# Position Details

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| **Job Title:** | CSIRO Undergraduate Vacation Scholarships – Digital Productivity  |
| **Reference No:** | 2044 |
| **Classification:** | CSOF1.1  |
| **Stipend:** | $1462.77 per fortnight |
| **Location:** | Please refer to the List of Projects at the end of this document |
| **Tenure:** | 8 to 12 weeks from November 2015 to February 2016 |
| **Role Purpose:** | The 2015/16 Vacation Scholarship Program is designed to provide students with the opportunity to work on real-world problems in a leading R&D organisation.Participation in the Vacation Scholarship Program has influenced previous scholarship holders in their choice of further study and future career options. Many have gone on to pursue a PhD in CSIRO or to build a successful research career within CSIRO, a university or industry. |
| **Project Description:** | Please refer to the list of Projects on the following pages of this document. *If you require further information please contact the person listed as the contact for the project.* |
| **How to Apply:**  | Please apply for this position online at [www.csiro.au/careers](http://www.csiro.au/careers)**You will be required to:**1. select your **top 2 research projects** in order of preference;
2. submit a **CV** which includes:
* the reasons why the research project/s you have selected are of interest to you; and how your previous skills/knowledge and experience meets the project requirements; and
* an outline of your longer-term career aspirations and detail how this program will help you achieve them.
1. upload your **academic results**.

**Referees:** Please ensure that your resume includes the name and contact details of your academic supervisor and at least one other referee (work or university)**.**If you experience difficulties applying online call 1300 984 220 and someone will be able to assist you. Outside business hours please email: csiro-careers@csiro.au. *Please do not email your application. Applications received via this method may not be considered.* |
| **About CSIRO:** | The [**Commonwealth Scientific and Industrial Research Organisation (CSIRO)**](http://www.csiro.au) is Australia’s national science agency. At CSIRO we shape the future. We do this by using science to solve real issues. Our research makes a difference to industry, people and the planet.  |

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| **Project No.** | **Project Title *(see the following pages for more information)*** |
| DP01 | Rescue-bot |
| DP02 | Autonomous Pinpoint Landing of Unmanned Aircraft |
| DP03 | Flexible landing gear for a hybrid ground/air platform |
| DP04 | Micro-Nano Robots |
| DP05 | Hexapod Scout MAV |
| DP06 | Tree Climbing Robot |
| DP07 | From Small Data to Big Data: Secure Data Trading over Cloud  |
| DP08 | Get that perfect shot! |
| DP09 | Rich Acoustic Perception for Mobile Robots |
| DP10 | 3D Indexation System for Planning/Operation |
| DP11 | 3D Library |
| DP12 | A MineCraft Approach to a 3D Global Indexation system |
| DP13 | ACT-RE Cognitive Architecture |
| DP14 | Applying visual markers to 3D data |
| DP15 | Gaze with Ray Casting in Unity 3D |
| DP16 | Import/export tools from sensor and mapping streams |
| DP17 | Speech pathology screening and decision support system |
| DP18 | Robotics, Brain Computer Interface and Eye-tracking for assistive rehabilitation |
| DP19 | Design for Machine-Building Machines |
| DP20 | Big Data Analytics on a Mobile Platform: Predicting Biosecurity Hot-Spot |
| DP21 | Augmented Visual Analytics |
| DP22 | Autonomous Visual Analytics |
| DP23 | Machine learning for next generation activity trackers |
| DP24 | Application of Image Processing Aquaculture Research |
| DP25 | Context Driven User Queries (CDUC) |
| DP26 | CSIRO Site Smart Phone App |
| DP27 | Low Power Heart Monitoring |
| DP28 | Distributed point cloud processing and web-based visualisation |
| DP29 | Graphical and textual summaries of data |
| DP30 | Data Science and the Future of Work |
| DP31 | New business planning with social media and census data: “Placer” |
| DP32 | Hedging FX risk Through LSV Model |
| DP33 | My Suburb Profiler |
| DP34 | Evaluating Social Media Content |
| DP35 | Standards exploration with ERIC |
| DP36 | Joining the social dots: Looking for similar content across different social media platforms |
| DP37 | Integrating Data Analytics and Visualisation in a Virtual Reality Environment |
| DP38 | Immersive Visualisation for Bushfire Preparation and Response |
| DP39 | Simulation of human movement using dynamic feedback control |
| DP40 | MobiCollab: A mobile field app for confidential document and image exchange with the CSIRO Collaboration Platform (CCP) |
| DP41 | ASPIRE to engage with industry |
| DP42 | Exploring Matheuristics for Optimal Rostering |
| DP43 | Web Data Explorer |
| DP44 | Understanding bushfire consequence: compiling sources, understanding them, and improving data  |
| DP45 | Application of Stochastic Interpolation to Economic Models |
| DP46 |  Investigating distance sampling methods for surveying flying-fox populations |
| DP47 | Computational Electromagnetics with High Performance Computing |
| DP48 | Image based insect phenomics for biodiversity discovery |
| DP49 | Novel Urban Visualisation |

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| **Project Number** | **Digital Productivity - Vacation Scholarships Project Details** |
| **DP01** | **Project Title**Rescue-bot**Project Description**Rescue bots have it tough: uneven terrain limits wheeled vehicles, smoke and darkness obscures most sensors, falling debris requires resistance to knocks and hits. Rescue-Bot is a project to develop a six-legged robot that uses highly compliant joints to cross uneven terrain and absorb knocks without relying on any terrain sensing whatsoever.**Project Duties/Tasks*** System identification of compliant joints
* Applying existing compliant control system to real hexapod
* Testing on increasingly uneven terrains
* Modification to gait, controllers and robot hardware to improve ability to cross this terrain
* Demo video under smoke/dark conditions (simulated rescue situation)

**Relevant Fields of Study*** Computer Science
* Electrical Engineering
* Mechatronics

**Location:** QCAT, Pullenvale, QLD**Contact:** Thomas Lowe on (07) 3327 4027 or email thomas.lowe@csiro.au |
| **DP02** | **Project Title**Autonomous Pinpoint Landing of Unmanned Aircraft**Project Description**The objective of this project is to design and validate a system for autonomous landing of small unmanned aircraft using an active ground helipad and an onboard neuromorphic camera. This capability will significantly extend the functionalities and autonomy of UAVs by allowing them to perform routine and long-term operations without human supervision. The successful candidate will work with CSIRO researchers to develop the system and flight test it.**Project Duties/Tasks*** Improve the design of the active landing helipad (hardware + software).
* Improve the design and implementation of the onboard vision system for tracking the landing helipad.
* Help implementing more robust and reliable guidance and control algorithms.
* Assist in conducting flight tests and analyzing flight data.

