Division	MSTC	STC	Location	Project Title	Project description (provide a brief description of the project that can be used to advertise the project and give students an understanding)	Desirable Skills	Aerospace / Aeronautical Engineering, Naval Architecture Stream	Chemical, Radiological, Biological, Food Sciences Stream	Computer Sciences, IT, Software Engineering, Telecommunications Stream	Electronic / Electrical Engineering Stream	Materials Science Stream	Mathematics and Physics Stream	Mechanical and Mechatronic Engineering (including Robotics) Stream	Psychology and Social Sciences Stream	Other related areas
Aerospace Division	Aerospace Combat Performance	Flight Mechanics	Fishermans Bend, Victoria	Application of Conceptual Design to New and Novel Configurations	There are a range of conceptual design tools and techniques available for the development of new aerospace designs. This project will investigate the applicability of these tools and techniques to new and novel configurations. A range of novel configurations may be investigated through the conceptual design process, such as high-altitude pseudo-satellites and loyal wingman/teaming air vehicles. Depending on any limitations or shortcomings identified, the project may investigate certain aspects of the system design through more detailed preliminary and detailed design techniques as necessary.	--> Successful completion (by the commencement of the placement) of the following subjects to third year engineering level is highly desirable: preliminary aircraft design, aircraft performance, aerodynamics, propulsion. --> Computational programming skills, Matlab, C or C++, Python, etc., are highly desirable --> Excellent communication skills --> Ability to work independently and integrate into a small team	X								
Aerospace Division	Aerospace Materials	Material State Awareness	Fishermans Bend, Victoria	Vibration Energy Harvesting for Air Vehicles	The successful IEP applicant will be expected to be a significant contributor to a programme of research investigating potential diagnostic health monitoring systems for use on Australian Defence Force air vehicles. In particular, the successful applicant will be involved in the development of techniques for parasitic energy harvesting from vibrating aircraft structures. These energy harvesting devices should be capable of harvesting power from aircraft vibrations using novel piezoelectric materials, with the goal of powering for example Condition Based Maintenance devices for material state awareness. Tasks include mechanical and electronic design, code/script development, model development, and experimental validation. The experimental studies will require taking measurements under laboratory conditions and then analysing the data where necessary and reporting on the findings. The applicant can expect to develop various specific skills during the 12 month posting e.g. MatlabTM scripting may be used for COMSOLTM finite element multiphysics modelling. MatlabTM and/or PythonTM may also be used for automation of various laboratory tests. SolidworksTM may be used for the development of mechanical design ideas for 3D printing of devices. The applicant may be exposed to C, C++, required for low power embedded microcontrollers, and high power Digital Signal Processing. Additionally, the applicant has the option of developing their technical communication skills by presenting their research findings at an Australian scientific/engineering conference.	An interest and skills in one or more of the following: physics, mathematics, materials science, energy and power, sensors, script development, mechanical/materials/aerospace/materials engineering.	X			X	X	X	X		Aerospace and mechanical engineering, electronics engineering, mechatronics, materials engineering, physics, mathematics and computer science. Strong academic results throughout undergraduate degree.
Aerospace Division	Aerospace Materials	Material State Awareness	Fishermans Bend, Victoria	Robotic Inspection of Composite Aerospace Platforms	The successful IEP applicant will contribute to the development and testing of a new technology for ground and aerial based robotic inspection of advanced composite based aerospace structures. This is a multidisciplinary project which brings together concepts in robotics and mechatronics, with materials science and advanced multi-spectral sensing to create a new capability for rapid diagnostic inspection of critical aerospace components, including wings and control surfaces. As the successful applicant you will work in a supportive team environment with a diverse and multi-skilled group of DST scientists on the development and testing of ground and aerial robots, the integration of advanced visual and IR imaging sensor systems and associated software, and in the test and evaluation of these robotic systems on full scale aircraft components. This project will appeal to students with interests in one or more of the following: robotics, mechatronics, advanced sensors, programming, and materials science. Through your involvement you will acquire new skills in a range of advanced experimental and computational tools and methods, an exposure to cutting edge R&D, and an opportunity to hone your communication skills by contributing to publications and presentations stemming from your work.	An interest and skills in one or more of the following: robotics, mechatronics, sensors, programming and software development and materials science.	X		X	X		X	X		
Aerospace Division	Aerospace Materials	Material State Awareness	Fishermans Bend, Victoria	Advanced Structural Assessment of an Aerospace Platform using Fibre Optic Strain Sensing	The successful IEP applicant will be expected to be a significant contributor to a critical program of research investigating a new fibre optic strain sensing technology for structural assessment of an aerospace platform. Current electrical strain gauge technologies are time consuming to install and for high density strain surveys can add considerable weight to the structure under test due to the associated wiring. These gauges are also prone to fatigue and require continual calibration when installed on operational aircraft. 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, fatigue, 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. This project will evaluate the suitability of a recently developed fibre optic strain sensing system for application to Australian Defence platforms.	An interest and skills in one or more of the following: photonic sensors, materials science, physics and mechanical/materials/aerospace engineering.	X				X	X			
Aerospace Division	Aerospace Materials	Material State Awareness	Fishermans Bend, Victoria	Data Fusion for Material State Awareness	The successful IEP applicant will contribute to the development of a new capability in real-time data fusion and 3D visualisation of material state awareness data obtained using novel multi-spectral sensors to support improved availability, sustainability and survivability of high value aerospace platforms. The successful applicant will be involved in the development of data fusion and imaging from existing sensing capabilities. As the successful applicant you will work in a supportive team environment with DST scientists and industry representatives on the development and testing of this capability. While the project is broad in scope it would appeal most to those with an interest in one or more of the following: image processing and manipulation, data analytics, big data, advanced sensors, and programming. Through your involvement you will acquire new skills in a range of advanced experimental and computational tools and methods, an exposure to cutting edge R&D and an opportunity to hone your communication skills by contributing to publications and presentations stemming from your work.	An interest and skills in one or more of the following: data fusion, image processing and manipulation, data analytics, big data, advanced sensors, software development and programming.	X		X	X		X	X		photonic sensors, materials science, physics and mechanical/materials/aerospace engineering.
Aerospace Division	Aerospace Materials	Structural Materials and Forensics	Fishermans Bend, Victoria	Forensic Engineering Investigations of Australian Defence Force Aerospace Components and Systems, and Additive Manufacturing research	This project involves investigating failures of components and systems from Defence platforms which will contribute to the enduring Forensic Engineering and Accident Investigation capability. The position is a unique opportunity to be working with Engineers and Scientists in priority incident investigations associated with military aircraft components and systems. The placement will also expose the student to current research in Additive Manufacturing. Throughout this placement, a broad range of laboratory, forensic and research skills will be developed, exposure to military aircraft and components, assisting in writing investigation reports and research papers, and interacting with military clients	Skills in the use of scientific laboratory equipment including optical and scanning electron microscope and metallography Familiar with materials assessment. Familiar with fracture surface interpretation. Excellent computer, verbal and written communications skills and the ability to work in teams are required to undertake this project.	X				X				
Aerospace Division	Aerospace Platform Systems	Propulsion, Power & Energy	Fishermans Bend, Victoria	Propulsion and Power Systems for Manoeuvrable small satellites	Using modelling the student will explore the small design space to find combinations power and propulsion systems that enable debris avoidance. There will also be opportunity to experiment on electric thrusters and measure their performance.	Physics, Electronic, Electrical, Mechanical or Aerospace Engineering. Good Modelling skills. Knowledge of vacuum systems, plasmas, solar cells or battery technology desirable.									
Aerospace Division	Aerospace Platform Systems	Propulsion, Power & Energy	Fishermans Bend, Victoria	Stochastic Microstructural Damage accumulation model for metallic components used in aero-propulsion components - investigating the numerical and analytical solution to stochastic partial differential equations	The student will be developing microstructural stochastic models for damage accumulation in metallic components use aero-propulsion systems. Mathematically, the project requires understanding how to microstructural evolution can be formulated as a stochastic partial differential equation (SPDE), which defines the local variation of the microstructural damage and the diffusion subjected to stochastic variation of local stresses. The solution of the SPDEs is a very challenging area of current mathematical research (e.g. 2014 Field Medal). The IEP student will explore both analytical and numerical methods for solving SPDEs and related it back to the condense matter physics that describes microstructural damage accumulation. This work will extend work of the current IEP student, which concentrates on damage accumulation at the mesoscale. Also the project has wider application in that SPDEs define a class of stochastic reaction-diffusion equations related to swarming, chemical reaction, and combustion reactions etc. So understanding the solution of these equations will also have wider application to similar problems defined by the same mathematics. Here it's important to make the distinction between the deterministic diffusion-reaction equations, which are well understood, compared to stochastic diffusion-reaction equations, which aren't well understood and are a subject of current mathematical research. A possible approach to solving these equation would involve physics constrained Machine Learning/AI.	Physics and Mathematics									
Aerospace Division	Aerospace Platform Systems	Propulsion, Power & Energy	Fishermans Bend, Victoria	Dynamic Characterisation of a representative research blisk with effects of damage, blending and repairs using acoustic travelling wave excitation system	This project will assess the effects of FOD, blending and repair on a representative research blisk widely used in modern gas turbine engines. The DST in-house developed acoustic travelling wave excitation system will be used for vibration excitations while a laser vibrometer will be used to measure dynamic behaviour of the blisk under various conditions. Also there are opportunities for the successful candidate to learn FE modelling techniques and dynamic analysis methods.	Mechanical and Aerospace Engineering	X								

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Aerospace Division	Aerospace Platform Systems	Structures, Loads & Aeroelasticity	Fishermans Bend, Victoria	Damage Accumulation in Aerospace Composite Structures	This project will investigate how damage in aerospace composite structures impacts the Aircraft Structural Integrity and management of the platform in service. This program will involve the design, test and analysis of composite structural elements for evaluation of likely in-service damage and its impact on residual strength and durability of the structure. This student will work closely with the Aerospace Composites Structures team in supporting large composite structures research activities on current and future composite aircraft in the RAAF Fleet.	Studying Aerospace/Mechanical Engineering (single or double) degree. Understanding and interest in Aircraft Structures and Composite Material systems. Ability to work in a Team Environment as well as proactive with an ability to take individual responsibility for work outcomes. Interest in practical and hands on activities, including the potential manufacture and testing of composite structure. Finite Element Analysis (using Abaqus) is desirable.	X				X				
