

DAIRNet symposium 2021: session 1 transcript

00:00:02:22 - 00:00:23:04

Jason Whittle

Hope you had a chance to stretch your legs and I apologise for the confusion with the timing. Apparently I need a watch. So we have another session, which is going to last just over an hour. And to introduce the session, I'm going to I'd like to welcome Lieutenant Colonel Stephen Fry, who is the Director of the Defence A.I. Centre.

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Jason Whittle

And Stephen is going to give a short keynote, but also introduce a panel discussion with Ralph Gailis, from DSTG and Professor Hussein Abbas at UNSW. So Stephen, I'll hand over to you. Thank you.

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Stephen Fry

Thanks, Jason. Good morning. And in fact, even. Good afternoon. Good evening. Some ladies and gentlemen, for anyone that's dialling in from overseas. I understand it's a diverse audience here today, and I really appreciate the opportunity extended to myself to speak to you briefly this morning and give you not necessarily a perspective on the future of Defence AI but highlight sort of where we are now and I guess some potential opportunities going into the near future.

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Stephen Fry

And one of them, one of the key opportunities that we have is indeed the DAIRNet announcement and establishing of that going into the new year and the excellent opportunities that will provide for Defence and also all the the academic institutions here in Australia. So thank you very much Jason. And so yeah, myself, I'm currently the acting director of the Defence Artificial Intelligence Centre.

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Stephen Fry

Some of you may or may not have heard of that. It has been around in, in various guises for the last couple of years and I'll sort of cover that shortly. But I guess the key construct is, and I understand that we probably have do have some military people here and some people here that understand the construct of Defence.

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Stephen Fry

But if I do say anything that you are not familiar with, please throw it in the chat and we'll address those at the end. There'll be plenty time for questions, but the Defence AI Centre, so we're part of the Joint Capabilities Group. So Defences has a number of different groups and

services that provide the broad organisational structure for the department. The services are the typical, you know, Navy, Army, Air Force and the groups include such things as the Joint Capability Group amongst others, such as the Chief Information Officer Group, DSTG and also Defence Intelligence Group amongst some others.

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Stephen Fry

We provide or JCG provides those joint capabilities so those capabilities that are broad reaching across all of Defence, not just the single services. And that's important for the construct of where we sort of sit. Myself, I'm a signals officer in the army for about 20 odd years. Electrical engineer background. I'm fortunate to have been posted here to JCG earlier in the year and currently fulfilling the acting director role. So where do we find ourselves at the moment in, in Defence I here in Australia?

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Stephen Fry

So I guess globally this slide just highlights some recent documents - in fact the majority, if not all of these, are from this year - that sort of paint the context for just how quickly this space is moving and not just technically, as I'm sure a lot of you in this audience here know just how quickly the technological advancements are in machine learning and associated technologies, but also in the policy and regulatory space.

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Stephen Fry

So you've got the various guises from the left hand side, the national based strategies or reports to various government bodies. Through to our own in the centre there, the Australian AI Action Plan and the Digital Economy Strategy released this year. And then importantly too on the right hand side, you've got some other key documents that sort of provide some other perspectives on the landscape that we sit in and sit amongst not just nationally or as a department, but also globally. At the top right hand side

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Stephen Fry

some of you may be already aware of some of the APS efforts to increase or to create some of their professional streams for their workforce, including the APS data professional and digital professional. And some of those workforce challenges, not just unique to the APS, but also more broadly to the ADF and I'm sure into industry and the various organisations that you represent today. So back in 2020, Defence released two sort of foundational key documents.

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Stephen Fry

A lot of you are no doubt aware of them the Defence Strategic Update and the Force Structure Plan. Both are official so they're accessible to the general public and online. And the key one there being the Defence Strategic Update or the DSU highlights just how rapidly the strategic environment is changing, particularly for us in the Indo-Pacific region, but also more broadly globally. The Force Structure Plan highlights government's future investments out to

2040, so about 20 odd years, and highlights some of the important initiatives that are required to make sure that we are providing strategic Defence objectives of shape, deter and respond within our strategic environment

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Stephen Fry

that the DSU speaks to. At a national level you would all be familiar with the Digital Economy Strategy released earlier in the year and the government's current efforts to increase or leverage some of the economic benefits from AI technologies. And I'm sure there may be some people here in the audience that are representative from that body work or well and truly tied in. The graph at the top left there highlights just how the Australian economy has responded or sits within the current crisis of COVID and also amongst the readiness level and the momentum that

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Stephen Fry

we're carrying for the digital economy. So a little bit to catch up on nationally. And we know on a national level we do have some other challenges with skilled workforce, et cetera. All those those challenges filter down to Defence as well. The government also released their AI Action Plan almost five months ago now.

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Stephen Fry

And again, it just highlighted some of the key efforts that the Department of Industry's body of work there highlights the importance to Defence as well in the how other whole of government bodies are responding and supporting those national pollination efforts. Back in August, again another document that's accessible online and released releasable is the Defence Data Strategy.

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Stephen Fry

So this is a, this is a foundational document for us in a number of ways. It's only, as you can see there, a few years in future looking out to '23. But it sets the baseline requirements for the department to uplift its data writ large, in particular getting ready for some of those technologies that you would be all too familiar with and, and just how much data we need.

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Stephen Fry

There are pockets of excellence in Defence with regards to data management and curation and arguably probably readiness for AI. But as a department we have a fair ways to go. This document outlines the strategy to fixing that problem and the department has formally just last week announced the appointment of an interim chief data integration officer and the inaugural chief data integration officer, Ms Teresa Blair, as a band two.

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Stephen Fry

So she sits as part of the Associate Secretary function in Defence. Importantly, dislocated or sorry, delinked from the delivery agency being the Chief Information Officer group that has and amongst other delivery agencies that provides that support to the Department for data and the networks that that resides on. This is key for us here in the Defence AI Centre and we certainly will be working in lockstep with the data division and Teresa's staff to ensure that where we can best posture going into the future for our data requirements and data needs to feed our AI technology capabilities. And again, another recent announcement that has some implications for Defence AI

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Stephen Fry

was the AUKUS announcement amongst the other major announcements that have got a lot of media attention regarding some of the maritime platforms, there was also key four focus efforts in that partnership announcement and one of them in fact being artificial intelligence. The Defence AI Centre, we've been around for a few years now. I'll flick to a slide in a second that will step you through the lineage of where we have come from and shape or that allows us to posture I guess going into 2022, and I'll also cover off on some of the key forward work plan initiatives that we

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Stephen Fry

have going into the new year and how some of those will tie into DAIRNet and some of the opportunities that you all may be able to help us in our journey together. The DAIC lineage, the Defence AI Centre was established sort of back in sort of 2018, albeit under a slightly different name, and that was largely as a response to or in support of the looming release of the strategic policy and industry's strategic policy statement on AI. The Defence AI Centre back then and still to this day completes what is called an AI stocktake, it effectively tries to establish the baseline for all of those different activities

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Stephen Fry

across the groups and services that that have AI technologies, machine learning in scope or other activities. So not just the major projects and programmes that you may read about or can think about in Defence, but also some of those smaller activities, including operational activities as well. Over the last three years that we've done that stocktake

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Stephen Fry

unsurprisingly, the number has increased significantly and that is a trend that I have no doubt will continue into the future. This highlights the importance of such a body as the Defence AI Centre to coordinate and accelerate those sometimes disparate activities across the department and to make sure that we are optimising the investment and also the operational outcomes to achieve an interoperable workforce. A couple of years ago that the name changed but not the role.

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Stephen Fry

And also importantly another line of effort was commenced and has surprisingly even through COVID been achieved reasonably quickly and that was the creation and fit out of the Defence Technology Acceleration Collaboration Laboratory. So the DTAC, and it is a facility that I'll speak to shortly and certainly one where we look forward to working with our key academic and industry partners to help solve some of those challenges that we have in Defence. So we do actually have an enterprise or Defence AI Strategy.

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Stephen Fry

It is a couple of years old now and you'll note there that it was released back in late 2019, and that was before the release of those two sort of foundational contemporary documents, the DSU (Defence Strategic Update) and the Force Structure Plan. That's important because that enterprise AI strategy needs to be recast and updated to ensure that it includes some of the important changes from those two documents and also the broader changes that we see across the board in AI technologies. A slight organisational move, but we've been restructured in Joint Capabilities Group to form fall in under the Joint Communications Command and Control and Computers

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Stephen Fry

Branch, a part of Information Warfare Division. They provide, as you can imagine, some of those key joint functions across the groups and services with regards to the C4 functions. And at the moment that is where the Defence Artificial Intelligence Centre resides. So the old or the in force but obsolescing quickly, if not obsolete, Defence AI Strategy is currently not fit for purpose and unfortunately - and I'll speak to this shortly - not releasable to the broader general public. We are fixing that problem. So we understand the importance of engaging our partners and we want to make sure that we bring our partners, such as yourselves and all of the other industry and academic partners that

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Stephen Fry

we leverage here in Australia and from our partners overseas, to make sure that we provide and deliver a fit for purpose contemporary AI strategy. So that work is about to commence and it will go into the new year through stakeholder engagement. And we're looking at releasing that to the general public before mid-year next year.

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Stephen Fry

So that's an important step for us because we understand that particularly in this industry, but also academia, you need to be able to posture towards supporting or best supporting our priorities. And if you don't know what our priorities are and what we're interested in, that can make that challenging if not near impossible. So a key output for that will be that come mid next year

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Stephen Fry

you will have some hopefully clear guidance on what our priorities are going into the future to support our requirements in support of Defence planning, guidance and other activities. The old strategy did have five broad themes. They're probably no surprise to you but they're listed there, one being that proliferation aspect to provide across all domains.

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Stephen Fry

So we have five domains we have maritime, land, air, space and now cyber. It was information and cyber. It has been recast as the cyber domain because with the acknowledgement that the information environment crosses all of those domain boundaries and that's what that recent change highlights. There's also another important aspect here for education. Unfortunately, there are an increasing amount of educational requirements and training requirements for different people in Defence, be it APS and or ADF, and also our contracted workforce as well

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Stephen Fry

that provides some strong support. The DAIC has been fortunate to be engaged with the UNSW at ADFA this year with regard to the provision of a defence science, sorry a data science for Defence capability course of which another one is running or kicking off just next week under Professor Hussein Abbas and we'll get to speak to him in the forum after this.

