impact on the world.
In alignment with our national research agenda, we continued to collaborate with big corporations on research programmes. This year we inaugurated several partnerships with industry, such as the ST Engineering Corporate Laboratory on advanced robotics and autonomous systems, and NTU-Hyundai Urban Systems Centre. Total investments in these partnerships came up to S$61 million.

Exciting Research Developments in 2015

2015 saw the College of Engineering making waves in research again. We also saw progressive growth in translational research leading to start-ups and spin-offs. An Innovation and Evaluation Lab was set up at the School of Computer Science and Engineering to facilitate translation of in-house technologies to industry. We also partnered TUV SUD PSB (the former PSB Corporation) to expedite commercialisation and consultancy in the testing, training and regulatory certification of chemicals.

Our research and innovation continued to attract significant funding support. The Singapore Economic Development Board (EDB), for example, is funding our NXP Vehicle-to-Vehicle programme. Responding to the national initiative to optimise land and liveability, we set up the Centre for Usable Space (CUS) at the School of Civil and Environmental Engineering, which has a first-of-its-kind-in-the-world Gas-Emission-Measuring and Monitoring (GEMS) Station, and web-based 3D GeoData modelling and management system.

In the arena of Health and Biomedical Sciences, our School of Mechanical and Aerospace Engineering teamed up with the Singapore Changi General Hospital to set up a Centre for Healthcare Assistive and Robotics Technology (CHART), in alignment with the National Robotics Programme and Ageing Research Programme 2020.

Our Satellite Research Centre added two more satellites to Singapore’s skies: a climate satellite, and the other an experimental communication satellite. This brings the number of satellites built and launched by NTU to six within the short span of five years.

Through interdisciplinary research and collaboration with peer universities, research institutes and organisations locally and abroad, we have made our mark on the international scene with excellent research output and impactful solutions.
Ultra Fast-Charging Lithium-Ion Battery

Commonly used rechargeable lithium-ion batteries usually have a lifespan of about 500 recharge cycles, which is typically between two and three years. Each cycle requires about two hours for full charging. A new lithium-ion battery was developed by a team led by Professor Chen Xiaodong from the School of Materials Science and Engineering (MSE) which has a lifespan of more than 20 years – 10 times greater than existing batteries. Such a technology could have a wide-ranging impact on all industrial cultures built on this premise.

The team has demonstrated the ultra-fast charging capability of TiO₂-based anode material in coin cells and pouch cells, with different cathode materials, and proved the excellent stability in full cell assembly successfully. They will be evaluating the technology in 18650-type full-cell assembly in the next stage of their development.

To enable superfast charging, the chemical reactions occurring within the battery during charging must be accelerated. The NTU team achieved this by transforming the naturally spherical titanium dioxide particles into tiny nanotubes that are a thousand times thinner than a human hair to accelerate the ionic transport and reactions.

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Noise-Resistant Chip for Music Buffs

With these new, ultra-fast charging lithium-ion batteries, electric vehicle drivers could recharge their cars in a matter of minutes and also save a tidy sum on battery replacement costs over the lifetime of the vehicles.

Normal lithium-ion battery uses traditional graphite for the anode while this new battery uses a gel based on titanium dioxide (TiO₂) for the anode while this new battery uses a gel based on titanium dioxide (TiO₂).

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Professor Terry Steele of the School of Electrical and Electronic Engineering who led the team in this invention: “Every electronic device has limitations. We were able to overcome some of these limitations in this application with the use of complex mathematics,” he explains.

The design of our chip was based on mathematical formulas,” says Professor Joseph Chang of the School of Electrical and Electronic Engineering, who led the team in this invention: “Every electronic device has limitations. We were able to overcome some of these limitations in this application with the use of complex mathematics,” he explains.

Voltaglue was developed using hydrogels consisting of carbon molecules called dendrimers, grafted onto tree-shaped plastic known as dendrimers. The inventing team comprises researchers from Oxford, Paris, and Jerusalem and aims to develop Voltaglue further to produce a new class of electro-curing glues that could enable greener manufacturing and easier product recycling.

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Enter EDGAR: a step forward in mobile animatronics

The EDGAR series of robots are physical display devices developed by NTU. EDGAR-1 can serve as a robotic avatar by mimicking his user’s gestures and pose. His head can also display the user’s facial features and expressions. Therefore, the robot represents cutting-edge telecommunication technology by relaying his user’s physical presence over a distance. EDGAR-2 is a social robot for autonomous interaction and has immense potential for use in the hospitality industry as well as in retail and education. Equipped with an integrated Kinect sensor from Microsoft, EDGAR-2 can see and hear people. Through this, he listens to queries and searches his own database as well as the Internet for an appropriate response. He can, for example, engage people in public spaces to promote products, recommend restaurants, describe a museum artifact or simply greet visitors.