Aerospace Division	Aircraft Combat Performance	Aerial Autonomy	Edinburgh, South Australia	Aerial Swarming for Radiological Threat Detection and HADR Response	Autonomous Uninhabited Aerial Systems (UASs) can assist with much of the dull, dirty and dangerous work faced by military personnel. Swarms of such platforms could further increase the efficiency, mass and effect of a single platform. As part of the Aerial Autonomy group, the successful IEP applicant will contribute to several 'machines-first' projects such as the detection of radiological threats, and Humanitarian Assistance and Disaster Relief (HADR) response. Research components of the role include designing heuristic and/or machine learning-based multi-agent swarm algorithms for cooperative surveillance, communication and environmental sensing. Technical aspects of the role may include building, programming and experimentation with small rotary and fixed-wing UAS. Experiments may take place onsite at DST Edinburgh or at other experimental test ranges such as the Woomera Test Range. The applicant will have skills in software development and a familiarity with the Python scripting language and the Linux (Ubuntu) environment. Previous experience with robotics, UAS and workshop skills such as 3D printing are desirable but can be developed through on-the-job training. The role will provide the successful applicant with opportunities to develop their written and oral presentation skills through presentations at technical meetings, forums and academic conferences. The successful applicant must have excellent interpersonal skills, and the ability to work independently in the office and from home. While part-time applicants will be considered, full-time applicants will be given priority. In their applications, applicants should draw upon their study and extracurricular activities to describe their involvement in similar projects e.g. robotics projects, algorithm and software implementation projects, etc.	• Experience in the Python scripting language and familiarity with Linux (Ubuntu). • Software development, computer science and robotics. • Knowledge or interest in swarm algorithms and/or machine learning. • Strong academic results and the ability to work independently and as a team.			X	X			X		
Aerospace Division	Aircraft Combat Performance	Aerial Autonomy	Edinburgh, South Australia	Precision sensor emplacement from small UAS into compromised and denied environments	Uninhabited Aerial Systems (UAS) are being used increasingly to perform risky work that would otherwise need to be conducted by humans. This includes the placement of early warning sensors into dangerous environments, and delivery of resources to locations that are inhospitable or contaminated following a natural disaster or other major event. The successful applicant would work on both hardware and software aspects of a sensor delivery system. The project will involve developing software techniques to optimise release point calculation for the payload, including influencing UAS behaviour to enable planning and following of the optimal flight-path to the destination. Software solutions will be tested in both simulation and flight-test environments. To accommodate flight-test aspects of the project, the student will design and integrate novel payload delivery mounts onto fixed wing and multi-rotor UAS, using CAD software and rapid manufacturing techniques such as 3D printing. This position is suited to someone undertaking studies in Mechatronics, Electronics and Robotics fields, and with an interest in developing both their software and hardware integration skills. The incumbent will be required to participate in outdoor flight tests to demonstrate and refine their work, and will develop their written and oral presentation skills throughout the placement by participating in technical presentations and the DSTG student conference.	• Software development and robotics. • Experience in Python, C++ programing languages. • Experience in CAD and rapid-prototyping techniques. • Strong academic results and the ability to work independently and as a team.			X	X			X		
Aerospace Division	Aircraft Combat Performance	Aerial Autonomy	Edinburgh, South Australia preferred but can also be Fishermans Bend, Victoria	Developing Nano/Micro scale drones as an early warning threat detection system in compromised environments using biologically inspired approaches.	The use of drones (or Unmanned Aerial Systems – UAS) in a warfighting environment is becoming increasing prevalent. However, the warfighting environment is a complex and ever changing one, and UASs need to evolve to not only have resilience in these environments but be able to perform increasingly diverse and sophisticated mission sets, singularly or as a team. This body of work focusses on developing a Nano/Micro scale UAS capability for operating in a Chemical, Biological, Radiological and Nuclear (CBRN) threat environment with the purpose of keeping our warfighter safe and enhancing troop movement. We will explore the use of biologically-inspired approaches for designing control systems and mission behaviour. This research activity will focus on: • Adaptive CBRN threat detection and localisation • Enhancing human-machine cooperative behaviour for navigating CBRN environments • Improving the resilience of Nano/Micro systems operating in complex environments The successful applicant will be responsible for supporting the design of novel UASs, integration of biologically-inspired behaviours onto Nano/Micro scale drones, flight testing and re-iterating. One of the objectives will be a flight demonstration relevant to the current strategic thrusts.	• Software development and robotics. • Knowledge or interest in machine learning and evolutionary algorithms. • Strong academic results and the ability to work independently and as a team.	X		X	X			X		
Aerospace Division	Aircraft Combat Performance	Aerial Autonomy	Fishermans Bend, Victoria	UAS Profiling based early threat warning system	The increase in the use of UAS in modern warfare has seen Commercial Off-The Shelf systems being adopted by adversaries to conduct roles such as Surveillance and Reconnaissance (SAR), drone strikes, munition delivery and electronic attack to name a few. This research program aims to investigate technology and systems that can be used to generate an early warning to detect, inform about and deter the possible threats during surveillance. Embedded in the Aerial Autonomy group, the successful IEP candidate will work hands-on, on a project using acoustics, visible and IR sensors to detect, localise and track a target COTS multirotor UAS. The initial detection of the target UAS will be accomplished by obtaining a relative bearing of the target UAS using acoustic sensors on-board an observing UAS. Once the field of view for the target UAS is established, its motion will be continuously tracked using the visual and IR sensors on-board the observing UAS. This information will be used to build the profile of the target UAS which will inform the observing UAS of its malicious intent, if any and correspondingly issue an early threat warning to the end user. The skill set required for this IEP position would suit a candidate undertaking study in Robotics, Electronics or Mechatronics Engineering disciplines. The work package for the IEP candidate will involve the following tasks: • Target localisation using acoustic sensors: The acoustic component of this task would involve using an array of microphones mounted on an observing UAS in an environment with no self-noise or background noise to detect and find the bearing of the target UAS. Once this is accomplished, the next stage would be to obtain the bearing of the target UAS in the presence of self-noise generated from the observing UAS. • Fusing sensor data to build UAS Profile: Continuous tracking of the UAS will involve capturing its movement patterns using the visual and IR sensor components. Fusion of these sensor streams is required to be able to track the target UAS, given the environmental obstructions and varying weather conditions. In some conditions, the visible spectrum may provide a better solution to that of the IR spectrum and vice versa. For this reason, we require the fusion of the data outputs to establish a better detection and tracking accuracy.	Interest in sensors and integration - Acoustiv, Visible and IR Signal Processing Electronics and soldering Software development Experimental setup, testing and data collection written and verbal communication skills Ability to work in a team and contribute to project deliverables			X	X			X		

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Aerospace Division	Aerospace Combat Performance	Flight Mechanics	Fishermans Bend, Victoria	Fixed wing UAS launch and recovery modelling for complex aerodynamic environments	UAS are expected to operate in complex turbulent environments, particularly for launch and recovery phases. This project will : * Investigate the requirements on the Flight Mechanics groups AMIEL flight modelling software/framework for the effective modelling of embarked fixed wing UAS. * Use existing flight models within Flight mechanics and look to adapt these models for integration into complex turbulent environments, such as the groups airflow models of Naval aviation decks. * The project will stretch the student in flight dynamic modelling and software development.	--> Successful completion (by the commencement of the placement) of the following subjects to third year engineering level is highly desirable: preliminary aircraft design, aircraft performance, aerodynamics, propulsion. --> Computational programming skills, Matlab, C or C++, Python, etc., are highly desirable --> Excellent communication skills --> Ability to work independently and integrate into a small team									
Aerospace Division	Aerospace Materials	Multifunctional Composites	Fishermans Bend, Victoria	Developing Improved Processes to enable out-of-autoclave processing of high temperature composite materials used in 5th Generation Composite Airframes	The IEP student will continue the work from the previous year in which vacuum consolidation techniques were being optimised for thick section composite structure used on 5th generation composite air frames. In this stage of the work 100+ plies of composites will be prepared and novel repair techniques will be examined to enable depot level maintenance processes to be developed for critical airframe locations.	The candidate should have an interest in materials in general and preferably composite materials, with experience in FEA and CAD a benefit to assist in designing and interpreting experiments and programming equipment required in the composite manufacturing.	X				X		X		
Aerospace Division	Aerospace Platform Systems	Structural Concepts	Fishermans Bend, Victoria	Augmented Reality Graphic User Interface Development & Evaluation for Aircraft Maintenance	The primary objective for this IEP student shall be to continue development of a graphical user interface (GUI) using HoloLens 2 to optimise the user experience with innovative technologies associated with the hardware (e.g.. Gesture control, eye tracking, voice recognition and controls etc.). The aim of the student shall be to build functionality and useability into a user interface in the HoloLens environment to enable a user to; interact with aircraft data contained in a Neo4J graph database; visually overlay that data onto a 3D model of a real aircraft (on the ground) in the field of view of the user. The GUI shall enhance the end user understanding of the real environment and allow the user to create new data that is then stored back into the graph database. This activity will build upon work already underway at DST, and will be an important part of AD research efforts in the field of Mixed Reality (MR) and Human Machine Interfaces (HMIs).	The candidate should have a good understanding and interest in the following technical disciplines: GUI design with Augmented Reality systems including human factors experience, data fusion and visualisation techniques, programming for Unity, Unreal Engine, SQL. Excellent verbal and written communication skills are required to undertake this project.	X		X					X	
Aerospace Division	Aerospace Platform Systems	Structures and Materials Experimentation	Fishermans Bend, Victoria	HAFT-TD Test Interpretation/Data Analysis and Structural Engineering Reporting	DSTG's Aerospace Division is undertaking an ambitious S&T demonstrator project to investigate the feasibility of conducting a viable* full-scale fatigue test on a helicopter airframe. Known as the Helicopter Advanced Fatigue Test – Technology Demonstrator (HAFT-TD) program, DSTG have been focussed on various research streams to develop the major technologies required for the demonstration phase; these being the derivation of laboratory test loads from flight data, manipulation of test loading spectra to reduce the number of applied load lines, development of a multi-axial control system for high-speed loading, and the design and manufacture of custom built test rig and associated systems. All of these streams are scheduled to converge in 2022 in what will be one of the most complex and challenging large scale structural test programs performed in DSTG's 80 year history. The demonstration phase will generate a huge quantity of raw data (e.g. control system information and strain sensor measurements) which will require interpretation to assess predicted and applied versus measured outcomes. Additionally, other aspects of the testing such as structural degradation and any modifications will also require to be analysed and reported, and practical hands on work to support maintenance and inspection activities may also be required. The ideal candidate is expected to be an Aerospace, Mechanical or Control Systems Engineer interested in either structural testing of military platforms, complex test control systems and/or data analysis/big data. Favourable consideration will be given to candidates who possess strong numerical analysis skills, practical knowhow, flexibility to contribute to different tasks and be an excellent communicator. (* viable = technologies required to run a meaningful test for 2.5 years of running time).	* Experience with coding and numerical analysis software (e.g. R / Python / Matlab) * Excellent written and verbal communication skills * Ability to work as part of a diverse team, in a laboratory and office environment * An interest in using both analytical/digital and practical/hands on skills * A keen interest in aircraft structures and/or testing * A keen interest in Defence aerospace research with a customer outlook									
