ANNEX: DEEP-TECH START-UPS FUNDED UNDER NUS GRADUATE RESEARCH INNOVATION PROGRAMME (GRIP)

BeeX

Innovators:

- Mr Goh Eng Wei, Research Associate, NUS Advanced Robotics Centre (right)
- Ms Grace Chia, NUS Faculty of Engineering, Class of 2014 (left)

"It has helped us crystallise the business strategies to make our vision a reality. GRIP funding is essential to accelerate our commercialisation process so that we can reach out to more customers with the same requirements."
- Ms Grace Chia -

In the maritime industry, there is heavy reliance on large vessels and equipment to inspect underwater and offshore assets, as well as to perform underwater tasks such as carrying heavy loads and adjusting torque valves. Trained manpower, such as divers, and equipment required for such missions are costly, and these operations may also be hazardous.

While some autonomous underwater vehicles (AUVs) are currently being used to carry out inspections, they need to be tethered thus restricting operations. Such AUVs are also exposed to high drag underwater, and require bulky and heavy infrastructures to keep them in place.

BeeX, an Autonomous Underwater and Surface Vehicle, is highly manoeuvrable and can be operated wirelessly. Hence, it does not require large manned boats and supporting infrastructure, making missions less costly, as well as more efficient and effective. Using the pre-programmed missions, vessel operators are able to gain a comprehensive understanding

of their remote assets faster. Overall, with BeeX, the manpower required for missions can be reduced by half, leading to more than 50 per cent in cost savings while making it safer for the personnel involved.

This novel invention has attracted industry interest, and the team is currently working on enhancing the performance of its AUVs to enable longer and a wider variety of autonomous missions.

Newgen Gas

Innovator:

- Dr Maninder Khurana, Research Fellow, Department of Chemical and Biomolecular Engineering, NUS Faculty of Engineering

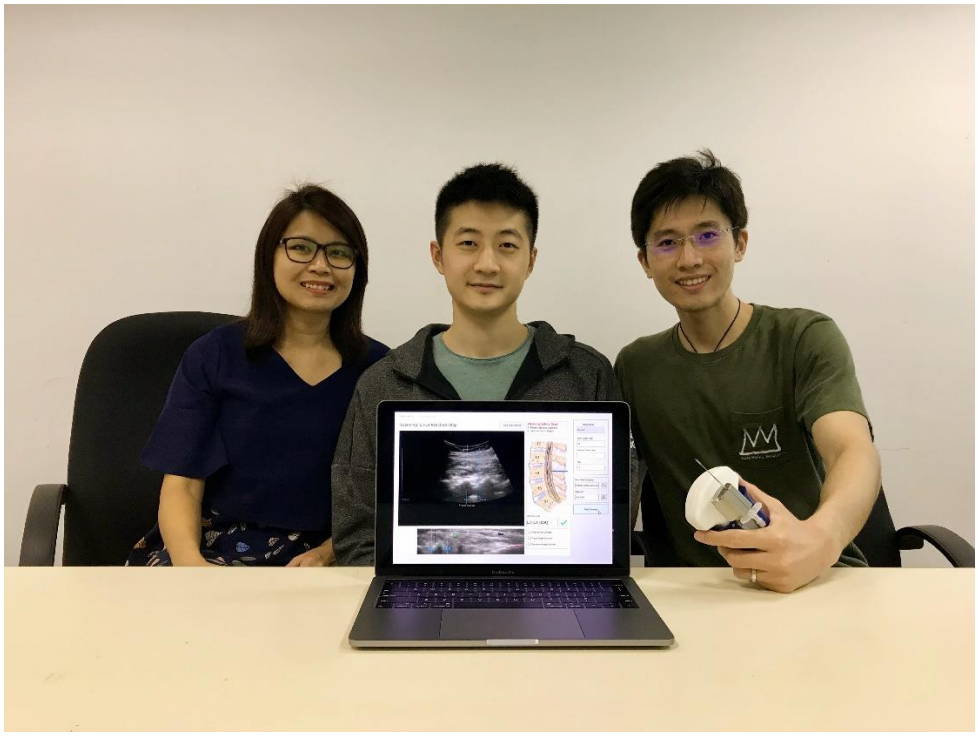
"Going out there and validating your ideas and assumptions is essential. GRIP has allowed me to be more at ease with going out and talking to the market. I am now more at ease with the cycle of assumption, validation, pivoting and repeat - the core principal for doing a start-up. The funding from GRIP enables us to validate the customer needs and to develop proof-of-value prototypes corresponding to those needs."
- Dr Maninder Khurana -

Natural gas is the cleanest and fastest growing fossil fuel, and a low-cost and safe way of storing it is essential for energy security and energy resilience. Currently, natural gas storage is challenging due to the capital intensive nature of liquefied natural gas (LNG) storage tanks, as well as the safety issues associated with LNG handling and high-pressure compressed natural gas (CNG) tanks.

