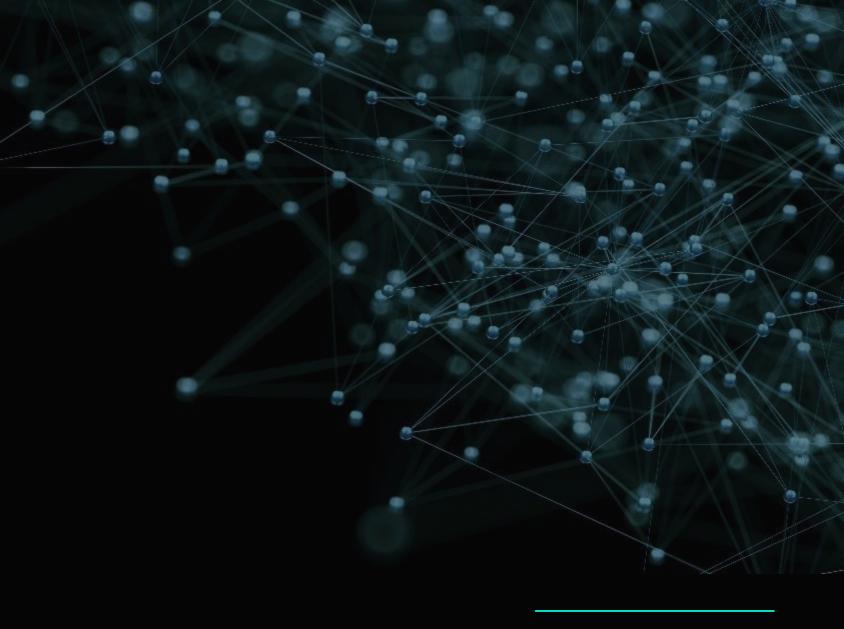


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Director's report

Dear colleagues, supporters, and members of the Defence Al ecosystem,

It is my pleasure to present to you our annual report for 2024.

With every year, we see the rapid development, implementation and regulation of AI, both within Defence and civilian contexts. In the past 12 months we have seen the emergence of new LLM (both good and bad), increased use but awareness of generative AI, and the release of responsible use of AI guidelines both domestically (specifically Department of Industry, Science and Resources' "Safe and responsible AI in Australia") and internationally.

Al is here to stay so there is an increasing and continuous need to use this technology in a manner that is traceable, trustful, governed, with clear assignment of responsibility, and with increased literacy. This requires a whole of network approach, needing multi-disciplinary subject matter experts from across multiple sectors. Across both the Defence and Al ecosystems.

2024 was a year of putting the Network in DAIRNet, and we hosted many events including:

- A second responsible AI (RAI) co-design workshop, focusing on the practical and responsible implementation of AI within Defence. The workshop capitalised on a diverse range of experts and the invaluable insights of current practices within the UK and USA Defence forces and industry. A significant outcome was the Defence RAI working group, which continues to meet on a regular basis to activate and implement recommendations.
- Industry networking forums, such as the industry symposium
 as part of the ADM SA Defence summit, providing industry
 with the opportunity to hear from Defence sector on a range
 of topics including cybersecurity, cognitive and information
 warfare, decision systems and space.

- We continued our relationship with the Australian Joint Congress on AI (AJCAI) by hosting the Defence AI presymposium in Melbourne.
- Involvement and sponsorship of industry, academic and Defence networking events and summits, demonstrating our commitment to supporting the Defence and AI ecosystems.
- Originating as a pilot program in 2023, the fortnightly Defence AI seminar series continued into 2024, with presenters from across Defence, government, academia, and industry.

And we had another year of growth, and over the past 12 months:

- Our LinkedIn followers increased from 663 to 961
- Our website was visited by between 251 to 2,007 individuals per month
- Our emails reached \sim 1,150 individuals per campaign, and we have >1,500 contacts in our CRM
- Interest in our Defence AI Seminars continued to grow, with between 59 and >100 attendees per session, 57-73% conversion rates (attendees/registrations) and a total of 619 log ins over nine seminars.

Lastly, a significant achievement for Defence was the establishment of the Defence AI Centre (DAIC), which was officially launched in November 2024. DAIC is a partnership between Data Division (Associate Secretary Group), Defence Science Technology Group and Joint Capability Group, and aims to coordinate, inform and sponsor activities to facilitate the adoption of AI at scale. DAIRNet is excited to be working with DAIC to support activities, initiatives and events to assist with communication across the Defence enterprise and broader ecosystem in 2025 and beyond.

The Defence section is facing an uncertain period, where there is a need for the rapid development and implementation of disruptive technologies to provide asymmetric advantages.

With the recent move of Advanced Strategic Capabilities Accelerator (ASCA) to Vice Chief of Defence Force (VCDF), common thread is the need to consult with end-users early and to consult frequently. DAIRNet will continue to assist with bringing together innovators with end-users and practioners.

I would like to thank members of the DAIRNet management team, DAIRNet governance committees, our sponsors within Defence and UniSA and the continued support from Defence and academia. I look forward to continuing our work and making even more significant contributions to our field in the coming year.



Dr Mel McDowall Director - DAI<u>RNet</u>



Sponsor statement



Mr Andrew Seedhouse Chief of Space, Intelligence, National Security and Cyber Division Defence Science and Technology Group Department of Defence

What another exciting year for developments in AI. Not only the technology, but how Government is getting to grips with how the AI revolution is managed in our society and how Defence is driving policy and best practise to accelerate its safe adoption.

Every day we are seeing the use of autonomous systems in conflicts around the world underpinned by AI approaches. You will see announcements about both Air and Maritime autonomous systems being developed for future Defence capability, also enabled by AI. We are experimenting with automated decision aids to help our commanders get to grips with complex decisions involving data ingestion way beyond the ability of a human.

Hence, noting DAIRNet's response through its Al for Decision making theme.

I hope you can see the hunger for AI developments in Defence is nothing but growing.

We cannot feed this beast if we do not have an AI innovation Science & Technology (IS&T) Ecosystem to help us develop the solutions. This year, as with others, the DAIRNet has grown its influence and delivered innovations. Noting especially the leadership of workshops and other network events held this year.

Thank you all that have led the network and those that are doing the innovation it is much appreciated.



Sponsor statement

The Defence Artificial Intelligence Research Network (DAIRNet) is a transformational national initiative which brings together thought leaders from Defence, academia and industry to provide strategic advice and innovative AI solutions to Defence, while supporting the next generation of Defence AI researchers.

In 2024, DAIRNet has continued to drive collaboration and innovation across the Defence sector by facilitating critical and impactful activities across Defence, academia and industry. These activities included cutting-edge Defence AI seminars, symposiums, responsible AI co-design workshops, conferences and travel scholarships. As research and technology advance, DAIRNet has ensured that the responsible and ethical use of AI has been front of mind to enhance decision making and operational capabilities.