**Relevant Fields of Study*** Mechanical and/or Aerospace Engineering
* Robotics
* Computer Science
* Previous programming skills in C/C++ and/or hands-on experience with robotics will be useful for the completion of the project

**Location:** QCAT, Pullenvale, QLD**Contact:** Farid Kendoul on (07) 3327 4050 or email farid.kendoul@csiro.au |
| **DP03** | **Project Title**Flexible landing gear for a hybrid ground/air platform**Project Description**We are developing a hybrid ground/air platform and need a capable student with hardware experience (and preferably aerial vehicle experience) to develop, model, and prototype some different ways that will allow the hybrid platform to function in both ground-based and air-based modes, and transition between them effectively.**Project Duties/Tasks*** Use sound reasoning and principles to look at different ways of allowing freedom of movement in both ground and air-based modes --- create a suite of test ideas
* Create a set of metrics for evaluating these ideas
* Deploy the best version on our actual robot!

**Relevant Fields of Study*** Mechanical engineering
* Mechatronics
* UAVs

**Location:** QCAT, Pullenvale, QLD**Contact:** David Howard on (07) 3327 4714 or email david.howard@csiro.au |
| **DP04** | **Project Title**Micro-Nano Robots**Project Description**Micro nano robotics are an exciting new frontier of robotics which bring together techniques in robot design, novel materials and novel perception and control strategies. This vacation project would extend the development of a centimetre scale robot being developed at ASLab. The purpose of the project would be to design the robot exoskeleton and subsequently navigation and control strategies of such a centimetre scale robot.**Project Duties/Tasks*** Improve the current design of the centi-root
* Develop state estimation modules for the robot
* Develop controllers for targeted locomotion
* Demonstrate a controlled navigation for the robot

**Relevant Fields of Study*** Mechanical design
* Micro/Nano fabrication skills
* Signal processing

**Location:** QCAT, Pullenvale, QLD**Contact:** Tirthankar Bandyopadhyay on (07) 3327 4008 or email tirtha.bandy@csiro.au |
| **DP05** | **Project Title**Hexapod Scout MAV**Project Description**The ASLab is very active in the development of hexapod robots for a number of applications such as inspection, environment monitoring, etc. Getting around in unknown natural terrains is challenging due to limited FOV of the onboard sensors. The “Hexapod Scout MAV” is a proposed add-on to the ground robot that will extend its FOV and improve its autonomous navigation. The MAV (micro air vehicle) would take off from the hexapod when needed, fly ahead or track the robot, and land autonomously on the hexapod.  **Project Duties/Tasks*** Select avionics for the MAV
* Define a reliable embedded architecture
* Develop and implement vision and control algorithms for the autonomous flight of the MAV.
* Perform experiments and analyse data

**Relevant Fields of Study*** Computer Science
* Electrical Engineering
* Mechatronics

**Location:** QCAT, Pullenvale, QLD**Contact:** Dr Navinda Kottege on (07) 3327 4024 or email Navinda.kottege@csiro.au |
|  **DP06** | **Project Title**Tree Climbing Robot**Project Description**The project is to construct a preliminary demonstrator of a flywheel stabilised tree climbing robot. The robot will have counter rotating flywheel stabilisation and rear leg actuation with IMU and leg strain feedback.**Project Duties/Tasks*** Assist with design and assembly of robot
* Develop and test climbing algorithms
* Document performance of hardware and software with recommendations for future work

**Relevant Fields of Study*** Electrical Engineering
* Mechatronics
* Mechanical Engineering

**Location:** QCAT, Pullenvale, QLD**Contact:** Ross Dungavell on (07) 3327 4170 or email ross.dungavell@csiro.au  |
| **DP07** | **Project Title**From Small Data to Big Data: Secure Data Trading over Cloud**Project Description**This project aims to build a cloud service that allows people (data owners) to trade their small data with trading partners (data users) who want to build big data sets for analysis. This project will be beneficial for both data owners and data users by facilitating data flow among them, with the privacy of data owners preserved.**Project Duties/Tasks*** Design the software architecture for data storing and trading on the cloud
* Analyse the security property of the design
* Implement a demo

**Relevant Fields of Study*** Internet of Things
* Information Security
* Software Engineering

**Location:** Marsfield, NSW**Contact:** Dongxi Liu on (02) 9372 4152 or email dongxi.liu@csiro.au |
| **DP08** | **Project Title**Get that perfect shot!**Project Description**Wearable technology has come to the rescue of people seeking that thrilling sport action shot taken by a high quality camera (cf., Lily camera, SoloShot or Move’nSee). This project will use wearable sensors to determine real-time location, activity, and environmental context of a group of users, record videos of the scene from multiple angles, and create a punchy collage of the most exciting events. Come work with us and develop a system for capturing exciting highlights of your favourite sport activity!**Project Duties/Tasks*** Embedded software: sport activity classification, real-time data collection, location tracking
* Video/image processing
* User/web interface