Leading the EDGAR project team are Professor Gerald Seet and Professor Chen I-Ming from the School of Mechanical and Aerospace Engineering. Partnering the research is NTU’s Institute for Media Innovation. The research team examines human-robot interaction as well as tele-robotics in the context of human-human interaction via robotic avatars. The team has also developed the MAVEN series of mobile social robots. This project received a grant of S$1.8 million from Singapore’s Media Development Authority and is also supported by the National Research Foundation of Singapore.

A beetle-drones is born

The School of Mechanical and Aerospace Engineering (MAE) and the University of California (UC), Berkeley, have successfully achieved free-flight control of an insect, in a giant flower beetle to demonstrate the feasibility of an insect-computer hybrid robot. The broad objective of this research is to create self-powered biotechnological machines for a legged robot and a micro air vehicle (MAV).

Led by Professor Hirotaka Sato of MAE, the team mounted a tiny electronic backpack on top of the beetle. This converts radio signals received remotely into a variety of actions by the beetle. Unlike typical remote controlled synthetic drones, there is no need for constant human control as the beetle is able to maintain flight stability on its own, manoeuvre around obstacles and crawl into small confined spaces. Human intervention is only needed to change the intended direction.

Dead bacteria offer hope for treating colorectal cancer

Colorectal cancer is the number one cancer in Singapore and the foremost cancer among men, according to Singapore’s Health Promotion Board. It is also the third most common cancer in the world, with about 1.4 million new cases annually, the World Cancer Research Fund International estimates.

Traditional cancer treatments such as, chemotherapy and radiotherapy, rely on oxygen molecules to damage the DNA of cancer cells, and blood flow to transport therapeutic drugs to the tumour. The reduced blood flow and lack of oxygen and nutrient flow in the tumour environment of the colon mean that these treatments do not work well for colorectal cancer.

So far, research groups experimenting with bacteria therapy as an alternative to destroy cancer cells have encountered a big problem: live bacteria will proliferate, posing a high risk of infection and increased toxicity to patients.

Harvesting Clostridium sporogenes bacteria found commonly in soil, the team was able to harness the secrets of bacteria in their dead form, to destroy colo tumour cells effectively.

Professor Teoh Swee Hin (seated on the right) and members of the research team.
Harvesting *Clostridium sporogenes* bacteria found commonly in soil, the team was able to harness the secretions of bacteria in their dead form, to destroy colon tumour cells effectively. Even in the dead form, the natural toxicity of these bacteria continue to kill cancer cells and there is no risk of the bacteria multiplying and causing more harm.

Leading the project was Professor Teoh Swee Hin from the School of Chemical and Biomedical Engineering who collaborated with Professor Kathy Luo Qian from the University of Macau. The findings have been published in the journal, *Scientific Reports*, a title under the prestigious Nature publishing group.

**Smart glass getting smarter**

Electrochromic smart glass, often used in green buildings, has been projected to reduce HVAC (heating, ventilation and air-conditioning) consumption by between 15 and 20 per cent. The technology behind electrochromic smart glass can also be applied to digital signage, packaging, sensors, thermal and light modulation, and wearable display, among other things.

Current problems with electrochromic glass are the high cost of conventional transparent conductors and the need for vacuum deposition. This project, under the Nanomaterials for Energy and Water Management (NEW) programme of the Campus for Research Excellence and Technological Enterprise (CREATE), conducts research on developing nanomaterials for energy conversion. The specific aim is to realise solution processed, printable and patternable electrochromic coatings for better optical modulation. The novelty is twofold: development of a nanoparticle ink that is ink-jet printable; and indium-free transparent conductors. Uniform electrochromic coatings on conductive glass and plastic substrates have been achieved with improved transmittance modulation, faster switching time and versatile patterning capability.

Professor Lee Pooi See from the School of Materials Science and Engineering leads the NTU team that is collaborating with Professor Shlomo Magdassi from the Hebrew University of Jerusalem, and Singapore Safety Glass on this project.

This work has created interest from local and overseas companies and international venture capital firms. Part of the work received recognition at the TechConnect 2015 Innovation Award in Washington, D.C.

**Advanced data analytics to expedite gas pipeline risk detection**

Professor Abhishek Um from the School of Electrical and Electronic Engineering heads a team that is addressing advanced monitoring of underground gas pipelines using advanced data analytics of signature parameters such as temperature, pressure, and flow rate, for early detection of anomalies such as leaks, water ingress, and third-party damages.

Robust, real-time condition monitoring of underground low pressure gas distribution network, measuring about 3000 km in Singapore, is challenging but critical for reliable power generation and utilisation.