A highlight of 2024 was the Practical Approaches to responsible AI workshop, held in April at UniSA City West campus in Adelaide. The workshop brought together participants from Defence, industry and academia and from different disciplines to explore strategies for implementing responsible AI within Defence.

With input from a range of sponsors from both Defence and DAIRNet, the session's scope and objectives were carefully designed. Using the MG Taylor (co-design) methodology, the workshop promoted innovation by involving diverse stakeholders and encouraging collaborative and creative problem-solving. Participants explored both internal and external environments, learned from industry experts and engaged in scenario testing and iteration to develop mechanisms for implementing responsible Al within Defence.

DAIRNet also formed a partnership with The Alan Turing Institute, the UK's national institute for data science and Al. Recognising the synergies between The Alan Turing Institute, the Commonwealth, and UniSA, all parties have agreed to sign a Memorandum of Understanding to establish transnational collaborations with government and academia. The first initiative of this partnership is set for 2025, where discussions will commence on shared areas of interest and the planning of future collaborative research projects.

DAIRNet remains committed to driving research impact for Defence by supporting the concept-to-capability journey. To date, DAIRNet has supported \$13 million in research funding across 59 Defence-related

projects, resulting in the development of 37 prototypes, facilitated 21 Defence AI seminars and hosted 8 research events and co-design workshops.

In 2024, DAIRNet also hosted a planning session for the Jericho Disruptive Innovation team and an Al Toolkit Hackathon for the Defence Science and Technology Group and international partners.

As a vital network for idea exchange and technological collaboration within the Defence AI ecosystem, DAIRNet is excited to share the 2024 achievements, and we look forward to continuing future collaborations that will advance Australia's Defence capabilities.



Distinguished Professor Marnie Hughes-Warrington AO Provost and Chief Academic Officer, Standing Acting Vice Chancellor and Bradley Distinguished Professor University of South Australia

Professor Peter Murphy,
Deputy Vice Chancellor
Research and Enterprise,
University of South Australia





DAIRNet strategy

DAIRNet is an initiative of the Department of Defence and managed in partnership with the University of South Australia. Activities are driven by our mission and vision statements, and our objectives.

Our mission

Connecting Defence opportunities with next generation AI solutions

Our vision

By empowering innovation and collaboration across diverse national AI capabilities, we will develop safe and secure AI solutions to provide advantages for Defence



People & talent

Strategy: sustain a talent pipeline to grow domestic AI capabilities and Defence AI-ready specialists



Research impact

Strategy: supporting R&D and providing the platform in which Al-users work alongside researchers and developers



Integration & evolution

Strategy: bringing together and supporting the broader Defence and Al ecosystems



DAIRNet achievements

A summary of DAIRNet achievements since establishment in 2021.

59

Projects commenced

28

Organisations funded 10

Projects provided data for follow on projects

30

Publications, including 14 peer-review journals

37

Prototypes developed

1000+

LinkedIn followers

\$13M+

Research funding awarded

Conference travel sponsorships

1400+

Active subscribers

8

Research events and co-design workshops



2024 Snapshot

February

Inaugural Defence AI seminar series: 22nd February – 31st October

- 9 seminars
- 8 different organisations represented
- 59 virtual attendees per session
- Teams/GovTeams online webinar

April

Responsible AI Workshop #2: 22nd and 23rd April

- 12 sponsors from across Defence and DAIRNet
- Hosted in Adelaide
- 47 in person attendees
- Co-design strategies for implementing responsible AI
- 13 scoped mechanisms to address risks when implementing Al

August

Science Alive!: 2nd – 4th August

- 21,143 visitors over 3 days
- Hosted in Adelaide
- Engage primary and secondary school attendees for "STEM DAY OUT" and public visitors

ADM Defence AI and Industry Symposium: 29th August

- Hosted in Adelaide
- 61 in person attendees
- 25 different organisations represented

November

International Federated Hackathon:

11th - 15th November

- Encouraged collaboration
- Simulated real-world problems
- Shared resources and developed code in co-location

DAIC launch: 25th November

 Lead acceleration and adoption of responsible AI at scale

March

DTC BD After Five event: 7th March

- DAIRNet sponsored event
- Hosted in Adelaide
- 100 in person attendees
- Networking opportunity for Defence Industry community

TAP meeting: 27th March

- Discussed memberships
- Identified research priorities

June

Jericho Disruptive Innovation workshop: 24th June

 Planning day hosted in Adelaide

September

ADSTAR: 17th – 19th September

- Hosted in Canberra
- DAIRNet sponsored plenary session
- Networking opportunity for Defence Industry community

November continued

Defence Al Symposium (part of AJCAI): 26th November

- Hosted in Melbourne
- 67 in person attendees
- 45% registered for symposium only
- Representation for Defence, academia and industry





"DAIRNet helps Jericho Disruptive Innovation (JDI) deliver on its AI Integration efforts by making it easy to collaborate and communicate with academia. One of JDI's innovation principles is Teaming-to-Win, and DAIRNet has already brought together many of the institutions, researchers and stakeholders that Air Force needs to team with for many aspects of Al integration. In 2025, JDI intends on continuing to leverage the helpful, proactive team within DAIRNet to make the most of Australia's Al experts, especially in the area of Responsible AI application."

WGCDR Michael Moroney, AI Lead, Jericho Disruptive Innovation.



Engagement and events

DAIRNet primarily communicates with stakeholders through four main channels: website, direct email campaigns, LinkedIn and X.





Defence Al seminar series

Aligning with DAIRNet strategies of research impact, integration and evolution, and an initiative of the Key Stakeholder Group, DAIRNet continues to host the Defence AI seminar series. These seminars are designed to develop a community of AI researchers and practitioners, encouraging the exchange of innovative ideas and knowledge.



on the field of Al



8 different
organisations
represented, including
Defence, DSTG,
University and Industry



69% average conversion rate from registrations to attendees



>59 virtual attendees per seminar



Networking between Defence, Academia and Industry



Defence Al seminar series

Presenter/s	Organisation	Title
Dr Ralph Gailis	Defence Science and Technology Group (DSTG)	Defence Al Research Network
Dr Liming Zhu	CSIRCLIATAGE	A System-level Approach to AI Safety and Guardrails: Ensuring Testing, Transparency, and Accountability Through Standards
Professor Tim Miller	The University of Queensland	Why your AI tool probably doesn't work and why it is so *#\$# hard to get it to do so
Professor Antonio Robles Kelly	Defence Science and Technology Group (DSTG)	Al for Structured Data: Gathering Information and Acquiring Knowledge at Scale
Claire Ripley and William Giacometti	Standards Australia	Understanding the Al Management System Standard
Dr Kathryn Kasmarik	University of New South Wales	Designing Collective Motion Behaviours for Swarming Robots Solving Coverage Problems
,	,	Advanced Algorithms for Early Infection Detection: Transforming Wearable Data through Functional Data Analysis
Dr Kate Conroy and Amy Plant	Jericho Disruptive Innovation	Measuring human-centred military use of Al
Professor Rain Liivoja	The University of Queensland	What is Responsible AI in the Military: a read out from the Seoul REAIM Summit



DAIRNet sponsored event

In March, DAIRNet sponsored the Defence Teaming Centre (DTC) BD After Five event in Adelaide. This event provided a valuable networking opportunity for DTC Members and the wider Defence Industry community, connecting key decision-makers and Prime Contractors.