**Relevant Fields of Study*** IT
* EE
* CS

**Location:** QCAT, Pullenvale, QLD**Contact:** Brano Kusy on (07) 3327 4023 or email brano.kusy@csiro.au |
| **DP09** | **Project Title**Rich Acoustic Perception for Mobile Robots**Project Description**Use the ever-present acoustic cues in our surroundings to discern additional information about the surroundings by way of localising ‘sounds of interest’, tracking sound sources, mapping the ambient soundscapes and aligning them with a topographical map to identify ‘hot spots’.**Project Duties/Task*** Perform signal processing to extract sounds of interest
* Autonomously build a soundscape map with semantic information
* Evaluate system and document results

**Relevant Fields of Study*** Computer Science
* Electrical Engineering
* Mechatronics

**Location:** QCAT, Pullenvale, QLD**Contact:** Dr Navinda Kottege on (07) 3327 4024 or email Navinda.kottege@csiro.au |
| **DP10** | **Project Title**3D Indexation System for Planning/Operation**Project Description**Indexing with a basis in Longitudinal and Latitudinal coordinates and additional Height/Depth for 1mx1mx1m = 1m ³ block/cube structure. The volumetric indexation with centrepoints is a global approach which shall penetrate the whole world through Air, Water, Land and Underground. **Project Duties/Tasks*** Graphics programming: Visualize associated grid/block structure in various ways (contour, volumes within volume, texture, indexation nodes being centre points and cube objects).
* Based on database structure

**Relevant Fields of Study**Previous programming skills in C#, C++, Java, UnityScript. Environment is Unity 3D.**Location:** Sandy Bay, Hobart, Tasmania**Contact:** Charlotte Sennersten on (03) 6237 5699 or (03) 62375647 or email charlotte.sennersten@csiro.au |
| **DP11** | **Project Title**3D Library**Project Description**To create a 3D Library for 3D objects. This Library in the database shall also include additional information where these objects are located in the indexation system.**Project Duties/Tasks*** Create an outline for the 3D Object Library, a taxonomy with provenance and implement it
* Model critical objects and reuse existing ones

**Relevant Fields of Study**Previous programming skills in C#, C++, Java, UnityScript. Environment is Unity 3D.3D Modelling skills is appreciated (familiarity with Blender, 3D Studio Max, Maya, ...)**Location:** Sandy Bay, Hobart, Tasmania**Contact:** Charlotte Sennersten on (03) 6237 5699 or (03) 6237 5647 or email charlotte.sennersten@csiro.au |
| **DP12** | **Project Title**A MineCraft Approach to a 3D Global Indexation system**Project Description**To show how a 3D indexation system can be used for Research and Business we will use parts of Mine Craft as a concept.**Project Duties/Tasks*** To explore what Mine Craft as a concept can give us in form of ideas into a Robotic Research context. Interactive interaction with cube content is core, think inventories.
* Make use of our 1m³ blocks/cube approach and contextualize this for research purpose(s).
* Implementation and demonstration as a standalone .exe file/prototype.

**Relevant Fields of Study*** Previous programming skills in C#, C++, Java, UnityScript. Environment is Unity 3D.3D Modelling skills is appreciated (familiarity with Blender, 3D Studio Max, Maya, ...)

**Location:** Sandy Bay, Hobart, Tasmania**Contact:** Charlotte Sennersten on (03) 6237 5699 or (03) 6237 5647 or email charlotte.sennersten@csiro.au |
| **DP13** | **Project Title**ACT-RE Cognitive Architecture**Project Description**Apply ACT-R/ACT-RE theories about human cognition and research/develop a software system architecture relevant to cognitive AI in autonomous robots operating in challenging environments. **Project Duties/Tasks*** Research a cognitive architecture with specific application in robotics and the mining industry.
* Explore the interaction with robots, sensors, and cognitive AI in constrained environments
* Interface ACT-RE/visualization with real-time 3D engine displays (such as Unity3D)

**Relevant Fields of Study*** Previous programming skills in C#, C++, Java, UnityScript. Environment is Unity 3D.3D Modelling skills is appreciated (familiarity with Blender, 3D Studio Max, Maya, ...)
* It is of great importance that you have an interest in Artificial Intelligence and Robotics.

**Location:** Sandy Bay, Hobart, Tasmania**Contact:** Charlotte Sennersten on (03) 6237 5699 or (03) 6237 5647 or email charlotte.sennersten@csiro.au |
| **DP14** | **Project Title**Applying visual markers to 3D data**Project Description**Disparate 3D data sources often need to have marker data applied to facilitate recognition of features and locations when using 3D visualization. This work involves the development of technologies to allow the addition or overlay of marker data onto pre-existing 3D geometry data.**Project Duties/Tasks*** Investigate existing technologies for adding marker data to 3D data such as DXF files.
* Propose and develop solutions to the marker problem, in the context of requirements of the existing project.
* Integrate solution with current database and display technologies in use in the existing project.

**Relevant Fields of Study*** Previous programming skills in C#, C++, Java, UnityScript. Environment is Unity 3D.3D Modelling skills is appreciated (familiarity with Blender, 3D Studio Max, Maya, ...)

**Location:** Sandy Bay, Hobart, Tasmania**Contact:** Charlotte Sennersten on (03) 6237 5699 or (03) 6237 5647 or email charlotte.sennersten@csiro.au |
| **DP15** | **Project Title**Gaze with Ray Casting in Unity 3D**Project Description**Interconnect Eye tracker with Unity 3D for stationary computer set up. Goal is 3D object logging/steering. Being able to track/log AND steer expert interaction via screen.**Project Duties/Tasks*** Interconnect the eye tracker with Unity 3D
* Define up 3D scenes with 3D objects so the interconnection with eye tracker can work for defined tasks
* Run scenarios, and log AND steer real time
* Logged data stored in Database format

**Relevant Fields of Study*** Previous programming skills in C#, C++, Java, UnityScript. Environment is Unity 3D and Tobii EyeX API

**Location:** Sandy Bay, Hobart, Tasmania**Contact:** Charlotte Sennersten on (03) 6237 5699 or (03) 6237 5647 or email charlotte.sennersten@csiro.au |
| **DP16** | **Project Title**Import/export tools from sensor and mapping streams**Project Description**Project involves development of systems to manage real-time data streams and a custom database (input side) and export of selected datasets from the database to distributable files (DXF/Unity3D, etc). Project will require skills in database use and design, and software engineering.**Project Duties/Tasks*** Analysis and documentation of streaming data formats from various sensors on-board robotic vehicles (e.g., LiDar, RGB-D, sonar) and interface to database API.
* Development of export-tools from the database to specified data formats as directed.