SP PowerGrid, the project’s collaborator, will provide the test rig for field testing. ENGIE, France is the second international industrial collaborator. The project has received more than S$2 million funding from Energy Market Authority under its Energy Innovation Research Programme in 2015.

**NAMIC@NTU enhances Singapore’s 3D printing ecosystem**

The National Additive Manufacturing Innovation Cluster (NAMIC) is a partnership between NTU, National University of Singapore and SP PowerGrid, the project’s collaborator, will provide the test rig for field testing. ENGIE, France is the second international industrial collaborator. The project has received more than S$2 million funding from Energy Market Authority under its Energy Innovation Research Programme in 2015.

This exercise is for real-time anomaly detection, problem location identification and predictive maintenance for early detection of potential problematic areas.

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NAMIC@NTU aims to harness, strengthen and expand on Singapore's existing Additive Manufacturing capabilities as an integrated hub, and position Singapore as a world leader in this technology.

Singapore University of Technology and Design to boost Singapore's efforts in enhancing its 3D printing ecosystem. The new cluster will comprise three additive manufacturing translation and capability development research centres from the three universities, including NTU's Singapore Centre for 3D Printing headed by Professor Chua Chee Kai.

Currently, there are two initiatives: Airport Precision Air-side Robotics Technology (APART), and Crisis Response Intelligence Support Programme (CRISP).

Launch of the Robotics ADVANCe Laboratory.

In APART, one project will develop robotic arms that load luggage onto driverless vehicles and then take them to the aircraft. By 2018, one of the Singapore Changi Airport's terminals is expected to pilot a fully automated baggage transit system that could cut the manpower requirements by about half.

In CRISP, small robots can survey disaster-struck areas rapidly and help emergency responders look for survivors. Unlike their counterparts today that need to be remotely controlled, the "smart" robots will be autonomous. They would use on-board sensors, such as laser rangefinders, to create precise maps of the damaged areas for safer planning and more effective rescue missions.

These projects are:

1. Developing a precast module and mooring system for challenges in urban cities.
2. Developing technology on sediment reutilisation by using industrial by-products for land reclamation through steps to construct artificial islands with minimal environmental impacts. This project aims to reduce costs by recycling and reusing materials.
3. Developing a construction management and system for an offshore floating platform to systematically assess and mitigate the overall risk during rock cavern construction. It is jointly led by Professor Wang Dan Wei from the School of Civil and Environmental Engineering and Keat from CEE is the principal investigator of this project. This project aims to use data mining method to estimate various rock cavern construction parameters, and to develop an advanced monitoring based construction management system to systematically assess and mitigate the overall risk during rock cavern construction.

By 2018, one of the Singapore Changi Airport's terminals is expected to pilot a fully automated baggage transit system that could cut the manpower requirements by about half.

The inventions made here are expected to be used in healthcare, transport, security and urban development and help Singapore realise its ambition to be a "Smart Nation", powered by next-generation technology.

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2. Developing technology on sediment reutilisation by using industrial by-products for land reclamation through steps to construct artificial islands with minimal environmental impacts. This project aims to reduce costs by recycling and reusing materials.
3. Developing a construction management and system for an offshore floating platform to systematically assess and mitigate the overall risk during rock cavern construction. It is jointly led by Professor Wang Dan Wei from the School of Civil and Environmental Engineering and Keat from CEE is the principal investigator of this project. This project aims to use data mining method to estimate various rock cavern construction parameters, and to develop an advanced monitoring based construction management system to systematically assess and mitigate the overall risk during rock cavern construction.
(4) Developing low-energy and cost-efficient hybrid desalination processes using a forward osmosis system. The forward osmosis-based water treatment system will be developed for applications in energy-efficient seawater desalination and simultaneous treatment of wastewater and seawater. Professor Bae Tae-Hyun from the School of Chemical and Biomolecular Engineering is the principal investigator.

(5) Establishing a coastal hydraulics analysis system for the advanced design of intake and outfall facilities. Professor Law Wing-Keung, Adrian from CEE leads this project that aims to improve the hydraulic design analysis of coastal intake and outfall facilities for future power and desalination plants around the South China Sea. The outcome can lead to cost reduction for the infrastructure development.

NTU-NXP Smart Mobility Test Bed
This collaboration with NXP Semiconductors N.V. is led by Professor Guan Yong Liang of the School of Electrical and Electronic Engineering (EEE) and examines the various aspects of implementing ITS (Intelligent Transport System) technologies. These technologies include vehicular networks, localisation techniques, traffic analytics, security and MIMO (multiple-input multiple-output) systems. The aim of the project is to increase road safety using Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) communication, known collectively as V2X communication.