In April, DAIRNet hosted a "Practical Approaches to Responsible AI" workshop, facilitated by Yellow Hat Consulting. The workshop brought together participants from Defence, industry and academia, representing various disciplines, to explore strategies for implementing responsible AI within Defence. With valuable input from a range of subject matter experts from across Defence, the session's scope and objectives were carefully designed. Using the MG Taylor co-design methodology, the workshop promoted innovation by engaging diverse stakeholders and encouraging collaborative and creative problem-solving.

Scope

The unique risks when implementing Al and what consistent mechanisms we can create to enable responsible use at Defence.

MG Taylor Co-Design Methodology

Encourages inclusivity and innovation by involving diverse stakeholders, fostering creativity and ensuring solutions reflect varied perspectives.

Objectives

Together, we will:

- · Align on our context.
- Identify the unique risks related to trusted and responsible use of AI in the Defence context.
- Explore what others are doing at a practical level and support the use of Responsible AI.
- Identify or design the consistent mechanisms required to support Defence implement AI.
- Scenario test the mechanisms designed using case studies.
- Based on the scenario testing, identify and address the gaps related to the unique risks of Al.
- Align on our next steps.

Givens

This work will be codesigned with representatives from across Defence and external SMEs (AI academics and researchers) to ensure we consider all perspectives.

- We will understand best practice methods and tools.
- The methods and tools will need to align with the UK and US, while recognising Australia will have nuanced differences.
- The development and use of AI in the Defence context is in accordance with Australia's international and domestic legal obligations.
- As we develop methods and tools, we need to consider that Foreign Military Sales will bring in AI systems developed overseas.





Co-design strategies for implementing responsible AI



13 scoped mechanisms to address risks when implementing AI



12 sponsors from across Defence and DAIRNet



47 in person attendees



Networking between Defence, Academia and Industry











Understanding the complexities of implementing AI and the associated risks is more important than ever. Workshop participants identified key mechanisms required to address the unique risks of AI implementation within Defence. By leveraging existing resources, encouraging collaboration, and investing in a coordinated strategy, Defence can navigate these challenges while maximizing benefits and minimizing risks.

Scoped mechanisms:

- Library of Certified Al Functions
- Engineering
- Job Families
- Training Programs
- Design process for use of data/models in decisions
- Defined Use Cases and Scenarios

- Register of Al Systems
- Terms of Use
- Model Registry
- Defence Al Framework
- Al considerations to obtain Authority to Operate (ATO)
- Legal Compliance/Advice
- Ethics Committee





"My outstanding highlight was watching people from other areas within Defence,

• • •

multi-disciplinary individuals talking and using that diverse set of experiences to create a joint outcome."

Dr Mel McDowall, DAIRNet Director



Workshop video: youtu.be/plomnHIX2zw



Science Alive!

In August, DAIRNet occupied a booth in the Defence outreach area at Science Alive, where they used gamification to engage and educate school children and their families about AI and data science.











Think Pictionary meets machine learning. You draw, and a neural network tries to guess what you're drawing. The more you draw, the more it will learn.



Defence Al and Industry Symposium

In August, DAIRNet hosted an Industry Symposium as part of the ADM South Australian Defence Summit in Adelaide. The symposium was a forum for the exchange between the Australian Defence and AI communities, exploring the impacts of AI on cyber security, cognitive and decision systems, information warfare, space and technology. Key highlights included a panel discussion with representatives from the Department of Defence, DSTG and Industry, where they addressed the challenges, impacts and future of AI.



61 registrations from 25 different organisations



7 presentations with representation from Department of Defence, DSTG, DAIC and Industry



42% of attendees from Defence



8% of attendees from Universities



50% of attendees from Industry











DAIRNet sponsored event

In September, DAIRNet sponsored the Australian Defence Science Technology and Research (ADSTAR) summit in Canberra. ADSTAR brought together the innovation, science and technology sectors to share ideas on a global scale. The summit focused on the theme of "Accelerating the Delivery of Asymmetric Defence Capabilities", alongside exploring the IS&T priorities outlined in the 2024 National Defence Strategy.

The six priorities:

- Trusted autonomy
- Quantum technology
- Information warfare
- Long-range fires
- Hypersonics
- Directed energy





DAIRNet symposium

In November, DAIRNet hosted a Defence AI Symposium as part of the 37th Australian Joint Conference on Artificial Intelligence (AJCAI) at the University of Melbourne. The symposium provided a platform for the exchange between the Australian Defence and AI communities, exploring key priorities, opportunities and commonalities.

Highlights included a presentation by Mr Tony Lindsay, Lockheed Martin Australia, on Al Deployment in Defence, as well as a fireside chat with Dr Dale Lambert, former DSTG chief, Professor Jennifer Palmer from RMIT and Dr Ralph Gailis from DSTG, discussing the challenges of scaling Al in Defence.



67 registrations



45% of attendees registered for symposium only



5 presentations from 10 speakers and panellists



40% of attendees from Defence



30% of attendees from Universities



30% of attendees from Industry









Defence Al Centre (DAIC)

The DAIC is a partnership between Data Division in Associate Secretary Group, Defence Digital Group, Joint Capabilities Group, and the Defence Science and Technology Group. Operating under a hub-and-spoke model, Liaison Officers from a range of Groups and Services support DAIC activities. The purpose of DAIC is to coordinate, inform and advance Defence initiatives aimed at scaling AI capabilities, a key initiative in Defence Data Strategy 2.0. This includes managing risks, identifying and embracing opportunities, and supporting the growth and increasing integration of AI across Defence.

Officially launched in November 2024, DAIC marks a key milestone in Defence's efforts to achieve asymmetric advantage through the responsible use of AI. As a central hub, DAIC will establish governance and assurance frameworks, connect Defence's AI centres of excellence, and facilitate the widespread adoption of responsible AI across Defence operations. DAIRNet is proud to support and partner with DAIC to achieve these key outcomes.