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Stephen Fry

That is just one aspect of where we're looking at uplifting all of Defence's education requirements and training and baseline knowledge, not just in machine learning per se, but importantly also across other things such as data. And under the guise of the Chief Data Integration Officer, they are also looking at where we can upskill particularly some of the current Defence representatives, not always necessarily the new recruits, because a lot of them now have grown up in an environment that we are trying to grasp ourselves.

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Stephen Fry

The middle one there, the third, was to engage with external partners and allies. Now that's just not the standard sort of military allies that you that you can imagine. What is most important there, I think, is the engagement with the whole of government and also the academic and industry partners here in Australia, and that's what a forum like the DAIRNet can provide us and we will look to leveraging that quickly into the new year.

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Stephen Fry

So definitely looking forward to that. Number four there is the military ethics and AI governance. That will be recast, and I'll speak to that later on, more along the lines of

responsible AI. So not just the ethical aspects of which they are extremely important, but also some of the other organisational aspects of responsible AI and the use and implementation of that.

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Stephen Fry

There's a body of work that will kick off very shortly with regards to creating a responsible AI policy or guidance, and that will in turn inform this strategy development next year. Number five, there is that coordination piece. So there's, particularly in the services in the Navy, Army and Air Force, there's an extant for a number of years now

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Stephen Fry

in fact in some ways even leading the DAIC's creation is their own efforts in robotic and autonomous systems and AI. They will always, the services, and I speak to this as an Army officer, the individual services, and rightly so, will always look at opportunities to support their service needs. Increasingly and well and truly, it is it absolutely of vital importance

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Stephen Fry

we consider joint warfighting functions and joint capabilities. So that is what the Joint Capabilities Group does alongside other groups that have other broader non single service perspectives to make sure that those single services and the groups are doing what they need to do, but also contributing to the broader joint force. This is a bit of a work in progress with regards to how we're framing the AI acceleration that the Defence AI Centre is looking at providing to the groups and services.

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Stephen Fry

So of the two key functions, the coordination and the acceleration, this highlights particularly I guess both, but, but more importantly, the acceleration piece is at the background. So if we did not have the acceleration aspect, we would still achieve arguably some AI capability outcomes for Defence or across Defence, but not necessarily, and I'd argue most definitely not, at the speed of relevance that we need to - noting how quickly the field, the various fields are changing. We need to keep pace.

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Stephen Fry

So I'll quickly skip to this slide and this expands a little bit. Depending on your screen, it might be hard to see. This is still a work in progress and some of this will fall into or form part of the AI Strategy, but it highlights some of the subordinate elements of those individual areas and in particular how we are looking at accelerating some of those efforts across the board.

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Stephen Fry

I'm happy to answer questions in the chat, but OK, going on in the time. So the Defence Technology Acceleration Collaboration Laboratory or DTAC is a new facility fit out managed by the DAIC. If you're familiar with Canberra, it's at Fairbairn. So on the other side of the Canberra Airport, which is a convenient location for us to host academic and industry partners, that can fly in for the day or the week.

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Stephen Fry

It is the top two floors, level three and four. And it's there to provide an environment that is actually not easily accessible typically or historically in Defence, and that's an area where we can meet with academic and industry partners and work collaboratively together and be supported by the technology that we need, particularly in this field. It doesn't really exist at that unclassified level for us.

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Stephen Fry

So this facility was... the design of that certainly is how we cast this and it provides an accredited development environment, hyperscale cloud. Two hyperscale cloud providers are in the pipeline up to official sensitive regarding data. So that's a data classification. If you're familiar with the old parlance, it's the For Official Use Only. And that is where we look to create some of that acceleration effect not just in AI but also across other technologies.

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Stephen Fry

There's a virtualisation room there, a VR room, a media room. It's a great facility and we're looking forward to using that. It's not yet at IOC, but we're definitely looking forward to that coming quickly in the coming months. In fact, early next year I'd suggest will be the formal opening. So what's next for for Defence AI?

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Stephen Fry

So the DTAC will open formally early next year. We're already looking at hosting some events. In fact, this event was supposed to be co-hosted out there. Unfortunately with the various restrictions we were unable to, and some of the fit out remediations, but we're very close. So in the early parts of next year we'll have a formal opening. We're also, as I mentioned, a body of work for the contemporary and importantly shareable Defence AI Strategy to inform hopefully some of your posturing to support us.

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Stephen Fry

The responsible AI policy body of work will also kick off shortly. And that is also a foundational body of work that needs to happen quickly as we start to accelerate the implementation of some of these technologies. DAIRNet, you're all familiar with and that's why we're here today.

Looking forward to seeing how we can quickly pivot and leverage some of those opportunities to support our requirements.

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Stephen Fry

Industry days and indeed academic symposiums. We can certainly host them at the DTAC, if not purely physical, but also virtual. It's fitted out upstairs with a full streaming suite where we can host a number of educational and informative sessions to help uplift our knowledge across the board. And AUKUS. This is certainly a moving feast. And I'm sure you will continue to read about it in the news, but the opportunities that that may present, noting that artificial intelligence was highlighted as a focus effort. Yet to be fully thrashed out, but quickly coming to a head. So that will provide some great opportunities indeed through

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Stephen Fry

the DAIRNet mechanism. So what is the future of Defence AI? As the this keynote was supposed to be about. I'll leave you with four ideas of where I think, regardless of how it plays out over the next year or two or more, where we need to be and that's agile and responsible.

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Stephen Fry

So agile highlighting our requirement to respond to not only the technological advancements and policy and regulatory advancements in this space, but also the strategic environment to make sure that we are providing to Australia the requisite capabilities to shape, deter and respond. Responsible AI, as I mentioned earlier, it goes without saying includes ethical and more organisationally and culturally. That is something that is critical to us implementing some of these

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Stephen Fry

technologies. Partnered: and this is probably the key one for me and for this audience. We, as a department, cannot continue to achieve capability outcomes in this space without leveraging heavily in partnership throughout the journey. So from ideation to capability delivery and operation sustainment, without the academic and industry partners that is where particularly in industry, where these technologies are being led by and this entire ecosystem is being shaped. We need to be there in lockstep with you.

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Stephen Fry

And that's an opportunity that the DAIRNet can provide through the academic side of the house. And that is most important for us into the future. And finally, interoperable. And that's not just as I spoke to before, about across different services and across the different domains, but also across to our whole government partners and regional partners and also our allies. I'll leave it at that.

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Stephen Fry

We've got a few minutes for questions, I think, before we kick off into the broader panel. But more than happy to continue this discussion afterwards. There's a group in box there. Please drop us a note if you need to. And yeah, definitely look forward to working alongside and with you over the coming months and years.

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Stephen Fry

Thank you.

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Jason Whittle

Thank you, Stephen. And I think we have a there was one question I could see in the live Q&A, which was from Oleg Vornik. The lifeblood of a large global datasets. Does the DAIC or the DTAC have any datasets that can be used by industry and academia to develop AI tools? Stephen, did you want to say anything to that in particular and comment on that as well afterwards?

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Stephen Fry

Absolutely. So yeah, we are looking at it and part of the the Chief Data Integration Officer's remit will be to help provide some of that accessible dataset piece. But certainly at the moment we don't, but we will in the future. And yeah, I don't know if I've necessarily answered the question there, but our accreditation for the network has only just come through within the last couple of weeks.

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Stephen Fry

So we are looking at quite quickly. Yep. Sorry, Jason.

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Jason Whittle

No, no, I was just going to say we're in a similar position through DAIRNet in that the plan is to make some of those data sets available and to have DAIRNet that maybe host some of those data sets where it's appropriate. But a lot of the difficulty is making sure that the data sets the right data sets we need and that needs engagement between the research community and with DSTG to try and work out what data sets we have and at what access level we can make those available. So we don't currently have them,

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Jason Whittle

but that's what we're looking at, being able to provide for projects that we're operating under DAIRNet.

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Stephen Fry

Yeah, we're actually looking at releasing, probably in the coming months, patterns and throwing them up on GitHub. So similar sort of vein to what the UK has done I believe recently and some other organisations, to make that more accessible to our partners. And that's important.

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Jason Whittle

OK. I don't see any more questions at the moment, Stephen. So I guess we'll bring Ralph and Hussein back in and I'll let the three of you lead the panel discussion.

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Stephen Fry

Thanks Jason. I'll quickly introduce both Hussein and Ralph, and I believe that's all we have here in on this panel, but there we go. Perfect. So I've had the fortunate experience this year to work alongside Ralph from the Commonwealth perspective, but also working with Hussien in the development of the defence science data course that he's been leading at UNSW at ADFA and, looking forward to that course kicking off again next week.

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Stephen Fry

So I guess I'll leave this on. I'm not sure if the formal introductions happened whilst I was in other meetings before this, but yeah, I guess do want me to... I'll flick to you Ralph or Hussein for some opening remarks, if you like, before we sort of kick into a broader discussion.

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Ralph Gailis

Thanks, Stephen. Yeah, thanks for having us here and for providing the overview of the DAIC. I think it's going to be a great function moving forward. So DAIRNet and DAIC working together. And, we've seen a few those questions come up already around access to data and so forth. I can mention that, you know, we I think it was mentioned earlier, we were sort of attending an evaluation process for what we call DAIRNet Call 5.

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Ralph Gailis

And that was in terms of trying to look at a lot of problems, like a wide span of problems, what we sort of term patterns and noisy and dynamic data. And we would like to share some datasets to help people along with that. And so we framed some of the problems where we think we could generate datasets, but I think it's a bit of an iterative process as well.

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Ralph Gailis

So we do these calls in two phases. So there's the six month scoping phase. And that's that's really to help us work more closely with the successful tenderers to just scope what they really need, the sort of data they would like to work with, what we can actually source in terms of

data and more generally, not just data, but also framing the problem in more detail and doing the literature review and that all sort of thing.

