DAIRNet symposium 2021: session 1 transcript

00:00:09:23 - 00:00:38:13
Jason Whittle
OK. Good morning, everybody. I hope there is an everybody. At the moment I can't see anyone, so I might just be talking to myself. But good morning. My name is Jason Whittle and I'm the director of DAIRNet and the Master of Ceremonies for today's symposium. And I'd just like to acknowledge that I'm joining our meeting today from the traditional lands of the Kaurna people of the Adelaide Plains, and I recognize their enduring connection to the land and pay my respects to Elders past, present and emerging.

00:00:38:20 - 00:01:01:23
Jason Whittle
I extend that respect to all Aboriginal and Torres Strait Islander peoples here today. Given that we're all joining from different places today, I'd like to encourage you all to acknowledge the traditional custodians of the land wherever you happen to be using the chat window. I think it would be fair to say that today's event is not quite how we imagined it would be, but there are several advantages to hosting you all in this way.

00:01:02:05 - 00:01:29:16
Jason Whittle
Firstly, it's allowed us to invite many more people than we might otherwise have been able to. And secondly, it's really lowered the barrier to participation so that many more of those people invited can actually attend. I'd like to thank Emma and Jo and the DSTG Events team helping us out with the On Air platform and also Mel and Aleesa at DAIRNet for all their hard work in arranging today's schedule. So today is really about introducing DAIRNet to you all.

00:01:29:21 - 00:01:46:02
Jason Whittle
The establishment of DAIRNet is part of a fairly long journey, and we're going to share the vision for that journey with you today. And then that's going to continue to develop to better serve the needs of all stakeholders. This symposium is intended to serve as a bit of an introduction, provide some background on how we got here, and explain where we aim to go next.

00:01:46:09 - 00:02:07:04
Jason Whittle
We've got speakers lined up from Defence, from industry and from academia, and a mixture of presentation types, from the strategic to the technical. And so on our platform, you can ask questions as we go. Using the chat box, those questions are going to be triaged and passed onto the speakers at the appropriate time. Ideally, we would have a much more informal tone for today's proceedings.

00:02:07:05 - 00:02:26:04
Jason Whittle
I don't know how easy that's going to be for an online session, but please try and use the chat function. Reach out to the presenters and to each other as best you can. Online is never really

going to replace the intimacy of an in-person event, and obviously we hope to do those in-person events in future years.

00:02:26:04 - 00:02:45:14
Jason Whittle
Now normally for an in-person conference, I'd explain to you where the toilets are and what to do in an emergency, but in this format, I can't help you. We've got three main sessions today with some breaks in between. But without further ado, I'd like to kick off with our very first speaker. Our first speaker is Andrew Seedhouse who probably needs no introduction, but I will introduce him anyway.

00:02:45:21 - 00:02:57:20
Jason Whittle
Andrew is the Chief of the Intelligence Surveillance and Space Division at DSTG. Andrew joined DSTG after many years at the similarly named DSTL in the UK. And so, Andrew, I'll hand over to you.

00:03:02:03 - 00:03:48:11
Andrew Seedhouse
Thank you very much, Jason. And I'm an Aussie now and, even though I don't sound like it, but there's plenty of us like that. Again also, welcome everybody to what effectively is a launch of the DAIRNet as well as a symposium for us to discuss the technology of AI. And I think as prompted I'll take on responsibility on behalf of the Defence personnel attending to acknowledge the traditional owners of the land on which we are meeting. For myself, I'm actually on the borders of the Kaurna and the Peramangk people and I'd like to pay my respects to their Elders both past, present and emerging.

00:03:48:12 - 00:04:16:11
Andrew Seedhouse
The launch of the DAIRNet is marks actually a good couple of years of work on bringing to the point where we are today. It is an initiative that is funded out of the Next Generation Technology Fund, which is an innovation initiative that was started back out of the White Paper in 2016, and it gives us great opportunity to be able to invest in long term while preparing for the future. Now DAIRNet, that of course is the Defence A.I. Research Network.

00:04:16:11 - 00:04:56:05
Andrew Seedhouse
And really just want to talk to you a little bit about why AI is important to us and where Defence is looking to AI technologies in the future. And then I'll come back to Jason to take us on those three areas of key interest in AI fo us. One of those is the fact the characteristics of the example being developed, and that takes in the fact that if you just simplify it, AI can read, see and hear data and information in a similar way that we can, but it can do it at a huge scale, searching through data that we could possibly not do ourselves.

00:04:57:05 - 00:05:42:18
Andrew Seedhouse
It performs these tasks without, like us, getting knackered and wanting to take a break. So it's got that attribute as well. And also by sharing lots and lots of data to these systems, they can find

patterns. So those are three characteristics that we're hunting for among among other activities. There have been huge strides in this technology development over the last few years, I think especially going back to 2012, when the technology started to do some of these image tests and found that we got to the point now where, especially in identifying objects in control data, the performance of AI techniques and machine learning was outperforming human performance and I think there have been some similar

00:05:42:18 - 00:06:26:23
Andrew Seedhouse
results in reading text, so that's quite exciting for us. So let me talk to you then about why Defence is interested and give you a bit of a background for that as to why the various topics of research which you can hear about today, and based on events this year, are important to us. So Defence is going to be operating in a complex, congested and contested space where we need to know what is going on, what's the situation, who's doing what, where, what will happen next and the reason we need to do that is in order to make the right decisions, some of those decisions will hopefully avoid conflict.