**Relevant Fields of Study*** Computer science/engineering/information technology, mathematics, remote sensing with strong programming knowledge such as python /C#, C++, Java and knowledge of web programming

**Location:** Sandy Bay, Hobart, Tasmania**Contact:** Charlotte Sennersten on (03) 6237 5699 or (03) 6237 5647 or email charlotte.sennersten@csiro.au |
| **DP17** | **Project Title**Speech pathology screening and decision support system**Project Description**In this project we are working together with speech pathologists to develop tools to identify speech development problems in children. We use speech and language models, machine learning and procedures from speech pathology to develop a new system to assess problems in an automated fashion. Such a system should alleviate the current pressure on speech pathologists, reduce long waiting lists for receiving professional assessment, and provide non-experts (e.g. GPs, school nurses, parents, etc.) with a decision support mechanism for assessing speech problems in young children.**Project Duties/Tasks*** Assist in data collection i.e. recording speech and audio data editing
* Background research
* Segmentation of speech data
* Development of models to detect pronunciation problems in children's speech

**Relevant Fields of Study*** Computer Science
* Engineering
* Mathematics

Should have an interest, and preferably experience with signal processing, machine learning and programming.**Location:** Sandy Bay, Hobart, Tasmania**Contact:** Andreas Duenser on (03) 6237 5678 or email andreas.duenser@csiro.au |
| **DP18** | **Project Title**Robotics, Brain Computer Interface and Eye-tracking for assistive rehabilitation**Project Description**The aim of this project is to test the feasibility of a new robotic system to improve arm function in stroke patients who have lost upper limb mobility.We are developing a system that provides robotics-assisted movement to rehabilitation patients. It gives real-time visual and sensory feedback with the ability for participants to steer the movement direction of the robot by eye movements. Movements are triggered through a Brain-Computer Interface that enables patients to imagine upper limb movements, and through the robotic assistance be able to perform them. To achieve hundreds of repetitions, which are required for neuroplasticity to take effect, the system is paired with gaming technology to increase motivation to perform the required movements.**Project Duties/Tasks*** Assist in the assembly of the mechanical / robotic system
* System integration
* Set up a testing environment and perform initial system tests with users

**Relevant Fields of Study*** Engineering
* Mechatronics
* Computer Science

Should have an interest, and preferably experience with engineering (robotics), and programming.Interest in game development (gamification) and assistive rehabilitation is an asset.**Location:** Sandy Bay, Hobart, Tasmania**Contact:** Andreas Duenser on (03) 6237 5678 or email andreas.duenser@csiro.au  |
| **DP19** | **Project Title**Design for Machine-Building Machines**Project Description**This project will develop a design environment for designing and printing machines based upon the Unity 3D engine. Output to be processed by STL with modifications for part insertion, with the STL++ driving a cartesian robot operating as a 3D plastic printer (using standard printer components). The design environment and cartesian robot will be enhanced with the ability to embed pre-made parts during the 3D printing process. We have several 3D printers in Tasmania already (including a novel design created at Sandy Bay), and have assembled the basic cartesian platform for this project.**Project Duties/Tasks*** create a constructive solid geometry design tool in Unity
* add the ability to select from a library of part models
* enhance STL with part annotations
* develop the algorithm to implement part insertion during 3D printing

**Relevant Fields of Study*** Interactive 3D programming,
* Mechatronics

The project requires strong programming skills in C#, C++, Java, UnityScript or similar. **Location:** Sandy Bay, Hobart, Tasmania**Contact:** Craig Lindley on (03) 6237 5646 or email craig.lindley@csiro.au |
| **DP20** | **Project Title**Big Data Analytics on a Mobile Platform: Predicting Biosecurity Hot-Spot **Project Description**This vacation project aims to build a mobile application for intelligent monitoring and early Downy mildew alerting in large area salad plantation. Intelligent big data analytics techniques will be developed to run on a mobile platform to produce a large area farm scouting HOT-SPOT map to be used by the farmers.**Project Duties/Tasks*** Mobile Application Development for Biosecurity Decision Support, Very good programming skills in Java, Java Script and Python
* Requirement analysis and establish an optimum interface design for a Biosecurity HOT-SPOT App for the farmers
* Interact with current project team to establish a link between current CSIRO CLOUD based systems and implement a biosecurity app for field trial with partnering industrial companies
* Report writing on the project work and potential publication in high impact journal

**Relevant Fields of Study*** Big Data Analytics
* Machine Learning
* Remote Sensing
* Biosecurity

**Location:** Sandy Bay, Hobart, Tasmania**Contact:** Dr Ritaban Dutta on +61 3 6232 5423 or email ritaban.dutta@csiro.au |
| **DP21** | **Project Title**Augmented Visual Analytics**Project Description**Performing data analytics on real-world instances would allow for users to gain real-time insight while navigating a natural environment. In this project, we aim to implement an augmented analytics and visualisation system on a tablet (Android or iPad) for the specific use case of studying bee behaviour in the field. **Project Duties/Tasks*** Implement an application on a tablet that captures the environment and recognises instances
* Implement a simple interface that augments the real-world view with analytics on the instances
* Test the system with end users in the field