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Ralph Gailis

So, you know, in time, no doubt we'll have more sort of comprehensive data sets available. But I think it is a bit of a two way street in terms of understanding the needs of what sort of approaches and techniques people get after as well. So maybe I could throw over to you Hussein. From an academic perspective as well, how do you look to Defence to help you in that sort of way in terms of the data, the platforms to work on, how to what best way to articulate the problems, and so forth?

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Hussein Abbass

Thank you, Ralph. Thank you. Working with Defence I would say there are two ways that Defence and DC could really help academia in this type of contemplation. Putting aside the fact that it's really important to start as early as possible, that is almost from day zero or maybe from day minus one, because the earlier we consult together, even when the problem is not defined just talking to each other, it takes time to establish a relationship, it takes time to establish mutual understanding of the concepts and the terminology is being used in these ecosystems.

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Hussein Abbass

So starting as early as possible is really key. But going back to the point of data, I would say that the support that we could gain from Defence probably to mean obvious one is in data and the second is in the problem definition and in shaping up the problem definition together because again the our different application languages issues that needs to be resolved and we might be talking about the same problem in completely different languages.

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Hussein Abbass

So early engagement with Defence and academia to shape the problem definition could seriously speed up the solution of the problem. And once this problem definition is shaped and obviously availability of data. It doesn't really matter if it is absolutely real data or synthetic but there needs to be a level of data surely that's, that's going to happen to facilitate the collaboration both ways.

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Ralph Gailis

Yeah. Yeah, that's a great point.

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Ralph Gailis

I guess Steve, maybe just throw to you because you know, we've talked about DAIRNet and how we want to work with academia, but at the same time we've got DTAC, right? And so the

DAIRNet and the DTAC need to work quite closely together, you know. And I think we conceptually mapped earlier how that might happen in terms of where problems go, whether it's a research problem or then a transition into some sort of capability.

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Ralph Gailis

So maybe you want to give us a quick overview of what the thinking is with some of the problems and so forth that you're going to tackle within the DTAC itself.

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Stephen Fry

Yeah. Thanks for saying that. Thanks, Ralph. So yeah, the DTAC was designed, as I mentioned, as that space where Defence could easily meet and use or have access to the tools and applications and data that we need for these technologies in the same room and working on the same problems. And you know, through that ideation and problem design thinking with our academic and industry experts, because Defence has got a number of workforce challenges, as does the broader national work force in particular in some of these spaces in AI technologies. Defence has workforce challenges in that and we'll always likely have workforce challenges in that.

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Stephen Fry

And that's why it's so important that we work alongside people such as yourselves in the research side and the academic side to help. I guess sometimes even for us, just understand what it is we, the art of the possible, what we need. And as Hussein as you mentioned, it's important that that we can provide that context for the academic community with what our requirements are, both initially and on the journey together.

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Stephen Fry

It's critical that we do that because otherwise, potentially the academics may pursue something that is not necessarily what Defence is after. And conversely, Defence may not know what the art of the possible is realistically or achievable. And it's important for the researchers and academics to be able to shape that thinking and help us come along on that journey. And there are various mechanisms out there to do such things as lean start up, the design thinking piece, co-design.

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Stephen Fry

There's a number of initiatives that you would have probably seen with regards to some of these sort of hackathons and hack Defence style events. That is certainly where we see DTAC as being a potential facility. But also conversely, some of the academic institutions I understand have similar areas where they can collaborate with industry and work alongside their customers and partners on that journey.

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Ralph Gailis

It's a good point I think you make around, well I think Hussain made that point as well, around the conversation, around understanding the problems and shaping them. And, I think that's exactly what DAIRNet is about as well, right? So I think a bit of our struggle in the past has been we go out with calls,

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Ralph Gailis

and so it becomes quite a transactional thing. We put a call out. We do a tender. We take a university on the that we think has the best proposal. And so it's sort of this quite a [no audio] maybe a couple of years that sort of thing. And I guess we're trying to build with DAIRNet is this community where actually people understand more generally what our [no audio] engaging and think the future and so forth as well.

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Ralph Gailis

So that's, I think, the really empowering thing and more generally then through DTAC and I think is more generally throughout the Defence as well.

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Stephen Fry

Yeah. I'm sorry, Ralph.

00:40:49:23 - 00:40:51:16

Ralph Gailis

Oh sorry.

00:40:51:24 - 00:40:57:15

Stephen Fry

Yes I see Russell's got his hand up, but I'll save my question till after that. Thank you.

00:41:02:07 - 00:41:04:20

Ralph Gailis

So who's got ...

00:41:04:20 - 00:41:56:01

Stephen Fry

Russell. I'll see if I can bring him in. If you've got a question, Russell, please throw it in the chat, mate. Otherwise Ralph and Hussain, as well and truly practising researchers and academics in this field and even as an interested amateur myself, seeing just how quickly some of these technologies are changing. So, there's papers getting dropped every day and every week and that sometimes changing the field foundationally. How is the academic and research side of the house posturing to accommodate that and I guess

00:41:56:11 - 00:42:05:09

Stephen Fry

both in the curriculum side of the house, but also sort of the research side of the house?

00:42:05:10 - 00:42:27:11

Hussein Abbass

Maybe I can kick it off on on the curriculum side and potentially a little bit on the science as well. So it is getting really tough. That's all I can say. It's getting tough because on the one hand, you would like to be by the nature of a university environment, you would like to be ahead of the game.

00:42:28:08 - 00:42:55:00

Hussein Abbass

When we are discussing ideas, we are looking at the future to come and in the blue sky space. But we are also very keen to look at achieving immediate impact. So we are looking at the problems and the issues that potentially organisations are faced with today so that we can use some low hanging fruit to deliver immediate impact into that.

00:42:56:07 - 00:43:25:20

Hussein Abbass

But over time you also discover that we all have to work together so it's not wise to be in the university environment talking about the technology to come and the population it needs to catch up with what's happening today and even potentially with some of the foundations that needs to be in place.

00:43:25:20 - 00:43:54:10

Hussein Abbass

So it needs to be an integrated approach. It needs to be an integrated approach. And if we split it into some problems, we don't necessarily have the resources available to spread our wings in lots of different dimensions. So I think the trick that I see is how we could really align education with research.

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Hussein Abbass

And instead of seeing these two concepts as two different business models, how we can actually bring them together so that what we all deliver in our education from a stage zero all the way to stage nine as we are delivering advanced courses and as well delivering even foundational courses, how we can bring research elements so that we can use the available resources in the best way we can and how we can leverage form those social into the education and the other way around, how I can actually design my curriculum in such a way that it can actually feed into the research agenda that we have.

00:44:42:21 - 00:45:34:08

Hussein Abbass

And to me, that does not that does not happen by having the university alone coming up with its ideas. It happens through proper collaboration and coordination with our partners, by us

sitting down on the table, sharing our plan, sharing our ideas, and having an open discussion and sharing our risks and that's the value that I see with partnerships that you really sit down and you open and you talk about the risks and we'll try to find solutions together while maintaining the fact that we are all accountable in whatever contractual framework that we are working with.

00:45:35:01 - 00:45:50:14

Hussein Abbass

And I think that is really the key that I see, Stephen, that we need to integrate the social education, but we also need to integrate people and organisations in our business model and in our working model.

00:45:51:09 - 00:46:22:01

Stephen Fry

Yeah. And there's certainly similarities there on our side of the house as well. Particularly how you mentioned the low hanging fruit. For us culturally in the organisation, sometimes what is important is to bring both the senior leadership group, but also the whole Defence community, along that journey. So from that ideation piece all the way through to the capability and then the use of that capability.

00:46:22:22 - 00:46:48:23

Stephen Fry

Yeah. And things such as demonstration or demos and other activities can help achieve that. But certainly the education piece, that baseline education piece and then, where appropriate, going much further and deeper with academic institutions is certainly another part of how we can look at doing that into the future. Ralph.

00:46:49:14 - 00:47:09:10

Ralph Gailis

I think it's worth saying also, through these sort of forums like we're doing now and through DAIRNet this, then, you know, we're going to have various panels and other activities that we do. And maybe we, as a community, can actually shape the curricula, how we think, what we need going forward.

00:47:09:10 - 00:47:45:03

Ralph Gailis

Right. So you know, there's a much larger effort of AI beginning to really scale up in Australia. So, you know, there's this National AI Strategy and the government's put a lot of resources in. So I think part of it is us in the conversations with the big issue, if you like, the bigger AI across the country. Because there is a lot of resources going into the National AI Centre, but then also within our own DAIRNet community and so forth really to try to shape some of these curricula and then how to transition those curricula into postgraduate studies and so forth and then get into the framing those research problems.

00:47:50:22 - 00:48:14:19

Stephen Fry

I'll just quickly... I think we might have a couple of questions in the chat. There's one there from Wenyi Wang. In my field of aircraft health monitoring, we have lots of unlabelled data which could be useful for unsupervised learning. Labelled data is hard to come by. Yeah. I guess, we've got a number of challenges I spoke to earlier with regards to our data.

00:48:14:19 - 00:48:55:04

Stephen Fry

So Defence has got a lot of data at various classifications and data quality standards. Part of the remit of the Chief Data Integration Officer and the Data Division is to look at uplifting that data so that we can quickly posture to support some of these technologies. Even... It sounds... Even only recently our HR data and financial data was not necessarily easily accessible to people that needed it to inform their own decisions.

00:48:55:04 - 00:49:23:01

Stephen Fry

And that was the old style or old way of using that data, not necessarily feeding the beast of machine learning and things. So we've got a long way to go. We've made that first step in the creation and release of that data strategy. And then we'll go from there. I guess what I didn't mention, or should have in my presentation - I meant to - was the announcement of the RAS AI.

00:49:23:01 - 00:50:14:01

Stephen Fry

So the Robotics, Autonomous Systems and AI SIC-P, which is the Sovereign Industrial Capability Priority and that highlights government's intent to support some of those foundational sovereign industry capabilities that they realise and understand, that going into the future, and as the strategic environment stands today, they're the things that we need to be investing in nationally. And it's a national effort, not a Defence effort, a national effort to, to support those industries. Keen for some thoughts maybe from yourself, Ralph or Hussein how you think potentially DAIRNet, but also, you know, the broader academic community can support such national efforts as the, the,

00:50:14:01 - 00:50:18:18

Stephen Fry

the SIC-Ps and things if you're familiar.