Aerospace Division	Aircraft Combat Performance	Aerial Autonomy	Edinburgh, South Australia	Machine Cognition for Uninhabited Aerial System	Accompanying the increasing pervasiveness of autonomous systems in our lives is the need to instil in these systems advanced reasoning and intelligence capabilities; so that they may operate with greater autonomy, resilience, and effectiveness in the real world. DSTG is developing advanced machine cognition capabilities that enable aerial autonomous systems to conduct complex search and threat identification missions in dynamic, unpredictable environments. The successful IEP applicant will be a significant contributor to this research program. The applicant will help develop and evaluate novel Machine Learning algorithms that provide an autonomous system with an advanced and adaptive decision-making capability. The successful applicant will also undertake technical work integrating sensors and other hardware onto aerial platforms and conduct real-world experiments with these platforms to verify the efficacy of the Machine Learning algorithms. The specific objectives of this project are: 1. Validation of machine learning algorithms that enable an autonomous system to intelligently choose navigation techniques. 2. Development of robotic platforms, including the development and installation of new sensors onto robotic platforms. 3. Experimentation on robotic vehicles in an indoor robotics lab to validate algorithms including data collection, analysis and reporting. 4. Cyclic upgrading of the algorithm through development, simulation and physical experimentation.	Software development, computer science and robotics. Experience in the Python and/or C++ programming languages Strong academic results and the ability to work independently and as team.	X		X	X		X	X		
Aerospace Division	Aircraft Combat Performance	Aerial Autonomy	Fishermans Bend, Victoria	Autonomous Vehicles Operating in Complex Environments (2 positions)	The Defence Science and Technology (DST) Group is conducting research on the use of autonomous aircraft and ground robots in urban terrain, including indoor environments. The research has the goal of developing machine-cognition technologies and them demonstrating in conjunction with new sensing to enable missions for intelligence, surveillance, and reconnaissance; contaminant-source localisation and tracking; and humanitarian assistance and disaster relief in complex, congested, and potentially contested environments. Two students are sought to assist with simulation-based and laboratory testing of autonomous search and mapping algorithms, robotic teaming, etc. The students will work directly with DST Group staff to carry out the laboratory components of this project and will work largely independently to carry out its non-laboratory components. The project activities will require the students: 1. To design and build robotic systems capable of operating in the challenging conditions of an urban environment 2. To create simulations of robotic systems performing exploratory and search missions 3. To demonstrate the resulting systems in representative indoor and outdoor trials facilities Activities will include: 1. Programming (e.g., in C++, ROS, and MATLAB) 2. Control-system development and testing 3. Electro-mechanical design 4. Laboratory experimentation 5. Data analysis 6. Report writing 7. Final placement presentation	• Software development, computer science and robotics. • Strong academic results and the ability to work independently and as a team.			X	X			X		
Cyber & Electronic Warfare Division	Cyberwarfare Operations	Cognitive Cyber Security	Edinburgh, South Australia	Statistical models for autonomous cybersecurity	In this project, the student will do statistical analysis of penetration testing experiments. This will be used to develop probabilistic models for use in the simulation of autonomous cyber defence systems.	Software development skills and knowledge of the Python language. Experience with, or an interest in, data science and cybersecurity. An ability to work in teams.			X						
Cyber & Electronic Warfare Division	Cyberwarfare Operations	Program Analysis Cell	University of Queensland	Program Analysis for Information Flow Security	This project will involve working in a collaborative environment with the aim to build an automated tool for information flow security analysis on assembly code. A number of tasks in this context are suitable for the project and can be shaped according to interest of the candidate.	General software development skills			X						
Cyber & Electronic Warfare Division	Cyberwarfare Operations	Program Analysis Cell	University of Queensland	Formalisation of mircoarchitectural vulnerabilities	This project will involve developing a theoretical model of the micro-operational level within modern processors, in order to explore known and potential security vulnerabilities via simulation.	Sound understanding of discrete maths, specifically set theory and predicate logic			X			X			

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Cyber and Electronic Warfare Division	Cyberwarfare Operations	Counter Cyber Threats	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 will study the effects of AML techniques in an application domain with relevance to Defence. Contribution to the creation of tools to test and evaluate existing approaches, 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						
Cyber and Electronic Warfare Division	Electronic Warfare Operations	Electro-Optic Electronic Warfare	Edinburgh, South Australia	Sim Chair	Project Background: The Virtual Proving Ground (VPG) is a high-fidelity simulation environment used to both develop experimental Electro-Optical (EO) systems and validate operational EO sensor responses in combat environments. The signatures produced by the simulation are derived from real-world collected data for threats, platforms and countermeasures to provide realistic representations of what a vehicle-mounted sensor system can expect to see in the field. To control a vehicle in the simulation we currently use a steering wheel/keyboard combination, while another operator controls simulation settings/configurations at a different terminal. This project would be the design and realisation of a vehicle control interface that physically represents the upcoming Redback/Lynx L400 Infantry Fighting Vehicle. Project Details: The Vehicle Control Interface (VCI) would be composed of multiple panels, buttons and displays set out in a representative way that would mimic the experience of a real world driver. This hardware can either be off-the-shelf or custom made/integrated, which will communicate with a custom-built oversight master controller (micro-controller with PCB or single-board-computer). The VCI should act as a single USB or Ethernet device that communicates with windows. If you've ever wanted to design and build your own flight-sim controller, but instead for a modern military land vehicle, then this is the project for you. This role may also include participation in land trials to collect data for the simulation, and participation in development workshops and in related test activities.	Required Skillset: -->Experience in electronics, micro controllers and/or Arduino. Beneficial Skillset: -->Experience in PCB layout software (Altium) and SolidworksTM/3D printing.				X			X		
Intelligence, Surveillance & Space Division	Integrated Intelligence Surveillance and Reconnaissance	High Frequency Systems	Edinburgh, South Australia	Monitoring and calibration of High Power	Monitoring and calibration of High Power HF transmit systems are crucial to reliable and predictable operation. Continuous monitoring of waveform performance and transmit power levels are fundamental metrics currently employed. To facilitate such an online monitoring and control system calibration of the monitoring system must be periodically performed. Automation of this process is a key ingredient and therefor a controllable high accuracy and reliability calibration system must be employed. This project seeks to use Ethernet controlled RF switching and signal distribution hardware to implement the above mentioned monitoring calibration system.	Microcontroller design, printed circuit board design, power amplification				X					
Intelligence, Surveillance & Space Division	Integrated Intelligence Surveillance and Reconnaissance	High Frequency Systems	Edinburgh, South Australia		Ionosondes are sounder instruments which determine the state of the ionosphere, the ionised-plasma atmospheric boundary with Space above 90km altitude, by measuring the time delay of high-frequency (HF) radio signals refracted through it, across a wide frequency range. Adding direction of arrival to the set of parameters that these sounders measure can improve their ability to measure various ionospheric phenomena. However the usual interferometry method of measuring direction of arrival requires a physically large array (on the order of 100 m or more in length) to produce precise measurements. This project seeks to investigate the use of an alternate approach to measuring direction of arrival using polarimetric "vector-sensing" receive antenna system, consisting of co-located orthogonal dipole and loop antennas. The proposed project involves experiment planning and participation, including data collection and presentation of analysis results to project team and wider HFR team	Experimental data analysis, software development, and development of electronic components (antenna, circuitry)				X		X			
Intelligence, Surveillance & Space Division	Integrated Intelligence Surveillance and Reconnaissance	ISR Information Systems	Edinburgh, South Australia	Edge Computing for ISR Integration	ISR sensors collect vast amounts of data which cannot be transmitted from the ground stations to the centralised Processing, Exploitation and Dissemination (PED) cells in a timely fashion. Cloud computing addresses some of this issues, however due to the nature of ADF operations, it is not feasible to have cloud based compute at the "edge" (remote locations, theatre of operation). Edge Computing is a model in which computing and storage move closer to the data source. Edge computing enables real-time and instant data processing. Pushing compute to the edge achieves reduction in latency, traffic, bandwidth, geographic distance, energy and power, enabling the transmission of only the relevant intelligence necessary to achieve decision superiority. Defence needs to define strategies for "Serverless" application development. Serverless enables us to build applications and services without thinking about the underlying servers. Serverless is an architectural movement to increase agility, in short it is an abstraction. Serverless enables the abstraction of the details of the underlying machine to enable a model in which pure application code is sent to the compute, be it the cloud or edge compute. This project will study the necessary networking, infrastructure, security and strategies for application code to be seamlessly deployed from the cloud to the edge and back to address the ISR data deluge.	- General software development skills, scripting, source control configuration management - Experience in coding with Java/C++ and Python languages, - Familiarity with cloud native development - Ability to work in teams			X						
Intelligence, Surveillance & Space Division	Integrated Intelligence Surveillance and Reconnaissance	ISR Protection	Edinburgh, South Australia	Interference Cancellation in High Frequency (HF) Radar	High frequency (HF) skywave radars are capable of detecting targets at very long ranges, typically up to thousands of kilometres. They use HF radio waves reflecting off the earth's ionosphere for very long range detection. Australia has a unique HF radar capability known as Jindalee Operational Radar Network (JORN). HF radar encounters interference from the other users of the HF spectrum, especially when relatively wideband radar waveforms are used. The existing techniques to deal with such interference involve adaptive signal processing techniques at a later stage of the signal processing chain. It would be more advantageous to remove the interference at an early stage when the received signal is in time samples before other processing such as range and Doppler processing occur. As continuous-wave interference is relatively narrowband, notch filtering techniques may help removing such interference. However, the challenge is to design such a filter such that it does not adversely affect following processing and detection steps, for example keeping the integrity of range sidelobes and clutter profile. In this project, the student will have the opportunity to develop new and efficient signal processing techniques to mitigate continuous-wave interference in HF radar signals. The student will work closely with the researchers in the DST IISR Branch during the period to gain valuable work experience in a Defence research environment.	Signal processing skills Good mathematical skills Programming in MATLAB				X		X			
