Australian Government
Defence

DSTG Industry Experience Placement Program

2024

Proposed Projects

List of Abbreviations

Division	Abbreviation
Human and Decision Sciences	HADS
Information Sciences Division	ISD
Platforms Division	PD
Sensors and Effectors Division	SED

Research Stream	Abbreviation
Aerospace / Aeronautical Engineering, Naval Architecture Stream	AAENA
Chemical, Radiological, Biological, Food Sciences Stream	CRBFS
Computer Sciences, IT, Software Engineering, Telecommunications Stream	CSITSET
Electronic / Electrical Engineering Stream	EEE
Materials Science Stream	MS
Mathematics and Physics Stream	MP
Mechanical and Mechatronic Engineering (including Robotics) Stream	MMER
Psychology and Social Sciences Stream	PSS

Project ID	Location	Project Title	Project description	Desirable Skills	AAENA	CRBFS	CSITSET	EEE	MS	MP	MIMER	PSS
IEP HADS 01	Fishermens Bend, Victoria	**Coordinated UAS Mission Autonomy**	DSTG has a program to integrate the Advanced Framework for Simulation, Integration and Modelling (AFSIM) or a plug-in for AFSIM onto a UAS platform. This project will extend this program by applying advanced Artificial Intelligence and Machine Learning on to multiple UAS and conducting complex missions in controlled environments.	• **Essential**: Software Development Skills (Python) • General IT systems knowledge • Embedded Systems • Ability to work in teams • Willingness to participate in Field Trials • Good verbal and writing skills.	X		X	X			X	
IEP HADS 02	Fishermens Bend, Victoria	**AI Behaviour Modelling for Collaborative Combat Aircraft**	This project will explore the development of behaviour models for autonomous Collaborative Combat Aircraft using artificial intelligence techniques. These behaviours will be integrated into a complex simulation environment and evaluated in the context of air combat scenarios.	• Experience in coding (Python, C++) • General software development skills: source control, testing, documentation • A strong interest in applied artificial intelligence • Strong written and verbal communication skills • Ability to work both independently and as part of a small team	X		X					
IEP HADS 03	Fishermens Bend, Victoria	**Mission Playback Tool Development**	This project will advance a new capability to that allows the playback of real-world aircraft tracking data within the Advanced Framework for Simulation, Integration and Modelling (AFSIM). The candidate will add functionality and visual aids to communicate the most important aspects of mission performance.	• Software Development Skills (Python, C++) • An aptitude for data analysis and visualisation • Ability to work both independently and as part of a small team	X		X	X			X	
IEP HADS 04	Edinburgh, South Australia	**Psychological Inoculation to Strengthen Societal Resilience against Disinformation**	This project aims to address a gap in the literature on the prevention of disinformation, and additionally examine an important critique of disinformation studies that relates to comprehensiveness. As such, the project will employ a systemic approach with a focus on prevention. The psychological component, nestled within a broader study and linked to two major projects, will examine facilitative and inhibitive conditions for psychological inoculation or the prebunking of disinformation. The goal of the study is to develop holistic and integrated, long and short-term strategies for psychological inoculation (inclusive of and beyond prebunking) aimed at strengthening societal resilience against disinformation.	• Ability to work in teams (collaboration, consultation, and openness to learning and sharing) • Interest in systemic or related approaches Critical thinking • Good verbal and writing skills • Marketing, media or religious studies			X					X
IEP HADS 05	Edinburgh, South Australia	**International Engagement and Influence – Comparative Case Study Analysis of International Policy and Practice**	The Influence and Conflict Analysis Group at DSTG examines how nations can and might seek to engage with and influence other actors cooperatively, in competition and in conflict. This project will undertake a review of existing, open-source materials that outline the doctrine, policies, approaches to, and evaluations of, information campaigns, strategic communications, military diplomacy and similar related activities. The outcomes will include a report and presentation outlining a critical analysis of current and recent practices, informed by relevant theoretical and scholarly approaches and applied to the situations outlined in the Defence Strategic Review (2023) and the Defence Strategic Update (2020).	• Demonstrated ability to undertake open-source document and archival research • General knowledge of strategic communications and international relations • Ability to work in teams • Excellent verbal and writing skills								X
IEP HADS 06	Edinburgh, South Australia	**Persuasive Technologies for Defence and National Security: Enhancing Digital Resilience to Disinformation**	Persuasive technologies are focused on design, research and programming of interactive computing technology. It includes functions and technologies we rely on in our day to day lives, such as various social media platforms, applications and devices such as smart watches or fitness trackers. The project aims to investigate persuasive technology in the context of enhancing digital resilience to disinformation. The project will involve all stages of conducting an independent research project from planning, ethics application, study execution and reporting. The student will be required to present their experience and findings to the team, and will work towards a publishable product.	• Demonstrated ability to undertake research i.e. comfortable with general quantitative and qualitative research methods • Good knowledge of relevant psychological and social sciences models, theories and frameworks • Ability to work independently and in a team • Excellent verbal and writing skills.								X
IEP HADS 07	Edinburgh, South Australia	**Exploration of C2 for Autonomous Systems: Goal-Based Control**	Human and Autonomous Decision Superiority are currently investigating the viability of a goal-based model of control for multiple autonomous agents. This approach involves a human operator providing mission goals and constraints that UAV teammates translate into actions for implementation. This project will involve comparing the new concept of goal-based control with existing control modalities such as action-based (real-time control of asset equipment	• Sound understanding of statistical principles, and proficiency in data analysis using a common software package (e.g., R, SPSS) • Understanding of psychological research best-practice • Willingness to collect data from live trials								X