Dr Khurana has developed a way of storing natural gas in the form of gas hydrates called solidified natural gas (SNG), which are safe to handle and ideal for long term storage. The hydrates can be stored at zero degree Celsius and at atmospheric pressure, eliminating the need for cryogenic conditions of LNG or high pressure risks of CNG. As a result of the milder conditions needed for storing SNG, Dr Khurana aims to reduce storage cost of natural gas by up to 50 per cent.

The current technology is able to produce up to 10kg of gas hydrates per day in the lab, and Dr Khurana is looking at demonstrating this at a larger scale. He is in talks with energy infrastructure companies to conduct pilot testing for the technology so as to evaluate its performance in real-world scenarios. As SNG technology is currently not available commercially, Dr Khurana hopes to be the first to bring this technology to market.

HiCura



Innovators:

- Ms Ng Cailin, PhD Student, NUS Graduate School for Integrative Sciences and Engineering (left)
- Dr Ma Jun, Research Fellow, Department of Electrical and Computer Engineering, NUS Faculty of Engineering (centre)
- Mr Leng Yusong, PhD Student, NUS Graduate School for Integrative Sciences and Engineering (right)

"What sets GRIP apart was the personal mentorship we received. Our mentor was there to guide us in the right direction. She understands our needs, listens to our story, and provides valuable advice."
- Ms Ng Cailin -

Epidural injections are administered on patients during childbirth to relief pain. Currently, palpation based "blind" procedures and ultrasound guided procedures only have a success rate of 40 per cent and 68 per cent respectively for successful first time needle insertion. Both procedures currently do not cater to obese patients (BMI>30). In addition, for ultrasound guided procedures, anaesthetists require the skills of a radiologist, and additional nurses are also needed to help administer the epidural.

By combining an AI based image processing software and a needle-based drug injection system, HiCura enables clinicians and anaesthetists to be guided by ultrasound images to administer epidural to the right location effectively, and in real-time. With this proprietary technology, which can be used with any commercially available ultrasound probe, procedures can be done faster with higher accuracy, leading to better patient experience. Anaesthetists with differing skill levels will also be able to administer the procedure easily given the highly intuitive interface, and they will no longer require assistance from nurses.

The team has validated the effectiveness of the software through two clinical studies conducted on 100 normal patients (BMI<30) and 50 obese patients (BMI>30). For both groups of patients, HiCura achieved a high level of accuracy at 92 per cent. Further clinical validation studies will be conducted for the integrated system later this year.

NUSoil

Innovators:

- Dr Tan Wee Kee, Research Fellow, NUS Environmental Research Institute (right)
- Dr Zhu Jingling, Research Fellow, NUS Environmental Research Institute (left)

"NUS GRIP has opened up an arena beyond science that encourages me to step out of my comfort zone. The training is very enriching and fulfilling. The funding from GRIP relieves us from the immediate monetary constraints and allows us to focus on translating lab-based ideas to marketable ventures."
- Dr Tan Wee Kee -

Farming accounts for at least 70 per cent of water usage. As existing soil is inefficient in retaining water, only about 10 to 30 per cent of irrigated water is taken up by plants. A

substantial proportion of water is wasted and leached out, and this may result in groundwater contamination.

The ability to retain moisture within the soil helps to ensure that trees, plants and crops are not water-starved, which could destroy vegetation. Moisture storage also protects vegetation during a drought and intermittent dry periods.

Dr Tan and Dr Zhu have developed a patented superabsorbent hydrogel - InnoGro™ - that acts as a mini-reservoir to retain water and nutrients closer to the roots of plants for longer periods of time. It will then gradually biodegrade in a controlled manner within the soil to release water and nutrients that the plant needs.

Made using okara, the by-product of the soy food industry, InnoGro™ is suitable as a soil supplement that helps reduce water wastage, minimise water frequency, prevent excessive nutrient leakage, prevent groundwater contamination, and enable plants to survive better under drought conditions.

Lab results showed that plants can grow 50 per cent faster in the presence of InnoGro™ under situations where water is limited. Available at an affordable cost, this novel gel is suitable particularly for vegetable cultivation, gardening, urban agriculture, horticulture, and green buildings.

The immediate next steps for the team will be to improve the production process to scale up manufacturing of InnoGro™. They are also developing hydrogels that slowly release fertilizers into the soil to improve plant growth and development.