Four Core areas

- Al Strategy, Policy and Governance
- Technology and Architecture
- Community of Practice and Engagement
- Al Innovation Science and Technology

Key outcomes

- Robust governance and risk management
- Scalable technology infrastructure and projects
- Engaged community of Al practitioners
- Tangible AI innovation and Research and Development outputs



"DAIRNet has played an important role in bringing together public sector, private sector, non-government, and academic AI experts and AI interested stakeholders to have meaningful collaboration. It has been a rewarding experience working alongside the DAIRNet as a part of the governance board. Activities like the Responsible AI Workshop in 2024 and the collaborative symposium with the Alan Turing Institute in early 2025, provided a valuable platform and opportunity to leverage the expertise of a diverse array of stakeholder to generate insights and guidance for the responsible use of artificial intelligence in Defence. In my role on the DAIRNet Governance Board, I look forward to further being able to work with and support DAIRNet contribute to further advancements in the field of responsible use of AI."

Mr Simon Joyce, Assistant Secretary Data Governance and Services, Department of Defence.



DAIRNet research programs

DAIRNet continued to support research impact for Defence, assisting with the concept to capability journey.

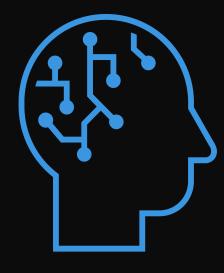
To date, DAIRNet have supported **four** NGTF **research programs**, Al for Decision Making and current state reports for Defence. This amounts to **\$13** million in funding, supporting **59**x Defence-related projects. A full list of DAIRNet-supported projects can be found in the appendices.

In 2024, two projects received Phase 2 funding to continue research into Patters in Noisy and Dynamic Data:

- Prof Siobhan Banks, UniSA, project title: Statistical machine learning algorithm for early detection of infection using data from consumer wearables.
- Prof Truyen Tran, Deakin University, project title: Coupled self-supervised learning and deep reasoning for improved processing of noisy and dynamic multimodal data from multiple sources.



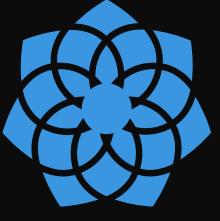
Autonomous processing & reasoning



Human-Al interaction



Distributed multi-domain networks



Patterns in noisy & dynamic data



DASA research project

Defence Aviation Safety Authority (DASA) aims to support a variety of research initiatives focused on the certification of autonomous systems within the aviation domain. This research will enhance the understanding of certification techniques for learning systems in aviation and explore how these methods can be integrated with existing approaches for software and system safety certification. Specifically, DASA seeks to determine the additional assurances required to assess the risks associated with high levels of autonomy and online adaptive systems, ensuring that safety levels are both credible and defensible.

In 2024, Dr Zena Assaad completed a curated literature review on the assurance and certification of dynamic, adaptive and learning systems in safety-critical domains. The final report highlighted a snapshot of existing approaches and research within this area. The resources captured within the report were reflective of best practice approaches.

The report provided a set of recommendations on a path forward for Defence on the assurance and certification of dynamic, adaptive and learning systems in safety-critical domains.

Dr Zena Assaad, School of Engineering, Australian National University





2024 Governance

The government and management of DAIRNet ensures representation from all relevant stakeholders, including Defence, the DAIRNet Management Team and foundation university members. As the DAIRNet network grows, committees and membership will evolve to ensure representation of our stakeholders.

DAIRNet Management Team

The Management Team implements decisions made by the management committee and coordinates the network on behalf of the Department of Defence. The team is from the University of South Australia and the Defence Science and Technology Group (DSTG) and is the main point of contact for Universities, researchers and other stakeholders.

Members

- Dr Mel McDowall, Director of DAIRNet
- Dr Ralph Gailis, Director of Al Innovation,
 DAIC/DSTG and Associate Director of DAIRNet
- Ms Emily Williams, DAIRNet Project Manager
- Ms Jacinta Lamacchia, DAIRNet Communications and Events Lead

- Associate Professor Belinda Chiera, Research Lead, UniSA
- Dr Gary Hanly, DSTG Liaison to DAIRNet, DSTG
- Mr Will Partridge, Project Officer, DSTG



2024 Governance

Governance Panel

The Governance Panel provides strategic direction to the DAIRNet Management Committee and ensures that DAIRNet activities align with the broader Defence AI strategic direction. Members of the Governance Panel represent DAIRNet, DSTG and key stakeholders within the Department of Defence.

The Governance Panel decided on the top priorities and mechanism through which DAIRNet activities can be communicated to the AI Board.

Members:

Chairs: Dr Robert Hunjet and Mr Guy Blucher, Program Lead, Al, DSTG

- Mr Simon Joyce, Assistant Secretary Data Governance and Services, Data Division, Associate Secretary Group
- CDRE Stu Watters, Director general Joint Command, Control, Communications and Computers (JC4), Joint Capabilities Group
- Ms Alison West, Assistant Secretary Strategic Capabilities
- Dr Mel McDowall, Chair of the DAIRNet Management Committee

Management Committee

The Management Committee coordinates implementation of the direction provided by the Governance Panel. The Management Team and the DAIRNet panels, committees and working groups report to the Management Committee.

The Management Committee provides the primary link between DAIRNet and the Department of Defence.

Members:

Chair: Dr Mel McDowall, Director of DAIRNet

- Dr Ralph Gailis, Director of Al Innovation, DAIC/DSTG
- o Ms Emily Williams, DAIRNet Project Manager
- Ms Jacinta Lamacchia, DAIRNet Communications and Events Lead
- Dr Gary Hanly, DSTG Liaison to DAIRNet, DSTG
- Mr Will Partridge, Project Officer, DSTG
- Mr Philip Keane, Assistant Director Strategic Programs, Science Partnerships, DSTG
- o Mr Matt Opie, Director Defence and Space, UniSA
- Dr Sebastien Hebert, Senior Manager: Business Development Enterprise Partnerships Unit, UniSA
- o Dr Sebastien Wong, Al Strategy and Leadership, DSTG
- o Dr Michael Bromley, DSTG Navigator



2024 Governance

Technical Advisory Panel

The Technical Advisory Panel provides advice on sovereign research strengths, suggested DAIRNet symposium topics, assistance with AI glossary and identifies future priorities. The panel also play a critical role in the development and assessment of research calls and activities conducted within the network, such as education and outreach and the identification of trends.