The laboratory will focus on finding ways to make insurance more accessible, and better manage rising healthcare costs issues. Leveraging technology, big data and analytics, it also targets improving patient well-being. The laboratory will also explore how customer experience and engagement can be improved, and find ways to help the life insurance sector adapt to changing technologies, as well as customer expectations and needs in the digital world. To achieve this, the EDGE LAB will combine commercial expertise and market access from AIA, the largest independent publicly-listed pan-Asian life insurance group, with NTU’s expertise and resources in areas such as applied computer science, design, business and medicine.
EMBRACING CHALLENGES, BLAZING TRAILS

We encourage our people to seek new knowledge, discover and create innovative solutions. By providing the necessary resources and environment, we help them embrace challenges and think outside the box to create game-changing and sustainable solutions for the benefit of industry and society.
OUR PEOPLE: EMBRACING CHALLENGES, BLAZING TRAILS

Our inspiring education and research environment spur students, alumni and faculty to push the boundaries of possibilities and realise their full potential. They have brought pride and honour to the college through their outstanding performances in prestigious international competitions, technopreneurial successes after graduation; and excellence in trailblazing research achievements.

With the wholesome education received at our College of Engineering, many alumni are making their mark in the industry and society while realising their dreams.

Honed for Excellence, Alumni Make a Difference

Some are pursuing paths their convictions or deep passions lead them to, while others are evolving in their chosen professions after graduation. All these illustrate how our versatile NTU education honours them for excellence and refines their worldview. We hope these stories inspire more to follow in their footpaths.

Joyce Chee Zhun Yu
Staying the Course for a Good Cause

After graduating from the School of Electrical and Electronic Engineering (EEE) in 2013 with a Bachelor of Engineering degree in Information Engineering and Media (IEM), Joyce Chee, with two other NTU mates, co-founded eVida. eVida won $50,000 funding in the ideas.inc Business Challenge, a national competition for young start-ups, in 2013.

eVida started out as a smarthome automation company, but now comprises eVida SmartHome, which designs personalised smart home solutions, and eVida Healthcare, which develops and builds unique patient care solutions for healthcare applications.

Despite the many ups and downs they encountered along the way, the partners persevered. “We stayed on as we believe the company we have established is here for a good cause,” Joyce explains. “We’ve learnt not to be discouraged by past setbacks or hiccups in my business; they’re part of the success equation.”

Explaining her decision to be an entrepreneur, Joyce says, “My final-year project professor at NTU encouraged and supported my entrepreneurial career. He gave me opportunities to interact with industry players.”

The partners are set to launch eBOS (a Bed Occupancy Sensor), which aims to cut the risk of patients falling of their beds, in the second half of 2016. eVida Healthcare is in talks with the Ministry of Health, public hospitals and private nursing homes to use eBOS in hospital and nursing home wards.

Joyce, who took on several high-profile roles outside academic coursework at NTU, sees EEE as more than a mere engineering school. “It’s also a bedewing ground of opportunities for students to exercise their skills in open tender projects. It’s through NTU EEE that I was exposed to various competitions and earned overseas exchange trips for further exposure. The knowledge and skills of engineering give a good foundation for one’s career. The rigorous curriculum pushes your cognitive abilities to a higher level and the analytical mind I have developed from studying engineering helps in most aspects of problem solving in life.”

“My final-year project professor at NTU encouraged and supported my entrepreneurial career. He gave me opportunities to interact with industry players.”
Joyce Chee Zhun Yu

Inspiring Alumni
Grace Chew Yi Xin

Passion and convictions set her on Environmental Path

Born into an entrepreneurial family, Grace Chew Yi Xin always knew she would one day set up her own company. From her entrepreneurial father she learned that Materials Engineering often provides breakthrough solutions for technological problems.

Convinced that our School of Materials Science and Engineering would reinforce her strong foundation in technopreneurship, she enrolled here.

After graduating with a Bachelor of Applied Science degree in 2000, Grace worked as a materials research engineer at Advanced Solutions Pte Ltd before co-founding Hydroemission Corporation Pte Ltd and becoming its Technical Director. Active in the research and development of her company’s products, she has filed several patents and designs in the United States and Singapore.

The company has since developed a proprietary biodegradable polymer matrix for use in time-release ambient scents marketing for global brands.

Hydroemission leverages high-end technologies, mostly from the pharmaceutical industry, and makes them cost effective and applicable to fast moving pharmaceutical industry, and makes them high-end technologies, mostly from the pharmaceutical industry, and makes them cost effective and applicable to fast moving pharmaceutical industry, and makes them cost effective and applicable to fast moving technology. These technologies can be applied in various fields ranging from pest control to scent marketing for global brands.

Grace says, “Caring for the environment has an ethical and religious connotation for me, so if I have to do something, I always look for the way that is most environmental friendly. It was natural for me to focus on technologies that allow me to achieve our goals while protecting the planet.”