00:06:27:06 - 00:07:07:19
Andrew Seedhouse
Others will enable us to handle it better and use our vested in this. It comes under an initiative called Assured Decision Advantage. This is something that our new Defence Intelligence Group were announcing in terms of discussions with Defence this year. And we have been falling behind with that and we have therefore invested in quite a lot in research and capability. That ambition is an opportunity for us to build an automated environment that will do three things.

00:07:08:12 - 00:07:57:08
Andrew Seedhouse
It'll do a thing called smart data, it'll do [no audio] and it will do prediction. And let me just unpack some of that for you. In the smart data area, we are looking for the ability to in huge amounts of sensor data from the real world, and that's available for objects, define them automatically and get their poison state. Similarly, ingest lots of information produced by humans like voice and text and understand that, translate it and get sentiment and also data that is within the cyber world and be able to [no audio] well. Since making them takes that information issued by the smart data function and then tries to, literally by the name of it, make sense of what is going on

00:07:57:15 - 00:08:30:17
Andrew Seedhouse
and try and understand the linkages and events within that information and final function, which is one of the more difficult ones, is trying to predict what might happen in the future and also what might happen if we do certain things well following advice. That ambition to build that system, which has already started, of AI technology at the heart of this is automation. Automation is really key to us, Australia and Australian Defence.

00:08:31:05 - 00:09:00:02
Andrew Seedhouse
There aren't many of us with the capacity to compete in that contested environment I was talking about. Now we need artificial intelligence technologies in that's sure decision advantage a

machine, if you like, in order to create a level playing field with others that have more capacity than we do. Now, we're not building Deep Thought because the answer '42' is not enough.

00:09:01:07 - 00:09:48:01
Andrew Seedhouse
We're not building Skynet. This is an information system that we're trying to do, but then we want to bring forward and change the way in which Defence works over the next ten years. So DAIRNet is a partnership where we work together to safeguard Australians through the use of this technology. It's really coming together and is going to be able to exploit the innovations in academia, the translation of those innovations into tools by industry and to shape the machine within Defence laboratories. So today we're going to be learning more about DAIRNet.

00:09:48:15 - 00:10:13:24
Andrew Seedhouse
So we'll be getting an overview of what's going on in general we'll get some updates on some of the projects and how they're progressing. I mentioned before that we have put a bit of processing on this, and we'll be hearing from initiatives that started a little while back. The Defence AI Centre, which is a coordination role within Defence that is trying to escalate AI technology into operational use.

00:10:13:24 - 00:10:28:21
Andrew Seedhouse
So we hear from them and they the role of AI in Defence. We have an address from Jamie Sherrah on the future trends in AI. There'll be a chance to hear a little bit of the industrial perspective as well and how they fit into this initiative.

00:10:30:24 - 00:11:11:10
Andrew Seedhouse
At lunchtime - this is a virtual lunch of course - my boss, the Chief Defence Scientist, Professor Tanya Monro, hopefully will be joining us to do the virtual ribbon cutting and launch of the DAIRNet. And as I mentioned at the beginning, this symposium really is the start of a set of annual events that will be following from this symposium. So just to get to the point where I shall close, AI technology for us [no audio] achieve really important and effective things. Defence is [no audio] of this technology to enable automation to give us onto a level playing field.

00:11:12:14 - 00:11:37:00
Andrew Seedhouse
And the DAIRNet has been formed to help us do that and create a partnership for that technology to help us safeguard Australians in the future. Most importantly, though, for today, the goal is open and have some fun understanding what we've achieved in DAIRNet thus far. Thank you very much for that and I'll pass the talking stick back to Jason.

00:11:37:20 - 00:12:01:20
Jason Whittle
Thank you, Andrew, for that introduction. That's great. So our next presentation is from me and from Brian and we're going to talk a little bit about DAIRNet and the AI science and technology overview. I think I need to share my slides and then Brian can speak to them first and then I'll take over about halfway through. So Brian, over to you.

00:12:03:15 - 00:12:26:04
Brian Hanlon
Thanks, Jason and thanks, Andrew for that terrific introduction. I just want to add my voice to thanking everybody for coming along to this symposium today. It's really important. We appreciate your support and I think for Andrew's point as well, it's all about having fun. So please, please engage. So this presentation is about giving you a bit of background about what the DAIRNet actually is,

00:12:26:04 - 00:12:47:09
Brian Hanlon
the Defence AI Research Network, or DAIRNet for short. I think one of the key things or messages I'm keen to get across is that DAIRNet is not something that is monolithic. It's not set in stone. Nor should it be. We expect it to evolve over time and it really underscores the importance of community engagement the AI community engagement as we go forward.

00:12:48:21 - 00:13:07:01
Brian Hanlon
So that's a key message coming out from today. And I guess in terms of the idea of agility and flexibility as that Jason mentioned, he and I will be tag teaming on this presentation. I think we're the only ones who are doing that for the day. So this is our first test of DAIRNet flexibility and agility. So thanks, Jason,

00:13:07:01 - 00:13:43:15
Brian Hanlon
next slide. So the work we do in Defence is obviously set by strategic policy and this is being informed by the Defence Strategic Update and Force Structure Plan. And these really talk to the rapidly changing strategic context in our region, including the scale of military modernization and disruptive impact of new technologies. And from an AI perspective, I think that was really underscored by the recent announcement of AI Autonomous systems and robotics being one of four new strategic industry capability priorities.