**Relevant Fields of Study*** Computer Science
* Human Computer Interaction (HCI)
* Augmented Reality

**Location:** Sandy Bay, Hobart, Tasmania**Contact:** Ulrich Engelke on (03) 6237 5650 or email ulrich.engelke@csiro.au |
| **DP22** | **Project Title**Autonomous Visual Analytics**Project Description**(Semi-) Autonomous visual analytics aims to recommend analytics and visualisation choices to improve interactive data exploration, effective information communication, and user experience. In this project, we aim to implement a specific semi-autonomous visual analytics pipeline that recommends analytics and visualisations given certain data types, user queries, and user profiles.**Project Duties/Tasks*** Establish a database with relevant metadata to facilitate user queries
* Define a set of analytics and visualisation tools and map against data and information
* Implement the system and evaluate it with end users

**Relevant Fields of Study*** Computer Science
* Data Analytics
* Data Visualisation

 **Location:** Sandy Bay, Hobart, Tasmania**Contact:** Ulrich Engelke on (03) 6237 5650 or email ulrich.engelke@csiro.au |
| **DP23** | **Project Title**Machine learning for next generation activity trackers**Project Description**Existing sensor based tracking systems of human activity only provide basic functionality (tracking steps, flights of stairs, sleep, etc).  This project aims to track a richer, more descriptive set of activities by integrating motion and location information using current mobile technology. The extent to which existing machine learning techniques can infer higher level activity from mobile technology will be tested.**Project Duties/Tasks*** Undertake activity trials with mobile phones
* Capture data (using existing apps where available) during trials
* Time series processing and transformation
* Development and validation of machine learning models

**Relevant Fields of Study*** Computer Science
* Engineering
* Mathematics

Should have an interest, and preferably experience with signal processing, machine learning and programming.**Location:** Sandy Bay, Hobart, Tasmania**Contact:** Andrew Hellicar on (03) 6232 5547 or email andrew.hellicar@csiro.au |
| **DP24** | **Project Title**Application of Image Processing Aquaculture Research**Project Description**The project offers the opportunity to develop an image analysis tool for characterising the morphology of Atlantic salmon eggs. The student will digitise microscope slides, and develop the image analysis workflow and algorithms to consistently identify and parameterise egg morphology. **Project Duties/Tasks*** Capture image data from prepared slides
* Develop and validate image processing algorithms to parameterise egg morphology from images obtained from the historical slides.
* Batch run the algorithm over the selection of slides
* Work with the physiologist to draft a paper on the analysis technique and morphometric results

**Relevant Fields of Study*** Computer Science with familiarity with the openCV computer vision suite of tools

**Location:** Sandy Bay, Hobart, Tasmania**Contact**: Andrew Hellicar on (03) 6232 5547 or email andrew.hellicar@csiro.au |
| **DP25** | **Project Title**Context Driven User Queries (CDUC)**Project Description**In order to overcome the limitations of current data query methods the use of context driven user queries is proposed.  In this project, we aim to implement an apiology (study of bees) ontology and associated interaction tools to support such queries.**Project Duties/Tasks*** Design and implement an apiology ontology
* Design and implement an interaction API for use with the ontology
* Evaluate the system with end users

**Relevant Fields of Study*** Computer Science
* Information Technology

**Location:** Sandy Bay, Hobart, Tasmania**Contact:** Peter Marendy on (03) 6237 5670 or email peter.marendy@csiro.au |
| **DP26** | **Project Title**CSIRO Site Smart Phone App**Project Description**Develop a smart phone application with location and situation awareness to improve site productivity and safety of employees and visitors.**Project Duties/Tasks*** Consult and gather requirement specifications of application features
* Deploy iBeacons and develop low power Bluetooth site location services
* Implement a user interface for visitor and staff services

**Relevant Fields of Study*** IT
* Computer Science
* ElecEng

**Location:** Pullenvale, Brisbane, Qld**Contact**: Philip Valencia on (07) 3327 4136 or email philip.valencia@csiro.au |
| **DP27** | **Project Title**Low Power Heart Monitoring**Project Description**Utilise a range of low power sensors to continuously estimate heart rate on animals. Initially humans will be used as the target species, however cattle, pigs, bats and other species of animals are of interest also.**Project Duties/Tasks*** Report on existing heart rate monitoring methods
* Analysis of low power sensors and techniques for detecting heart rate using these sensors
* Implementation of low power heart rate monitoring on existing devices (or prototype of new h/w if necessary)

**Relevant Fields of Study*** Electronic Engineering
* Electrical Engineering

**Location:** Pullenvale, Brisbane, Qld**Contact:** Philip Valencia on (07) 3327 4136 or email philip.valencia@csiro.au |
| **DP28** | **Project Title**Distributed point cloud processing and web-based visualisation**Project Description**Point clouds can now be generated using many commodity sensors/devices. Visualising large point clouds through the web gives flexibility in mobile devices/platforms for many applications.**Project Duties/Tasks*** Point cloud data models and structures, streaming, query, transformation and alignment of large point clouds using distributed processing
* Visualising large point clouds in the web

**Relevant Fields of Study*** Computer science/engineering/information technology
* Mathematics
* Remote sensing with strong programming knowledge such as python/C++/Java
* Knowledge of web programming

**Location:** Sandy Bay, Hobart, Tasmania**Contact:** Md Sumon Shahriar on (03) 62375690 or mdsumon.shahriar@csiro.au |
| **DP29** | **Project Title**Graphical and textual summaries of data**Project Description**CSIRO is developing technology to search amongst tables of data (for example, government statistics or scientific data) like we can search the web. This project will build tools to visualise data (for example, drawing graphs) or describe it in text, automatically and for data from any source.**Project Duties/Tasks*** Evaluate existing tools for graphics and for text generation, and understand their strengths and weaknesses
* Build a system to visualise or summarise data
* Run this system with test data, and report how well it works