Intelligence, Surveillance & Space Division	Integrated Intelligence Surveillance and Reconnaissance	ISR Protection	Edinburgh, South Australia	HF Spectrum Usage	In periods of HF spectrum congestion the efficient use of the spectrum is paramount to achieving civilian and defence missions. Here we wish to investigate the class and patterns of occupancy through statistical methods including an examination of AIML.	Signal processing skills Good mathematical skills Programming in MATLAB	X			X		X			
Intelligence, Surveillance & Space Division	Intelligence Analysis	Identity Intelligence	Edinburgh, South Australia	Mis/disinformation detection	With the advent of sophisticated AI-tools such as GPT-3 and GANs and the unprecedented spread speed on social media platforms, the impact of manipulated news media (falsified media) becomes serious social threats. This project aims to explore various mis/disinformation datasets and state-of-the-art AI models to identify and analyse falsified media outlets and its effects.	Programming experience in Python and knowledge in Git are essential. An interest in Artificial Intelligence, Natural Language Processing and Machine Learning and/or skills in languages other than English are desirable but not essential.			X			X			
Intelligence, Surveillance & Space Division	Intelligence Analysis	Identity Intelligence	Edinburgh, South Australia	Cross-lingual and multimodal information retrieval	Emerging methods in AI using multilingual models are being increasingly used to enable crosslingual and multimodal tasks in language processing. This project aims to explore crosslingual methods to query and rank in information retrieval.	Programming experience in Python and knowledge in Git are essential. An interest in Artificial Intelligence, Natural Language Processing and Machine Learning and/or skills in languages other than English are desirable but not essential.			X			X			
Intelligence, Surveillance & Space Division	Intelligence Analysis	Sensemaking	Edinburgh, South Australia	Combining Artificial Intelligence and Machine Learning for Multi-Source Intelligence	The Reasoning under Uncertainty with Soft and Hard data (RUSH) project combines the state of the art in Artificial Intelligence (AI) and Machine Learning (ML) with natural language processing of multi-source intelligence. Students participating in this project will contribute directly to the RUSH reasoning and learning framework, and have the opportunity to apply a number of AI and ML tools and techniques to build a demonstrator and perform experiments. The project will be tailored to suit the skills of the student.	Data processing, programming			X	X		X			

Division	MSTC	STC	Location	Project Title	Project description (provide a brief description of the project that can be used to advertise the project and give students an understanding)	Desirable Skills	Aerospace / Aeronautical Engineering, Naval Architecture Stream	Chemical, Radiological, Biological, Food Sciences Stream	Computer Sciences, IT, Software Engineering, Telecommunications Stream	Electronic / Electrical Engineering Stream	Materials Science Stream	Mathematics and Physics Stream	Mechanical and Mechatronic Engineering (including Robotics) Stream	Psychology and Social Sciences Stream	Other related areas
Intelligence, Surveillance & Space Division	Intelligence Analysis	Sensemaking	Edinburgh, South Australia	Automatic Image captioning	The project will make use of various machine learning and AI techniques to produce captions from images. Presenting the rich content of an image in natural language format is both a valuable activity and also challenging technically. The successful candidate will get broad exposure to deep learning by experimenting, modifying and training various deep learning models and will also be exposed to state of the art in various fields of AI.	Good computer programming skills in python, working knowledge of git. Desirable: Mathematics, data science and machine learning			X	X		X			
Intelligence, Surveillance & Space Division	Intelligence Analysis	Social Analytics	Edinburgh, South Australia	Insider threat	This project will investigate individual susceptibility to insider threat behaviour. The student will conduct a literature review and contribute to the development of one or more tools to measure individual susceptibility as part of a larger work program.	Ability to work independently and in teams Good communication skills Knowledge of relevant psychological models, theories and frameworks Experience with statistical data analysis								X	
Intelligence, Surveillance & Space Division	Intelligence Analysis	Social Analytics	Edinburgh, South Australia	Social Media simulation for Wargaming in Information Operations	Wargaming is an approach to training and exploration of tactics and strategy that allows exploration of a much wider range of scenarios and capabilities than can be explored in live training. This project will build on previous work exploring the use of Social Media simulations to support training and wargaming. The student will learn about and potentially participate in wargames supporting Information Operations and contribute to their improvement.	Critical thinking skills and an interest in politics, disinformation or information warfare is essential. An understanding or interest in complex systems analysis and organisation learning would be beneficial.			X					X	Political science, Sociology
Intelligence, Surveillance & Space Division	Intelligence Analysis	Social Analytics	Edinburgh, South Australia	Technology forecasting: AI and ML in the grey-zone	Various state and non-state actors conduct operations in the 'grey-zone' of information warfare, below the threshold that would elicit a military response from Western democracies. The rapid growth in readily-available artificial intelligence and machine learning capabilities is likely to make this problem worse. This project will explore the potential future risks posed by these rapidly developing technologies.	Critical thinking skills and an interest in politics, disinformation or information warfare is essential. Experience or a strong interest in AI or ML is desirable but not essential.			X			X		X	Political science, Sociology
Intelligence, Surveillance & Space Division	Space Intelligence	Automated Imagery Analysis	Edinburgh, South Australia	Deep Learning for Defence Imagery	Interpretation of physical structures and geographically referenced activities of human beings on the Earth from the analysis of optical remote-sensing imagery is crucial for Australia's security. The analysis process needs to be automated to handle massive amount of data in order to assist a human imagery interpreter. This project aims to apply Artificial Intelligence, specifically Deep Learning (DL), to detect objects of interest in Defence imagery. This is to be performed using the DL tools developed by the Defence Science & Technology Group, and includes labelling of targets, training and validation of Neural Network (NN) models for object detection, and extending existing NN models as well as implementing them into object detectors	- Experimental skills in building, training and validation of a Machine Learning system, preferably a supervised Deep Learning NN - Experience in coding with the Python language - Ability to work in teams			X	X		X			
Intelligence, Surveillance & Space Division	Space Intelligence	Automated Imagery Analysis	Edinburgh, South Australia	Image Processing in low SWaP space-edge environments	Interpretation of physical structures and geographically referenced activities of human beings on the Earth from the analysis of optical remote-sensing imagery is crucial for Australia's security. The analysis process needs to be automated at the edge to minimise bandwidth requirements in constrained communication networks. This project aims to transition traditional and Artificial Intelligence based object detectors from large scale ground based systems to low Size, Weight and Power environments such as small satellites. This is to be performed using image processing tools developed by the Defence Science & Technology Group, and includes optimisation and minimisation of resource requirements of deployed detection algorithms.	- General software development skills, scripting, source control configuration management - Experience in coding with C++ Python languages, - Knowledge of software profiling techniques, - Ability to work in teams			X	X		X			
Intelligence, Surveillance & Space Division	Surveillance Systems	Resilient Radar Systems	Edinburgh, South Australia (RAAF Base)	C-band imaging radar	This project will contribute to the development of software for a cutting-edge research surveillance radar.	Experience/interest in one of: - UI design/production - control systems - signal processing - Hardware interfacing Some experience in C++			X	X					
Intelligence, Surveillance & Space Division	Surveillance Systems	Sensor Systems Analysis	Edinburgh, South Australia	Propagation modelling for passive radar	Passive bistatic radar is an emerging capability that relies on existing emitters in the environment, such as radio, TV or satellite signals. Predicting the performance of these radars requires understanding how Radio Frequency (RF) signals interact with the atmosphere and surrounding terrain. The task involves the collection and analysis of real-world data and comparison of existing mathematical models of propagation.	Experience with statistical analysis, RF systems, meteorology and Matlab and/or Python is desirable, although training will be provided and the scope of the work can be adjusted to suit the skillset of interested students.	X			X		X			
Joint and Operations Analysis Division	Aerospace Capability Analysis	Aerospace Computational Modelling and Simulation	Fishermans Bend, Victoria	Application of AI to air combat Simulation	This project will explore the use of artificial intelligence to model tactical decision-making in a constructive aerospace simulation environment. A number of identified AI techniques will be integrated into a complex simulation environment and evaluated in the context of air combat scenarios.	- Experience in coding, with a preference for Python and 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						
Joint and Operations Analysis Division	Aerospace Capability Analysis	Aerospace Computational Sciences	Fishermans Bend, Victoria	Application of AI to Uninhabited Aerial Systems (UAS)	This project seeks to create an interface between existing constructive simulation software with standard UAS autopilots. The aim is to demonstrate the employment of advanced AI techniques (that are currently being used in constructive simulations) in trials with small UAS.	- General software development skills, scripting, source control configuration management - Experience in coding, with a preference for python and/or C++ language - Experience in coding, with a preference for Python and C++ - General software development skills: source control, testing, documentation - A strong interest in applied artificial intelligence and augmented/virtual-reality technologies - Strong written and verbal communication skills - Ability to work both independently and as part of a small team	X		X	X			X		
Joint and Operations Analysis Division	Aerospace Capability Analysis	Aerospace Experimentation and Wargaming	Fishermans Bend, Victoria	Visualization for force design	This project will contribute to web-based visualization of the ADF's force structure and aerospace capabilities, including testing how the design affects users' ability to navigate and comprehend the data. Project options include designing reusable interactive visualization layouts and vignette visualizations, or creating novel animated transitions between different views.	General coding skills, with a preference for JavaScript Skills in one or more of the following: Human Computer Interaction, Design, Visualization or Computer Game Design Interest in User Experience Ability to work in teams	X		X					X	
Joint and Operations Analysis Division	Aerospace Capability Analysis	Aerospace Experimentation and Wargaming	Fishermans Bend, Victoria	Wason selection task	This project examines the influence of instruction format on a person's conditional reasoning.	Logical reasoning skills. Ability to discuss logic and psychology with a team. Ability to conduct experiments with individual human subjects, who may be located remotely or be present in person. Ability to fulfil workplace health and safety requirements and ethics requirements. Ability to read, discuss, and summarise journal articles on the Wason selection task. Experience in writing reports.								X	Logic Philosophy
Joint and Operations Analysis Division	Aerospace Capability Analysis	Aerospace Experimentation and Wargaming	Fishermans Bend, Victoria	Method Selection	This project will answer the research question "How should AEW define the inclusion and exclusion criteria for its knowledge elicitation methods, so that we can establish and continually extend a method selection scheme?" or implement the scheme. There are multiple lists of knowledge elicitation methods and we wish to rationalise this for AEW to support seminar wargame.	Ability to read, discuss, and summarise journal articles on the Wason selection task. General coding skills, with a preference for JavaScript Skills in one or more of the following: Human Computer Interaction, Design, Visualization or Computer Game Design Interest in User Experience Ability to work in teams	X		X					X	