Project ID	Location	Project Title	Project description	Desirable Skills	AAENA	CRBFS	CSITSET	EEE	MS	MP	MIMER	PSS
			and sensors) and plan-based (setting pre-defined 'plays' for autonomous agents to enact) within a simulated environment. Performance will be assessed in relation to both task and psychological outcomes (e.g., task accuracy, workload, trust in autonomy) across multiple experimental conditions.	• Interest in human-autonomy teaming • Good verbal communication and writing skills • Ability to work independently on a research project.								
IEP HADS 08	Edinburgh, South Australia	**Morphing Teams: Dynamic Topographies and Shapes of Human-Machine Missions**	Imagine being a military member responsible for decisions about the formation, de-formation and re-formation mixed human-machine teams during a dangerous mission in a foreign country! You could probably handle small teams, but what about massive teams with variable, decentralised command structures? What if priorities were changing swiftly during missions where you don't even know all of the adversaries' goals and capabilities? I'm sure you would be grateful for some algorithms and recommendations to help morph team topographies and shapes towards faster, more effective, achievement of team missions, goals and priorities. In this project you will develop concepts, software and experiments to compare relative effectiveness of team morphing techniques.	• Curiosity and ability to craft your own research questions, software and experiments around this open-ended problem space. • To do this in collaboration with your Defence colleagues and academia. • Existing or learnable skills in algorithms, maths, AI, UI and programming.			X			X		X
IEP ISD 01	Lot 14 Adelaide, South Australia	**Multi-Agent Communication for Autonomous Cyber Defence**	The Autonomous Cyber Operations (ACO) discipline performs research into how Artificial Intelligence (AI) may be leveraged to defend computer networks. This autonomous defence is important because it is not always possible for human cyber security operators to actively defend every aspect of a network at all times. A system of multiple autonomous defenders can scale to large networks and work cooperatively prevent a major cyber security incident. Inspired by advances such as AlphaStar and OpenAI Five, we are currently researching how to use Multi-Agent Deep Reinforcement Learning to train a system of agents capable of autonomous cyber defence. A key aspect of multi-agent systems is the ability for these agents to communicate efficiently and effectively with each other. Students working on this project will learn how to train AI agents using Multi-Agent Deep Reinforcement Learning, build valuable programming expertise, and contribute to cutting-edge research into multi-agent communications systems by: • Helping to implement state-of-the-art multi-agent communication algorithms that can detect a cyber-attack and evict an attacker from the network • Evaluating the effectiveness of these multi-agent communications systems in simulation and real computer networks • Presenting research findings to the ACO team, and wider Defence community	• Software Development including familiarity with tools such as Python and Git • Machine Learning with tools such as PyTorch • Good verbal and writing skills			X					
IEP ISD 02	Lot 14 Adelaide, South Australia	**A Path Towards Autonomous Cyber Operations via Machine Learning**	The Autonomous Cyber Operations (ACO) discipline performs R&D to harden and defend computer systems and networks through autonomous decision-making and action. Autonomy is particularly important for isolated networks operating in contested environments where skilled human cyber security personnel may not be present nor have remote access. It may also be important in future Cyber warfare, where machine-speed responses could offer an advantage over human-speed. In such scenarios, the network must continue to support the users' mission in the face of adversary attacks and changing conditions. A network with autonomous decision making has potential to achieve these aims via dynamic decision making, distributed scalability, continuous monitoring, and fast response times. We are currently researching how the exciting capabilities of Large Language Models (LLMs) can be used as a tool for ACO. We aim to use LLMs to enable an analyst to respond to threats at near machine speed. You will work as part of a team to: • Make specialist Cyber security knowledge available to the LLM • Integrate Cyber sensor data the LLM for multi-modal operation • Test autonomous agents in simulated or emulated environments • Build metrics for the agent's ability to incorporate Cyber security knowledge, sense the cyber environment, plan, and respond to threats.	• Software Development skills (Python) • Machine Learning frameworks such as PyTorch • Good verbal and writing skills			x	x				