Vox Dei

Innovators:

- Ms Jennifer Dodgson, PhD Student, Lee Kuan Yew School of Public Policy at NUS (above)
- Mr Pei Junjie, Research Associate, Lee Kuan Yew School of Public Policy at NUS

"I was amazed by how easy and fun creating a start-up was - before this, I'd never thought of it as an option. The whole team's looking forward to being able to work full-time on this. We are going to use the GRIP funds to improve and speed up the software, so that we can bring it to market."

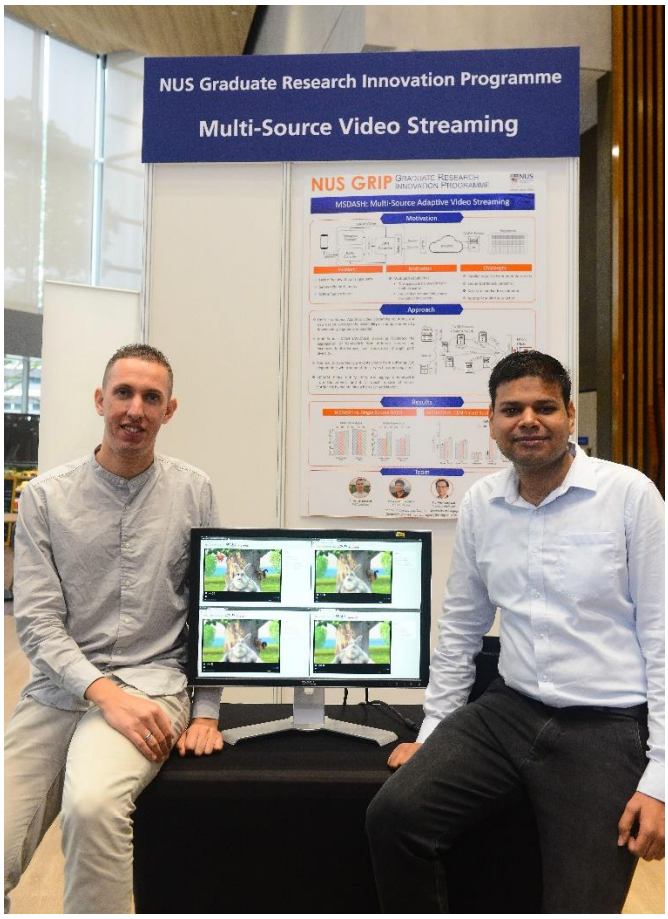
- Ms Jennifer Dodgson -

Spotting categories, concepts and trends by analysing large amounts of text while trying to make meaningful connections can be time consuming and costly. It also comes with problems of human error, bias, and subjectivity. Ms Dodgson and Mr Pei have developed a software that can perform the same task faster and with a higher level of precision and objectivity.

Vox Dei utilises a simple algorithm and only requires processing power of a typical notebook. This is unlike existing text analysis methods like latent semantic indexing and natural language processing, which could require high-level coding skills to implement and huge amounts of processing power.

The team has filed a patent for its technology. They have also secured their first paying client, as well as other testing partnerships with academic partners, and there are plans to introduce the software to NUS researchers. The team is now working with a local consultancy company to introduce Vox Dei to other public and private sector customers to gather feedback and raise market awareness. The beta version of Vox Dei is expected to be available online by mid-2019.

Atlastream



- Mr Abdelhak Bentaleb, PhD Student, NUS School of Computing (left)
- Mr Praveen Kumar Yadav, PhD Student, NUS School of Computing (right)

"GRIP helped us kick-start our entrepreneurial journey through guidance and support on transforming our innovation into a commercial product, through market validation and the

different aspects of starting up a start-up company. It provided a high level of guidance from experienced mentors who have assisted us with the different challenges, and also served as a bridge to the industry and investors."

- Mr Praveen Kumar Yadav -

Video streaming users often encounter issues such as poor visual quality, re-buffering, and frequent changes in quality due to changing workload at the server and dynamic network conditions. This could lead to users discontinuing the service, resulting in revenue losses for content providers.

Atlastream aims to address this challenge by using an advanced queuing theory based quality adaptation algorithm. The algorithm allows multiple servers and CDNs (content delivery/distribution networks) to be used in parallel for video streaming, resulting in a superior video streaming experience with minimal re-buffering and quality fluctuations. It is also in full compliance with the current video streaming standard - DASH. As the invention is an algorithm-based software, no additional hardware or modification of existing infrastructure for video streaming is required, thus making the solution highly scalable.

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