Members:

Chair: A/Prof Belinda Chiera, Deputy Director, Industrial Al Research Centre, UniSA

- Dr Ralph Gailis, Specialist Science Advisor for AI, DSTG
- Prof Markus Stumptner, Chair, DAIRNet Technical Advisory Panel,
 Director Industrial AI Research Centre, UniSA
- Prof Christopher Fluke, Swinburne University of Technology
- Prof Matt Garratt, University of NSW Canberra
- A/Prof Yuan-Fang Li, Monash University
- Dr Glennn Moy, Research Specialist AI and Machine Learning, DSTG
- Prof Flora Salim, University of New South Wales
- Prof John Thangarajah, RMIT University
- Prof Michael Webb, The University of Adelaide

Key Stakeholder Group

DAIRNet has established the Defence AI Key Stakeholders Group. This group brings together representatives from across the Defence and AI ecosystems, enabling a concerted effort to empower and evolve Defence AI capability.

The group reports to the DAIRNet Management Committee and function as an advisory body to inform the Defence Al Innovation, Science and Technology (IS&T) Program.

Responsible AI working group

The group was formed as the sponsor and advisory group tasked with advising on the scope and objectives of a "Responsible use of AI" co-design workshop sponsored by Defence and DAIRNet.

Following the workshop, the group continued to meet on a regular basis to develop mechanisms to ensure the responsible use of AI within Defence. In November, the group became a committee under the Defence AI Centre (DAIC).



Technical Advisory Panel (TAP)

TAP plays a critical role in the development and assessment of research calls and activities conducted within DAIRNet, such as education and outreach and the identification of trends. TAP initiatives are to aid in the development of an efficient ecosystem.

Government (Federal, State)

Strong relationships
with key government
agencies and
stakeholders, by
offering expertise,
resources and support
to help them identify,
understand and address
their most pressing
Al-related challenges.

Industry (Primes, SMEs)

Provide support and resources to assist industry partners in developing their own Al capabilities and offer training and education to help them stay up-to-date with the latest Al technologies and best practices.

Research Organisations and Universities

Strong focus on R&D
leveraging the AI
technologies and
methodologies to develop
cutting-edge solutions as
well as collaboration with
other leading research
organisations to ensure
alignment with global trends
and best practices in the field.

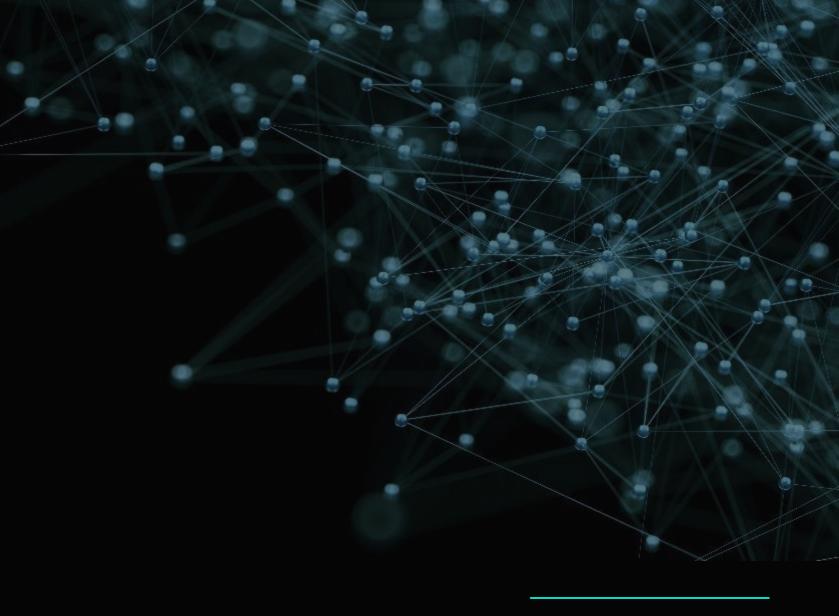
Department of Defence

Delivering tangible results and demonstrate its effectiveness in solving real-world AI challenges that will help to establish the organisation as a trusted and reliable partner for the defence industry in the field of AI.



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DAIRNet events

Date	Objective(s)	Name	Deliverable	Organiser	Format	Location	Involvement
21/02/2024	Research Impact	ADM Congress	Conference	Australian Defence Magazine	In person	Canberra	Invited Speaker
22/02/2024	Research Impact	CADR-RAS Showcase	Conference	University of Adelaide	In person	Adelaide	Attendee
22/02/2024	Research Impact	Defence Al Seminar: DSTG	Seminar	DAIRNet	Virtual	Virtual	Organiser
7/03/2024	Research Impact	DTC BD After 5	Conference	Defence Teaming Centre	In person	Adelaide	Sponsor
7/03/2024	Research Impact	Defence Al Seminar: Data61	Seminar	DAIRNet	Virtual	Virtual	Organiser
21/03/2024	Research Impact	Defence AI Seminar: University of Queensland	Seminar	DAIRNet	Virtual	Virtual	Organiser
22/04/2024	Research Impact Integration & Evolution	Responsible Al Workshop #2 - day one	Conference	DAIRNet	In person	Adelaide	Organiser
1 7 3 / 1 / 1 / 1 / 1 / 1	Research Impact Integration & Evolution	Responsible AI Workshop #2 - day two	Conference	DAIRNet	In person	Adelaide	Organiser
16/05/2024	Research Impact	Defence Al Seminar: DSTG	Seminar	DAIRNet	Virtual	Virtual	Organiser
11/06/2024	Research Impact	IPIA Phoenix Challenge	Conference	DAIRNet	In person	Adelaide	Invited speaker
13/06/2024	Research Impact	Defence Al Seminar: Standards Australia	Seminar	DAIRNet	Virtual	Virtual	Organiser
24/06/2024	Research Impact Integration & Evolution	Jericho Disruptive Innovation workshop	Workshop	Jericho Disruptive Innovation	In person	Adelaide	Host

DAIRNet events - continued

Date	Objective(s)	Name	Deliverable	Organiser	Format	Location	Involvement
27/06/2024	Research Impact	Defence Al Seminar: UNSW	Seminar	DAIRNet	Virtual	Virtual	Organiser
1/08/2024	Research Impact	Defence Al Seminar: UniSA and IVAI	Seminar	DAIRNet	Virtual	Virtual	Organiser
2/08/2024	People & Talent	Science Alive!	$\Delta I \Delta cademv$	National Science Week	In person	Adelaide	Exhibitor
22/08/2024	Research Impact	Defence Al Seminar: Jericho Disruptive Innovation	Seminar	DAIRNet	Virtual	Virtual	Organiser
28/08/2024	Research Impact	Defence and Industry Research Symposium	(ontoronco	Australian Defence Magazine and UniSA	In person	Adelaide	Invited Speaker
29/08/2024	Research Impact	Defence AI and Industry Symposium	Conference	Australian Defence Magazine and DAIRNet	In person	Adelaide	Organisation
1 //(19/ /(1 //	Research Impact Integration & Evolution	ADSTAR	Conference	Defence Science and Technology Group	In person	Canberra	Sponsor
16/10/2027	Research Impact Integration & Evolution	AIML Research Showcase	Conference	University of Adelaide	In person	Adelaide	Attendee
31/10/2024	Research Impact	Defence AI Seminar: University of Queensland	Seminar	DAIRNet	Virtual	Virtual	Organiser
1 1 / 1 1 / / () / //	Research Impact Integration & Evolution	International Federated Hackathon	Workshop	DSTG	In person	Adelaide	Host
1/5/11//11/4	Research Impact Integration & Evolution	Defence Al Symposium	Conference	AJCAI	In person	Melbourne	Attendee/Sponsor