Project ID	Location	Project Title	Project description	Desirable Skills	AAENA	CRBFS	CSITSET	EEE	MS	MP	MIMER	PSS
IEP ISD 03	Lot 14 Adelaide, South Australia	**Autonomous Digital Forensics**	The Autonomous Cyber Operations (ACO) discipline performs R&D to harden and defend computer systems and networks through autonomous decision-making and action. Autonomy is particularly important for isolated networks operating in contested environments where skilled human cyber security personnel may not be present nor have remote access. It may also be important in future Cyber warfare, where machine-speed responses could offer an advantage over human-speed. In such scenarios, the network must continue to support the users' mission in the face of adversary attacks and changing conditions. A network with autonomous decision making has potential to achieve these aims via dynamic decision making, distributed scalability, continuous monitoring, and fast response times. The goal of the project is to develop a prototype autonomous digital forensic analysis capability against a limited set of common attacks. The student will be required to run penetration tests against target networks and investigate appropriate detection and mitigation techniques. They will also apply artificial intelligence techniques to perform autonomous decision making.	• Essential: Software Development Skills (Python) • Experience with Cybersecurity and /or AI desirable.			X					
IEP ISD 04	Edinburgh, South Australia	**Practical Adversarial Machine Learning**	Adversarial machine learning (AML) targets the security of machine learning (ML) by introducing malicious inputs to ML processes. This project studies the effects of AML techniques in an application domain to be determined with relevance to Defence. Contribution to the creation of tools to test and evaluate ML security, the development of defences, and participation in AML red-teaming exercises will offer skill development in research, software engineering and cyber security.	• Excellent computer and software development skills (Python) • General knowledge of machine learning and willing to learn concepts of computer security • Basic understanding of research methodologies • Good verbal and written communication skills • Ability to work in teams and independently.			X					
IEP ISD 05	University of Queensland	**Supporting Security Analysis With Code Annotations**	Compiler optimisations can introduce unexpected behaviours that may invalidate security analysis performed at the level of the source program. Consequently, it is preferable to conduct such analysis over an intermediate representation (IR) lifted from the compiled assembly code. When the analysis requires user annotations to the code, these annotations needs to be transferred from the source code, through the assembly code, to the IR and thus to the analysis. The reverse direction poses a similar problem: Feedback from the analysis needs to be made available to the user at the level of the actual source code. This project will develop an approach to transfer annotations from source code to an IR and analysis results from the IR back to the source code. The approach will be implemented within a security analysis framework developed at DSTG, and the participant will work alongside the development team.	• Software development in Scala/Java • Familiarity with assembly code and compiler operation/techniques • Good communication skills.			X					
IEP ISD 06	Edinburgh, South Australia	**Qualitative Study Exploring the Design of Open Systems**	The Australian Defence Force (ADF) is exploring new ways of developing and sustaining military systems with a focus on moving to an open systems approach. An open system can be defined as a model that allows Defence to competitively source hardware and/or software from a range of developers, without being locked-in to one company due to Intellectual Property (IP) constraints or a closed system design. An open systems approach can allow greater flexibility in system design, increased opportunity for innovation, and greater participation of small to medium-sized companies within the Australian defence ecosystem. However, moving to this new way of developing military systems presents a number of sociotechnical challenges around people, culture, goals, processes, technology and infrastructure. The aim of this research project is to explore successful examples of other industries adopting an open systems approach (such as the automotive or aviation industry) in order to tease out how and why an open approach has worked in that industry, and what lessons may be applicable for Defence. The project will involve conducting a literature review, study preparation such as determining the recruitment strategies and interview questions, conduct of interviews and analysis of results, and report write-up and presentation to the DSTG team on the findings. In addition, in line with the requirement of the Master of	• Background in psychology or social science (or similar) • Understanding of qualitative study design and analysis • Good verbal and writing skills • Motivated and goal-focussed • Ability to work independently and in teams.								X