Joint and Operations Analysis Division	Aerospace Capability Analysis	Aerospace Experimentation and Wargaming	Fishermans Bend, Victoria	Reasoning for AI	Psychology and AI have different views on reasoning logic. This project will look at combining the different views on reasoning logic from psychology and AI AI research uses conditionals, important in reasoning research, as the dominant knowledge representation. An AI system may regard the affirmation of the consequent as a means of overturning a previous conclusion. Affirmation of the consequent is: if P then Q. Q. Therefore, P. In contrast, psychology research emphasises negation and treats the affirmation of the consequent as a fallacy.	Ability to read, discuss, and summarise journal articles on the Wason selection task. General coding skills, with a preference for JavaScript Skills in one or more of the following: Human Computer Interaction, Design, Visualization or Computer Game Design Interest in User Experience Ability to work in teams	X		X					X	
Joint and Operations Analysis Division	Aerospace Capability Analysis	Aerospace Systems Analysis	Fishermans Bend, Victoria	Data analytics and machine learning	This project's aim is to design and prototype a data analytics toolbox, that combines data analytics and machine learning techniques to discover and visualise meaningful insights into complex Defence problems to Subject Matter Experts. This will involve research into data analytics techniques, prototype coding, user interface design and development of innovative data visualisations.	- Experience in coding in Python and Java - Knowledge or interest in machine learning and data analytics - Basic understanding of mathematical concepts - Creative thinker who can provide innovative solutions to effectively visualise and explain complex problems - Understanding of effective user experience design - Ability to work autonomously and as part of a team			X			X			

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Joint and Operations Analysis Division	Aerospace Capability Analysis	Aerospace Systems Analysis	Fishermans Bend, Victoria	Simulation Optimisation & Visualisation	Comprising of almost 100,000 serving members, the Australian Defence Force (ADF) is one of Australia's largest and most complex workforces. It is one that without proper personnel management can lead to significant shortfalls in Australia's Defence capability. DSTG has developed a suite of tools to model, simulate and analyse the ADF workforce to ensure that the right number of personnel with the right skills are in the right positions at the right time. This project's aim is to develop a software module for the purpose of optimising the various aspects of the ADF workforce. This includes research into suitable optimisation techniques, implementation of mathematical algorithms in backend code as well as design and development of intuitive visualisations of results. At the end of the project the software module would be integrated with DSTG-developed software suite.	- Software development programming skills – frontend and backend and familiarity with either C++, Java and/or Python. - General software development skills – source control, design patterns, data structures etc. - Basic mathematics skills – knowledge of first-year university level mathematics concepts. - Creative thinker with interest in exploring effective visualisation. - Communication Skills – good ability to write summaries and reports on the work being undertaken. - Ability to work independently and self-motivated.			X			X			
Joint and Operations Analysis Division	Aerospace Capability Analysis	Aerospace Systems Analysis	Fishermans Bend, Victoria	Simulation Development to Analyse Defence Operations	1. Contribute to the development of a simulation framework for aerospace operations. Includes sensor, weapon and platform computational models. Student to be given specific code examples at the beginning of the project 2. Contribute to artificial intelligent agent modelling with C++/Python. 3. Contribute to the development of data analysis simulation capability.	• General software development skills • Familiarity with object -orientated programming • Interest in artificial intelligence • Interest in game development/simulation • Interest in high-performance cluster computing environments • Motivated and goal-focussed • Good verbal and written communication skills • Ability to work in teams	X		X						
Joint and Operations Analysis Division	Joint Warfare Operations	AI for Decision Analytics	Edinburgh, South Australia	Sentiment Analysis using Open Source Big Data	This project will develop web-based user interfaces and microservices to enhance in-house sentiment analysis tools that exploit open source big data. These tools support the improved understanding of countries and the relationships between them.	- General software development skills, scripting, source control, configuration management. - Experience in coding with Python for machine learning and database programming. - Experience in web development, preferable with JavaScript and Python Flask framework. - Experience in network programming and, ideally, microservice development. - Ideally, experience with natural language processing and sentiment analysis. - Ability to work in multidisciplinary teams (incl. AI specialists, Social Scientists, etc.) on the development of in-house sentiment analysis tools and their use in a desktop country study.			X			X			
Joint and Operations Analysis Division	Joint Warfare Operations	C2 Information Systems	Fairbairn, ACT	User Experience Design for Military Command and Control	This project will adapt user experience (UX) metrics into user-interactive prototypes that will help elicit subsequent design parameters for software in a Military context.	- user research, preferably in software marketing analysis - visual and graphic design (research) - interaction design - software prototyping of user interfaces and decision support systems - usability testing using quantitative metrics - interactive data visualisation (dashboards)	X		X				X	X	
Joint and Operations Analysis Division	Joint Warfare Operations	Influence & Conflict Analysis	Edinburgh, South Australia	Power and Influence in the Digital Anthropological Terrain	This project will assess how far efforts to regulate digital technology go to address critical vulnerabilities in democratic societies.	-Educational background in International Relations/Strategic Studies -Specialist knowledge in big tech and the data economy -Ability to self start and direct research'								X	
Joint and Operations Analysis Division	Joint Warfare Operations	Influence and Conflict Analysis	Edinburgh, South Australia	Pacific voices on Australian and other foreign assistance: A desktop study	Using a Pacific country as a case study identify key local influencers, influential groups (both state and non- state actors), and institutions. Identify, using open source material, the potential major views and sentiments of these influential entities towards Australian and other foreign assistance.	Strong research skills- particularly qualitative research. Qualifications in social sciences or humanities (e.g.. psychology, sociology, international relations) or a background in related fields. Ability to work in teams (incl. multi-disciplinary teams).								X	X
Joint and Operations Analysis Division	Strategy and Joint Force	Strategy, Systems and Synthesis	Fairbairn, ACT	Strategic Wargame	Assist evaluate conceptual models for international relations and develop a strategic wargame prototype.	Background in political science (or similar), understanding of qualitative analysis and problem structuring methods								X	
Joint and Operations Analysis Division	Strategy and Joint Force	Strategy, Systems and Synthesis	Fairbairn, ACT	Group decision making	Conduct qualitative research into group decision making with a view to enhancing the ability to support SME based experimentation activities.	Background in management, social or political science (or similar), understanding of qualitative analysis and problem structuring methods								X	
Land Division	Chemical and Biological Defence	Assessment and Characterisation of Chemical Agents and Toxins	Fishermans Bend, Victoria	Liquid Chemical Repellency and Penetration of Protective Fabrics	Operating in a chemically contaminated environment is a fundamental Australian Defence Force (ADF) capability. Individual protective equipment (IPE) is purpose-designed to provide personnel protection against chemical warfare agents (CWAs) and Toxic Industrial Chemicals (TICs) threats. Typically, a protective ensemble is a system of a number of different components including a protective suit, respirator, gloves and boots. Understanding the performance of the fabric/material of the different components is a critical aspect of assessing the effectiveness of a protective ensemble system. Fabric surface properties such as liquid chemical repellency, as well as, more general chemical permeation and penetration evaluations can be used to characterise and assess a components protective performance. Specifically, contact angle measurements can be used to provide a quantitative assessment of a fabric's ability to repel a chemical of interest, whilst methodologies such as those outlined in ISO 6530 (commonly known as "the Gutter Test") can be used to assess the degree of liquid penetration of a chemical through a fabric. The project will focus on the validation of contact angle measurements and the "gutter test" methodologies to assess the performance of several fabrics of interest. Validation will include developing sample mounting techniques, optimising method parameters and streamlining post-analysis processes. The validated methods will then be used to undertake performance assessments on a number of fabrics and materials against a range of CWA simulants, precursors and industrial chemicals. The data acquired from these experiments will inform DSTG's assessments of ADF's protective ensembles.	Wet chemistry Interest in surface chemistry Scientific report writing skills Ability to work in small teams, and autonomously Motivated and goal-focussed Excellent verbal communication skills		X			X				
Land Division	Chemical and Biological Defence	Assessment and Characterisation of Chemical Agents and Toxins	Fishermans Bend, Victoria	Chemical Analysis and Imaging of Chemical Warfare Agent Simulant Removal from Surfaces	The ADF requires a better understanding of how Chemical Warfare Agent (CWA) contamination is removed from surfaces. This project proposes to utilise common CWA simulants such as methyl salicylate mixed with commonly used infection and contamination training tools such as GloGerm to produce a mixture that will mimic the surface retention adsorption of CWAs and be able to be imaged under UV light. Furthermore this project proposes to utilise image analysis software to try and quantify or semi-quantify residual surface contamination by comparing residual surface contamination determined by image analysis software to residual surface contamination as determined by analytical chemistry. The project is also intended to develop procedures for employing this technique in the decontamination of personnel to monitor for cross-contamination, a term used to describe the phenomena where contamination from one individual or surface is inadvertently transferred to another individual or surface. In this instance, a different mixture of CWA simulant and GlowGerm or equivalent will have to be used in order to be safe for use will personnel. This project is likely to involve the use of small scale trials of personnel, and personnel equipment, decontamination.	A basic understanding and interest in chemistry. Ability to work autonomously and in teams. Familiarity with chemical laboratory safety. Willing to learn new skills and take direction. Some exposure to image analysis software Good written and verbal communication skills Proactive and shows initiative Motivated and goal focused		X			X				
Land Division	Chemical and Biological Defence	Assessment and Characterisation of Chemical Agents and Toxins	Fishermans Bend (possibly some time at Florey Institute)	Development of a NanoBRET ligand binding assay	Traditional in vitro assays to measure the binding of drugs to their target cell surface receptor usually utilise radioactively-labelled compounds. Recent advances in synthetic enzyme design has enabled a non-radioactive approach to receptor binding that uses the bioluminescence resonance energy transfer (BRET) technique. In addition to improved safety, this approach offers many advantages over the traditional method. The aim of this project is to assist in developing a state-of-the-art live-cell BRET receptor binding assay that will be applied to chemical compounds of Defence interest. This project is immediately relevant to DST's international Defence collaborations.	Some or all of: mammalian cell culture (asceptic technique), pipetting and liquid handling, biochemistry, cell and molecular biology, methods and results documentation.		x							

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Land Division	Chemical and Biological Defence	Biological Defence	Fishermans Bend, Victoria	Biological aerosols	The characterisation of aerosols is required to understand the hazard that they pose to military and civilian health. For safety reasons, a surrogate or simulant material is required in place of an active biological agent. This project aims to create simulant liquids to mimic a set of defined standards. The student will create liquid solutions/suspensions and measure their physical properties and aerosol performance. The student will compare these properties to those of the defined standard and re-optimise the mixture as required. [other details/tasks?]	- Experience in measuring physical properties of liquids and data processing/interpretation (e.g. viscosity, surface tension, aerosol droplet sizes) - Experimental skills, preferably in fluid/chemical engineering (this is for protein solutions) AND/OR... - PC2 lab experience - Experimental skills, preferably in handling PC2 organisms or toxins - Ability to work in teams		X					X?		