Current research projects

Lead Researcher	Organisation	Funding Initiative	Project Title
Anna Ma-Wyatt	The University of Adelaide	NGTF: Human - Al interaction	Modelling, Monitoring and Moderating Human-Al Interaction
Christopher Fluke	Swinburne University of Technology	NII-1E: HIIMAN - ALINTARACTION	Artificial Intelligence as the Most Valuable Player: Enabling cyber-human teams to achieve decision superiority
Hung Nguyen	The University of Adelaide	INITE I DISTRIBUTED MUITI-DOMAIN NETWORKS	Machine learning solutions for BGP-based software defined combat clouds
Matt Selway	University of South Australia	INIT I F. I JISTRINITED MILITI-DOMAIN DELWORKS	Advanced Integrated Modelling Environment for Self- Adaptive Software Systems (AIME)
Siobhan Banks	University of South Australia	INIT I E. Pattorne in holen and dynamic data	Statistical machine learning algorithm for early detection of infection using data from consumer wearables
Truyen Tran	Deakin University	NGTF: Patterns in noisy and dynamic data	Coupled self-supervised learning and deep reasoning for improved processing of noisy and dynamic multimodal data from multiple sources
Yuan-Fang Li	Monash University	NGTF Call 1: Autonomous processing and reasoning	RUSH: Reasoning and Learning under Soft and Hard Data

Completed research projects

Lead Researcher	Organisation	Funding Initiative	Project Title
Aneta Newmann	The University of Adelaide	Al for Decision Making	Applying machine learning techniques to games on graphs for the detection and concealment of spatially defined communication networks
Belinda Chiera	University of South Australia	NGTF: Patterns in noisy and dynamic data	Towards the real-time robust identification of online malicious information using open source intelligence
Charles Martin	Australian National University	Al for Decision Making	Open-Form Music Composition for Synchronised and Coordinated Action
Clinton Fookes	Queensland University of Technology	Al for Decision Making	A multi-modal deep generative framework for video based identification
Colm Flanagan	Hiroco	Al for Decision Making	Mapping agent capability to objective for multi-agent planning
Flora Salim	University of New South Wales	Al for Decision Making	Online learning-based forecasting with irregular time-series data
Flora Salim	University of New South Wales	Al for Decision Making	A general time-series representation learning pipeline with self-supervised learning
Frank den Hartog	UNSW Canberra	NGTF Call 3: Distributed multi-domain networks	Use of SDN for multi-bearer time-sensitive distributed systems in the combat cloud
Guoxin Su	University of Wollongong	Al for Decision Making	Temporal objective modelling, reasoning and learning for multiagent systems
Jamie Sherrah	The University of Adelaide	NGTF Call 1: Autonomous processing and reasoning	Intelligent decision superiority through vision and language technology
Jihong Park	Deakin University	Al for Decision Making	Federated subgraph learning for fast, robust and communication efficient low probability detection
Jingge Zhu	The University of Melbourne	Al for Decision Making	Generalisation of learning algorithms: theory and efficient implementations from an information-theoretic point of view
Josephine Plested	Perceptrix	Al for Decision Making	Zero shot learning and domain adaptation for direct neural speech translation
Keshav Sood	Deakin University	Al for Decision Making	Accurate decision-making for network security with compromised data



Completed research projects - continued

Lead Researcher	Organisation	Funding Initiative	Project Title
	•	NGTF Call 2: Human - Al interaction	Graphical interaction representations aiding prognostic health management (GIRaPHMan)
	University of Technology Sydney	Al for Decision Making	Using AI for real-time victim detection in mass disasters
Markus Hagenbuchner	University of Wollongong	Al for Decision Making	Explainable Graph Neural Network via explicit causality modelling - a proof-of-concept study
Matt Duckham	,	NGTF Call 5: Patterns in noisy and dynamic data	INDEX: Intention and Explanation for Fusion of Uncertain, Noisy, and Dynamic Spatial Data
Matt Duckham	,	NGTF Call 1: Autonomous processing and reasoning	NEXUS: Explainable and unified spatial reasoning and sensor fusion
Mingyu Guo	University of Adelaide	Al for Decision Making	Abstract Game Prototype for Cyber Attack/Defence
Mingyu Guo	University of Adelaide	Al for Decision Making	Tackling the TTCP CAGE challenge using Monte-Carlo planning for large-scale POMDPs
Mohd Fairuz Shiratuddin	Murdoch University	Al for Decision Making	Multi-Layered Adaptive FCMs for High- and Low-Level Decision Making
	University of Technology Sydney	Al for Decision Making	Sequential Monte Carlo methods for TTCP CAGE
Nayyar Zaidi	Deakin University	Al for Decision Making	Discretization Inspired Defence Methods for Adversarial Attacks on Cyber Security Domain Data
Nhat Nguyen	The University of Adelaide	Al for Decision Making	A Decentralised Combined and Hybrid Approach for Multi-agent Decision Making
Paul Black	Federation University Australia	Al for Decision Making	Security Patch Identification Using Compiled Updates and Release Notes
, ,	Core Intelligence Technologies Pty Ltd	Al for Decision Making	Reward isn't enough: combining promising techniques into a significantly stronger state-of-the-art agent
	University of Southern Queensland	Al for Decision Making	Sequential field tokenisation and type classification

Completed research projects - continued

Lead Researcher	Organisation	Funding Initiative	Project Title
Richard Dazeley	Deakin University	Al for Decision Making	Application of Generic Actual Argument Model to represent complex decisions and generate narratives
Rolf Schwitter	Macquarie University	Al for Decision Making	Bi-directional translation from written English to probabilistic logic programs
Sajib Mistry	Curtin University	Al for Decision Making	Resource allocation using multi-agent distributed collaborative learning in a contested environment
Sebastien Miellet	University of Wollongong	Al for Decision Making	The influence of trust in the algorithm on AI explanations use and decision-making
Simon Williams	•	NGTF Call 5: Patterns in noisy and dynamic data	Multi-agent coordination for undersea surveillance
Son Lam Phung	University of Wollongong	Al for Decision Making	New Deep Networks for Iris-based Post-Mortem Identification
Thanh Thi Nguyen	Deakin University	Al for Decision Making	Holonic-based deep reinforcement learning for multi-agent systems
	University of Technology Sydney	Al for Decision Making	Dynamic vessel pulsations and eyeball movements based liveness detection
Yuan-Fang Li	Monash University	Al for Decision Making	Cross-lingual text summarisation with a plan