Project ID	Location	Project Title	Project description	Desirable Skills	AAENA	CRBFS	CSITSET	EEE	MS	MP	MIMER	PSS
			Psychology program, the student undertaking this project will have the opportunity to complete a student placement with DSTG supervised by an endorsed organisational psychologist.									
IEP ISD 07	Edinburgh, South Australia	**Resilient UxV Communications**	This project aims to integrate the use of multiple wireless bearers onto UxV and other platforms in order to enhance the resilience and availability of their communication links. This includes the integration of wireless bearers such as 4G/5G, Starlink Satellite, point-to-point and point-to-multipoint wireless links and mesh radios. The aim of this project is to design a scalable architecture for the integration, characterisation and efficient utilization of these different types of wireless bearers.	• Basic knowledge of Linux operating systems • Good knowledge of computer networking concepts • Software development skills in python or other scripting language • Basic knowledge of wireless communication systems would be beneficial too.			X	X				
IEP ISD 08	Edinburgh, South Australia	**Controlling Distributed Systems with Mixed Autonomy Levels**	Work is ongoing within Adaptive Information Architectures to experiment with multi-national sharing of resources when using Uncrewed Vehicles (UxV) (ground, air, surface, subsurface). We would like to extend this work to assess information architectures for control of distributed systems with a broader mix of autonomy levels. This may incorporating Robotic Operating System (ROS) based systems into our engineering testbed to enhance our system and explore capabilities including teaming.	• Software Development Skills (Python) • ROS skills • Ability to work in teams • Good verbal and written skills			X				X	
IEP ISD 09	Edinburgh, South Australia	**Probabilistic Inference Engines for Autonomous Systems: On-board Processing and Team Coordination Considerations**	The aim of this project is to explore the capabilities and applications of probabilistic inference engines in the context of adaptive knowledge bases for autonomous systems. The project will focus on two key aspects: on-board processing on lean computer systems and information supporting team coordination. By leveraging probabilistic reasoning techniques, the project aims to enhance the information assessment capabilities and team coordination efficiency of autonomous systems operating in complex and dynamic environments.	• Familiarity with robotic systems, research skills, experimentation skills, basic python programming, general IT systems knowledge • Ability to work in teams • Good writing and verbal skills.			X	X		X	X	
IEP ISD 10	Edinburgh, South Australia	**Balanced Classifier for Multiple-Class (>2) Classification**	A supervised learning method has been developed to enable projections of a multiple dimension feature space onto a lower dimensional subspace in a manner that balances the separation between classes in the subspace when there are multiple (>2) classes. The objectives of the project are: • Extend this dimensionality reduction method to produce a multiple-class classifier • Modify the original balanced method in various ways to furnish related algorithms • Explore the mathematical behaviour of the original algorithm in depth.	• **ESSENTIAL**: Expertise in machine learning in particular (especially supervised learning), and mathematics in general • **HIGHLY DESIRABLE:** MATLAB programming skills • Proficiency in other methods of artificial intelligence, such as unsupervised learning, deep learning, reinforcement learning, etc. • Programming skills in Python or other languages suitable for AI/ML • **DESIRABLE**: Good communication skills, including scientific report writing (you will be expected to contribute to writing journal papers, but will not be doing so alone).			X	X		X		
IEP ISD 11	Edinburgh, South Australia	**Machine Learning Application in Object Detection and Classification: Design of Large Models Using Small Models**	Application of Machine Learning in object detection and classification is one of the main focuses of the Information Sciences Division (ISD). A variety of Convolutional Neural Networks (CNNs) have been developed in ISD for this application. This project aims to improve the training time as well as the performance of the CNNs, focussing on the use of a smaller CNN model to train the initial weights for the required CNN models. This is similar to the invert problem of model compression, in which the weights of a small CNN (which takes less time to train) are employed as the initial starting point to train the required (large) CNN.	• **Essential:** Software Development Skills (Python) • General IT systems knowledge • Ability to work in teams • Good verbal and writing skills.			X	X		X		
IEP PD 01	Edinburgh, South Australia or Fishermans Bend, Victoria	**Flocking Control for a Swarm of Fixed Wing UAVs**	DSTG is conducting research into the use of swarms of fixed wing UAVs. Fixed wing UAVs are well suited to long range missions over open environments. This project will first seek to implement a state-of-the-art flocking controller on a swarm of fixed wing UAVs in a simulation environment. Once the controller has been thoroughly tested in simulation it will be implemented on a physical swarm of fixed wing Defence operated UAVs. Field trials will be conducted to ensure that the	• Software Development Skills (Python, C++). • Good mathematical skills • Ability to work in teams • Willingness to participate in field trials • Good verbal and writing skills.			X	X			X	