Land Division	Chemical and Biological Defence	Chemical and Biological Agent Detection and Protection	Fishermans Bend, Victoria	Miniaturised real-time chemical sensor optimisation	At DST Group, an anthropometrically correct, articulated, chemical resistant manikin system within a controlled environment chamber is used to conduct the assessment of individual protective equipment against biological and chemical threats. To enhance this assessment, a novel sensor system was developed by DST Group to provide time and activity based breakthrough information when assessing protective suit ensembles. Dubbed the 'MIST' sensor, it is a miniaturised, lightweight, real time sensing technology, for the detection of chemical agent simulants and toxic industrial chemicals. The sensor utilises colorimetric chemistry, where a colour change of the reactant substrate is observed in response to exposure to the vapour challenge. Working within both the Chemical and Biological Agent Protection, and the Chemical Agent Detection teams, this project aims to complete the following: - Investigate substrate optimisation, focussing on improved sensitivity and stability through the use of novel materials and method development - Investigate substrate development for additional analytes - Benchmark the sensors using the manikin system The project is an opportunity for an IEP student to work with both teams on an applied project with direct application in assessing individual protective equipment for Defence and first responder communities.	General knowledge of chemistry, preferably organic chemistry and materials science. Motivated and goal-focussed. Good communication skills both written and verbal. Ability to work autonomously and in small teams.		X			X				
Land Division	Chemical and Biological Defence	Chemical Defence	Fishermans Bend, Victoria	Assessment of host-directed therapeutics against bacterial bioterror threats	This project will assess the effectiveness of a novel class of host-directed therapeutics (SMAC mimetics) against bacterial biodefence pathogens such as Coxiella burnetii. Evaluation of host-directed therapies against intracellular bioterror pathogens With the emergence of resistance to current antimicrobial therapies, there is an urgent need to investigate novel therapeutic mechanisms for targeting bacterial pathogens. Targeting the host cell harbouring an intracellular infection, rather than the bacteria itself presents is one such mechanism. Recent studies have identified a class of anti-cancer drugs, SMAC mimetics, capable of selectively killing infected cells by inducing cell death (apoptosis) by interfering with the inflammatory TNF-α pathway. Preliminary data suggests that TNF-α expression is increased during intracellular biothreat bacterial infections with Coxiella burnetii (Q fever) and Burkholderia pseudomallei (melioidosis), making these difficult to treat infections ideal for SMAC mimetic treatment. The aim of this project is to assess the effectiveness of SMAC mimetics in vitro for treating intracellular bacterial biothreat pathogens, specifically Coxiella burnetii. The project will use established (molecular) microbiology techniques and will also develop new techniques, such as those based on in vitro cell impedance for the assessment of novel therapeutics. The successful applicant will gain skills in microbiological, cellular and molecular techniques including cell culture, inhibitor testing and microscopy.	Experimental skills/interest in microbiology or molecular biology -cell culture, drug discovery		X							
Land Division	Chemical and Biological Defence	Chemical Defence	Fishermans Bend, Victoria	Mass Spectrometric Identification of Micro-organisms	Defence is aiming to enhance its mass spectrometric capability to identify micro-organisms. The knowledge and capability developed will be employed for the verification of micro-organisms that are of Defence and National Security interests. From this, it also hopes to shape and influence current deployable capabilities in bacterial identification to support Operations. This project aims to develop and optimise proteomic techniques, mass spectrometric data acquisition and analysis for the accurate identification of micro-organisms. The following activities outlined the overall project plan: 1. Microbial manipulation and deactivation 2. Sample preparation including enzymatic digestion 3. Mass spectrometric spectral acquisition and data interrogation to establish algorithms for correct microbial identification	Technical Skills Basic analytical and microbiology techniques, and knowledge of mass spectrometry Personal Attributes: Self-motivated with a problem-solving mindset. Task driven and focussed with a 'can-do' attitude with good communication skills (verbal and written).		X							
Land Division	Chemical and Biological Defence	Modelling, Analysis and Physical Sciences (MAPS), Aerosol Defence	Fishermans Bend, Victoria	Aerosol sensors performance assessment and modelling	Understanding the performance and response of CBRN detectors to dynamic challenges is required for their effective deployment in contaminated environments. Testing of aerosol sensors is typically performed under steady-state conditions, providing limited information about their performance when used in different operational scenarios. This project will utilise the recently developed Dynamic Sensor Test Bed (DSTB) to test aerosol sensors under well controlled dynamic test conditions simulating real-world environments. Through combining experimental, analytical and modelling methods this work program will provide better understanding of aerosol sensors 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 by airborne CBRN materials to personnel operating in a contaminated environment. The project will develop an experimental test method and a modelling framework allowing characterisation and better understanding of CBRN sensors performance. Several aerosol sensors will be evaluated experimentally under dynamic test conditions and their responses mathematically modelled. Using these results the viability of each sensor will be assessed for different operational scenarios.	Data analytical methods, Mathematical modelling, Statistics, Programming skills (Matlab, Python, LabVIEW), Engineering, Signal processing	X		X	X		X	X		
Land Division	Chemical and Biological Defence	Modelling, Analysis and Physical Sciences (MAPS), Aerosol Defence	Fishermans Bend, Victoria	Assessment of passive electrostatic air sampler for collection of aerosolised CBR materials	Airborne Chemical, Biological and Radiological (CBR) hazardous material poses a threat to personnel operating in contaminated environments. Development of effective countermeasures and strategies to minimize personal exposure requires capability to detect, collect and identify the airborne hazard. This work program aims to assess performance and usability of an advanced passive electrostatic air sampler (PEAS) reported in the literature and its further enhancement for DST applications in both, defence and civilian domains. The specific focus will be on sampling of biological aerosols under controlled laboratory test conditions and assessment of the PEAS performance as a wearable bio-dosimeter. The activity is closely aligned and compliments the existing DST research in the area of environmental air sampling and airborne hazard assessment. The self-contained, miniature, low-cost and maintenance-free air sampler operates as a passive collection device (no pump and battery requirements) allowing long-term unattended collection of airborne material across a broad aerosol particle size range. The sampler's simple design (spiral polarized ferroelectric polymer film in a 3D printed plastic holder that fits in a standard-size vial) allows easy storage, transport and expedited particle extraction. The student will assist in design, construction and evaluation of the PEAS performance using nonhazardous CBR aerosol simulants in laboratory settings followed by R&D work aiming to enhance its collection efficiency using theoretical, modelling and experimental means. Depending on the student's skill and interest the project may include re-design and optimisation of the current PEAS using CFD modelling and development of simple physics based-models for aerosol collection mechanisms (e.g., electrostatic deposition).	Experimental data collection and analysis, laboratory skills; chemical and biological analytical methods, programming (Matlab, SolidWorks, CFD Fluent), Physics	X	X			X	X	X		

Division	MSTC	STC	Location	Project Title	Project description (provide a brief description of the project that can be used to advertise the project and give students an understanding)	Desirable Skills	Aerospace / Aeronautical Engineering, Naval Architecture Stream	Chemical, Radiological, Biological, Food Sciences Stream	Computer Sciences, IT, Software Engineering, Telecommunications Stream	Electronic / Electrical Engineering Stream	Materials Science Stream	Mathematics and Physics Stream	Mechanical and Mechatronic Engineering (including Robotics) Stream	Psychology and Social Sciences Stream	Other related areas
Land Division	Protection and Networked Autonomy	AVS	Fishermans Bend, Victoria	Field Estimation Using Mobile Autonomous Robots	In the presence of CBRN (chemical, biological, radiological, and nuclear) attacks, being able to map out a contaminated area/field accurately and efficiently is an important task in allowing operations (e.g. humanitarian, disaster relief or military) to be carried out. We consider a setup that consists of multiple mobile robots, which can move around and take measurements that are shared with other robots, in order to construct a map of the contaminated area. We have considered the situation where the each robot has access to noisy binary measurements. By modelling the field as a sum of radial basis functions, the field estimation problem can be reduced to a parameter estimation problem, which may then be solved using particle filtering algorithms. Active sensing mechanisms for the robots to adaptively choose their next measurement locations, given the information currently collected, have also been considered. In this project, we seek to implement (in Python, and time permitting, in the Robot Operating System ROS) and evaluate the performance of various extensions of the developed algorithms. These extensions may include: 1) multi-level quantized measurements, 2) estimation of time-varying fields by incorporating wind sensor measurements, and 3) active sensing while the robots maintain a desired formation.	Some knowledge of statistical estimation and/or particle filtering algorithms. Experience with Python programming.			X			X			
Land Division	Protection and Networked Autonomy	AVS	Fishermans Bend, Victoria	Swarm Flocking with Behaviour Selection	In this project, we will explore the integration of soft-consensus into hybrid-flocking. The results will be implemented in a Python-based swarm simulation. A multi-objective comparison study will be conducted between this new approach and prior flocking algorithms of other team members. There would be an opportunity to explore the academic publication process by submitting a paper on the findings of the project.	Some familiarity with coding in Python (or similar languages) will be required. Familiarity with multi-agent and swarm robotic simulations are also desirable.			X			X	X		
Land Division	Protection and Networked Autonomy	Integrated Soldier Technologies	Fishermans Bend, Victoria	Generative overlays on camouflaged soldiers to confuse adversarial threats	This project will investigate the use of generative adversarial networks (GANs) to reduce the likelihood of soldier detection by a machine vision classifier based on a deep neural network. A discriminator network will be trained to detect camouflaged soldiers in an image. Then, a generator network will be trained to propose patterns which when overlaid onto parts of camouflage, will lower the confidence of soldier detection in the modified image by the discriminator. The effect of network architectures, datasets, and training configurations will form a part of the experimental evaluation.	Machine learning and/or deep learning. Experience in programming with a preference for Python/MATLAB.			X	X	X	X	X		
Land Division	Protection and Networked Autonomy	Integrated Soldier Technologies	Fishermans Bend, Victoria	Can you see through my camouflage? Assessing signatures in virtual environments	In the modern battlefield, before the even first shot is fires, a complex game of hide-and-seek occurs between our forces and our adversaries, as we seek to detect, recognise and identify each other using a plethora of sensors and platform. This can be a pair of regular binoculars or night vision googles on a soldier; an infrared sensor on a small flying drone; or a sophisticated EO/IR packages vehicle or a larger UAV flying far overhead. On top of that, there are increasing advance multispectral/hyperspectral sensor backed up advanced AI ML algorithms. This is not even considering what camouflage or other countermeasures are being taken by the soldier being observed, lets alone the weather and environment conditions. The only way tackle the full complexity of this environment is through Simulation and modelling. This project will involve using a variety of simulation engines and tools to create virtual environments and simulate the signatures of dismounted soldier across the electromagnetic spectrum. The student will build upon the work done by the SSA team and previously students to build up models and environments using data from cutting edge sensors and advances materials. The student will be working with the SSA team to use the software tools and simulation to create scenarios to assess the effectiveness of camouflage solutions. The student will also participate in limited data collection and in the laboratory and in the field experiments.	3D modelling; Working with game engine; Software programming skills highly desirable			X	X	X	X	X		
Land Division	Protection and Networked Autonomy	Integrated Soldier Technologies	Fishermans Bend, Victoria	Virtualised computer vision	Increasingly virtual environments are being used to develop and test autonomous and semi-autonomous systems. Object detection and recognition is a maturing capability, though this is often used in highly dynamic though less complex environments virtualisations (e.g. autonomous driving). Detection and recognition in more vegetated virtual worlds with high degrees of clutter is more challenging. Likewise, recognition of small objects at distance becomes challenging to model at pixel level due to modern rendering pipelines that use many simplifications and anti-aliasing techniques to look more natural (but may not at the pixel level). This project seeks to utilise and extend computer vision methodologies for the study of object recognition from virtualisations generated from a variety of engines (e.g. UE4, Unity, VBS). The project would seek to develop characterisation techniques for complex (small/obscured/moving) objects. This would initially commence on visible images, but would be extended (through collaboration across DST) to other sensor types.	Complex shader development for gaming engines (e.g. UE4); sensor hardware simulation (and integration); experience with machine learning/computer vision methods desirable;			X						