Prototypes and products

Lead Researcher	Organisation	Funding Initiative	Partners	Prototype Summary	TRL Level	Student Involvement
	Australian National University	Al for Decision Making		Our prototype system includes a web-based musical instrument application that can be used for collaborative musical performances.	TRL 4	
	,	NGTF: Human - Al interaction	University	We are developing data collection and analysis tools to provide a dashboard for monitoring individual and team based decision-making performance. The dashboard integrates data from a variety of biometric sensors (e.g. galvanic skin response, electrocardiogram) and eye tracking (e.g. point of gaze, blink rate). The next stage will incorporate machine learning methods to indicate decision-making status based on development of individualised cognitive performance profiles.	TRI 1-3	
Clinton Fookes	Queensland University of Technology	Al for Decision Making	Defence	We developed a software prototype to quantitatively evaluate the utility of auxiliary feature modalities in video to conduct person reidentification (ranging from logos in the possessions or clothes on the subject through to his or her behavioural trajectories). Furthermore, we developed software for a generative adversarial learning-based feature anticipation pipeline that aims to address domain discrepancies when associating diverse feature modalities.	TRL 1-3	
Colm Flanagan	Hiroco	Al for Decision Making	Defence	The prototype demonstrates how different agents with different capabilities can be optimally mapped to actions in a plan they are most suited to executing.	TRL 4	
	University of New South Wales	Al for Decision Making	Defence	We have designed a framework that can conduct time series representation learning in a self-supervised learning manner. The implementations provide the data processing modules, scripts for pre-training the representation encoder. The framework supports the processing of data in batches.	TRL 1-3	One PhD or Masters student



Lead Researcher	Organisation	Funding Initiative	Partners	Prototype Summary	TRL Level	Student Involvement
Flora Salim	University of New South Wales	Al for Decision Making	Defence	We have designed a general framework that is suitable for the representation learning of time series data from diverse domains in a self-supervised learning manner without leveraging large-scale well-labelled data in the training process. The learned representation features can be used for different downstream tasks. The prototype pipeline was tested with air flight traffic and maritime vessel trajectory data.	TRL 1-3	
Guoxin Su	University of Wollongong	Al for Decision Making	University	It is a research software tool which advances the technology of software verification. It uses GPU and multiple CPU cores to accelerate the verification algorithms.	TRL 1-3	One PhD or Masters student
Hung Nguyen		NGTF Call 3: Distributed multi- domain networks	Defence	Developed a prototype of a multi-bearer management solution using machine learning. The solution autonomously manages traffic on multiple communication bearers to maintain high throughput in disruptive and contested environments.	TRL 1-3	
Jamie Sherrah		NGTF Call 1: Autonomous processing and reasoning	University	Allow user to search through overhead imagery using text queries about the image content.	TRL 5	
Jingge Zhu	The University of Melbourne	· ·	Non- Defence Industry	It is an algorithm implemented in software that can be further modified or improved.	TRL 1-3	One PhD or Masters student
Maiken Ueland	University of Technology Sydney	Al for Decision Making	Industry	Software prototype developed that allows us to map and monitor sensor responses of electronic nose in real-time.	TRL 1-3	
Matt Duckham	,	NGTF Call 1: Autonomous processing and reasoning	Defence	The NEXUS prototype is a system-of-systems able to take streaming spatial data as input (such as marine AIS data streams), perform real-time spatial reasoning on data (such as identify anomalies such as suspected location spoofing), as part of reconfigurable workflows and analytics chains, and output human-usable intelligence to analytics dashboards with associated query-able explanations for output.	TRL 4	



Lead Researcher	Organisation	Funding Initiative	Partners	Prototype Summary	TRL Level	Student Involvement
· ·	Australia	NGTF Call 3: Distributed multi- domain networks	Defence	PoC graphical modelling environment and runtime environment demonstrating the goal-oriented, context-driven management of systems to support self-integration. The architecture is broadly applicable allowing the modelling of a variety of scenarios. Example scenarios included the reconfiguring of software systems on Kubernetes (or similar), dynamic and model-driven integration of new sensors (extensible to other data sources). The PoC was also partially translated into the future systems architectures being developed by DST Group.	TRL 1-3	
Mingyu Guo	The University of Adelaide	Al for Decision Making	Other	We created a competition entry.	TRL 1-3	
Mohd Fairuz Shiratuddin	Murdoch University	Al for Decision Making	Defence	This project investigates the novel use of FCM and explores its extension for modelling adaptive complex decision-making processes at different levels of abstractions. The use of hierarchical FCM could enhance the modelling. To better understand the modelling, we also explore the visualisation of such a system in a client-server desktop environment. A client-server desktop computer environment is developed to simulate the behaviours of the behaviour and modelling abilities of the proposed multi-layered adaptive FCMs for use with high- and low-level decision-making. A case study on the Civilian Emergency Services: Wildfire Natural Disaster is used to feature the development outcome.	TRL 1-3	
Nayyar Zaidi	Deakin University	Al for Decision Making	Defence	We have been able to develop an effective methods for adversarial defence on tabular datasets. We have been able to develop a framework that successfully leverages generative models as a defence.	TRL 4	One PhD or Masters student



Lead Researcher	Organisation	Funding Initiative	Partners	Prototype Summary	TRL Level	Student Involvement
Ravinesh Deo	University of Southern Queensland	Al for Decision Making	Defence	This set of experiments has focused primarily on determining whether the sequence-to-sequence model variants demonstrate capacity to infer the structure of novel-protocols which have been withheld from the training dataset. The experimentation has focused on a constrained setting where the model is trained on three "known" protocols (ARP, DNS and NTP) and generalisation is evaluated on an "unknown" protocol (ICMP). Protocol examples are generated first through simulation and second via filtering packet capture files. In both scenarios the sequence-to-sequence model variants demonstrate the capacity to accurately infer byte-boundary and type information from the "known" and "unknown" protocol sets.	TRL 1-3	One PhD or Masters student
Rolf Schwitter	Macquarie University	Al for Decision Making	Industry	I developed a small prototype together with Dr. Jonathan Legg (sensemaking team at DST) in the context of an illegal fishing scenario to demonstrate the usefulness of (probabilistic) answer set programming for temporal reasoning using a linguistically motivated version of the event calculus.	TRL 1-3	
Sajib Mistry	Curtin University	Al for Decision Making	Industry	We have developed a simulated dynamic environment that emulates Autonomous Vehicles (AVs) to encounter specific points of interest in a real contested environment. We have incorporated a Multi-Agent Deep Deterministic Policy Gradient Framework for autonomous exploration. A Multi-Agent Proximal Policy Optimizer Framework has been implemented for optimising communications in a contested environment.	TRL 1-3	One PhD or Masters student
Sebastien Miellet	University of Wollongong	Al for Decision Making	UOW and UNSW	Developing an evidence-based prototype of software supporting Human-AI teaming for optimal decision-making, taking into account both AI biases and human cognitive biases.	TRL 5	