00:13:43:21 - 00:14:09:15
Brian Hanlon
And it really identifies that AI is going to be critically important to training and warfighting into the future, and particularly in areas like reducing cognitive load and providing decision advantage for Australia. Now, what I thought was particularly interesting around these documents was their discussion around the Australian innovation sector, the importance of Defence, harnessing that innovation sector and of being agile.

00:14:10:01 - 00:14:29:09
Brian Hanlon
And it hearkens back again to the point that Andrew raised, that within Defence we simply don't have the capacity to get after everything we need to do, even within the AI space. So these strategic documents really do underscore that harnessing and agility and that's exactly what DAIRNet's seeking to achieve. So we're definitely aligned with the broader Defence strategic policy.

00:14:30:15 - 00:14:57:11
Brian Hanlon
Thanks Jason, next slide. So this is further underscored by Defence guidance. Now this is not meant to be a complete set of documents. We just referenced a few here including the are More Together Defence Science and Technology Strategy, which consciously draws out artificial intelligence. But I think also more recently and importantly, the Defence Data Strategy explicitly draws out artificial intelligence.

00:14:57:21 - 00:15:18:22
Brian Hanlon
So for our non-Defence colleagues online today, it's important to understand that Defence is a very large and disparate organization. It takes a long time to put all the parts into place to start a new initiative. What I'm really encouraged by when you see these documents and again, this is not the complete set, is those building blocks are now being put into place.

00:15:18:22 - 00:16:02:03
Brian Hanlon
And that really hearkens to the fact that artificial intelligence is only going to become more important and only going to grow as we go forward. And the DAIRNet is a key component of that overarching Defence ecosystem. So that's really exciting for the future. Next slide, please, Jason. So what is DAIRNet and I wanted to start by saying, look, then it is not. DAIRNet is not a mechanism by which Defence Science and Technology Group, which is my home organization, nor the University of South Australia takes people's money out of Defence, puts it into a consolidated bucket and then decides what research gets undertaken. DAIRNet is meant to be a framework, a facility by which we can

00:16:02:04 - 00:16:26:16
Brian Hanlon
generate collaboration between industry and academia. And also help to scale AI research going forward. So as an example, if one of the services, Air Force, Navy or Army wanted to use, then to take forward an AI program, they could approach DAIRNet and then engage with that group of subject matter experts to better understand the technologies and what would be best to go forward and what's the cutting edge.

00:16:27:06 - 00:16:47:07
Brian Hanlon
They could look at our portfolio of research already underway and maybe want to complement that as a way of helping us to scale our programs. Or they could go forward with a whole new call out to the broader ecosystem, and the DAIRNet would be there to help them to do that so DAIRNet will facilitate and help them to actually activate that procurement process.

00:16:48:01 - 00:17:06:24
Brian Hanlon
That really key thing behind all of that is that the Defence stakeholder owns the money and makes the decision on what they fund. DAIRNet does not take any money away from anybody. So in that last example, DAIRNet helped the Defence stakeholder go forward and the proposals that came back and the Defence, they didn't like any of those proposals,

00:17:06:24 - 00:17:38:18
Brian Hanlon
there's no obligation for that Defence stakeholder to sign up to anything. So DAIRNet is really there to help facilitate grow and bring people together. And for the nonDefence participants in DAIRNet, a great opportunity to engage with a range of Defence stakeholders and to learn more about what Defence needs, what the Defence requirements are. And that's critically important, so this is all about building that broader Defence AI community. As part of that, we're already starting to think about how we're going to do this.

00:17:38:18 - 00:18:11:12
Brian Hanlon
It's also about supporting the AI STEM pipeline. That's critically important. So DAIRNet is not just about the research when you do now, it's also about planning for the future. And again, just to underscore, scaling programs is really critically important. So ideally we'd be bringing together different parts of Defence, different Defence programs, having to marry them together and to grow much bigger programs in artificial intelligence that includes also as we grow our portfolio and better understanding of the ecosystem in Australia, bringing together different players in Australia, they have complementary capabilities to grow those partnerships as well.

00:18:12:08 - 00:18:30:18
Brian Hanlon
So overall for me, this is about building Team Australia. It's about aspects, as Andrew mentioned, and I'll underscore it again, we within Defence do not have the capacity to do all this on our own. We have to take a Team Australia approach to this. And I think the really exciting thing is that by doing this we can build real depth in the Defence

00:18:30:18 - 00:18:53:08
Brian Hanlon
AI work that we are doing, and that places us in a great position then to go to our international partners and build further collaboration. So I think that's really exciting. Next slide, thanks. So again, as Andrew mentioned, we're doing this under the NGTF, the Next Generation Technologies Fund. So as I mentioned DAIRNet is all about bringing together funding from across the department.

00:18:53:08 - 00:19:23:16
Brian Hanlon
But the foundation of this program is Next Generation Technologies Fund. That is a $1.2 billion up to 2030 program across multiple themes, not just AI. And it's part of a broader roughly $3 billion innovation program within Defence. Now when we talk about broadening the Next Gen Technology Fund theme, some of the work that you'll see today was originally taken forward under what was known as the Intelligent Decision Superiority Network.