Land Division	Protection and Networked Autonomy	Integrated Soldier Technologies	Edinburgh, South Australia & Flinders University	Next generation coatings for camouflage applications	Camouflage and visual deception by various means is as old as warfare itself, with there being a constant arms race between new camouflage solutions and the methods to detect them. There is always room for improvement in this field and an advantage to be gained by exploiting cutting edge technology to hide, deceive and confound human observers and sensors. We are seeking a candidate who wants to work as part of a team working on cutting edge coatings and materials for camouflage applications. This project will allow the candidate to experience the entire material development process, from idea generation, the formulation of coatings and application onto materials to generate prototypes, as well as their testing for durability, performance and colour in a lab based and field environment.	• General knowledge of chemistry, preferably organic chemistry and materials science • Knowledge of paints, coatings, colours and colour measurement • Knowledge about textiles and textile science • Ability to work independently and as part of a small team • General competence in mathematics and statistical analysis • Problem solving skills and outside the box thinking		X			X				
Land Division	Protection and Networked Autonomy	Integrated Soldier Technologies	Fishermans Bend, Victoria	Shifting the camouflage paradigm; virtual assessment of novel camouflage solutions	Finding new ways to camouflage the dismounted combatant on the modern battlefield is more challenging than ever before, as before the first shot is even fired, there is a complex game between adversaries to detect, recognise and identify each other. The proliferation of high quality optics, human portable and platform mounted sensors covering a large portion of the electromagnetic spectrum has only made camouflage more difficult yet more important than ever. What happens when a new camouflage technology comes along that has many different potential methods of application and function? It is not possible, feasible or realistic to try and generate a prototype of every iteration and for every battlefield scenario. We are seeking a candidate who can apply their passion for 3D modelling and simulation to model new camouflage solutions in a range of representative virtual settings in order to contribute to how to best leverage an exciting new technology being developed by DSTG.	• 3D modelling and working with game engines • Software programming skills including the ability to translate mathematical concepts into functional code • Ability to work independently and as part of a small team • General competence in mathematics and statistical analysis • Problem solving skills and outside the box thinking			X	X	X	X	X		
Land Division	Protection and Networked Autonomy	Integrated Soldier Technologies	Fishermans Bend, Victoria	Development of Prototype Cooling Vest	This project looks at designing and manufacturing a prototype cooling vest - one unpowered and the other powered. Outcomes: 1. Design Modification: Identify and rectify issues with design 2. Manufacture: Redesign and construct unpowered and powered options 3. Evaluate Performance - Manikin Testing	Some hands on experience and design engineering background.					X				X
Land Division	Protection and Networked Autonomy	Integrated Soldier Technologies	Fishermans Bend, Victoria	Development of chemical protective clothing based on nanomaterials	Design, fabrication and testing of chemical protective materials	material, chemistry background					X				
Land Division	Protection and Networked Autonomy	Integrated Soldier Technologies	Fishermans Bend, Victoria	Investigation into oblique impacts of armour piercing projectiles on hard armour	Given the increased interest in contoured armour solutions, both with regards to the difference in body shape between male and female combatants and lower profile contoured armour, there is an increased likelihood of projectile impacts occurring at angles other than perpendicular to a hard armour plate. This project will be a study into the effect of oblique projectile impacts onto hard armour, giving a good basis of knowledge going forward to advise on the practicality and inform future design studies of hard armour with curvature.	Some hands on or experimental interest or experience would be preferred.					X				
Land Division	Protection and Networked Autonomy	Integrated Soldier Technologies	Fishermans Bend, Victoria	Soldier Autonomy: Multimodal Edge Control	The team at Soldier Autonomy have been developing robotic capabilities that can assist a dismounted soldier. Work in this project area will provide support in the development of software and hardware to increase the control tools available to a soldier for commanding a field robot. Additional work in this area can assist in enhancing the soldiers' knowledge of the world around them utilising technologies such as Android phones.	Software development, Simulation experience, Source control configuration management, Good communication skills, Ability to work in teams, Motivated and goal focussed									Robotics and Mechatronics Engineering, Computer Science / Software Engineering
Land Division	Protection and Networked Autonomy	Integrated Soldier Technologies	Fishermans Bend, Victoria	Further investigations into Multiple hits on soft armour	This project follows on from a previous IEP project looking at two impacts on soft armour materials. This project will focus on using a biosimulant backing to assess the impact of multiple hits.	Either material science, computational modelling or physics background					X	X			

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Land Division	Protection and Networked Autonomy	Integrated Soldier Technologies	Fishermans Bend, Victoria	Soldier Autonomy – Soldier Robotics	IST have a developing capability to support the dismounted soldier through the use of assistive technologies such as autonomous robotic platforms. This work will support exploring the concept of disposable and ubiquitous robot for Australia Army in humanitarian assistance and disaster relief (HADR) operation. In HADR environment, landscape could be different from known map/floorplan. It is essential that the robot can adapt the environment and safely navigate for time critical operation. In addition, the robot may be contaminated after operation and need be disposed of. It is desirable to have low cost robot with fundamental autonomous capabilities.	Software development, Source control configuration management, Good communication skills, Ability to work in teams, Motivated, goal focussed, Manufacturing design and integration									Robotics and Mechatronics Engineering, Computer Science / Software Engineering
Land Division	Protection and Networked Autonomy	Integrated Soldier Technologies	Fishermans Bend, Victoria	Barbed Wire Detection in Autonomous Ground Robot	Barbed wire is type of obstacle commonly used by armed forces for access control. Autonomous war fighting robots must be capable of detecting this kind of obstacle in order to navigate the battlefield. Despite its significance in autonomous navigation, the barbed wire detection problem has not been properly addressed. Lidar and radar are the most commonly used sensors for obstacle avoidance in automotive industry. However, these sensors tend to have difficulties differentiating barbwire from noise due to it sparsity nature. In this project, the student will have an opportunity to investigate computer vision approaches to the problem of barbwire detection under the supervision of computer vision and robotic specialists. They will gain experience in Robotic Operating System (ROS) and its applications within autonomous warfare context, OpenCV library, C++ programming language, and Boost Library.	Software development Source control configuration management Good communication skills Ability to work in teams Motivated, goal focused									Computer Science, Software Engineering, Robotics and Mechatronics, Engineering
Maritime Division	Non-Acoustic Signature Management	Environmental Signatures & Protective Systems	Fishermans Bend, Victoria	Development of a 3D Underwater Surface Scanner to characterise biofouling induced roughness.	This exciting Defence research project will further development of a prototype underwater scanner capable of characterising complex biofouling surfaces. This information will enable accurate predictions of vessel performance penalties, optimised underwater coatings and hull husbandry practices for the Royal Australian Navy	Experimental skill, basic data analysis, image analysis, CAD knowledge, basic manufacturing skill	X			X			X		
Maritime Division	Non-Acoustic Signature Management	Specialised Coatings Technology	Fishermans Bend, Victoria	Reflectivity of Navy Coatings	This project will determine changes in surface reflectivity and bulk properties of Navy coatings when alternative pigments are used.	Intermediate Word and Excel skills. Prepared to work in teams and communicate effectively. Science/Engineering student having attained 2nd to 3rd Year university skills in a organic/inorganic chemistry or materials science laboratory, noting they will handle chemicals.		X			X				
Maritime Division	Sonar Technology and Systems	Underseas Sensor Systems and Expt	Edinburgh, South Australia	A hybrid technique for building bistatic sonar PD maps	Sonar Probability of Detection (PD) used in sonar performance prediction and signal processing are conventionally built using Sonar Equation level modelling. Computing PD maps using signal processing of simulated sonar time series provides a better link with the actual signal processing but requires significant computational effort. This project will develop a less demanding hybrid technique in which clutter components are computed using signal processing of simulated clutter time series, while the echo component is obtained using Transmission Loss computations.	Applied Mathematics and Physics, Knowledge of Statistics and Signal Processing fundamentals, Experience with object-oriented MATLAB			X			X			
Weapons and Combat Systems Division	Advanced Propulsion and Weapons Effects	Advanced Warhead Technologies Group	Edinburgh, South Australia	Reactive material characterisation for warhead integration	This project will involve characterisation of RM formulations and integration into novel warhead systems, including bespoke instrumentation development (such as spectroscopy) to quantify benefits/ effects; and modelling for effects prediction.	Desirable skills include: MATLAB experience, Finite Element Analysis experience, experimental skills using instrumentation with oscilloscope, optics and/or spectroscopy knowledge	X			X	X	X	X		
Weapons and Combat Systems Division	Distributed Combat & Mission Systems	Human & Autonomous Decision Superiority	Edinburgh, South Australia	User Interaction with Autonomous Systems for Tactical Decision Making	The student will work as part of the Human Systems Discipline research team, which aims to understand and inform human systems integration needs and requirements for tactical warfighting systems. Although there is scope for the student to develop their own project (with guidance) according to their particular interests, the project should involve the application of psychological principles to human-based decision making for tactical warfighting, most likely addressed through experimentation. A potential area for investigation includes examining human and autonomous system interactions, such as how humans can work together with drones to achieve tactical outcomes. The project may explore how one operator can control multiple drones, or how information collected from drones can be presented back to an operator to support decision making. In addition, in line with the requirement of the Master of Psychology program, the student will have the opportunity to complete a student placement, supervised by an endorsed organisational psychologist.	The design, conduct, analysis and write-up of human experiments. Good communication skills, ability to work in teams, motivated and goal-focussed.								X	Human Factors
Weapons and Combat Systems Division	Distributed Combat and Mission Systems	Combat Information Interoperability	Edinburgh, South Australia	Using AI-Enabled Technology to Exploit Multi-Modal Information Fusion	This project will develop and test artificial intelligence and machine learning (AI/ML) techniques that can be adapted to prosecute Multi-modal Information Fusion. The project aims to enhance Information Fusion using computational methods to extract tactical information manually captured by humans over a long period of time (focusing on unstructured modes of communication; such as sight, text and sound). This will ultimately reduce operator workload and enhance share situation understanding by capturing tactical information to be presented in human and machine readable mechanisms. This research project will employ programming skills, knowledge and analytic capacity to research AI/ML solutions to solve the above problem. This includes experimenting with existing dataset and model to capture tactical meta-data within an information system. The project will promote the use of machine learning to generate fused meta-data from unstructured sources. The application space could be tested using the information feed from representative data captured during the Heimdall trail. The intent is to deploy a suitable model in a representative combat system test-bed. The research will be presented to a group with the results and conclusions captured in a report.	- General software development skills, scripting, source control configuration management - Experience in coding, with a preference for Python, C or C++ languages preferred. - Ability to work in teams - Some experience with AI/ML preferred.S4	X		X			X			
Weapons and Combat Systems Division	Integrated Combat Capability Assessment	Combat Capability Analysis	Edinburgh, South Australia	Concept Assessment	For this project the student will be responsible for assessing the feasibility of a countermeasure concept designed for missile defence. This assessment will require the students to undertake research of the enabling technologies, engage with subject matter experts to ensure sound understanding of technical limitations, and develop numerical models to demonstrate the potential capabilities of the concept system.	Desired skills include - General analytical and problem solving skills - Some experience with basic coding and numerical modelling (MATLAB or Python preferred) - Ability to work in teams - Ability to engage with Subject Matter Experts and draw on their knowledge base - Some experience with broad literature review and reporting (verbal and written)	X		X			X	X		
Weapons and Combat Systems Division	Integrated Combat Capability Assessment	Combat Capability Analysis	Edinburgh, South Australia	Model Development	In support of modelling and simulation-based analysis, the student in this project will perform complex data analysis, develop analytical scripts and design and implement data visualisation concepts.	• Algorithm implementation; • Testing & evaluation including verification & validation; • Configuration management and documentation of software development and hardware infrastructure; • Agile approaches to software development and project management;	X		X	X		X			
Weapons and Combat Systems Division	Integrated Combat Capability Assessment	Missile System Analysis	Edinburgh, South Australia	An exploration of Digital Engineering and Model-Based Systems Engineering to support Weapon Concept Development	This project will seek to apply Digital Engineering and Model Based Systems Engineering principles to the development of a modular missile testbed concept. This work will ultimately assist in informing the development and application of requisite principles, tools and processes to enable the effective and efficient transition of viable weapon concepts an operational capabilities.	Experience in a relevant Aerospace discipline (Aerospace or Engineering, Physics, Applied Mathematics or similar) - Knowledge of Systems Engineering principles (Model based Systems Engineering preferred) -Experience in coding with a preference for MATLAB/Python - Ability to work in teams	X					X			
Weapons and Combat Systems Division	Weapons Systems Technology	Sensor Processing and Algorithms	Edinburgh, South Australia	Object classification and recognition with low-cost sensors.	The project will investigate a number of approaches and algorithms for classification and recognition of objects using non-collocated sensors operating in visible and infrared bands.										
