



## Fact Sheet

The Young Defence Scientists Programme (YDSP) is an initiative by the Defence Science and Technology Agency (DSTA) and DSO National Laboratories (DSO). Established in 1992, YDSP nurtures students' passion for science and technology by providing an out-of-classroom, immersive learning experience with Singapore's top defence engineers, software developers, cybersecurity experts and research scientists.

YDSP also provides students with insights to the careers of professionals in the defence technology community, and recognises achievements of our young talents through the YDSP Scholarship and DSTA Junior College Scholarship.

In the past year, over 380 students from 19 schools participated in various YDSP initiatives, which include:

### **Research@YDSP**

Research@YDSP is a four-month project attachment which offers students a hands-on opportunity to work on defence-related projects, under the mentorship of top defence engineers, software developers, cybersecurity experts and research scientists from DSTA and DSO.

Some of these projects have also gained recognition on prominent platforms. For instance, a project with DSO from YDSP 2022 won the Gold award at Singapore Science and Engineering Fair 2023, while another team with DSTA from YDSP 2021 clinched the Best Paper Award at the 8<sup>th</sup> International Researchers Club Conference on Science, Engineering and Technology 2022.

From September to December 2022, more than 70 students took part in some 40 projects on a diverse range of topics, including aerodynamics, cybersecurity, machine learning, robotics, unmanned systems, and more. Two of these projects were showcased on stage at YDSP Congress:

**Gamification of Individual Marksmanship Training: Towards marksman competency and safety**

For their project attachment with DSTA, students Adele Lim and Chin Jen Bin worked on how gamification can potentially be introduced to the Singapore Army's Individual Marksmanship Trainer simulator. By applying the Design Innovation methodology, the students explored various ways gamification can be applied to enhance the training's effectiveness in terms of competency and safety, while also making it more engaging for trainees.

**Real-world implementation and security structured encryption on Amazon Web Services**

Modern applications seek to outsource large databases to the Cloud due to its accessibility and reliability. However, one may not trust a third-party Cloud provider (e.g. Amazon Web Services) with sensitive military data. In this project, students Song Yiyang and Jed Lim designed a system that encrypts this data before sending it to the Cloud, allowing the user to access and make queries to the data without revealing the contents to the Cloud. The team then evaluated its security by exploring attacks that can be run against it using Wireshark.

**Science & Technology Camp**

DSTA organised two Science & Technology Camps, which provide students with both theoretical knowledge as well as hands-on training. The first hybrid camp held in June 2022 was centred on the Internet-of-Things (IoT). Over 70 students explored the fascinating world of the IoT, where they learnt about the fast-growing field of IoT technologies and their applications in the real world. As part of the camp, the students underwent structured training where they learnt how to programme a pocket-sized IoT micro-controller to carry out a wide range of functions. The camp concluded with a final competition, where students teamed up to develop a prototype using IoT

technologies and their micro-controllers to enhance the SAF's operations. The winning team's prototype was a wearable that uses artificial intelligence (AI) for early detection of fatigue in soldiers.

The second camp, which was held in person in December 2022, revolved around Autonomous Unmanned Ground Vehicles (AUGV). Seventy students gathered at DSTA for a five-day physical camp for the first time since the COVID-19 pandemic, where they were engaged in a meaningful learning journey about AUGV and the technologies that drive them. Students were introduced to how mechanical and electrical sub-components can be integrated with software and AI algorithms to deliver autonomous systems. They also had the opportunity to implement their knowledge onto a programmable self-driving car dubbed the Donkey Car. Students were tasked to build a self-driving car that incorporated various machine learning capabilities and algorithms; and ideate and prototype autonomous cars that could solve real-world problems in the context of defence.

### **World of Science (WOS)**

Organised by DSO National Laboratories between May to June 2022, close to 170 students experienced the exciting world of defence R&D through workshops, lab visits, and hands-on activities over seven modules ranging from physical sciences to infocomm technologies that are critical to Singapore's defence and national security.

#### **Aerodynamics Module**

24 students had the opportunity to let their imagination take flight at this 4-day workshop where they learnt to design planes, tried their hands at flying using a flight simulation software, and built their own gliders!

#### **Artificial Intelligence Module**

Held over three fun-filled days at DSO, 24 students explored and learnt about the latest trends in Artificial Intelligence (AI) such as Natural Language Processing and Computer Vision, and its applications in defence. Participants put their skills to the test with an Intelligent Game AI Agent Sandbox developed by DSO, which culminated in a mini-competition where students' AI agents battled it out in a virtual environment.

### **Cryptography Module**

24 Mathematics enthusiasts were introduced to the intricate work of Mathematics in modern Cryptography, with lectures designed to deepen their understanding of advanced concepts in this field. A series of challenging problems were also designed to excite and inspire the students through the revelation of mathematical applications in the area of security research.

### **Computer Security Module**

From testing of web applications for vulnerabilities to uncovering a PIN code, this module broadened the horizons of 24 students by exposing them to various aspects of computer security. Students also had the opportunity to present their findings for a malicious software that might compromise a computing system.

### **Electromagnetics Module**

25 students learnt various electromagnetic (EM) applications through a series of exciting demonstrations and hands-on activities. They observed naturally-occurring periodic structures under a microscope, designed antennas, constructed shielding boxes, and competed to build a Gauss Gun that could propel a steel ball furthest. To reinforce the relevance of EM to the real world, they visited the advanced EM test and measurement facilities within Temasek Laboratories at NUS.

### **Robotics Module**

Held across five days, 24 students gained hands-on experience in robotics such as 3D printing and the Robotic Operating System (ROS), as well as learnt the basics of electronics design, prototyping, and debugging. The highlight of the module was a friendly competition between autonomous robots built and programmed by the students to navigate and map an area with LiDAR.

### **Sensors, reducing the fog of war Module**

In this five-day module, 24 students explored the various sensing technologies crucial to defence such as sonar, radar, and digital image processing, and

toured the NUS Satellite Technology and Research Centre (STAR) to gain an appreciation of space-based sensing. At the end of the module, they applied their newly-acquired knowledge of sensors in a multi-player war game.

### **YDSP Scholarship**

30 YDSP Scholarships were awarded this year. The scholarship recognises students who show interest and excel academically in science and technology, and is open to science students in Secondary three or equivalent. Scholarship recipients will receive S\$1,000 over two years.

### **DSTA Junior College Scholarship**

35 DSTA Junior College Scholarships were awarded this year. The scholarship recognises outstanding academic achievements in science, and is open to science students in their first year of junior college studies or equivalent. Scholarship recipients will receive S\$2,000 over two years.