00:19:24:13 - 00:19:41:22
Brian Hanlon
But it was a recognition on our part that really that was talking about AI, and given the strategic importance of AI, we wanted to change that to what is now known as the Defence Artificial Intelligence Research Network. So you can see some of that work today, but that work is now transitioned into the DAIRNet. What's different about the DAIRNet

00:19:41:22 - 00:20:02:22
Brian Hanlon
is it's not just a set of activities. We are now bringing all those different parts together underneath a collaborative framework that provides a means by which we can work together across different organizations, et cetera. And under the DAIRNet, in addition to bringing in those current research programs, we've just gone out with a new call for research proposals.

00:20:03:03 - 00:20:30:12
Brian Hanlon
So our first call under the DAIRNet proper and that call closed just last week. Next slide, thanks. So I mentioned we're doing this within a broader strategic context. And I think working with our other Defence partners and stakeholders is a great way for us as we're working into those acquisition programs and other programs to be strongly linked to Defence requirements and then transition of AI capabilities into service.

00:20:31:07 - 00:20:51:03
Brian Hanlon
Part of that also is the work that we're doing within DSTG group under the More Together Strategy, in particular STaR Shots. Now, Professor Monro will talk to this a little bit later, probably in a bit more detail. But just in broad terms, the STaR Shots are strategic programs on the order of ten years strongly aligned with the strategic needs of Defence.

00:20:51:17 - 00:21:12:06
Brian Hanlon
So as we do our AI work, one of the key linkage points for us is working with those STaR Shot programs. So the key takeaway from this is that in addition to larger Defence engagement, even within DSTG Group, we're building these strategic pathways, so DAIRNet is set within this growing much broader push to mature the Defence innovation system in Australia.

00:21:12:06 - 00:21:32:15
Brian Hanlon
So we're part of a bigger story and we can work into that bigger story to help us transition that we're developing through DAIRNet. Next slide please, Jason. Just the last one for me before I leave the stage, really important. So Lieutenant Colonel Stephen Fry will talk to the Defence AI Centre a little bit later so I won't steal his thunder,

00:21:32:15 - 00:21:51:06
Brian Hanlon
but I just want to underscore that the DAIRNet is really part of the Defence Artificial Intelligence Center. It's a research component to Defence AI Centre. This is not just a DefenceScience and Technology Group effort, it's an all of Defence effort and is very much a one Defence capability, and it's there to help all of Defence

00:21:51:11 - 00:21:59:12
Brian Hanlon
take this artificial intelligence forward. And I think that's it for me, and I'll hand over to Jason to continue.

00:22:00:20 - 00:22:26:21
Jason Whittle
OK, thank you, Brian. So this slide here really just is to illustrate how DAIRNet fits in with the broader ecosystem in terms of technology transition. And so as Brian said and as Andrew said before him, DAIRNet is an interface between Defence and other stakeholders in the Defence AI space. Just to try and make it easier for everyone to work together.

00:22:27:04 - 00:22:57:06
Jason Whittle
And part of that is working with people who are in Defence and people who consider themselves to be researchers and [no audio]. But it's also about bringing in other AI researchers who may not have worked in Defence space before, but who have plenty of skills and capability that can be applied in the Defence space. So DAIRNet can really try and draw together the strands of research that are happening out there from the academic sector and from the industry sector and in Defence at the fundamental and applied level.

00:22:57:08 - 00:23:10:02
Jason Whittle
And then that will transition through to the Defence AI Center as part of the technology transition process. And again, as Brian said, we'll be hearing from Lieutenant Colonel Stephen Fry about that in a little while.

00:23:12:15 - 00:23:37:15
Jason Whittle
So also, as Brian said, you know, DAIRNet is has grown out of existing activity, particularly the Intelligent Decision Framework projects that were funded over the last couple of years. And so there are three research programs that are highly Defence relevant that are already underway. And we're going to be hearing from some of those a little later. So there's an Autonomous Processing and Reasoning program.

00:23:37:15 - 00:24:06:22
Jason Whittle
There are two projects under there. The Human-AI Interaction program, which is around modeling, monitoring and moderating human-AI interactions and artificial intelligence is the most valuable player. And then there's another program in distributed multi domain networks, and there are three projects and that were funded under that banner. And again, we closed the Patterns in Noisy Data Program call last week.

00:24:06:22 - 00:24:30:21
Jason Whittle
And so those projects are under evaluation at the moment. And the idea of of having these different programs all bracketed together under DAIRNet is that now we can start to have that kind of interplay between those projects, between those researchers from year on year and across the sector to try and benefit and try and get the leverage from that broader application of some of that project work.

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Jason Whittle
So commonly when you have a standalone projects, the project happens and there are outputs, but often they then then disappear off into a black hole somewhere and nobody really knows what happened to those projects. And so by having them all processed and managed together or monitored together through DAIRNet, we hope to be able to leverage the kind of added value from those projects and really get that continuity of the research. So this slide is probably the most complicated slide we've had on the screen so far, but I will just talk to it very briefly. It's about how DAIRNet is governed.

00:25:07:01 - 00:25:43:22
Jason Whittle
And as Brian said, DAIRNet is an initiative of Defence, and it has a governance panel which is populated by Defence, one stars. And that governance panel has oversight of the DAIRNet management process. And the DAIRNet management consists members from UniSA, who is the management partner and from DSTG. And we sit on that management committee, which all of DAIRNet activities and has oversight of everything that DAIRNet is doing.

00:25:44:12 - 00:26:19:24
Jason Whittle
And so I'm the director of DAIRNet, and we have a senior manager, Mel McDowell, who many of you will have heard from in the last few weeks and together our job is to try and draw together all of the DAIRNet membership to try and get that benefit from from having a range of different researchers across different institutions. Now, having drawn in these projects from previous calls, we have what we have called members of DAIRNet, and that's kind of capital M members.