“The decision to start a company percolated in me over a few years,” Grace explains. “It is a sort of awareness that grows in you over time, until you believe that you can do more for yourself, for the society you live in, and for the world. It is important to keep these three pillars in view along the route, whatever the challenges are.”

And there were challenges – from human resources issues to being cheated and losing money. But Grace and her team have stayed the course and the tenacity saw them clinching the “Best Innovation Award” at the annual Emerging Enterprises Awards 2011 and the SBC-Sankei Energy Green Innovation Award 2012. Grace herself received the Nanyang Outstanding Young Alumni Award in 2012.

Reflecting on her success, Grace says, “All the tools that I am applying daily come from NTU. I only had to merge them with my personal interests of industrial design to transform my previous R&D background into a more complete focus on Product Development.”

Adrian Chye Choon Hoong

Holistic Development Led him to Digital Media Space

Early in his undergraduate days, the culture at NTU made Adrian Chye Choon Hoong realise the importance of developing holistically. “The technical training was tough but it built up our competency. The personal development was equally tough, but improved my interpersonal skills through active involvement in the student committees,” he recalls.

As he had not decided on any specific career path then, he opted to study Computer Engineering since he had a “soft liking for programming”. In 2004, he graduated with a Bachelor degree and went on to attain a Master of Science degree in Technopreneurship and Innovation at the Nanyang Technopreneurship Centre (NTC).

Looking back, the General Manager of Mediafreaks Group of Companies is glad his first degree is in Information Technology. “My background in technology has definitely given me an edge in the digital media industry. Pursuing the Master of Science degree in Technopreneurship and Innovation has propelled me to acquire the skills and network I would need to further build and grow my business,” he explains.

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“Outstanding Young Alumni Award in 2012. Grace herself received the Nanyang Technopreneurship Centre (NTC). “In many ways, they have inspired and guided me in my career development till today.”

The Mediafreaks Group is an award-winning new media and 3D animation company dedicated to producing high-end animation work and conceptualising new media strategies. Since 2007, the Group has a division geared towards digital marketing and creating interactive media for its clients. Also an elected Council Member of the Singapore Computer Society (SCS), and a 2010 Nanyang Alumni Service award recipient, Adrian says his father continues to inspire him to be a good son, husband, father, businessman and person. He has also drawn inspiration from lectures and tutors at our School of Computer Science and Engineering, industry professionals through the SCS, and mentors at the NTC. “In many ways, they have inspired and guided me in my career development till today.”
Connecting Technology to Business Makes him Tick

Passionate about technology, Chinmay Malaviya finds it immensely rewarding to build something that has an impact on people’s daily lives. He achieved this by co-founding the online food ordering platform, foodpanda, for the Singapore market in 2012 and becoming its CEO and Managing Director. With just a few clicks online, families here can get a good meal delivered to their homes.

Being the go-getter that he is, he also launched the chain in the Hong Kong market in May 2014. “In my tenure, I established foodpanda as a brand and market leader in both Singapore and Hong Kong. I went on to be Vice-President, Business Development, in the global management team,” he says.

Chinmay majored in Computer Engineering at our School of Computer Science and Engineering on a scholarship from Singapore Airlines. The broad-based approach of the curriculum also allowed him to pursue his interest in translating technologies into commercial applications by doing a Minor in Business.

“NTU gave me access to internships and travel abroad that made me realise what I really wanted to do in life. On my graduation, I was already set to explore a non-traditional path and pursue some of my entrepreneurial ambitions,” he explains.

Reflecting on his success and the impact of his education at NTU, he says: “Going to NTU, with the diversity of minds that I met there and worked with, was a humbling experience for me. The rigorous courses in both theory and practices advanced my knowledge in the field of technology multifold, and also helped me develop strong analytical and time management skills.”

Many members of our brilliant faculty have brought esteem and accolades to our college and the university besides their normal professorial duties. They do so through their deep commitment to research, often coming up with breakthroughs and innovations that leave huge positive imprints on our society.

Professor Low Kay Soon Making Space History in the Region

One of Singapore’s engineering pioneers, Professor Low Kay Soon from our School of Electrical and Electronic Engineering, is best known for his contribution to the nation’s satellite programme. The Director of Satellite Research Centre and Co-director of SATURN (Smart Small Satellite Systems), Thales in NTU, has helped launch six satellites so far and is leading a team to develop the 7th satellite in partnership with Kyushu Institute of Technology. This satellite will demonstrate a pulse plasma thruster technology and will lift off in 2016/17 from a Japanese launch vehicle. He is also spearheading the team to conduct in-orbit experiments for climate study and communication on-demand technology from the latest two satellites which were successfully launched in December 2015.

Recalling the experience of seeing his first satellite lift off after years of effort, Professor Low says: “The joy was like a father witnessing the birth of his baby.”