**Relevant Fields of Study*** Computer Science
* Statistics
* Design

**Location:** Acton (ANU Campus), Canberra, ACT **Contact:** Paul Thomas on (02) 6216 7065 or email paul.thomas@csiro.au |
|  **DP30** | **Project Title**Data Science and the Future of Work**Project Description**This project will apply data science techniques to analyse the historic drivers of labour force change, in order to better understand the future of work in Australia. Findings from the research will be tailored towards government and industry, to inform policy design, strategic planning and decision making.**Project Duties/Tasks*** Data ingestion and munging
* Exploratory analysis and data visualisation
* Use of GLMs and mixed models to test hypothesises
* Clear presentation of results in a form suitable for non-technical readers
* Optional extensions to the project include; graph models to expand the exploratory analysis, and machine learning for predictive modelling

**Relevant Fields of Study*** Science
* Mathematics
* Economics
* Engineering

provided the student is capable of using a statistical software package for data import, cleaning and analysis, and has experience with generalised linear models.**Location:** Acton (ANU campus), Canberra**Contact:** Lachlan Rudd on (02) 6216 7002 or email lachlan.rudd@csiro.au |
|  **DP31** | **Project Title**New business planning with social media and census data: “Placer”**Project Description**In this project the student will investigate the use of social media (e.g. Twitter) along with ABS census data in the development of software for planning the placement of new small businesses. For example, if setting up a new gym in Newcastle, who are the competitors? Do the competitors have social media accounts, and what can we find out about them (e.g. are their customers happy?). What is the demographic of our target market, and how does it compare to regional ABS census data?**Project Duties/Tasks*** Investigate sources of social media information about businesses and customers
* Write software to query and analyse social media data about businesses and potential customers
* Integrate analysis software into a front-end mapping GUI (pre-written) to display rankings and details between potential business locations

**Relevant Fields of Study*** Software engineering
* Computer Science
* Information Modelling

**Location:** Acton (ANU Campus), Canberra, ACT or Marsfield, Sydney, NSW**Contact:** Canberra:David Ratcliffe on (02) 6216 7001 or david.ratcliffe@csiro.au, or Marsfield: Stephen Wan on (02) 9372 4703 or stephen.wan@csiro.au  |
| **DP32** | **Project Title**Hedging FX risk Through LSV Model**Project Description**We have developed a Local-Stochastic-Volatility (LSV) math model that can more accurately represent the underlying volatility dynamics of the foreign-exchange options market. This project will use the LSV model to study the hedging performances of the LSV model, in particular, to verify if the dynamics of assuming lognormal volatility is more superior.**Project Duties/Tasks*** Develop a hedging procedure using existing Excel testing interface established by the team
* Compute and generate hedging performance over historical market data and for a number of currency pairs regarded as highly skewed in the market
* Analyse the hedging performances of the lognormal LSV model and benchmark against a previous Heston LSV model
* Document the analysis and prepare for possible publication

**Relevant Fields of Study*** Applied Mathematics
* Probability theory
* Computer Engineering

**Location:** Clayton, Vic**Contact:** Geoff Leeon (03) 9545 8040 or email Geoffrey.Lee@csiro.au |
| **DP33** | **Project Title**Mr Suburb Profiler**Project Description**Develop flexible web service data integration capabilities for the My Suburb Profiler tool. This tool provides personalised information about suburbs Australia wide: similar to the liveable cities ranking, see <https://en.wikipedia.org/wiki/World%27s_most_liveable_cities>, but user configurable and at the suburb scale.**Project Duties/Tasks*** Investigate standards for information exchange such as from the OGC.
* Deploy web services to establish a testing framework.
* Develop data integration components to dynamically obtain data.
* Implement a data caching component for efficiency

**Relevant Fields of Study*** Software Engineering
* Information Modelling

**Location:** Acton (ANU Campus), Canberra, ACT**Contact:** Bella Robinson on (02) 6216 7049 or email bella.robinson@csiro.au |
|  **DP34** | **Project Title**Evaluating Social Media Content**Project Description**The admiralty code, <https://en.wikipedia.org/wiki/Admiralty_code>, is a method for rating the reliability and credibility of information. We want to develop a raking measure inspired by this system to help emergency managers assess social media content in terms of relevance and reliability.**Project Duties/Tasks*** Develop an algorithm to define reliability and credibility of tweets and Twitter users
* Verify the algorithm using an existing CSIRO test tweet collection
* Deploy a prototype to process a near-real-time tweet stream

**Relevant Fields of Study*** Software Engineering
* Information Modelling

**Location:** Acton (ANU Campus), Canberra, ACT or Marsfield, Sydney, NSW**Contact:** Robert Poweron (02) 6216 7039 or email robert.power@csiro.au |
| **DP35** | **Project Title**Standards exploration with ERIC**Project Description**Applying the Common Alerting Protocol CAP-AU, an international standard for sharing emergency alert and warning messages between various systems and networks, to ERIC (Emergency Response Intelligence Capability) to build import and export capability. Exploring how good a fit CAP-AU and other OASIS standards are to data captured in ERIC: <http://eric.csiro.au/>**Project Duties/Tasks*** Compare the CAP-AU standard to the ERIC Data model
* Build import and export facilities into ERIC
* Either look at other OASIS standards or analyse vocabulary usage in ERIC

**Relevant Fields of Study*** Software Engineering
* Information Modelling

**Location:** Acton (ANU Campus), Canberra, ACT**Contact:** Gavin Walker on (02) 6216 7030 or email gavin.walker@csiro.au |
| **DP36** | **Project Title**Looking for similar content across different social media platforms**Project Description**In this project, the student will develop a system to highlight similar content on different social media platforms. This would one to see how topics are expressed and discussed across a variety of different media types (Twitter, comments on photos on Instagram, discussions about videos on Youtube).**Project Duties/Tasks*** Investigate social media APIs to retrieve textual information.
* Design software components to highlight similarities.
* Integrate analysis software into a front-end mapping GUI (pre-written), web application or web service