Lead Researcher	Organisation	Funding Initiative	Partners	Prototype Summary	TRL Level	Student Involvement
Son Lam Phung	University of Wollongong	Al for Decision Making	Defence	Two prototypes have been developed. The first prototype segments the iris region from a large post-mortem iris image. The second prototype recognises the person's identity from the segmented post-mortem iris region.	TRL 1-3	One PhD or Masters student
Thanh Thi Nguyen	Deakin University	Al for Decision Making	Defence	This prototype has been developed based on the Microsoft CyberBattleSim environment (an OpenAI Gym) to simulate the interactions between agents in an enterprise network environment. The attacking agents are controlled by deep reinforcement learning algorithms to explore the vulnerabilities of the network. The agents communicate and cooperate within a holonic (hierarchical) architecture to maximize their exploration capabilities. This prototype will enable network defence personnel to understand the characteristics of complex large-scale coordinated machine learning-based attacks. The lessons learned from the simulation results will provide useful knowledge for the blue team to develop better automated defence strategies for enterprise networks.	TRL 1-3	
Truyen Tran	,	in noisy and dynamic	Non- Defence Industry	The prototype is capable of processing multiple temporal data channels (up to 5,000) and performs a variety of downstream tasks such as event annotation, forecasting, anomaly detection and classification.	TRL 1-3	One PhD or Masters student

Lead Researcher	Organisation	Funding Initiative	Partners	Prototype Summary	TRL Level	Student Involvement
	University of Technology Sydney	Al for Decision Making	Defence	Dynamic vessels pulsations and eyeball movements are involuntary biological evidence to evaluate liveness. They are almost impossible to be fabricated, while iris recognition, regarded as one of the most secure biometric information, can be used for further improving identity verification. This project investigates the reliability of using such biometric features to determine liveness and it also opens another gate for unifying highly-secured ID authentication and liveness detection.	TRL 4	
	University of Technology Sydney	Al for Decision Making	Defence	This project presents a Deepfake integration platform that can continuously integrate data generated by newly invented Deepfake techniques into a benchmark while balancing the ratio between real and Deepfake data. This platform also provides an interface, significantly easing evaluation of current deepfake generation and detection methods. Moreover, this platform not only supports image based data but also are extendible to audio, text based deepfake data, thus forming an ideal benchmark for evaluating multi-modality deepfakes.	TRL 6	
Yuan-Fang Li	Monash University	Al for Decision Making	DSTG	· ·	TRL 1-3	One Honours or undergraduate student
Yuang-Fang Li	,	NGTF Call 1: Autonomous processing and reasoning	DSTG	Developed a proof-of-concept system for constructing probabilistic knowledge graphs from text and applied it to the maritime events domain. The source code, system and accompanying report/manual have been delivered to the DST Group.	TRL 4	One PhD or Masters student



Follow-on projects

DAIRNet provided seed funding for the projects listed below, facilitating the development of a proof of concept that will support future research.

Lead Researcher	Organisation	Funding Initiative	Project Name	Project Description	Student Involvement
Paul Black	Federation University Australia	Makina	Classifying Security Patches in Compiled Programs: A Study Utilizing Pseudocode Features and Source Code	Continuing work on the AI4DM project in preparation for a journal paper.	
Son Lam Philing	,	Al for Decision Making	Multi-modal satellite-based vessel surveillance via optical and synthetic aperture radar imaging	The project aim is to establish space-based surveillance capability by developing a novel multi-modal deep learning system for detecting, recognising, and tracking sea vessels from satellite optical and synthetic aperture radar images. Utilising and extending the Siamese Deep Network that was investigated in the AI4DMI project.	Three PhD students



Publications – peer reviewed journal articles

Lead Researcher	Organisation	Citation	DOI:
Charles Martin	Australian National University	Martin CP, Hunter A, Schuetze B, Wang Y (2023) Composing Interface Connections for a Networked Touchscreen Ensemble, 4th International Symposium on the Internet of Sounds; 1-5.	10.1109/IEEECONF59510.2023.10335226
Hung Nguyen	The University of Adelaide	Phu A, Li B, Ullah F, Huque TI, Naha RK, Babar A, Nguyen H (2023) Defending SDN against packet injection attacks using deep learning, Computer Networks, 234: 109935.	10.48550/arXiv.2301.08428
Matt Duckham	RMIT University	Duckham M, Gabela J, Kealy A, Kyprianou R, Legg J, Moran B, Rumi SK, Salim FD, Tao Y, Vasardani M (2023) Qualitative spatial reasoning with uncertain evidence using Markov logic networks, International Journal of Geographical Information Science, 37(9): 2067-2100.	10.1080/13658816.2023.2231044
Matt Selway	The University of Souith Australia	Morgan R, Pulawski S, Selway M, Mayer W, Grossmann G, Stumptner M, Ghose A, Kypriano R (2023) Modeling Rates of Change and Aggregations in Runtime Goal Models, Data & Knowledge Engineering, 147: 102205.	10.1016/j.datak.2023.102205



Publications – conference proceedings

Lead Researcher	Organisation	Citation	DOI:
Guoxin Su	University of Wollongong	Robinson T, Su G (2023) Multi-objective Task Assignment and Multiagent Planning with Hybrid GPU-CPU Acceleration, NASA Formal Methods: 260-277.	10.1007/978-3-031-33170-1_16
Yuan-Fang Li	Monash University	Moghimifar F, Shiri F, Haffari R, Li YF, Nguyen V (2023) Few-shot Domain-Adaptative Visually-fused Event Detection from Text, 26th International Conference on Information Fusion (FUSION):1-8.	10.23919/FUSION52260.2023.10224213
Flora Salim	University of New South Whales	Liu J, Deldari S, Xue H, Nguyen V, Salim FD (2023) Self-supervised Activity Representation Learning with Incremental Data: An Empirical Study, 24th IEEE International Conference on Mobile Data Management (MDM), Singapore, Singapore, 2023, pp. 39-44.	10.48550/arXiv.2305.00619
Nayyar Zaidi	Deakin University	Zhou J, Zaidi N, Zhang , Montague P, Kim J, Li G (2023) Leveraging Generative Models for Combating Adversarial Attacks on Tabular Datasets, 27th Pacific-Asia Conference on Knowledge Discovery and Data Mining, 13935: 147-158.	doi.org/10.1007/978-3-031-33374-3_12