00:26:20:04 - 00:26:45:22
Jason Whittle
DAIRNet is not an exclusive club. It's a big tent kind of organization. And so when we talk about members of DAIRNet, those capital M members are just organizations who have previously received funding through DAIRNet calls. And there's no [no audio] membership and there's no restriction on people being permitted to apply for funding through DAIRNet having already been members.

00:26:45:22 - 00:27:08:07
Jason Whittle
That's not a condition for any of the funding that we may administer. But those academic partners that are inside the tent are already bringing research through DAIRNet, and they populate what we call the technical advisory panel and the research leaders panel. So all of the membership are represented on those technical advisory panels.

00:27:08:17 - 00:27:31:20
Jason Whittle
And the idea there is that, as a sector, we can evaluate our own kinds of research. We can we can work out what is what needs to be done, what the problem spaces are and how those problems can be addressed and make recommendations to Defence for how best to address those problems.

00:27:32:11 - 00:28:03:15

Jason Whittle
And so these panels are in the process of being established at the moment. The idea there is to try and bring as many people into the ecosystem as we can and make sure that we're able to maximize the benefit to everybody from having those large cohorts of researchers. We also want to reach out to our industry partners and industry role in kind of the technology transfer and the research outputs,

00:28:03:24 - 00:28:22:09
Jason Whittle
and so we're also in the process of developing that industry panel as well. And those panels, the research leaders and the industry panel and DSTG themselves are all going to be involved in any workshops we run in order to [no audio] problems in order to frame research calls in the future.

00:28:28:06 - 00:28:54:04
Jason Whittle
So the the last bit that I was going to cover today is what does success look like and now I guess the first the first success we have is that Brian and I are still talking to each other and [no audio] low hanging fruit. But the success of DAIRNet really depends on the the interaction between DAIRNet members and Defence.

00:28:54:15 - 00:29:27:03
Jason Whittle
And so it's really about building that network, building those connections and building the capability of AI research in Australia, like Brian said, building Team Australia. And so we have areas of success that we're trying to build, measurable things around in the areas of people, in research and in transition. In the people space we're interested in having that active community of researchers, post-docs and PhD students.

00:29:27:09 - 00:29:53:01
Jason Whittle
That's not just about research being done now, but it's about the pipeline of talent going into the future. And that's a big, big part of what we want to achieve with DAIRNet. We want to see well-supported outreach activities, so seminars and conferences like today's session. Having that online presence and also being able to run training and workshops which will again spread that capability and enhance that capability across the sector.

00:29:54:19 - 00:30:15:02
Jason Whittle
Under the research bracket. Obviously, we want to see our researchers do well and we want to see them publish great publications gain citations and invitations to speak and present. We want them to win grants and we want them to be successful. And all of that success reflects well on DAIRNet. It's all about growing the sector, growing the capability.

00:30:16:13 - 00:30:43:10
Jason Whittle
The other the other area of research is we're not just interested in those kind of academic metrics, but we're also interested in what have we tried that works and what have we tried that doesn't work. You know, a lot of these [no audio] how does that research help us understand the AI

landscape, how does it help us build that capability? And that can be through positive and through negative findings.

00:30:44:18 - 00:31:23:17
Jason Whittle
And the final part, of course, is the transition. And this is where Steven will speak to in a little while after the break. Once we once we're through that kind of that discovery phase, which really happens primarily in research institutions, through to the commercialization and development, that process, that transition can happen through the Defence AI Centre. And so we're interested in where where can we see concepts coming through DAIRNet projects and then transitioning into the Defence AI Center, looking at when Defence has a user acceptance of of a concept or a demonstration and looking for that transition into capability.

00:31:24:00 - 00:31:53:14
Jason Whittle
So again, that's where the end users like the industry partners and Defence come into play. And one measurable there is things like patents and licenses to use in nonDefence applications. So I'm going to end there. We're a little bit ahead of time and so we have maybe five or 10 minutes that we can answer some questions and maybe we can bring Brian back on the screen because he may field some of those.

00:31:53:14 - 00:32:01:22
Jason Whittle
And if I get any difficult ones, I'll just lob them over to Brian.

00:32:03:06 - 00:32:25:03
Brian Hanlon
So thanks, Jason. I just want to underscore some of the points that you already raised. One of the great things about DAIRNet is that the team will be learning about the Defence procurement rules and the mechanisms by which we can engage the broader community. So and that'll be whatever fits the purpose at the time. So as an example, the Next Gen Tech Fund, we need to do an open call.

00:32:25:03 - 00:32:49:20
Brian Hanlon
And so, Jason, you already pointed out that whether or not you're in the DAIRNet, that's not point. That needs to be open and fair and all that sort of thing. Other procurement processes need not necessarily always go up to the market depending upon the circumstance at the time. And the thing is for us to understand that portfolio approaches that we can undertake depending upon the constraints or requirements of those particular instances.

00:32:49:20 - 00:32:56:13
Brian Hanlon
So that's really important. So the DAIRNet team will be there to be across that and to help to take those things forward.

00:32:58:01 - 00:33:11:00
Jason Whittle

OK, I'm going to lob some of the questions from the from the Q&A thing towards you, Brian. Regina Blythe asking as a newbie to the AI community, are there similar initiatives or programs to DAIRNet in the UK and U.S? If so, who and where?