Weapons and Combat Systems Division	Weapons Systems Technology	Sensor Processing and Algorithms	Edinburgh, South Australia	Model development in synthetic environment.	The project will endeavour on development and /or modifications of multiple 3D models in synthetic environment together with their material properties.										
Weapons and Combat Systems Division	Weapons Systems Technology	Sensor Processing and Algorithms	Edinburgh, South Australia	Verification algorithms for models developed within synthetic environment.	The project will asses approaches to validate developed 3D models against their realistic counterparts.										

Division	MSTC	STC	Location	Project Title	Project description (provide a brief description of the project that can be used to advertise the project and give students an understanding)	Desirable Skills	Aerospace / Aeronautical Engineering, Naval Architecture Stream	Chemical, Radiological, Biological, Food Sciences Stream	Computer Sciences, IT, Software Engineering, Telecommunications Stream	Electronic / Electrical Engineering Stream	Materials Science Stream	Mathematics and Physics Stream	Mechanical and Mechatronic Engineering (including Robotics) Stream	Psychology and Social Sciences Stream	Other related areas
Weapons and Combat Systems Division	Weapon Systems Technologies	Collaborative Weapon Technologies	Edinburgh, South Australia	Aerial Swarm Demonstrator	Our group conducts research and development in machine learning and artificial intelligence applied to the control of aerial robotic swarms. Our goal is to develop advanced algorithms and implement them in real UAV hardware that we can then test in flight trials. We are looking for a motivated student to join our team in developing and demonstrating state-of-the-art algorithms in swarm robotics. The student should have a strong academic background and should be interested in developing technical skills in areas such as robotics, artificial intelligence, genetic algorithms, neural networks and machine learning. The project objectives are to support our research team in demonstrating swarm concepts in large scale simulations. The successful applicant will work with the research team to implement algorithms for the control of swarms in our simulation demonstration environments, typically using Python or MATLAB programming languages. This will also include assisting in the implementation of these algorithms in quadrotor hardware for demonstration. The student will be required to develop large scale simulations and generate performance data and videos for demonstration to DST Group management and Australian Defence Force stakeholders.	• Experience in robotics, artificial intelligence, software development or simulation • Fluency in at least one programming language (ideally Python, MATLAB or C++) • Strong background in mathematics • Good problem solving skills • Good communication skills			X	X		X	X		
Weapons and Combat Systems Division	Weapon Systems Technologies	Collaborative Weapon Technologies	Edinburgh, South Australia	Swarm Training Environment Improvement	Our group conducts research and development in machine learning and artificial intelligence applied to the control of aerial robotic swarms. Our goal is to develop advanced algorithms and implement them in real UAV hardware that we can then test in flight trials. We are looking for a motivated student to join our team in developing and demonstrating state-of-the-art algorithms in swarm robotics. The student should have a strong academic background and should be interested in developing technical skills in areas such as robotics, artificial intelligence, genetic algorithms, neural networks and machine learning. The project objectives are to improve the fidelity of our team's current swarm simulation environment by integrating and testing open source flight dynamics model 'JSBSim'. The successful applicant will need to become familiar with JSBSim, conduct simulations of UAV swarms using the improved simulation model, compare these results to data collected from field trials, and then, apply the team's machine learning framework to generate intelligent swarming behaviours.	• Experience in software development, modelling and simulation or aerodynamics • Fluency in at least one programming language (ideally C++, MATLAB or Python) • Strong background in mathematics • Good problem solving skills • Good communication skills			X	X		X	X		
Weapons and Combat Systems Division	Weapon Systems Technologies	Collaborative Weapon Technologies	Edinburgh, South Australia	Scaling Swarm Machine-Learning Capability	Our group conducts research and development in machine learning and artificial intelligence applied to the control of aerial robotic swarms. Our goal is to develop advanced algorithms and implement them in real UAV hardware that we can then test in flight trials. We are looking for a motivated student to join our team in developing and demonstrating state-of-the-art algorithms in swarm robotics. The student should have a strong academic background and should be interested in developing technical skills in areas such as robotics, artificial intelligence, genetic algorithms, neural networks and machine learning. The project objectives are to improve our team's ability to conduct large scale simulations for training swarm behaviours via Machine Learning. The student will need to investigate the use of Graphics Processing Units (GPUs) and multiple Virtual Machines to increase simulation throughput and enhance the learning performance of the swarm agents.	• Experience in robotics, artificial intelligence, software development or simulation • Fluency in at least one programming language (ideally Python, MATLAB or C++) • Experience with software acceleration libraries and frameworks including CUDA, PyTorch and TensorFlow would be well regarded • Strong background in mathematics • Good problem solving skills • Good communication skills			X	X		X	X		
Weapons and Combat Systems Division	Weapon Systems Technologies	Collaborative Weapon Technologies	Edinburgh, South Australia	Collaborative Drones - Implementation of research into real-world systems for field demonstrations.	Within the Weapons and Combat Systems Division at DSTG, Concept Demonstration and Experimentation (CDE) is focus of implementation and demonstration of research supporting many programs. CDE currently is focused on utilising Un-crewed Aerial Systems (Drones) for real-world collaborative systems research demonstrations. The project will focus on implementation of this research on a variety of drone systems which includes aspects of software development, embedded systems and communications. Opportunity to attain CASA RePL qualifications can be provided that will support involvement with field trials (including potential activities at Woomera or other remote locations).	Software Development Skills (Python) - Essential 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		
Weapons and Combat Systems Division	Weapon Systems Technologies	Directed Energy Technologies and Effects	Edinburgh, South Australia	Design , Modelling & Simulation of Precision Target Tracking/Pointing System	This Project will incorporate AI techniques in Target Modelling/State Estimation and undertake MATLAB modelling and simulation to asses feasibility.	A degree/PG qualification in Science, Engineering or Mathematics subject is required. Experience in dynamical system modelling and simulation is desirable along with prior experience in computer programming (e.g. C/C++) and/or MATLAB (incl. e.g. Simulink, Control/DSP toolbox).	X		X	X		X			
Weapons and Combat Systems Division	Weapon Systems Technologies	Directed Energy Technologies and Effects	Edinburgh, South Australia	Impact of electromagnetic interference on the performance of an Uncrewed Aerial Vehicle (UAV)	The aim of this project is to develop the HPRF effects on critical electronic components of the guidance and control systems of UAV. These models will be integrated into a HPRF modelling & simulation environment in order to evaluate the performance of the UAV when subjected to intentional HPRF irradiation.	Experience in Matlab, Simulink, C and Python and strong Mathematics	X		X	X		X	X		
Weapons and Combat Systems Division	Weapon Systems Technologies	Sensor Processing and Algorithms	Edinburgh, South Australia	Codification and evaluation of mission objectives for autonomous drones	Autonomous drones are becoming more prevalent and are expected to operate in complex and hostile environments. Given a sensors view of the environment and objects of interest, a means of codifying the mission intent, rules of engagement and ethical rules into a form suitable for use by autonomous algorithms on-board the drone will need to be developed and evaluated. This project will also utilise the Unreal Engine simulation software to generate realistic scenarios in which the algorithms can be developed and evaluated. The student ideally should have a machine learning and/or software engineering background. We are looking for a passionate student who can work in a team environment, and is willing to learn and work across a range of technology areas.	* Good communication skills. • Ability to work in a team environment under broad directions. • Fluency in at least one programming language (ideally Python) • Strong software development skills • Good problem solving skills • Ability to read and understand scientific papers	X		X	X		X	X		
Weapons and Combat Systems Division	Weapon Systems Technologies	Sensor Processing and Algorithms	Edinburgh, South Australia	Semantic scene understanding for autonomous drones	Autonomous drones are becoming more prevalent and are expected to operate in complex and hostile environments. To effectively achieve the mission goals in such an environment, the drone will need to detect objects of interest in the scene, and determine higher level semantic relationships between them. This project will also utilise the Unreal Engine simulation software to generate realistic scenarios in which the algorithms can be developed and evaluated. The student ideally should have a machine learning and/or software engineering background. We are looking for a passionate student who can work in a team environment, and is willing to learn and work across a range of technology areas.	* Good communication skills. • Ability to work in a team environment under broad directions. • Fluency in at least one programming language (ideally Python) • Good problem solving skills • Ability to read and understand scientific papers	X		X	X		X	X		