Project ID	Location	Project Title	Project description	Desirable Skills	AAENA	CRBFS	CSITSET	EEE	MS	MP	MMER	PSS
			controller is capable of collectively navigating the swarm of UAVs to a region of interest. Project activities will include: • Programming • Control-system implementation and testing • Experimentation on physical fixed wing Wanderer platforms • Data analysis • Report writing • Final placement presentation An article which will be submitted for publication will be written up in collaboration with the supervisor if the student demonstrates sufficient progress.This role will develop a deep understanding of swarming and UAV technology, which will set up an interesting set of career options.									
IEP PD 02	Fishermans Bend, Victoria	**Material State Sensing for Structural Assessment Under Extreme Environmental Conditions**	The successful applicant will be a significant contributor to a critical programme of research evaluating prototype fibre optic strain/temperature measuring capabilities for platform performance monitoring applications. Our team has successfully demonstrated use of this technology on high value maritime and aerospace platforms. As the successful applicant you will work with a supportive, multi-disciplinary team of DSTG scientists and have the opportunity to present and publish your work. Background: Optical fibre-based sensing systems present the opportunity to significantly reduce installation complexity and weight since strain sensing is distributed along a single optical fibre with a cross section approximating the dimensions of a human hair. These sensing systems are insensitive to EMI and fatigue, and are corrosion resistant and do not require ongoing calibration. In addition, the potential savings for full scale fatigue testing, where large numbers of strain gauges are required, is significant. Project Aim: Advance the use of this capability by evaluating the suitability of a recently developed fibre optic strain measuring capability on defence platforms. There is also an opportunity to evaluate fibre optic sensors for use in extreme environmental conditions.	• Knowledge in one or more of the following: ○ photonic sensors ○ materials science ○ physics ○ mechanical/materials/aerospace/electrical engineering and signal processing • Ability to work well in a team • Excellent verbal and written communication skills • Experimental record keeping • MatLab scripting & general IT systems knowledge • Willingness to participate in field trials.	X				X	X	X	
IEP PD 03	Fishermans Bend, Victoria	**Smartphone-Based Wave Measurement System**	As part of the Remote Undersea Surveillance StarShot, DSTG is researching the development of near real-time sea state estimation capabilities to enable a range of deployable autonomous systems to provide rapid in-situ sea state measurements for designated areas of interest. This project will involve the development of an Android smartphone app to acquire ocean wave measurement data from a Drone-based measurement system and execute required algorithms on-board the device to derive sea state statistical parameters for subsequent telemetry to shore-based operators. The project will require engagement with collaboration partners, entail broad interaction with a range of stakeholders and translate high quality scientific deliverables into Defence capability.	• **Essential**: Scientific programming and software development skills (Python/JAVA/MATLAB) • Research or professional scientific/engineering experience in aerospace/maritime/naval architecture (or related sciences) • Experience with air/sea platform dynamics, simulation, data analytics and visualisation.	X		X	X		X	X	
IEP PD 04	Fishermans Bend, Victoria	**Pressure Tolerant Battery Systems for Autonomous Underwater Vehicles**	DSTG is developing a new type of battery module that can be operated at depth in the ocean, balancing performance and buoyancy requirements for UAV applications. The project will focus on trialling numerous rechargeable cells in a range of pressure-tolerant potting architectures, designing creative housings that meet depth requirements, managing issues including heat, pressure cycling and cell arrangement to meet the required performance metrics.	• Electrochemistry (not essential) • Materials Science/Engineering • Ability to work in a team • Creative attitude to problem solving • General IT/Office skills				X	X			
IEP SED 01	Fishermans Bend, Victoria	**Miniaturised Real-Time Chemical Sensor Optimisation**	DSTG uses an anthropometrically correct, articulated manikin system within a controlled environment chamber to assess the performance of individual protective equipment against biological and chemical threats. DSTG has developed a miniaturised sensor system to transmit real-time data from under protective suits	• Chemical lab familiarity • Ability to work in teams • Good verbal and writing skills • Practical experimentation skills		X	X		X			