00:33:13:22 - 00:33:34:16
Brian Hanlon
I'm not aware of, particularly in the US, which is my recent experience in terms of research networks. Certainly they're doing things at scale and quite exciting ways, but not in this sort of research network context. And I'm not aware of the UK doing doing that, but that's more my ignorance than anything else.

00:33:37:08 - 00:33:41:17
Jason Whittle
OK, are there any questions in the discussion forum.

00:33:42:24 - 00:33:44:08
Jason Whittle
Discussion forum...

00:33:44:22 - 00:34:10:00
Jason Whittle
How to apply for membership. That's Shawn Goussous Well, I'll take that. So the small M membership, you are already members. So in terms of getting communications from data about activities, send us your email address and we'll put you on the mailing list to make sure you get everything that's going to all of our all of our other members.

00:34:11:05 - 00:34:38:14
Jason Whittle
Now the what I call the Capital M membership, the kind of official membership comes from signing research agreements from NGTF funding or DAIRNet sponsored funding and so there is both a bilateral agreement under the DSP, but also a multi-party agreement. And so when when we talk about the member organizations, sometimes we talk about those organizations who have signed that multi-party agreements.

00:34:38:14 - 00:35:10:23
Jason Whittle
And at the moment, those organizations are only those organizations who have been in receipt of funding through the NGTF. But actually that that signing of that multi-party agreement doesn't confer any particular benefits. It doesn't confer any advantage. It's really just a way of signaling that that they have joined and are participating actively in supporting the advisory panels and supporting that the other activities of DAIRNet. I hope that answers that question.

00:35:12:01 - 00:35:16:08
Jason Whittle
Oh, yeah. And Mel has put the DAIRNet email address in the in the chat there as well (DAIRNet@unisa.edu.au).

00:35:21:09 - 00:35:35:15

Jason Whittle
And I should also say that we're engaged with the Alan Turing Institute, which is not really a research network in the UK, but it is an AI research organization. That's right, isn't it Brian? It's Alan Turing?

00:35:35:22 - 00:35:37:05
Brian Hanlon
Yes, that's right, yeah.

00:35:45:03 - 00:35:51:17
Jason Whittle
So Dennis has asked, will DAIRNet be technology focused, application focused or both?

00:35:53:16 - 00:35:54:02
Andrew Seedhouse
Yes.

00:35:54:14 - 00:36:00:04
Jason Whittle
So a detailed, a detailed and specific answer. That's great, Brian.

00:36:00:22 - 00:36:22:05
Brian Hanlon
So what's interesting there is that when we think about artificial intelligence, I'm thinking about things like human-AI interaction and things of that sort of nature, ethical AI. Really, it's it's a research network, not just a technical network. So in that regard, if it's research and it's Defence relevant and it's within the scope of DAIRNet.

00:36:22:16 - 00:36:28:21
Jason Whittle
Anthony Szabo has asked, how does done it relate to other Defence innovation research?

00:36:30:05 - 00:37:00:12
Brian Hanlon
Yup. So, you know, I mentioned that in my presentation. So I really do see DAIRNet, while it is fundamentally true, DAIRNet is part of the growing Defence innovation ecosystem. And STaR Shots are a key part of that and a key connection into Defence requirements. So we are and we will continue to work very closely with the STaR Shots in order to create those transition pathways

00:37:00:12 - 00:37:05:08
Brian Hanlon
for the work they're undertaking.

00:37:05:19 - 00:37:07:08
Jason Whittle
At the moment, I don't see any other

00:37:07:08 - 00:37:08:04

Jason Whittle
questions.

00:37:08:22 - 00:37:36:18
Jason Whittle
And we are a little bit ahead of time, but in that case, I think we can probably take a slightly early break and before we come back for our next session. So the next session starts in just over 30 minutes oh gosh. I do apologize. I've got the schedule all wrong. Well, embarrassing sorry. We have another speaker.

00:37:36:18 - 00:37:37:04
Angela Consoli
That's okay.

00:37:39:21 - 00:37:49:15
Jason Whittle
Our speaker is Angela Consoli, who is the other Chief Defence Scientist Fellow for DSTG. Angela, over to you. I apologize for that. I was like.

00:37:49:19 - 00:37:58:14
Angela Consoli
Oh, that's fine, that's fine. OK, so can you see my slides?

00:38:08:19 - 00:38:11:00
Jason Whittle
You need to share your screen, Agela. Oh, there we go.

00:38:14:04 - 00:38:56:21
Angela Consoli
So can you see the slides? Great. Excellent. Thank you, Jason. It is my absolute pleasure to present to you all an overview and an update of my CDS fellowship which is titled AI-Centric Warfare: Augmenting AI-Enabled Technologies in Combat and Mission Systems. Before I start, I will provide a bit of a bio. I'm actually an alumni with UniSA, having graduated with both my bachelor's and PhD from the School of Engineering, I have been working in Defence since 2004, firstly with BAE Systems Australia and now with DSTG since 2011.

00:38:57:06 - 00:39:30:21
Angela Consoli
I am currently a senior researcher within the Weapons and Combat Systems Division. Since I started in Defence almost 18 years ago, I have been actively researching in the area of artificial intelligence. The CDS Fellowship Program is open to all DSTG, APS, S&T researchers, where we are given the opportunity to deep dive and research in an area for up to three years, which is considered to be a major priority for future and current Defence capability.