00:50:19:02 - 00:50:38:22

Ralph Gailis

Yeah. Let me just, before I do that, can I just pick up on Wenyi's comment that funny she says that around aircraft data because it is literally one of the problems we articulated in this latest call that's out. So we're actually really keen to see people's ideas of how you actually deal with these huge amounts of aircraft data and what interesting things we can do it.

00:50:38:22 - 00:50:48:10

Ralph Gailis

So it is one of the problems we just put out. And so we are hoping to be able to support some researchers in actually helping us with that problem.

00:50:50:13 - 00:50:54:04

Ralph Gailis

So sorry, I've lost the train. What was your question again, Stephen?

00:50:55:13 - 00:51:28:14

Stephen Fry

It was more about... Maybe just to comment about how the SIC-PS, so the Sovereign Industrial Capability Priorities, form part of that national effort to uplift some of the sovereign industry here in Australia. And, looking at how the academic community can support that in lockstep, as Hussein mentioned earlier, with Defence and to help shape those requirements from the ideation outset. So yeah, take that as a comment.

00:51:29:02 - 00:51:30:02

Stephen Fry

Yeah, sorry. Go Ralph.

00:51:31:14 - 00:51:55:10

Ralph Gailis

Yeah. The fact that we have these SIC-PS. So the key word is sovereign, right? So we're actually trying to build the capability internally. And that's what things like the Next Generation Technologies Fund is about as well, right? It's trying to actually invest in our own people, industry and academia. And looking at it from foundational research right

00:51:55:10 - 00:52:20:08

Ralph Gailis

through to very applied research and transition. So there is a lot of money being poured into really start to do this at scale. And I just mentioned before, there's a broader National AI Strategy. So all these things are being converged to really start to build these industrial sovereign capabilities.

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Ralph Gailis

And, you know, it's early days. Like they're still forming the National AI Centres and so forth. But we have had some conversations with people in that process. And so, going forward, we're going to need to build those closer partnerships with the National AI Centre to really move that forward. But it I guess you could say it is still early days for both of us.

00:52:42:21 - 00:52:51:00

Ralph Gailis

Certainly our intent is to build those relationships.

00:52:51:02 - 00:53:21:13

Hussein Abbass

Absolutely. And I would also add, from the academic side, it's almost like we see what we know and which means that what we see is shaped up with our experience. And bringing diversity to the table that is looking at the problem is really key for any solution. It is almost like a basic principle for risk management.

00:53:22:07 - 00:53:59:01

Hussein Abbass

So the academics bring different eyes to the table and sometimes that is really well needed over the whole supply chain and over the whole process. But also the role of academics varies. They could become the independent assessor or they could become the expert advisory group. They could become the people who contribute to the initial idea generation and the initial concept development phase.

00:53:59:10 - 00:54:40:08

Hussein Abbass

And we can go all the way to the test and evaluation once the system is in place, or even a prototype of the system is in place. So I see the integration of academia within the supply chain within the process, the procedural and the policy is actually an asset for any organisation, let alone for Defence and national security, so that we can inject this level of diversity to manage the potential current and future risk that we might be faced with.

00:54:40:23 - 00:55:12:09

Stephen Fry

Absolutely. Yeah, that's key. And as you know much better than I do Hussein, that this field is certainly multi-disciplinary and it will be into the future. And it's important that we leverage that diversity, that all of those people bring both through different or diverse knowledge, education, also backgrounds and expertise to this and help solve some of those joint challenges and problems that we face now and into the future.

00:55:12:09 - 00:55:40:04

Stephen Fry

Yep, that's great. Thanks, Hussein. I did see that in the chat there, Tim, asking about how undergraduates could be exposed to Defence a little bit in both AI and broader. Ralph, I might flick to you to sort of answer that, but I'll make a comment beforehand. I guess you're fortunate there Tim being co-located in Adelaide with a DSTG sort of primary location.

00:55:40:04 - 00:55:58:01

Stephen Fry

But yeah, certainly there are some, from my understanding, some sort of STEM initiatives led largely through DSTG and CDS as a capability manager I believe. But yeah, Ralph, I'll flick to you mate for that one please.

00:55:59:09 - 00:56:17:21

Ralph Gailis

So look, for a few years already we had this thing called the Cadet Programme, and that's really trying to get undergraduates engaged with DSTG early. And so we can we do such things as we take them on sort of summer student ships so you know, they can do it through a little project over a sort of academic interlude over summer.

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Ralph Gailis

Yea, that's a sort of ongoing programme. It's been around for a while. The cadets in general, it's a more serious thing where they actually sign up with us. You know, they finished their studies, but we actually offer them a job immediately after their studies and they come and work with us during their studies as well. And I mean I think it depends on the university and the course,

00:56:38:09 - 00:56:57:00

Ralph Gailis

but you know, that some of the courses have it required that you do an industry placement in any case. And so we're very open to having university students come in to do their industry placement in DSTG as well. Now the More Together strategy that we talked about earlier, I think that's sort of trying to scale it up now to a whole new level.

00:56:58:06 - 00:57:20:22

Ralph Gailis

I can't yet speak to the details of what the new initiatives are there. I'm not across that. It's all relatively new. But there are these strategic pillars within the More Together strategy. And one of those pillars is Brilliant People, and that's very much that is just investing in our people, not just our existing people in Defence, but investing in our talent pipeline and bringing that through.

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Ralph Gailis

So and so that's very much in our focus and in fact in the AI domain, we're really leading forces. And so to work with that strategic pillar and say, well, let's really focus on AI in terms of trying to really sort of scale up that that whole talent pipeline.

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Stephen Fry

Yeah, and I know DAIRNet is just in its infancy and being sort of, you know, announced and discussed today. But I mean, I'm not I'm not sure, and Ralph, you might know, and can speak to this or Brian in the chat if you know, if it could support small activities through the academic institutions with students, be they undergraduates or postgraduates coming to the DTAC for small sort of camp-like activities for a week or two to look to get after some sort of quick challenges.

00:58:15:18 - 00:58:42:12

Stephen Fry

I'm not sure if that's in scope or could be easily supported DAIRNet, but certainly that I would suggest that there would be certainly a desire from Defence's perspective. Again, in lockstep like Hussein mentioned, with creating and understanding, I guess, at each stage of addressing some of these challenges. Yeah. So Ralph or Brian in the chat.

00:58:43:24 - 00:59:10:15

Ralph Gailis

You know, that's a good point, Steve. And we are thinking about that sort of thing. I think definitely that's something DAIRNet can really help with - to organise some of those sort of events. I could sort of say you know, we've trialled this a little bit in our own organisation, DSTG. Just these little sort of so-called, I don't know, almost like a Kaggle style competition, maybe on, on a specific Defence relevant problem. We haven't done many yet, but people really enjoyed it and have learnt a lot.

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Ralph Gailis

We've also done something similar even with the UK, so we had this thing called the S&T Ashes. It's sort of like a bit of a friendly competition between our scientists here and in the UK for Defence scientists and so we actually ran one on reinforcement learning just this past year. When some of people came in there, they didn't actually know that much about reinforcement learning, but they, you know, they had some mentors sort of guide them through it and then were given a challenge problem that then they have to work on that problem for a,

00:59:41:22 - 00:59:56:07

Ralph Gailis

I think, different formats. Sometimes it was a really hard sprint for a couple of days and it's tough, you know, when you're doing a deal with the other side of world with the time zones and everything. I think the latest one was done has been more sort of maybe one day a week over several weeks is what we've done.

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Ralph Gailis

So that was an example of how we work internationally. But equally so, I think the DTAC and the, you know, the computational platforms you're providing and the ... facilities and they can be really great environments to do this sort of thing.

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Stephen Fry

Yeah. And also, I mentioned, we're looking at publishing, you know, open source, some of our design patents for, you know, our ML design patents, et cetera, as we develop them. So that's certainly another avenue that could support accessibility, I guess for the broader audience, both students or otherwise.

01:00:42:04 - 01:00:56:03

Ralph Gailis

Is there any sort of thing you do in the university Hussein, or those sort of more short term challenges and just trying to get after little problems quickly? Or is that a sort of, if you like, a sort of style of work that you are seeing emerging in universities at all?

01:00:57:08 - 01:01:55:09

Hussein Abbass

It is. I mean, there are a number of activities happening on the university side, so sandpit workshops and things like that. But looking if you focus on engineering and especially engineering and IT and computer science. It's really necessary to look at the university graduate as a professional engineer or professional computer scientist and what this actually means is that they're are learning outcomes that while working from the students beyond the technical knowledge that is the ability to work in teams, the ability to integrate in the profession, in addition to the obvious like ethics and values and so on. And that is that is where I see a great opportunity.

01:01:55:09 - 01:02:27:11

Hussein Abbass

So for engineers, engineering work experience every students needs to go and spend some time with an industry and that would include potentially DT and defence. So that's a great opportunity for students to get exposed to the problem and integrate with something that is really happening on that side. The same for computer sciences students will look always for one semester projects, for example.

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Hussein Abbass

So that's almost like a positive prototyping. The equivalent of ... within a university environment. So you come up with a problem quickly and you try to come up with an initial concept demonstrator for the problem that you have. So there are lots of things happening in the university at the moment. And we could also look at some of the innovation hubs being established in different universities as a fast, as an environment for faster prototyping as well.

01:03:02:14 - 01:03:31:17

Stephen Fry

I guess you'd say too Hussein, the students, you know, taking speaking to that multi-disciplinary sort of perspective, taking potentially some of the skills that they learn from their peers and from their academic lecturers and such, back to their sort of, I guess, parent or home disciplines. I think that would be certainly powerful and certainly something that that I think Defence

01:03:32:23 - 01:03:47:24

Stephen Fry

could probably, sort of, learn from a little bit better or more, yeah, for our own sort of education and experience and how we sort of share that amongst each other, rather than sort of staying in our sort of stovepipes. But just a general comment.