Project ID	Location	Project Title	Project description	Desirable Skills	AAENA	CRBFS	CSITSET	EEE	MS	MP	MIMER	PSS
			during the assessment, thus providing time-resolved and activity based information. This lightweight miniaturised, real-time sensing technology has been further developed to detect a range of chemical gas/vapour and aerosol targets for the detection of chemical agent simulants and toxic industrial chemicals utilising appropriate colorimetric chemistry. Working across the Chemical Biological Agent Protection and the Chemical Detection teams this project will investigate: • Colorimetric substrate optimisation appropriate to the sensor application, focussing on improved sensitivity and stability through the use of novel materials • Substrate development for additional analytes of interest • Benchmarking of sensors using the manikin system • Outdoor chemical plume tracking applications of the sensors The project is an opportunity for a student to work on a project with direct application in assessing individual protective equipment for Defence and first responder communities. There is also the opportunity to work on aligned projects looking at miniaturised chemical and bio-aerosol sensing systems relevant to real-world problems in chemical and biological detection.								
IEP SED 02	Fishermans Bend, Victoria	**Ricin Characterisation - Production of a Library of Purified Ricins for Hazard Assessment and Attribution**	Within the Sensors and Effectors Division at DSTG, the toxin ricin is of continued interest due to its potential to be used as a weapon of mass destruction. The objective of this project is generate a library of purified ricin from different castor bean varieties using laboratory protein purification strategies and characterise their primary structures using a combination of mass spectrometry and fluorescence to identify differences between ricin isolated from different sources. The toxicity of these ricin varieties will be determined to enable a correlation between ricin structure and toxicity to be established.	• Wet Chemistry • High Performance Liquid Chromatography • Understanding of Mass Spectrometry • Ability to work in teams • Attention to detail and process • Good verbal and writing skills		X	X					
IEP SED 03	Fishermans Bend, Victoria	**Identification of Microorganisms - Optimised Workflow for Trace Analysis**	Within the Sensors and Effectors Division at DSTG, there is an increasing need to identify microorganisms in a variety of environmental matrices. Some microorganism are potential biological warfare agents. The objective of this project is to establish a mass spectrometric capability for the identification of these microorganism including in trace amounts using model organisms. The successful candidate will receive training in the use of mass spectrometry for protein identification and related sample preparation procedures. The developed methods will be incorporated into the accredited Quality System at DSTG.	• Wet Chemistry • High Performance Liquid Chromatography • Understanding of peptide and protein chemistry • Attention to detail and process • Understanding of Mass Spectrometry • Ability to work in teams • Good verbal and writing skills		X	X					
IEP SED 04	Fishermans Bend, Victoria	**CBR Sensors Performance Assessment and Modelling**	Understanding of performance and dynamic response of CBRN detectors is required for their effective deployment in a contaminated environment. Testing of CBR sensors under well controlled dynamic test conditions simulating real-world environment can assist in providing currently limited information about their performance when used at different operational scenarios. The project will utilise recently developed Dynamic Sensor Testing and Evaluation Platform (D-STEP) and through combining experimental, analytical and modelling methods will provide better understanding of CBR sensors response and performance. Ultimately, this will support more effective application of CBRN monitoring and detection systems, providing DST clients with an enhanced situational awareness, protection and application of appropriate mitigation strategies minimising the risk posed airborne CBRN materials to personnel operating in a contaminated environment.	• Data analytical methods, Mathematical modelling (Physics, ML), Statistics, Programming skills (MatLab, Python), Engineering, Signal processing • Laboratory and experimental skills including data acquisition, processing and analysis • Ability to work in teams • Good communication skills.	X	X		X		X	X	
IEP SED 05	Fishermans Bend, Victoria	**Detection of Genetic Modification Using Novel Bioinformatic Tools**	In the age of genome modification, it is important to be able to identify and characterise the presence of genetic engineering attempts in bacteria. This can include insertion of additional genes, deletion of genes native to the species, and single nucleotide mutations. Such information will enable us to more accurately profile the microbial communities in biological samples.	• Bioinformatics • Computational science • Programming (e.g. bash, R, Python) essential • Microbiology • Genetics/genomics		X	X					