00:39:32:04 - 00:40:29:11
Angela Consoli
The Fellowship allows researchers within DSTG to pursue significant S&T advances in these areas. As such, the S&T being conducted in my CDS Fellowship aligns with a major strategic priority for

Defence: AI. The Defence Strategic Update 2020 provides strategic context into the challenges our current and future Defence force are faced. In particular, are the challenges in military modernization in the Indo-Pacific region and the introduction of emerging and disruptive technologies into weapons systems, which translates into reducing decision times and improving weapon precision and lethality. To ensure we can shape, deter and respond the force structures plan and the more together strategy clearly articulates that Defence will need to undertake significant investment in a number of strategic areas

00:40:29:17 - 00:41:14:23
Angela Consoli
that include but not limited to cyber, intelligence and information warfare. AI enabled technologies is the force multiplier in delivering the impact and capability edge in the above mentioned strategic areas, enabling a more superior and agile Australian Defence Force. My fellowship is focused on delivering A.I. at the tactical edge. What this means is conceptualizing, designing and developing, emerging and innovative A.I. enabled technologies that can be integrated within current and future Defence tactical platforms, both crude and autonomous systems that will give our warfighters the tactical advantage.

00:41:16:00 - 00:42:05:02
Angela Consoli
In addition, my fellowship is investigating how to enhance human AI augmentation or symbiosis that will facilitate enhanced situational understanding and decision making to effectively act against adversaries. Effective operations at the tactical edge is dependent on the level of situational understanding that can be acquired. Basically, this means how quickly a war fighter, including a human operator, can perceive, comprehend, project, and decide on courses of actions. This sensing to decision loop is becoming more and more smaller, and with the introduction of more intelligent and asymmetric threats, the ability for warfighters to acquire high quality situational understanding is becoming a challenge.

00:42:06:12 - 00:42:24:09
Angela Consoli
The introduction of autonomous systems will also add a layer of complexity, since there will be a need where a human operator will be either on the loop or simply a verifier. As a result, AI enabled technologies will become relied upon to achieve the basics of situational understanding.

00:42:26:15 - 00:42:59:06
Angela Consoli
The acquisition of situational understanding from a human perspective can be underestimated from a computational perspective. The top half of the slide show is Micah Ansley Situational Awareness Model for Human Operators, which includes perception, comprehension, projection of future state and lastly decision perception is the process of selecting, organizing, identifying, interpreting, and representing different stimuli and sensations. In an environment.

00:43:00:05 - 00:43:37:17
Angela Consoli
The organization of the stimuli and or sensation is done through neural processes, beginning from our senses, touch, smell, sight, hear and taste, and then transmitted to our brains and where it is then categorized. The important aspect to perception is the humans ability to attend to the stimuli

from each of our senses and fuze the information from all the different senses, i.e. fuze multimodal information or more importantly, humans will use existing information, i.e. knowledge, to help further categorize but also interpret stimuli.

00:43:38:10 - 00:44:13:17
Angela Consoli
This can include events, other objects, situations, or concepts. In the end, an object of interest has been formulated. In terms of A.I. perception involves three distinct processes that are currently not orchestrated simultaneous. Traditionally for machines sensors are in the form of audio, text, imagery, and machine generated. The organizing and categorizing of a stimuli is based on the intended sensor and requires machine and deep learning to extract the features from each sensor.

00:44:14:20 - 00:44:50:19
Angela Consoli
The result of this step is multimodal features interpretation requires the multimodal features to then be fuzed in which the stimuli can then be categorized. Categorization requires further processing, usually in the form of knowledge representation or construction, which allows assertions to be made on the interpretation. The interpretation and categorization of perception leads into the comprehension and understanding stages of a stimuli. In terms of situational understanding,

00:44:51:00 - 00:45:18:23
Angela Consoli
comprehension is a representation of an object, the environment and the event. The result of comprehension is sometimes referred to as a mental model. The understanding from comprehension relies on reasoning, which is where humans start to infer on their mental model, i.e. deduce or induce generalizations, truth or falsehoods on their beliefs, and in some cases their motivations. Reasoning is dependent on knowledge,

00:45:19:03 - 00:45:48:05
Angela Consoli
prior information that resulted in actions where reasoning can prove or disprove knowledge from current perception. And more importantly, reasoning is where conclusions start to be drawn. In terms of A.I., after knowledge-based construction are knowledge graphs, which allow relationships between categories for an object of interest, i.e. the basics of a mental model. The representation of knowledge, bases and graphs is through semantic ontologies.

00:45:49:03 - 00:46:23:19
Angela Consoli
Machine reasoning uses knowledge, base constructs and graphs with an inference engine to determine the truth or falsehood of an object of interest. However, the abstract notions of beliefs and even motivations is where machine reasoning models lack the explainability to match a small fraction of human reasoning. For completion is the projection of future state, which takes the conclusions made from reasoning and develops courses of actions and possible effects of these actions and then decision making.

00:46:24:17 - 00:47:09:14
Angela Consoli

For the purposes of my fellowship, these two stages of situational understanding are not considered. To achieve AI enabled situational understanding at the tactical edge requires skills, knowledge, techniques and tools from data science, human and cognitive science and informatics and ergonomics. However, the benefits of integrating AI at the tactical edge gives far more superior situational understanding, faster perception from more sources and senses and richer comprehension and understanding. This delivers optimal C2 through decision superiority to our warfighters and commanders, which results in more decisive and effective actions.