01:03:49:19 - 01:04:12:10

Hussein Abbass

Yes. And, in a way, as an academic I see myself as a lifelong learner. It's this ecosystem that students, when they go to industry they identify a problem they come back and discuss with the academic. The academic is learning outcomes. So it is it is a continuous journey of learning from each other.

01:04:12:20 - 01:04:47:01

Hussein Abbass

And I think this is really the core value of collaboration with Defence and industry that over time we develop our shared understanding of the problem space. And our students are almost like our ambassadors, our communication channels that we can actually use to communicate back and forth between practical problems, the organisations and us in the university environment.

01:04:47:01 - 01:04:47:15

Stephen Fry

Yeah, no, perfect.

01:04:48:01 - 01:04:50:01

Stephen Fry

Thanks. I'm sorry Ralph. You have something.

01:04:53:04 - 01:05:14:04

Ralph Gailis

I thought what I might just quickly do is just mention this conference, ADSTAR. So this is our, it's a new thing we're planning next year. So it's sort of in the middle of next year. I don't have the exact date at hand, but sort of round about July or thereabouts. So it's going to be a big Defence science conference or summit if you like.

01:05:14:22 - 01:05:38:07

Ralph Gailis

And AI's going to be one of the themes, like one of the big themes in that conference. And so, you know, this symposium what we're doing here, it's sort of a, sort of, small kickstart, if you like, to the whole effort. But ADSTAR's going to be much bigger next year. And within that conference within the DAIC, you know, we've got a few, sort of I guess, challenges and so forth that within that.

01:05:38:07 - 01:06:02:14

Ralph Gailis

And so I thought maybe it was worthwhile just talking a little bit about some of those, I guess having a little bit of initial discussion around what some of those challenges are. And, you know, that's sort of what we're going to take up next year. So to explore that, you know, in a lot more depth. So, you know, I mean, I think there was sort of three main themes or term challenges within the AI space.

01:06:02:14 - 01:06:29:22

Ralph Gailis

One is about AI alignment. So that's a challenge as an opportunity in actually realising the capabilities within Defence. Then another one was around verifiable AI for, for widespread adoption. And then also what will be the impact of AI. So they're, sort of, the major, sort of, talking themes that we're going to have in the ADSTAR conference next year. I thought, well, maybe it's worthwhile just having a bit of a talk about them now.

01:06:31:04 - 01:06:57:15

Ralph Gailis

And so maybe if I sort of throw it back to you Dougie, sort of, around, I guess, the measurement piece of how we actually measure Defence AI readiness and performance and the digital readiness and skill level. So I know both you and Hussein have been working on education programmes and so forth with Defence. So how do you sort of see that going forward?

01:06:59:23 - 01:07:27:24

Stephen Fry

Yeah, so for the readiness piece, readiness has a lot of connotations here in Defence, as you can imagine. But as we all know, and I may have sort of harped on it a bit, but the data piece is so important for us and, and getting our data sort of, you know, AI ready is certainly I guess foundational to any sort of future capabilities that we sort of look to pursue in this.

01:07:27:24 - 01:08:01:10

Stephen Fry

So, you know, I spoke about the, the stocktake that we do, the annual stocktake and the, sort of, trends of that increasing across the board from major project and programme to also, sort of, operational activities where there is AI in scope or, you know, tangentially we need to quickly posture and be ready for sort of some of that capability, sort of, landing here.

01:08:02:06 - 01:08:25:20

Stephen Fry

Yeah, it's certainly an ongoing challenge and it's something that sort of, you know, that the DAIC is certainly not alone in, but and the CTO has the lead for getting us our data, sort of, AI ready. But yeah, I guess there was a second part to your question Ralph as well, mate?

01:08:25:20 - 01:08:35:22

Ralph Gailis

Yeah. I guess, sort of, around measuring our own digital readiness, all the skill levels within Defence and how we actually achieve that.

01:08:35:22 - 01:09:31:07

Stephen Fry

Yeah. So there's, there is ongoing again body work under the lead by the Data Division with regards to the APS workforce and that's, look, not just the data and digital professionalisation

stream strategies but also looking at, indeed, data scientists and data engineers that are, and data analysts that are actually, you know, APS. That will have some challenges, I think. It's certainly a great initiative to, sort of, look at, but there are some ongoing workforce challenges, not just in the APS but also the ADF and you know, people with these skill sets particularly, you know, that have applied them for a number of years and are potentially experts. It will be challenging to recruit and retain them.

01:09:31:20 - 01:09:48:24

Stephen Fry

Defence has some unique aspects to it that aren't necessarily always accessible to, you know, broader industry. However, that is not necessarily always enough to attract them. So yeah, there are some ongoing challenges there.

01:09:49:00 - 01:10:17:22

Ralph Gailis

Hussein, one of the other, sort of, questions areas around technologies. And so what other emerging technologies such as some examples we have in this ADSTAR that we're planning to talk about in the ADSTAR forums around quantum computing and biological sciences and how potentially will they be impacted or will impact on AI. Did you, have you, sort of, thought about that, those, sort of, areas at all?

01:10:18:05 - 01:10:28:01

Ralph Gailis

Sort of I guess some of the broad applications AI or what other technologies can feed into on a more forward looking?

01:10:28:02 - 01:10:55:01

Hussein Abbass

Yeah. I mean, it goes back to the fact that the AI is, is really in the middle of multi-disciplinary cross-disciplinary fields. And it's touching on almost different technologies. So if, if we talk about things like say quantum computing, quantum computing, we'll go and say "so, what is the impact?".

01:10:55:01 - 01:11:43:22

Hussein Abbass

We know that at the moment in one of the main bottlenecks in quantum computing is is the memory. So while the out of all things is massively parallel type of computation, and the power that comes with sorting in multiple events simultaneously, so it give you this massive computational power. But the scale of the bottleneck in existing quantum computing and that's how many quantum bits we can actually we can actually hand and handle and process and when we look at the classic computing at the moment with cloud computation and the massive spaces that we have at the moment and the massive scans of competition that we can do with classical computing, we come and say, OK, is there

01:11:43:23 - 01:12:23:16

Hussein Abbass

an opportunity that we can actually leverage both? Is there an opportunity to start thinking about a taxonomy for problems that might be suited more for quantum computing and others, which might be suited more for classic computing. And as soon as we start structuring the problem like that, we can see opportunities even more early basic AI to do this type of classification problem and routing ability much the problem based on its suitability for a particular computing computational environment.

01:12:24:00 - 01:12:57:24

Hussein Abbass

So without getting into the optimisation field and the ... field and, and things like allocation of problems in this problem space. So AI is going to touch on every aspect of this type of technological advances that technology itself is going to open up opportunities for. AI, like quantum computing, offering opportunities for particular class of AI problems, but also AI is going to offer back opportunities in how to solve complex problems with these type of technologies.

01:12:58:05 - 01:13:28:08

Hussein Abbass

And you can take this all the way to bioinformatics, to the biological space, to the human AI and I was talking about today the human-AI teaming and the uses where we're still talking about wearable computing and we're still talking about even biological sensors that can be integrated within within the AI sphere. So I think, I think we'll see lots happening in the near future.

01:13:28:09 - 01:14:10:11

Hussein Abbass

It's going to be really exciting. But we go back to what Stephen was emphasising, responsible AI, and how we can actually balance that excitement that we have inside us as academics to jump into this while maintaining our social responsibility and looking at the ethical consequences and the potential social implications of these technologies on the wider community. As well as on the organisation as well as within Defence, on our command and control structure and the potential and the potential consequences that this could generate on on the national security level.

01:14:12:17 - 01:14:38:01

Ralph Gailis

You make a good point, I think, around quantum computing in terms of memory. So a really top guy in Australia, Lloyd Hollenberg, doing quantum algorithms, he sort of made the point I think that quantum computing is about deep computation but potentially small data. Right. And so AI, we know, sort of, in its modern incarnation, it tends to be around big data, which could be a real challenge with quantum computing.

01:14:38:01 - 01:15:02:16

Ralph Gailis

So I guess some of my thoughts are around, well I think yeah, I think you're right, it has a role and it's probably how to integrate computers in a very novel way. But you know, we might see some very different sort of algorithmic approaches. If we want to talk about AI and quantum computing together, it may not be for the very sort of standard stuff we're doing today on deep neural networks.

01:15:02:16 - 01:15:31:23

Ralph Gailis

I'm not sure how well they scale, you know, in a quantum computer. But, you know, I mean, there is some other sort of more near-term things that are happening right now, like for example D-Wave. Some people might have heard of them. They've been around quite a while now, more than a decade, I think. They were, I think almost, you know, almost the world's first quantum computing company, you know. And so they follow this different approach. They're a bit controversial in terms of how quantum is There has been controversy there in the past, but it's called this quantum annealing approach.

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Ralph Gailis

And that's actually very well suited to the optimisations and the advantage of the quantum annealing approaches is that they're already at about 5000 qubits. Right. So they're not the full scale sort of universal quantum computation, but I think sort of in the last year, some quite interesting research coming out there where they are key. If we think sort of at the cusp of almost being competitive or beyond or beyond what classical computers can do in certain types of optimisation problems which is obviously very relevant to AI.

01:16:01:09 - 01:16:30:12

Ralph Gailis

So there are sort of a whole lot of a number of different threads there, I guess, in terms of how it might help and you know. Maybe in the future they'll be one of our themes in DAIRNet to explore this in more depth. I sort of just mentioned, I did mention biological sciences and, you know, there has been a big impact already. You know, probably many people are aware of DeepMind's efforts on protein folding and so forth, and there's probably still a long way to go there.

01:16:31:00 - 01:17:03:23

Ralph Gailis

But I just wanted to mention, of course, our own CBRN International, which we're looking at some challenging problems there as well in the biological sciences in terms of, you know, the body the body manifests itself through many biomarkers and some of these biomarkers are just, you know, they come from all sorts of sources from being stressed to doing very hard physical exertion to being sick, to being infected with something, having bad sleepers, all these so different biomarkers.