The work since then has not become easier despite his experience in launching satellites, he notes. “Each satellite is unique in its own way. While my team is certainly more experienced in building satellites, the complexity of the satellites we build has also increased significantly.”

If he could go back in time, Chinmay would focus on building an even stronger technical foundation while pursuing his engineering degree. “I would not wait till I graduate to explore my start-up ideas, but would start right during the university days.”

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orbits, cannot be recalled. Failure is definitely not an option for me.”

Professor Low feels his greatest achievement at NTU is being a pioneer who has successfully built, launched and operated different classes of satellites and making space history in the ASEAN region.

The space industry, he believes, will potentially become an important economic pillar for Singapore. “Our pioneering work will pave the way for building Singapore's satellite industry, a high-tech industry that has yet to develop fully.”

Besides his satellite work, Professor Low also teaches and feels the best part of his job is watching his students become the professional engineers who work with him on the satellites. “They are like my extended family who share with me the many ups and downs.” In 2013, he was awarded the Koh Boon Hwee Scholarship for “inspirational mentorship to students.”

The space pioneer says, “I am very proud that our team has designed and built Nico (orange robot on the left) and Blue robot (right).”

Professor Chen I-Ming
Developing Robot Nico for Rehabilitate Patients

In collaboration with Changi General Hospital (CGH), Professor Chen I-Ming of our School of Mechanical and Aerospace Engineering and the team he heads have developed robot Nico.

Soon to be used at CGH’s Centre for Healthcare Assistive and Robotics Technology (CHATRC), Nico can perform many functions, such as taking blood pressure and temperature, keeping an eye on patients in wards, reminding patients to take their medications and even conversing simply and singing and dancing for children.

Developed from the world’s first consumer-grade humanoid robot NAO that is used for research in robotics and social interaction, Nico walks more steadily than its precursor, says Professor Chen, who is Director of the Robotics Research Centre at NTU. “Small humanoid robots tend to fall down easily, as they don’t normally have good stability. Our challenge in designing Nico was to make it walk steadily while preserving the attractive outlook of the robot.”

In the process, Professor Chen’s team also transformed the original gender-neutral NAO robot into a girl-like Nico robot wearing a long skirt that has a wire-frame structure running on wheels fixed to the waist of Nico. The robot still walks on its legs, but the supporting wheels give it stability.

Pleased that Nico has been well received, the professor says, “I am very proud that our NTU students who took on this project could design and enhance the functions and features of an already popular robot for real world applications.”

Considering all his accomplishments, Professor Chen feels proud to see his students develop into important professional roles locally and overseas. For example, one is a Director of a research institute of the Chinese Academy of Science in China, another, the rector of a university institute of the Chinese Academy of Science in Myanmar.

Professor Chen is now working with colleagues on projects involving construction and infrastructure service robots, such as mobile high-rise spray painting robot, construction quality inspection robot and also deep tunnel inspection robot.

“I hope these robots will be put to real use and have an impact on the respective industries,” says Professor Chen. “They are like my extended family who share with me the many ups and downs.”

Professor Zhang Hua
Interest and Curiosity Rev Him Ahead

Professor Zhang Hua feels that interest and curiosity are the driving forces behind his work, says. His greatest achievements at NTU, he believes, are the many first-time-in-the-world researches that his research teams have done here. “I am very proud that our researchers have done not an option for me.”

Professor Zhang feels proudest to see his research teams have done not an option for me.”

Professor Zhang Hua
Interest and Curiosity Rev Him Ahead

Ranked among the world’s best materials scientists and chemists, Professor Zhang Hua of our School of Materials Science and Engineering (MSE) lets his work show his claims. Top researchers, he believes, should pioneer at least one new research direction and/or have their own research area that are recognised by the research community.

Since joining NTU’s MSE in July 2005, he has filed more than 60 patents, published over 360 papers in top-tier journals, and has more than 26,000 citations and an exceptional H-index of 79, this index being a measure of the productivity and citation impact of publications of a scientist.

Among his achievements, Professor Zhang has developed various types of nanomaterials for applications in biosensing, opto-electronic devices, water treatment and clean energy. These nanomaterials include graphene, transition metal dichalcogenides nanomaterials, noble metal nanomaterials, such as gold, and various types of composites.

Explaining his special interest in nanomaterials, he says, “Our work in building nanomaterials show unusual properties and promising applications.”

Twice now, Thomson Reuters ranked him among “The World’s Most Influential Scientific Minds” in its 2014 and the 2015; the World Cultural Council (WCC) has named him a World Cultural Council (WCC) Specialist Recognition Award in 2013, and the SMALL Young Innovator Award in 2012.

Professor Zhang feels proudest to see his research teams have done not an option for me.”