00:47:12:09 - 00:47:54:01
Angela Consoli
My fellowship has three main research objectives. The first is multimodal informatics, which is focused on focusing on developing multimodal machine and deep learning for information processing and feature extraction and multimodal information fusion. Using traditional and nontraditional tactical information. This objective will use information from both subjective and objective sensors. The second, computational cognition, is investigating and developing knowledge base constructs, graphs and representations for use in perception in particular in fusion, i.e. as an artificial memory.

00:47:54:23 - 00:48:38:01
Angela Consoli
This moves to computational mental modeling and representation, in particular the concepts of beliefs and motivations in mental models, and then to machine reasoning. Finally, is human AI symbiosis, where the fellowship will investigate how to bridge human AI symbiosis in perception and comprehension. This objective will investigate current methods in hybrid intelligence. An important component of my fellowship is demonstration, where each objective has a requirement to demonstrate using tactical platform representations. For the past 12 months, my fellowship has been focused on objective one.

00:48:38:18 - 00:49:11:16
Angela Consoli
I have been designing and developing a multimodal information fusion engine to integrate within a tactical platform representation. The first stage is looking at multimodal machine and deep learning to extract beeches from text and imagery. To achieve this, I have been using data from experiments conducted in a surrogate Defence environment. The next stage is to work with academia and industry to finish the design and develop the multimodal information fusion engine using preexisting [no audio] information from the above mentioned experiments

00:49:12:04 - 00:49:45:04
Angela Consoli
and then to integrate the engine into a representative platform. Lastly is to investigate how to integrate multimodal information fusion with current data fusion engines. The next 12 to 18 months, my fellowship will be focused on this objective computational cognition. I'm currently conducting an extensive literature review in human and cognitive sciences to see how methods in those areas can facilitate computational mental modeling through knowledge representation

00:49:45:09 - 00:50:33:11
Angela Consoli

and also machine reasoning. Additionally, I'll be investigating using the multimodal information fusion engine in objective one to integrate knowledge from KBCs into fusion. In terms of machine reasoning, I'll be working with academia and industry using an interdisciplinary team to begin testing and evaluating current technologies in machine reasoning, focusing on neural-symbolic and neural-evidence systems. Additionally, I'll be working with the Defence client to understand their requirements on computational cognition in the Defence domain in particular, for air platforms. Human AI symbiosis will feature through objectives one and two.

00:50:33:24 - 00:51:04:08
Angela Consoli
I'm currently investigating human information processing and fusion and how to exploit it for tactical platform representations. This research will expand to how hybrid intelligence can be used in a multidimensional manner in tactical platforms. The aim is to provide advice to Defence on what is the continuum of human AI integration and how this can be achieved for the future battle space. This concludes my presentation today.

00:51:05:01 - 00:51:23:21
Angela Consoli
I'm extremely excited to have shared with you today an overview and update of my fellowship. I wish to thank the Defence AI Center and DAIRNet for the opportunity to present today. If you have any really in-depth questions, please do not hesitate to email me on either email addresses as seen on the screen. Thank you.

00:51:24:11 - 00:51:52:24
Jason Whittle
Thank you, Angela. That was lovely. And we do have a few questions that have popped up and where are they? Current questions. So Yuan-Fang Li has asked, It's fantastic talk. I'd like to have your thoughts on combining symbolic reasoning and neural network based learning, a neural symbolic inference. Can you talk to some, also

00:51:52:24 - 00:51:54:21
Jason Whittle
can you talk to some specific applications?

00:51:55:17 - 00:52:24:00
Angela Consoli
So I'm just in the process of looking through the literature on that. So although I'd love to today, I'm really in the preliminary stages of that. There is a lot of work in symbolic reasoning and neural network based learning, and I'm sifting through all that literature at the moment to to find out what's there and the specific applications in particular for dynamic and non-deterministic environments.

00:52:26:11 - 00:52:43:00
Jason Whittle
And Sebastian Wong said, Angela, I really like the details in your construction of the information just presented appeared feedforward where do you see the top down feedback links to occur? Any skip forward links? So hopefully that question makes more sense to you than to me.

00:52:44:04 - 00:53:12:00
Angela Consoli
So obviously the the feedback will occur from comprehension to perception in which it can be simply I need more information. So you go back to perception. The skip forward links is actually looking at the stage of comprehension. And so having the ability to have knowledge based constructs been looking at it that we don't have to go to first principles constantly at the perception level.

00:53:13:05 - 00:53:39:07
Angela Consoli
Hopefully that means that we can provide a more agile, situational understanding model. And so it's not always knowing what is that object because knowledge obviously means that we have identified previous objects of interest in an environment, but also it means it's giving us that context as well as actions that we have done against an object of interest. Hopefully that's answered your question

00:53:39:07 - 00:53:39:21
Angela Consoli
Sebastian.

00:53:43:21 - 00:54:09:10
Jason Whittle
OK, I don't see any more questions in the live Q&A. I'm just checking the discussion forum to make sure I've not missed any nope. And now, look, now I really think we have concluded the morning section just quickly check the schedules to make sure I don't missed any more speakers, but I have not. So this is the end of the first session.

00:54:09:21 - 00:54:41:19
Jason Whittle
We finished about five or 6 minutes early, but we have a break now until 10 a.m. sorry. Till ten, 15 or and so that's just over 30 minutes and then we will reconvene at 1015 with Lieutenant Colonel Stephen Fry and thank you all very much. I'll see you all in about 30 minutes.