01:17:03:23 - 01:17:31:24

Ralph Gailis

And it's really hard to disentangle all these different things. And so that's, sort of, one of the challenges we want to look at in within DAIRNet itself is and sort of helping that CBRN STaR Shot is really trying to disentangle all these effects and understand what are the signatures of infection in a person that may be due to a dangerous pathogen as opposed to some other effects, such as soldiers being forced to exercise in very hot and humid environments.

01:17:32:02 - 01:17:39:12

Ralph Gailis

And so really trying to disentangle a lot of those sort of signals and sort of hoping a lot of the modern machine learning techniques can really help with some of that as well.

01:17:44:16 - 01:18:09:23

Stephen Fry

I'd love to maybe understand for us... Sorry, I wanted to underscore a comment that that Hussein made regarding how important it is that some of these technologies. Sorry, I've just lost my train of thought. OK, I'll gather it in a second. I'm in a shared conference room here. Sorry, Ralph, can you take over?

01:18:11:14 - 01:18:36:11

Ralph Gailis

OK, so I guess, one of the big questions and maybe this question is more for you, Stephen than it is for me? So, as you have the military background that I don't, have you thought at all about how the widespread adoption of AI or particularly resilient AI systems how that might actually change military strategy or doctrine in the future?

01:18:37:05 - 01:19:27:15

Stephen Fry

Yeah, thanks, Ralph. And that was the point I was gonna make with Hussein's comment about how pervasive these technologies will be. So, you know, we're already seeing it sort of in broader society, but it won't be too long into the future where AI technologies will be foundational to sort of all Defence capabilities. So and indeed, you know, in, in society that, that sort of that, that highlights why it's important for us to sort of set the foundations right and get the baseline sort of right so things such as the responsible AI policy or guidance and also that inform strategy and partnerships will sort of I guess set the foundation for us

01:19:27:15 - 01:19:55:05

Stephen Fry

to sort of move ahead and hopefully and ideally keep pace with some of these technologies and how we can sort of use them in in, in each capability. It is certainly, you know, people often say game changing and things that I don't want to repeat that, but most of you, if not all of you here know or understand sort of some of the potential that is that is in the not too distant into the future.

01:19:55:05 - 01:20:33:08

Stephen Fry

Or indeed here, here now. So yeah, certainly important, and in fact critical, that we start to set the foundations right and how we maintain those into the future through such things as, you know, the education piece for the workforce and also the cultural impacts that some of these technologies will have on the workforce is just as important as the effect that they will they will be able to provide us.

01:20:34:05 - 01:21:01:14

Ralph Gailis

So Hussein, another thing we want to discuss at ADSTAR is around verifiable AI. So both how we do the verification and testing and then maybe on the flip side of things, what can adversaries do or what adversarial AI, or machine learning if you like, what can they do to potentially harm our own systems? Have you sort of looked at that that topic in the past, or have you thought about it? I'm just in your thoughts there.

01:21:01:14 - 01:21:55:22

Hussein Abbass

Yeah, we are actually looking at a few of these topics, Ralph, and the verifiable AI is one of the hottest topics in in the AI landscape internationally at the moment. And the issue of adversarial learning obviously is an important issue. If we if we if we stop going back, you know to the basics of vulnerability analysis that we even do in our human system without looking at, you know, the classic the classic risk assessment literature, the fact that there is a vulnerability which means that there is a critical element in the system that is easily exposed to a threat or to a hazard which mean that I need to understand what are the

01:21:55:22 - 01:22:21:24

Hussein Abbass

critical elements in my AI system and the obvious one would be the data if it's a data instance of AI, then I need I need to understand some bias. I need to understand the bias that the data is bringing to the development of the AI and what the AI is learning. Another critical element in the AI is the algorithm, which is updating the model.

01:22:22:14 - 01:22:45:16

Hussein Abbass

If it's a machine learning algorithm, it's accumulating the knowledge of the AI over time based on the interaction it has with the environment or based on the data that we have. But the AI is not just going to be data and algorithms. The AI is going to be integrated within the system, and this system is going to give it its information.

01:22:45:16 - 01:23:13:15

Hussein Abbass

So the sensors that I have in the system that's providing the input to the AI, I might have structured by some to be to be relatively safe by some of the sensors. Could be could could be hacked, for example. So when we start looking at the verification problem, I think I think we need to look at the system of system approach.

01:23:13:15 - 01:23:35:20

Hussein Abbass

We need to look at the wider decision cycle as well, and we need to look at a holistic perspective on this, on this full verification. And that takes us to the assurance problem as well. How do we know at the end who's going to sign on that? Who's going to say that this system is going to work in this particular environment?

01:23:35:20 - 01:24:09:19

Hussein Abbass

And I'm going to call responsibility if it doesn't. So the assurance and accountability problem is, is bulk of the wider challenge that we are talking about about here. I can offer a number of social directions looking at how to tackle that all the way from to let's get results into fit for purpose five approaches which are more practical approaches.

01:24:10:04 - 01:24:34:11

Hussein Abbass

But I think I think within the AI sphere and going back to the readiness problem that I would like to say that the verification and assurance should not be seen as a loss in the development. It should be integrated over the whole lifecycle of the development of the AI, and that is both of the readiness for this for this technology.

01:24:35:03 - 01:25:09:09

Hussein Abbass

I can mention very quickly two examples one is a group close by in my university and that's Professor Russell Boyce looking at the space sphere, establishing intelligent AI systems for space. And he's looking one of the things that I don't know all the details but I can mention quickly that he's looking at at the moment is establishing this distributed AI to look at the potential integration of edge computing with satellite computation.

01:25:09:23 - 01:25:40:05

Hussein Abbass

And one of the things that they are integrating in this technology is having digital twins. And the reason I mentioned this example is to bring the digital twins is that one of the ways that we can actually is both building confidence of this AI is to increase the maturity of our digital twins because it's going to be a key technology in the development of AI to establish trust, to establish confidence in what the AI is doing.

01:25:41:00 - 01:26:34:10

Hussein Abbass

But but also to provide early testing bids for the AI sphere. The second type of activity that we are looking at in our in my research group is what we call machine education. And that is instead of looking at AI as just a consumer of data, let us start talking about this AI as as a cognitive agent that while trying to educate and our starting point in this type of cycle is to shift the focus from just the agent that will we are trying to educate to the curriculum that we are using to educate this agent.

01:26:34:10 - 01:27:15:12

Hussein Abbass

And if I can actually construct and engineer this curriculum in a way that can be accredited by an organisation, then I can establish some level of assurance in the graduates in which in this case becoming the AI graduate. If this AI graduate is graduating, I can tell you that I'm graduating this AI similar to an engineer with an accredited curriculum and I can demonstrate to you the skill set, the graduate attribute of this AI that the AI has acquired.

01:27:15:16 - 01:27:34:11

Hussein Abbass

I can establish some some confidence for the social integration problem. So there are so much happening in that space and I have to stop here. Otherwise, I will keep going. It's a very fascinating space to work with. So I think I'll just stop here.

01:27:34:22 - 01:28:17:02

Stephen Fry

I might jump in there, Hussein. Thank you. From a Defence perspective, I'm sorry, real quickly. Yes, Defence about six weeks ago now released their, again publicly available, I'll throw the URL in the chat, their Defence Test and Evaluation Strategy. And it highlights how sort of today's test and evaluation in Defence is, you know, platform centric and not postured for some of these emerging technologies. And this sort of highlights some of the changes required as Hussein, you just mentioned. And that on going global sort the challenge of sort of the the test and evaluation or you know, validation and verification of some of these applications.

01:28:17:11 - 01:28:43:23

Stephen Fry

So yeah, I'll throw the URL in chat. But I know we're sort of coming up on, on time there. But Hussein and Ralph, thank you very much. It's been it's been a great chat we've had this morning and I know I'm looking forward to working with you both through the rest of the year and into the New Year. So I thank you again, gentlemen and pass the mike over to Jason to wrap up and pass on to Jamie.

01:28:43:23 - 01:28:44:08

Stephen Fry

Thank you.

01:28:45:08 - 01:28:45:18

Hussein Abbass

Thank you.

01:28:46:13 - 01:29:12:05

Jason Whittle

Thank you. Thank you all very much. That was a really illuminating discussion. I'll just pause ever so slightly to allow you to bask in the imagined applause of those who have been online

throughout that session. It was really interesting. So thank you, Stephen and Ralph and Hussein. That was really useful. So our next speaker is Associate Professor Jamie Sherrah from University of Adelaide's Australian Institute for Machine Learning.

01:29:12:16 - 01:29:18:16

Jason Whittle

And if we've got Jamie's presentation slides there I will pass over to Jamie. Jamie, over to you.

01:29:20:14 - 01:29:46:23

Jamie Sherrah

Thank you. Hi everyone. I'm Jamie Sherrah, the Technical Director for Defence at the Australian Institute for Machine Learning. I had a stint at DST Group as well. I used to work there for about six years in the ISR Division. And hope you're all having a good morning and thanks to the organisers for the symposium and for inviting me to speak about future trends in AI and how they relate to Defence.

01:29:50:07 - 01:30:21:24

Jamie Sherrah

So first to say a bit about the Australian Institute for Machine Learning. So it's part of the University of Adelaide and we have about 140 people doing machine learning and most of them doing deep learning, which you've probably heard of and you know, I guess machine learning at the moment is synonymous with artificial intelligence. So consider that we're working on AI and it's actually one of the best machine learning groups in the world, particularly focussed on computer vision.

01:30:22:16 - 01:31:07:07

Jamie Sherrah

So in terms of publications, we're ranked second or sometimes oscillate second and third in globally for computer vision publications and in CVPR conference on computer vision and pattern recognition we always have a lot of papers. This year we had 27 papers accepted and that conference is ranked fifth in publications in terms of impact in all of science. So we also do quite well in a lot of open challenges you know, for doing machine learning on various datasets.

01:31:08:00 - 01:31:56:22

Jamie Sherrah

Some of them are listed there on the slide. So with 140 people, there's generally someone doing everything you can think of. So you know what to say a bit about what we specialise in. If we have specialities, it's probably some of these listed here. One is vision and language. So this is processing both imagery and natural language together and fusing matte and deep geometry is about applying machine learning or deep learning to the traditional pipelines of computer vision geometry, mathematic geometry and trying to combine those two. Deep reasoning is a theme that I'll talk a bit more about later.