Project ID	Location	Project Title	Project description	Desirable Skills	AAENA	CRBFS	CSITSET	EEE	MS	MP	MMER	PSS
			The focus of this project will be using state-of-the-art bioinformatic tools to detect and characterise the presence of genetic engineering events, and discriminate these from naturally-occurring genetic variation. You will build on your existing computational skills to learn how to: i) generate synthetic DNA datasets *in silico* containing key bacterial species with and without genetic engineering; ii) use and evaluate the performance of state-of-the-art bioinformatic tools using the synthetic datasets; and iii) support and participate in an international forum with overseas counterparts/collaborators. This project will deliver into an international forum to improve current biodetection and biosurveillance capabilities to detect the misuse of genome editing, which can adversely affect public health, the economy, and national security.	• Scientific report writing skills • Ability to work in teams • Motivated & goal-focussed • Excellent verbal & written communication skills								
IEP SED 06	Fishermans Bend, Victoria	**Development of Novel Tools for the Assessment of Skin and Wound Decontamination Techniques**	In many cases, skin will be the only line of defence after exposure to toxic materials. Within the Chemical Biological Radiological Nuclear Defence team at DSTG, we provide science and technology advice in developing techniques for skin decontamination. Working within this context, you will develop novel test methods for the evaluation of materials and techniques effectiveness in skin decontamination. An aim of this work will be to replace existing methods involving excised skin with artificial skin simulants. The student will be fully supported to succeed by highly experienced chemists and will have access to state of the art instrumentation such as GCMS/LCMS and robotic sample preparation systems. This project will particularly suit those who are interested in developing skills in analytical chemistry and method development.	• **Essential**: General chemistry • General IT systems knowledge • Ability to work in teams • Good communication skills • **Desirable**: Analytical chemistry.		X						
IEP SED 07	Fishermans Bend, Victoria	**Developing a Hybrid Multizone Airflow and Contaminant Transport Model by Coupling High-Resolution Computational Fluid Dynamics (CFD) and Low-Resolution Well Mixed Models**	Multizone well-mixed models such as CONTAM and OpenModelica assume air momentum effects, contaminant concentrations and air temperature are uniformly and homogeneously distributed in a zone of a building. Conversely, a high-resolution CFD model is capable of modelling a complex system with high spatial and temporal resolution. However, this results in large datasets and a significant computational cost. Integrating a CFD model with a multizone well-mixed model to create a hybrid airflow and contaminant transport model will generate accurate results near the source location and reduce compute time, compared to a CFD simulation of the entire flow domain.	• Enrolment in software engineering or similar • Advanced coding skills in Python • Familiarity with co-simulation/hybrid • Ability to work self-sufficiently on assigned tasks as a part of a larger team			X					
IEP SED 08	Fishermans Bend, Victoria	**Predicting Human Health Effects Resulting from CBRN Incidents**	The CBRN Effects (CBRNfx) modelling team at DSTG is the sovereign capability for the assessment and prediction of chemical, biological, radiological and nuclear (CBRN) incidents. CBRN related casualties are typically computed by assuming the affected population is static and unresponsive for the duration of the incident. This assumption can be unrealistic as the exposed population may react to physical (e.g. odour threshold) or social (e.g. crowd evacuating) cues by taking protective actions. This project will explore a new human response model for investigating how humans are affected by, and react to, CBRN incidents. The objective of this project is to transform a prototype code previously developed into a working, usable tool, and to study the associated mathematical problem.	• Advanced programming skills (i.e. Python or similar) with experience in software development or software engineering • Mathematical modelling and numerical analysis of ODE systems (desired but not required) • Good problem solving skills, and written and verbal communication skills • Ability to work independently and in teams • Motivated and goal focused			X			X		
IEP SED 09	Edinburgh, South Australia	**Development of an HF Sounder Receiver Using Software Defined Radio**	This project will involve the development of an ionospheric sounder to probe the Earth's ionosphere using commercial off the shelf (COTS) software defined radio (SDR). The ionosphere is a weak plasma in the near-Earth space environment which supports propagation of high-frequency (HF) radio signals over long distances, enabling applications such as over-the-horizon radar and long-distance communications. The ionosphere also affects global navigation satellite systems (GNSS), such as GPS, by reducing position accuracy through scintillation of the trans-ionospheric signals caused by small scale disturbances and irregularities. Ionospheric sounders characterise the ionosphere by measuring the time delay of ionospherically propagated HF signals across a wide frequency range. Ionospheric sounder measurements are also important for investigating the physical processes which give	• **Essential**: Strong Physics and Mathematics skills • Software Development Skills (Python, Matlab) • Ability to work in teams • Willingness to participate in Field Trials • Good verbal and writing skills.			X	X		X		