Among the string of accolades to his name, Professor Low is one of 10 pioneers featured as having contributed significantly in Science and Technology to Singapore’s economic development at the “Celebrating 50 Years of Engineering Pioneers in Singapore” exhibition in 2012. He was also awarded the Public Administration Medal (Bronze) for “Excellence in contribution in pioneering the Satellite programme in Singapore” in August 2014, and X-GAT, the satellite that NTU and DSO National Laboratories jointly developed and launched in 2011, was among the 50 featured in the Straits Times’ “50 Singapore Firsts” article.

“Compared with bulk materials, nanomaterials show unusual properties and promising applications.”

Professor Zhang Hua

Academy of Materials in 2015 and a Fellow of the Royal Society of Chemistry (FRSC) in 2014. He also won the ACS Nano-Lecturehip Award in 2015, the World Cultural Council (WCC) Specialist Recognition Award in 2013, and the SMALL Young Innovator Award in 2012.

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Full Professorial Promotions

Congratulations to our colleagues who were promoted to Full Professorship.

Professor Hilmi Volkan Demir
School of Electrical and Electronic Engineering

Professor Chu Jian
School of Civil and Environmental Engineering

Professor Lou Xiong Wen, David
School of Chemical and Biomedical Engineering

Professor Lee Pooi See
School of Materials Science and Engineering

Professor Chen Peng
School of Chemical and Biomedical Engineering

Professor Joseph Chang
School of Electrical and Electronic Engineering

Outstanding Faculty

Faculty Honours and Awards
National Research Foundation (NRF) Investigatorship Awards

The NRF Investigatorship provides opportunities for established, innovative and active researchers in their mid-career to pursue groundbreaking, high-risk research. It is intended to support a small number of Principal Investigators who have an excellent track record of research achievements and are recognised as leaders in their respective fields of research. Each recipient will receive up to S$3 million over 5 years to pursue groundbreaking research.

We are proud to have with us the following four faculty members who won the NRF Investigatorship awards in 2015.

Professor Phee Soo Jay, Louis
School of Mechanical and Aerospace Engineering

Professor Hilmi Volkan Demir
School of Electrical and Electronic Engineering

Professor Lee Pooi See
School of Materials Science and Engineering

Professor Lou Xiong Wen, David
School of Chemical and Biomedical Engineering

Professor Ong Yew Soon
School of Computer Science and Engineering
The NTU team that set the world record in highest performance on floating point computation at the ASC15. Team members comprised students from the School of Computer Science and Engineering and School of Mechanical and Aerospace Engineering.

Professor Nripan Mathews from the School of Materials Science and Engineering won the prestigious Young Scientist Awards 2015 for his efforts in the development of novel electronic materials, devices, as well as their fundamental optical and electronic exploration. The Young Scientist Awards, administered by the Singapore National Academy of Science (SNAS) and supported by A*STAR, was presented at the President’s Science and Technology Awards Ceremony on 16 September 2015. The award is presented to young researchers, aged 35 and below, who are actively engaged in R&D in Singapore, and have shown great potential to be world-class researchers in their fields of expertise.

Institute of Electrical and Electronics Engineers Fellowships

Professor Ponnuthurai Nagaratnam Suganthan from the School of Electrical and Electronic Engineering was named a Fellow of the Institute of Electrical and Electronics Engineers (IEEE) in 2015 for his contributions to optimisation using evolutionary and swarm algorithms.

The Fellowship, which is the highest grade of IEEE membership, is regarded by the international engineering community as a prestigious honour that recognises individuals with extraordinary record of accomplishments in any IEEE field of interest.

Seizing the opportunities our college and university offer, many students have shown promise of being the beacons in their fields in future by winning prestigious awards in the international arena and bringing honour to the College of Engineering and NTU. Here are some of their inspiring achievements.

NTU Supercomputing Team Shines at Asia Student Supercomputer Challenge 2015 (ASC15)

NTU team beats 151 rival teams to clinch Highest Computing Performance award at ASC15.

On just our second appearance at the prestigious Asia Student Supercomputer Challenge, the largest supercomputer contest in the world, NTU’s supercomputing team walked away with the Highest Computing Performance Award and even broke the previous world record set in 2014.

ASC15 was co-organised by Inspur Group, Taiyuan University of Technology, and the Asia Supercomputer Committee and was held in Taiyuan, in China’s Shanxi province. A hundred and fifty-two teams from 135 universities across the world participated in it. With a system equipped with NVIDIA Tesla K80 dual-4GPU accelerators, the NTU team hit an impressive 11.02 Tflops (teraflops) per second, the highest LINPACK attained within the power budget of 3000W. LINPACK is the benchmark the industry employs to measure supercomputer performance.