01:31:56:22 - 01:32:50:11

Jamie Sherrah

But this would be general, you know, inference, probabilistic reasoning, trying to combine symbolic reasoning or knowledge bases with machine learning. And listed here as well, Technology Translation. So AIML has a software development group with eight or ten machine learning engineers, and they do anything from scoping studies to rapid prototyping or even making more significant low to mid TRL demonstrators using machine learning. But there's a lot more going on than just that. So we have in the group, we have a long history of working with Defence and we have a lot of past and current projects with Defence.

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Jamie Sherrah

Some of the areas that traditionally our main bread and butter has been on ISR. So intelligence, surveillance, reconnaissance. Processing, sensor data, overhead imagery and other kinds of data. This is something we're focussed on a lot and in the last few years we've had several projects in the electronic warfare domain using machine learning to do recognition of RF signals. We've also done a bit of space domain awareness and general space projects and we have a Technical Director for Space as well and trusted autonomous systems.

01:33:37:22 - 01:34:43:04

Jamie Sherrah

So we have Professor Ian Reid who leads a lot of robotic vision and has been doing a lot of semantic SLAM, you know, autonomous vehicle mapping and things like that for autonomous systems. And again, as I mentioned with our development team, rapid prototyping and just go into little more detail there about Defence projects. So we work mainly with DSTG on these projects. And some Five Eye partner involvement, for example, DARPA projects and we have had we had a trial lab with Air Force called Poppy where we were focussed on technology translation and rapid prototyping of ideas. So we have some Smart SAT CRC projects in the space area and one that I'll talk about a

01:34:43:04 - 01:35:13:00

Jamie Sherrah

bit later is our two year project under the Intelligence Decision Superiority and NGTF thing, which as I understand is the precursor to DAIRNet, on vision and language technology and overhead question answering. We have a project with BAE at the moment on autonomous vehicles and in hazardous environments and we have a few cybersecurity projects as well.

01:35:15:09 - 01:35:51:23

Jamie Sherrah

We have a strategic partnership with Lockheed Martin Australia, and they fund our research ongoing and are, I guess, a preferred deployment partner with us. And we also work with some SMEs like DEWC who are working on a surveillance satellite prototype for Australia and have some Defence related challenges that we've been involved with, like xView satellite imagery object detection challenge and ESA Satellite Pose Estimation Challenge.

01:35:51:23 - 01:36:01:13

Jamie Sherrah

And then that's the space robotics challenge this year where we came third. But there are many more Defence projects than that as well.

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Jamie Sherrah

So the first message I want to talk about is that at AIML we believe Australia really needs a sovereign AI capability. So not relying on Google and Facebook too heavily going into the future, but developing our own capability in Australia. It's not just good for Australian industry, but obviously also good for Defence because it can be tailored for Australia's needs and we can rely on and that capability should be competitive and world class.

01:36:38:01 - 01:37:09:08

Jamie Sherrah

So if you're in a battle situation, you don't want mediocre AI you want the best AI. You don't want to be 10% less accurate than your competitors. So you need to be cutting edge as has already been discussed this morning. This is a really rapidly changing field. So when you go to a conference now the work you're seeing is already old hat and journals are just like way off the scale.

01:37:09:18 - 01:37:38:05

Jamie Sherrah

Yeah, they're not talked about as much anymore in computer vision and machine learning yeah. People are putting their work out there in Archive and GitHub and it's being used right away to get our eye on and there's new revolutions happening every month in the literature. So it takes a lot of focus and a lot of effort to stay at the forefront and people need to specialise in their fields and things like that.

01:37:38:22 - 01:38:21:03

Jamie Sherrah

And we need the sustained workforce of world class researchers in this area and they need to work in environment that attracts the best people and allows them to do their job. So while, you know, I've worked for DST and Defence and know what it's like that there are a lot of barriers and you know, you're behind a fence in a lot of ways and have a lot of overheads with security and there's a lot of delays involved in accessing things and obviously that's not compatible with this fast paced collaborative research effort that's happening globally.

01:38:21:24 - 01:38:55:09

Jamie Sherrah

And that's where it's fantastic that Defence has this renewed impetus or emphasis to collaborate with academia and industry and exploit their ability to work in that environment. But we just need to be mindful not to try to put some of those limits on academia. And you know, one thing that I've got in mind there is thinking about the restrictions on projects with citizenship.

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Jamie Sherrah

And I wonder, you know, are there are cases where the researchers are not, or can be foreign nationals? Where we're getting best people from all around the world working on research and they work on analogous problems to Defence's problems. So they can work on pictures of cats and dogs, come up with great algorithms, and then we can have people that are clearable translate that technology across to Defence's specific problems.

01:39:21:18 - 01:39:53:24

Jamie Sherrah

And can we have a model like that that works? So another issue is competitive salaries. So where we're competing with Google, Facebook, Amazon, and they pay, you know, graduates with no PhDs like sky high salaries, and that's what we're competing with. And so are there ways that we can offer, you know, loadings on salaries or other incentives to attract people to come and work on Defence's problems?

01:39:54:18 - 01:40:19:02

Jamie Sherrah

And yeah, as I mentioned, we need an open research environment and be mindful that, you know, these great researchers, they're thinking about building their career, getting publications getting known in the field, collaborating with the best people in the world, working on data that's in the public sphere so they can benchmark their results against other people in the world and what they're getting.

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Jamie Sherrah

And so we need to make that environment for them. And we need to keep encouraging the government to invest in AI for Defence and more broadly on the scales that are required to to employ the number of people we need to solve these difficult problems. And AIML is now ongoing, you know, committed to being a partner with Defence and the rest of academia in Australia to help deliver this AI capability. So probably all of us here know something about machine learning and deep learning and what's happened recently.

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Jamie Sherrah

But just to recap, we've got sort of classical machine learning that's been around for decades and methods like decision trees and support vector machines, and they usually rely on these handcrafted features that you use your ingenuity to come up with some transformations of the data that make it easier to classify or process with these algorithms. And you know, you can get some pretty good and effective results, but it tends to kind of plateau where when you add more data to these algorithms, they either can't handle it or they don't really get better.

01:41:40:08 - 01:42:07:03

Jamie Sherrah

And one of the issues there is because the feature transforms you picked are not getting better you fixed them and chose them. And what we've seen in the last ten or 11 years with

deep learning, which is these artificial neural networks where we can work out how to add more and more layers and make them more complex and train them effectively on data, is that we can add more and more and more data.

01:42:07:03 - 01:42:42:01

Jamie Sherrah

And as we have more data, they get more and more accurate at the tasks that they're on line to do. So they are quite data hungry, but we can get great results on certain problems: object recognition, text analysis, speech recognition and synthesis and things like that. So we've seen amazing things happen and more amazing things are going to happen. Of course, the kind of thing we're aiming for would be, you know, more like how humans can learn that we've got all this prior knowledge built into us that we've learnt over our lives and have innate as well.

01:42:42:12 - 01:43:03:06

Jamie Sherrah

And we can learn very quickly from just a few examples. So you know, if you touch a hot plate and burn your hand, you probably won't do that again. You just need to do that once to learn not to touch hot things. And that hot plates can be hot. So you can see that we're kind of heading in that direction.

01:43:04:10 - 01:43:21:21

Jamie Sherrah

And also the flexibility of the way humans can combine lots of different information of different types of different uncertainty and do that in a dynamic, flexible way. It's something that we still need to move towards in the future.

01:43:28:08 - 01:43:50:21

Jamie Sherrah

So what are some current trends in AI at the moment? Well, probably the biggest one is this foundational models with large scale training. So, you know, probably a lot of us have heard of the image net, which would be the first example of this where we had a million images and they trained a, you know, a network like ResNet to do object recognition and visual tasks with that.

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Jamie Sherrah

And then you can fine tune that to perform new tasks. And this trend has continued where people are piling in more and more data and making bigger and bigger models. You might have heard of GPT-3, which is a language model where they've trained on, you know, a lot of the Internet to learn natural language. And you can use that for all sorts of language tasks and something that, you know, we're quite interested in, AIML, as well is multimodal fusion, which is I'm thinking here particularly of images and natural language text.

01:44:27:06 - 01:44:50:10

Jamie Sherrah

And this is where we learn joint models for imagery and text. So there's models like clip that you might have heard of where you can kind of interchange the representations of images in text. And we're starting to see from these foundational models a bit more adaptivity or that they're a little more dynamic and adaptable than traditional models.

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Jamie Sherrah

So usually when we started out, you would have an object detector and you train it to recognise planes and tanks and satellite images and you know, it does quite a good job of that, but it really won't be able to do anything else. But with these large models because they have seen so much data, they can be used for zero shot tasks.

01:45:12:06 - 01:45:31:11

Jamie Sherrah

So you can give it a new task it hasn't tried before and just see how it goes with it. So you might have seen this example with GPT-3 where you could type in a description of a web page and it will create HTML for that web page just because it thinks so many pages about writing web pages.

01:45:32:20 - 01:45:51:18

Jamie Sherrah

So this is this idea that if we just scale up what we're doing now, we'll get to some level of intelligence, which I don't think is the whole picture, but it certainly can be quite powerful and certainly fine tuning these models for particular tasks on a smaller amount of labelled data for your task can be quite effective as well.

01:45:52:20 - 01:46:30:00

Jamie Sherrah

You've probably heard of generative models as well. So deepfakes being able to generate faces and voice reproductions of specific people or generate fake news. We've used all these ideas together with our artist in residence, Laurie Anderson, to create like a fake avatar of her, where I've got an example here where she says we can generate text that sounds like something she would have written and then have it sound like her saying and look like her saying it.

01:46:30:00 - 01:46:57:21

Jamie Sherrah

She used this in her Harvard Norton lectures. And reinforcement learning is another paradigm where you have some environment, an agent, operating environment. It can take actions and it gets some reward and the rewards disjoint from the action. So the algorithms trying to automatically learn what how the actions relate to the rewards and do more of those good things.