**Relevant Fields of Study*** Software engineering/computer science

 Subfields:* Information retrieval and natural language process

**Location:** Marsfield, Sydney, NSW**Contact:** Stephen Wan on (02) 9372 4703 or stephen.wan@csiro.au |
| **DP37** | **Project Title**Integrating Data Analytics and Visualisation in a Virtual Reality Environment**Project Description**Virtual Reality Environments offer the potential to more deeply investigate scientific data and visualise 3D simulation output in ways that were previously impossible. This project will build on existing data analytics and visualisation capabilities to create an integrated tool for visualisation and analysis of simulation data in an interactive Virtual Reality Environment, applying this tool in the first instance to visualisation and quantification of performance of a set of industrial systems including crushers, mixers and rail wagons.**Project Duties/Tasks*** Develop data processing pipeline in C++ and C# from CSIRO’s [Workspace](http://research.csiro.au/workspace/) platform to [Unity](https://unity3d.com/) engine for analysis and display of simulation data
* Develop user interaction capability in Unity engine for selection of data analysis options
* Set up and demonstrate application of tool for visualisation and analysis of a set of industrial systems

**Relevant Fields of Study*** Computer Science
* Computational Science
* Physical Science
* Software Engineering
* Information Technology (Games and Graphics Programming)

**Location:** Clayton, Vic**Contact:** lachlan.hetherton@csiro.au, or gary.delaney@csiro.au |
| **DP38** | **Project Title**Immersive Visualisation for Bushfire Preparation and Response**Project Description**This project seeks to further develop a virtual/augmented reality visualisation environment to support planning and response to Australian bushfire events. Using world leading research by CSIRO scientists in the area of bushfire behaviour and spread, this project will allow fire simulations to be synthesize with other data sources such as public and government web map services, web data services and live data streams to create an integrated, immersive environment for communicating the science to stakeholders. The development of this capability will create a system applicable to any location within Australia and have applications in many other fields of computational modelling and simulation.**Project Duties/Tasks*** Develop asset and data source pipeline in C++ and C# from CSIRO’s [Workspace](http://research.csiro.au/workspace/) platform to [Unity](https://unity3d.com/) game engine
* Develop [Workspace](http://research.csiro.au/workspace/) C++ plugins for data acquisition and pre-processing from GIS web services, [Spark](http://research.csiro.au/spark/) bushfire solver and other datasets
* Develop procedural real-world generation, scenario simulation and situation analysis use case demonstrations in virtual and augmented reality based 3D visualisations

**Relevant Fields of Study*** Computer Science
* Software Engineering
* Information Technology (Games and Graphics) Programming
* C++, C#, Unity, OpenGL, GLSL

**Location:** Clayton, Vic**Contact:** Matt Bolger on (03) 95457892 or email Matt.Bolger@csiro.au |
| **DP39** | **Project Title**Simulation of human movement using dynamic feedback control**Project Description**CSIRO have a new 3D computational model of human movement that can simulate how we exercise, work and move about in our lives. This project involves developing a controller for the virtual model human that will allow application of it to improving sports performance, ergonomics and safety.**Project Duties/Tasks*** Literature review of best controller algorithms for dynamic human models
* Software implementation of the control algorithm as a C++ plugin using CSIRO’s Workspace platform
* Testing of the software algorithm against simple unit test cases
* Application of the algorithm to a performance by an elite athlete in competition

**Relevant Fields of Study*** Mechanical/Mechatronics/Electronics Engineering
* Control theory (required)
* Programming (required)
* Biomechanics (optional)

**Location:** Clayton, Vic**Contact**: Dr Simon Harrison on (03) 9545 8450 or email Simon.Harrison@csiro.au |
| **DP40** | **Project Title**MobiCollab: A mobile field app for confidential document and image exchange with the CSIRO Collaboration Platform (CCP)**Project Description**This project will develop a mobile tablet application that integrates a policy controlled, secure document store and telepresence with the existing CSIRO Collaboration Platform (CCP) infrastructure. This will permit sharing and discussion of sensitive documents and images and information, in real-time, between groups of collaborating researchers, some of whom may be in the field and not seated in front of a CCP unit.**Project Duties/Tasks**Design and implement an Android application (for a Nexus N9 tablet) that provides mechanisms for:* Authentication to provide credentials for controlled access to the document storage system (e.g. based on LDAP);
* Secure download of a catalogue of available documents to be sent to the device;
* Secure upload of documents to the document store from the device;
* Secure downloading stored documents from the document store and policy driven management of the encrypted documents on the device;
* Joining a SIP teleconference for the meeting to discuss the documents of concern.

**Relevant Fields of Study*** Computer Science
* Software Engineering

**Location:** Marsfield (Sydney) NSW**Contact:** Email john.zic@csiro.au  |
| **DP41** | **Project Title**ASPIRE to engage with industry**Project Description**This project, [ASPIRE](http://www.csiro.au/en/Research/MF/Areas/Innovation/Agile/Reducing-waste-through-ASPIRE), is building a digital tool to support the match making of companies with complementary resources, one company with a by-product or waste that can be used as an input for another company. The student project will contribute to information, data gathering, system testing and industry engagement for ASPIRE in Melbourne – combining your ability to understand technical details with polished written skills to deliver this practical project for Victorian industry.**Project Duties/Tasks*** Searching and documenting industrial symbiosis case studies
* ASPIRE system testing & development
* Support the ASPIRE team’s company engagement activities

**Relevant Fields of Study*** Business & Marketing
* Engineering
* Computer Science

**Location:** Clayton, Melbourne or Waurn Ponds, Geelong**Contact:** Melanie Ayre on +61 3 9545 8473 or email melanie.ayre@csiro.au |
| **DP42** | **Project Title**Exploring Matheuristics for Optimal Rostering**Project Description**Rostering can offer many challenges as an optimisation problem, constraints around what is legal and desired for both employers and employees can often be complex and hard to model. This can lead to more traditional optimisation methods performing poorly and encountering difficulties, exploring matheuristics for the problem may offer new insights and better outcomes for this problem.**Project Duties/Tasks*** Explore the literature around matheuristics and rostering problems
* Determine suitable approaches to the problem, including modelling and algorithms
* Implement your approach to solve real world data sets