Project ID	Location	Project Title	Project description	Desirable Skills	AAENA	CRBFS	CSITSET	EEE	MS	MP	MIMER	PSS
			rise to ionospheric disturbances, wave phenomena and other physics. SDRs provides the potential for development of low-cost, easily deployable ionospheric sounder receivers. This may provide an economical means for increasing the number of deployable ionospheric sounder receivers, increasing the spatial and temporal fidelity of the ionospheric models and giving greater physical insight and understanding of ionospheric disturbance processes. This may also provide the ability to field ionospheric sounders in offshore locations, such as those supporting Anti-Access/Area Denial operations, without the need to deploy sensitive technology components used in onshore Australian sounders.									
IEP SED 10	Edinburgh, South Australia	**Assessment of Models of Wind-Wave Spectra for the Calculation of Sea Backscatter of Radio Waves in the High Frequency (HF) Band**	The Jindalee Operational Radar Network (JORN) is a network of over-the-horizon (OTH) radars operated by the Royal Australian Air Force (RAAF) to monitor the air-sea gap to the north of Australia. JORN exploits the Earth's ionosphere to propagate radio waves in the high frequency (HF) band to long distances (1000-3000km) beyond the horizon. Backscatter sounders are environmental radars which measure the ground backscatter to help determine the best operational parameters for JORN to meet its tasked mission. However, strong backscatter may be due to good ionospheric propagation conditions, ground with a high backscatter coefficient, or a combination of both. To fully understand the problem, it is necessary to understand the backscatter properties of the surface. This project will build on existing work by assessing various models of ocean wind-wave spectra for the calculation of sea backscatter of HF radio waves.	• **Essential**: Strong Physics and Mathematics skills • Software Development Skills (Matlab) • Ability to work in teams • Willingness to participate in Field Trials • Good verbal and writing skills.						X		
IEP SED 11	Edinburgh, South Australia	**Calibration of High Frequency (HF) Radio Wave Directional Noise Models**	Accurate models of the high frequency (HF) radio wave directional noise field are important to assess and predict the performance of radio systems that operate in the HF band. One such class of system is over-the-horizon (OTH) radar, such as Australia's Jindalee Operational Radar Network (JORN). JORN is a state-of-the-art OTH radar network operated by the Royal Australian Airforce (RAAF) to monitor the air-sea gap to the north of Australia. HF radio wave noise originates from both terrestrial and extra-terrestrial sources with the former propagating into HF systems over vast distances beyond the horizon via the Earth's ionosphere. DST Group has developed a sophisticated model of the directional HF noise by careful consideration of the ionospheric propagation conditions. The ionosphere is the key determinant governing how HF noise from both terrestrial and extra-terrestrial sources propagates to HF radio systems. Recently, DST Group has developed a new model of the climatology of the ionosphere which improves upon the current "industry standard" International Reference Ionosphere (IRI). This project will involve the calibration and validation of DSTG's directional HF radio wave noise model using our improved understanding of the climatology of the ionosphere.	• **Essential**: Strong Physics and Mathematics skills • Software Development Skills (Matlab) • Ability to work in teams • Willingness to participate in Field Trials • Good verbal and writing skills.						X		
IEP SED 12	Edinburgh, South Australia	**Design and Prototyping of Bandpass Filter for S-Band Radar Applications**	Design S-band band pass filter using RF modelling and simulation tools, Manufacture the filter, and Test the manufactured filter. Verify the design against test results. Participate in other activities organised by the radar team (experiments, trials, etc.). Deliver a report on the developed prototype, and present the results to the team. Working in an R&D environment, Learning RF modelling and simulation tools, hands on experience for prototyping RF component in the lab, testing the prototype and verify against requirements. Develop skills in RF test equipment, including the use of Network Analyser, Spectrum Analyser etc.	• Knowledge on RF simulation tools. • Knowledge in RF Engineering • Ability to work in teams • Collaborate with different teams • Good verbal and writing skills.				X				
IEP SED 13	Edinburgh, South Australia	**Validation of 3D Printed Scaled Models for Acoustic Data Collection**	Detailed and accurate understanding of the acoustic echo response of complex objects can aid in the detection and classification of underwater objects, as the echo structure contains the intrinsic information about the target. The Sensors and Effectors Division at DSTG Edinburgh maintains a facility to measure and exploit features of the echoes of various underwater objects. ***6 month project preferred.***	• **Essential:** Software Development Skills (MATLAB) • General IT systems knowledge • Data collection and analysis • Laboratory and Measurement Systems • Ability to work in teams			X	X			X	

Project ID	Location	Project Title	Project description	Desirable Skills	AAENA	CRBFS	CSITSET	EEE	MS	MP	MMER	PSS
			This project will study, through measurements and data analysis, the acoustic properties of 3D printed model objects in comparison with conventionally fabricated models. By the end of the project the student will have gained a good understanding of target physics, acoustic signal processing, underwater acoustic technology and developed on existing skills in high level language programming.	• Willingness to participate in Laboratory Measurements and Field Trials • Good verbal and writing skills.								
IEP SED 14	Edinburgh, South Australia	**Evaluation and Design of Instrumentation for Remote Operation of Pan-Tilt Table.**	Within the Sensors and Effectors Division at DSTG, Guided Weapons Performance Analysis Multi-sensor data fusion team is conducting field experiments using a set of sensors to characterise the visual and infrared properties of objects and backgrounds.	• **Essential:** Software Development Skills (Python) • General IT systems knowledge • Embedded Systems • Ability to work in teams • Willingness to participate in Field Trials • Good verbal and writing skills.	X		X	X			X	
IEP SED 15	Edinburgh, South Australia	**Image-Based Navigation and Tracking for Unmanned Systems.**	Within the Sensors and Effectors Division at DSTG Guided Weapons Analysis Multi-sensor data fusion team is developing an environment for synthetic representation of EO sensors and processing of detection and identification algorithms with a realistic synthetic input. The project is focused on development and implementation of algorithms for system evaluation.	• **Essential**: Software Development Skills (Python) • Ability to work in teams.	X		X	X			X	