A Tflop is a trillion floating point operations. The previous world record was 10.1 Tflops per second, achieved by University of Edinburgh, UK, at the International Supercomputing Conference 2014 (ISC14) held in Germany.

The NTU team adopted a hybrid heterogeneous acceleration technology in designing their supercomputing system, using a total of seven supercomputing server nodes provided by Inspur and eight Nvidia K80 accelerated cards. At ASC14 the previous year, the NTU team had emerged as the Silver Winner although it was participating in the challenge for the first time. This achievement caught the attention of Prime Minister Lee Hsien Loong who wrote the team a special congratulatory message on his Facebook page.

NTU Supercomputing Team

Shines at Asia Student Supercomputer Challenge 2015 (ASC15)

Institute of Electrical and Electronics Engineers Fellowships

Professor Ponnuthurai Nagaratnam Suganthan

School of Electrical and Electronic Engineering

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NTU Supercomputing Team Shines at Asia Student Supercomputer Challenge 2015 (ASC15)

On just our second appearance at the prestigious Asia Student Supercomputer Challenge, the largest supercomputer contest in the world, NTU’s supercomputing team walked away with the Highest Computing Performance Award and even broke the previous world record set in 2014.

ASC15 was co-organised by Inspur Group, Taiyuan University of Technology, and the Asia Supercomputer Committee and was held in Taiyuan, in China’s Shanxi province. A hundred and fifty-two teams from 135 universities across the world participated in it. With a system equipped with NVIDIA Tesla K80 dual-4GPU accelerators, the NTU team hit an impressive 11.02 Tflops (teraflops) per second, the highest LINPACK attained within the power budget of 3000W. LINPACK is the benchmark the industry employs to measure supercomputer performance.

A Tflop is a trillion floating point operations. The previous world record was 10.1 Tflops per second, achieved by University of Edinburgh, UK, at the International Supercomputing Conference 2014 (ISC14) held in Germany.

The NTU team adopted a hybrid heterogeneous acceleration technology in designing their supercomputing system, using a total of seven supercomputing server nodes provided by Inspur and eight Nvidia K80 accelerated cards. At ASC14 the previous year, the NTU team had emerged as the Silver Winner although it was participating in the challenge for the first time. This achievement caught the attention of Prime Minister Lee Hsien Loong who wrote the team a special congratulatory message on his Facebook page.
NTU Venture Cars Create Roar at Shell Eco-marathon Asia 2015

Both NTU’s Venture Cars, NV8 and NV9, drove into Shell Eco-marathon Asia 2015 to the sound of hearty applause.

NTU Venture 8 (NV8) and NTU Venture 9 (NV9) both made an impact at the Shell Eco-marathon Asia (SEMA) 2015 held in Manila’s Luneta Park in the Philippines from 26 February to 1 March 2015. NV8 is Singapore’s first urban solar electric car with an innovative 3D-printed body shell that has 150 parts mounted on a carbon fibre single shell chassis. The parts were produced by various 3D printers at NTU and its sponsor companies and took the team three months to build. They were printed in acrylonitrile butadiene styrene, a lightweight plastic, which integrated a honeycomb structure and a unique joint design to hold the parts together, giving a lightweight, thin and yet strong shell. This innovative vehicle attracted a lot of attention and praise from other participating teams, judges, officials and visitors.

NV9, the other entrant, is a sleek three-wheeled racer that is powered partially by solar cells and lithium battery. Inspired by motorcycle racing, it is equipped with a unique tilting mechanism that allows the vehicle to take on sharp corners with little loss in speed. The team adopted a tear-drop shaped body shell to minimise aerodynamic drag and handmade contoured silicon solar cells to allow maximum harvesting of solar energy at every angle.

NV9 beat more than 124 other teams from 16 countries to seize top spots in the Technical Innovation and Safety categories. This makes NTU’s second Technical Innovation award and fifth Safety award at the Shell Eco-Marathon competitions.

Among Liu Xi’s achievements is FOMO, the world’s first social media photo booth. He was also the winner of the Unilever Sustainable Living Challenge 2013 and one of five Bloomberg Ambassadors in Singapore.

FOMO, which he co-founded, started off as a project at our Garage@EEE lab. The FOMO team was crowned champion at the Singapore edition of the Tech Plan Grand Prix 2015, beating more than 150 teams. FOMO is an all-round social media photo booth that gives users a new photo booth experience with Facebook, WhatsApp, Twitter, Instagram and WeChat. Besides capturing themselves and memorable moments with their smartphones and sharing these on the various social media platforms, users can print and receive their selfies, wefies and other photos on the spot within 20 seconds. At important events, FOMO serves as an engagement tool for entertaining visitors and giving them a memento.

Successfully commercialised, it is now a business valued at S$7 million, servicing more than 20 Fortune 500 companies and selling in eight countries.
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