**Relevant Fields of Study*** Mathematics
* Operations Research
* Computer Science
* Software Engineering

**Location:** Clayton, Vic**Contact:** Joseph Bunton on (03) 9545 8062 or email joe.bunton@csiro.au |
| **DP43** | **Project Title**Web Data Explorer**Project Description**Develop a tool to describe tabular data for automatic deployment as a web app to support simply data exploration tasks. The data deployed can be in various formats: CVS, XML, JSON or simple XLS spreadsheets.**Project Duties/Tasks*** Develop a simple data model to describe common tabular data formats.
* Develop a generic web app to deploy conforming tabular data, including simple search features to explore the tabular data.
* Develop supporting tools: data verifier (to check the input data is correct); data estimator (to propose data mappings for simple data types: strings, integers, reals, dates); data loader (process the input data)

**Relevant Fields of Study*** Software engineering
* Information Modelling
* JavaScript/Web apps

**Location:** Acton (ANU Campus) Canberra, ACT**Contact:** Bella Robinson on (02) 6216 7049 or email bella.robinson@csiro.au |
| **DP44** | **Project Title**Understanding bushfire consequence: compiling sources, understanding them, and improving data**Project Description**Understanding bushfire consequence in terms of loss of life, injury, or damage to property is vital, but often difficult to obtain due to the multiple agencies involved with recording relevant information. We wish to identify and collate information from key sources both for analysis purposes and to develop advice on what future best practice could look like for such record-keeping.**Project Duties/Tasks*** Identify and collate bushfire consequence data available from different agencies, including potential data gaps
* Summarize common causes for record gaps, and identify how they might affect analysis (possibly through simulation study of potential bias)
* Provide advice on how to improve record keeping practices to prevent loss of information and allow more streamlined analysis

**Relevant Fields of Study*** Information Technology (Statistics, Computer Science, etc)
* Information Management

**Location:** Clayton, Vic**Contact:** Dr Carolyn Huston on +61 3 9545 7893 or email Carolyn.Huston@csiro.au |
| **DP45** | **Project Title**Application of Stochastic Interpolation to Economic Models**Project Description**This project will develop a projection method for incorporating monthly and biannual historical data in the SUPA model (Simulation of Uncertainty for Pension Analysis), which projects annual long-term economic behaviour and its effects upon the superannuation savings of Australians. **Project Duties/Tasks*** Develop an interpolation model fitting procedure using existing Excel interface established by the CSIRO Super Cluster
* Integrate the interpolation procedure into the existing model projection interface
* Analyse the accuracy and efficacy of the interpolation method by benchmarking against relevant economic data
* Document the analysis and prepare for possible publication

**Relevant Fields of Study*** Applied Mathematics
* Probability theory
* Actuary Sciences

**Location:** Clayton, Vic**Contact:** Thomas Sneddon on (03) 9545 8099 or email Thomas.Sneddon@csiro.au |
| **DP46** | **Project Title**Investigating distance sampling methods for surveying flying-fox populations**Project Description**Monitoring flying-fox populations is important for understanding their population dynamics and for subsequently making good management decisions. However, survey method options are numerous, each with their own practical challenges, so focussed research on the distance sampling survey method will help to gain better understanding of when and how it can be used. **Project Duties/Tasks*** Background reading on flying-foxes and distance sampling methodology (1 week)
* Using real data, investigate a number of research questions in order to gain better understanding of when and how distance sampling can be applied to surveying flying-fox populations
* Write up findings in a formal report

**Relevant Fields of Study*** Statistics
* Mathematics
* Environmental Science
* Applied Science

**Location:** Dutton Park, Brisbane, QldContact: Melissa Dobbie on (07) 3833 5530 or email Melissa.Dobbie@csiro.au |
| **DP47** | **Project Title**Computational Electromagnetics with High Performance Computing**Project Description**CSIRO is developing new connected array antennas for applications in astronomy and subsurface sensing of complex media. This project will develop new algorithms for electromagnetic modelling of such systems with implementations on CSIRO’s high performance computing facilities.**Project Duties/Tasks*** Learn the principles of parallel computing
* Learn how to implement parallel computing algorithms in Matlab
* Implement and test an algorithm for computational electromagnetics in parallel computing

**Relevant Fields of Study*** Computer modelling of physical systems
* Basic electromagnetics

**Location:** Marsfield (Sydney) NSW**Contact:** Dr Stuart Hay on(02) 9372 4288 or email Stuart.Hay@csiro.au |
| **DP48** | **Project Title**Image based insect phenomics for biodiversity discovery**Project Description**Accelerating biodiversity discovery and populating biodiversity knowledge banks are becoming more important. In this project, we will focus on the automation of information capture from insect collections through the use of advanced image analysis.**Project Duties/Tasks*** Developing advanced image analysis algorithms for insect phenomics
* Writing/using C/C++ codes
* Documenting the work in a technical report or paper and giving a presentation

**Relevant Fields of Study*** Computer Science
* Engineering
* Information Technology
* Electrical Engineering

or any fields with strong programming skills.**Location:** North Ryde, Sydney, NSW**Contact:** Dr Changming Sun on (02) 9325 3207 or email changming.sun@csiro.au |
| **DP49** | **Project Title**Novel Urban Visualisation**Project Description**CSIRO is investigating new tools for urban decision-making and new ways for stakeholders to engage with urban scenario models.This project will provide opportunities for the vacation scholar to explore Virtual Reality, Augmented Reality, 3D Web Graphics, Data Visualisation, Geospatial Systems and/or Interactive Simulation.**Project Duties/Tasks*** Learn about existing CSIRO simulation and visualisation technologies
* Review and selection of available software libraries/standards
* Development of novel prototypes and demonstrators

**Relevant Fields of Study*** Computer Science
* Engineering

(Experience or interest in Computer Graphics is desirable)**Location:** Acton (ANU Campus), Canberra, ACT**Contact:** Matt Adcock on (02) 6216 7098 or email matt.adcock@csiro.au |