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Jamie Sherrah

And this has achieved great things in terms of game playing where we would get human level performance on some team games like Dota and Starcraft and traditional games like Go. And so that's obviously quite relevant to things like battlefield simulation and red-blue teaming and things like that.

01:47:21:06 - 01:47:59:15

Jamie Sherrah

So what are some future trends in A.I.? Well, I think in the future we're going to see increasing autonomy. So that doesn't just mean robots and drones that can go off on their own and make their own decisions. But even just rather than presenting filtered or ranked outputs using machine learning, having that start to take some some decisions on its own, where it might just be deciding, you know, to send somebody an email or something like that, and part and parcel with that is trust and explainability.

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Jamie Sherrah

So one of the downsides of deep learning is that it's a black box and you don't know what all these latent representations and numbers internally actually mean. And I think we're going to see more and more models that can give an explanation for their output and mechanisms for building trust between the human and the algorithm.

01:48:22:08 - 01:48:50:09

Jamie Sherrah

And adaptive machine learning is going to be a trend. I think there are related topics like out of distribution and generalisation and things like that, that this idea that if the system sees a new scenario that it's never encountered before during training, then it can do something sensible about that or that, you know, with human feedback system can learn to improve its performance over time.

01:48:50:09 - 01:49:15:06

Jamie Sherrah

And I think this is crucial, especially to Defence, for deploying these things in the real world. And learning with less data. As I said, you know, some of these experiments, like I said, where they're training on billions of examples they actually cost millions of dollars to run those experiments for the big companies like Google and Facebook in terms of the compute power that's required.

01:49:15:23 - 01:49:45:14

Jamie Sherrah

So they would be reticent to to do those experiments. And for most universities we just don't have the compute power to do that at all. So you know, I think it's not the whole answer. There's going to be more efficient ways of learning with less data and that's going to become more and more important in machine learning. I think we'll see more natural language

interfaces, which we're already starting to see with personal assistants and personalisation of human computer interfaces as well.

01:49:45:14 - 01:50:28:17

Jamie Sherrah

And AI systems that are more fast and flexible to configure on the fly. So systems that consist of, you know, modules that can do different things and can be configured to perform new tasks. And I think some impact there is going to be medicine, things like multi disease diagnosis and personalised medicine, agriculture getting efficiencies from targeted agriculture, obviously automation and autonomy and space. Just to say something about this idea of deep reasoning.

01:50:28:17 - 01:51:08:03

Jamie Sherrah

So you might have heard that AIML has been awarded \$20 million of federal funding to start the Centre for Augmented Reasoning which has begun. And this is Blue Sky research devoted to improving reasoning and machine learning. So I made this diagram here to say, you know what does deep reasoning mean. Well, as someone asked before we've got some powerful, you know, as they call good old fashioned AI and that's what GOFAL means consisting of ontologies, symbols, rules and logic that much they elicited by humans.

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Jamie Sherrah

And they have this great some great properties because they're explainable here and they have this, this property of super generalisation or constitutionality that we know that those rules will apply and compositionally in combination in any setting. So that can be quite powerful and it helps to build that trust. But the problem is that those rules are brittle. If you make a decision about a symbol being present at the start and that decision is wrong, that propagates to later decisions and it's not scalable because you need a human to go in and create all those rules, symbols and things.

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Jamie Sherrah

And, you know, there's just too many in the world for humans to do that and update it. On the other hand, machine learning has that scalability and the robustness to noise and it has some generalisation ability, but it's kind of an implicit or incidental generalisation, not a super generalisation and compositionality. So how can we combine those two to get the strength of both?

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Jamie Sherrah

I think this would be one of the things with the Centre for Augmented Reasoning. You should see exciting things happening there in the future.

01:52:24:00 - 01:52:58:06

Jamie Sherrah

So specifically for Defence, some of the frontiers in AI are obviously robust autonomous systems. So you know, drones underwater in the air on the land that are able to complete missions on their own and cyber security and information warfare, important you know, large data landscapes with lots of things happening historically and dynamically that will need to be processed and considered together to look for threats and, and signals. Cognitive electronic warfare.

01:52:58:07 - 01:53:25:08

Jamie Sherrah

So in the battle space, you know, there's are things happening in the RF realm that are happening too fast for humans to, to respond to. So eventually having a human in or on the loop making decisions about whether to deploy certain countermeasures is going to be too slow. We need some automated decision making where A.I. has that speed advantage.

01:53:25:08 - 01:54:12:07

Jamie Sherrah

Detection of biological threats and CBRN threats with AI combining sensors, it's a good opportunity and as I said, regarding to reinforcement learning, having more realistic wargaming and simulation for optimal decision making. For hypersonic systems, exploiting that potential for high speed decision making for control and back on the autonomy theme, having group behaviour or swarm behaviour and and swarm management of autonomous systems and my personal favourite AI for ISR.

01:54:12:07 - 01:55:02:22

Jamie Sherrah

So being able to fuse different data types you know, taking that huge swath of all the historical and current data that's unstructured from different clients, being able to interact with it through natural language and dialogue and being able to filter and summarise that for people at different levels, whether it's an analyst or a commander or a warfighter or someone in the cockpit who needs information right now. Just to say a little bit more on that about this data deluge problem that, you know, every day there's more and more data coming in, more sensors being deployed, but still the same numbers, roughly the same number of ADF staff there to process that and how can we

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Jamie Sherrah

manage that and make the right information available to them. And so under this NGTF project, the intelligence and security already project and vision and language technology, we've been looking at just that and making a start at looking at how we can do question answering on geospatial data, particularly satellite imagery, but also, you know, object tracks documents that are have geo referenced like Wikipedia and things like that.

01:55:38:06 - 01:56:14:21

Jamie Sherrah

And we've worked with various things are answering questions from structured data like SQL databases or unstructured data like Wikipedia articles or from imagery itself, just having the algorithms look at the imagery and work out what's in it and how it relates to your question. This can all be improved, we believe, in the future through dialogue as well to sort of work on those human computer communication limitations to iteratively solve problems together.

01:56:20:04 - 01:56:55:07

Jamie Sherrah

So in conclusion, the things I've talked about this need for Australia to have a sovereign capability in AI for Defence and what we need to do to build that up. And I talked a bit about current trends in AI and how currently has some degree of flexibility and adaptability and relies a lot on large datasets. But in the future I think we'll see more adaptability autonomy, but it would be more interactive with people and less reliant on large datasets.

01:56:56:08 - 01:57:21:06

Jamie Sherrah

And there are many opportunity areas for Defence. You know, that's quite silly to make a list because it's really almost everything. But some of the key areas I think are autonomous systems, sensor fusion, situational awareness, cyber security and cognitive EW. And at AIML we're keen to continue to be a partner in this Defence AI capability. OK, thanks think we've got some time for questions.

01:57:22:17 - 01:57:42:06

Jason Whittle

Thank you, Jamie. That was great and we do have a couple of minutes left for questions, so I'd like to throw that open to the discussion and the Q&A, if people want to add their questions in there. There are a couple of questions in the live Q&A. I think one of them was from the right, one of them was in the previous session.

01:57:42:14 - 01:58:04:14

Jason Whittle

Wenyi Wang, so it was a I don't know if you can see the Q&A, Jamie, but Wenyi Wang says Defence, Defence DOD used to be major drivers of technological front, now big tech are the drivers especially for AI, and they don't necessarily see things in the same way as Defence, such as Project Raven, where Google doesn't want to be a part of it.

01:58:04:14 - 01:58:05:24

Jason Whittle

Just want to see your comment on that.

01:58:06:19 - 01:58:19:24

Jamie Sherrah

So yes, sorry, I can't see the Q&A because the screen sharing one is covering it up.

01:58:20:18 - 01:58:43:23

Jason Whittle

So I guess the question is really about what are the major drivers for development in a I have been in the last ten years or so and how that shifted more to Dumer, you know, Facebook, Google marketing applications than it has from Defence and what that what that has meant for involvements in Defence AI research.

01:58:45:08 - 01:59:07:23

Jamie Sherrah

Yeah. Yeah. So that has been interesting, you know, because machine learning has been around for decades and Defence has been interested in it all that time. And then the big tech companies got really interested in the last ten years or so and invested big time and, and I guess they're focussing on a lot on their problems and they're very competitive with each other as well.

01:59:08:21 - 01:59:26:06

Jamie Sherrah

And there really are often going to this scaling up application and it's very multimedia focussed as well about speech and images and things like that. I think yeah, Defence has quite different challenges, you know.

02:00:00:01 - 00:00:31:20

Jamie Sherrah

Where there's little or no training data, you know, and there won't ever be, you know, if you think about, you know, some some problems and, you know, a company like Google it, you know, even for companies like Google and Amazon, the problem's always changing. And that's always the case, you know, for real problems. But they do have the luxury of going and relabelling another data set and just retraining using supervised learning.

02:00:32:16 - 00:01:07:02

Jamie Sherrah

Whereas for an autonomous system or for a lot of Defence applications, that might not be the case because it's just not the personnel or the data available to do that labelling. So I think there are quite different emphases and DST defence needs to be keep, you know, investing in their key areas like that. The you know, at least the big tech companies are making a lot of their models open and so we can benefit from those things as well as you know.

02:01:08:18 - 00:01:28:02

Jason Whittle

Yeah, there are several open access platforms now but you kind of said it in your presentation about the some of these companies are able to pay enormous amounts of money to people who are who are wanting to work in this kind of space. That kind of has the effect of competing people out of kind of the defence applications and towards the other applications.

02:01:29:16 - 00:01:32:16

Jason Whittle

Um, there are a few, I don't know if you can see the live Q&A.

02:01:34:00 - 00:01:53:01

Jamie Sherrah

I'm sorry. Another thing to mention on that open challenge idea and you know, it can be can we create more and more open challenges that are relevant to what we're doing? And you've got to do that in the, the flavour of the, the research community, you know, and make it all very open and collaborative.

02:01:54:08 - 00:02:03:09

Jason Whittle

Was a question about when in machine learning challenges, what makes a good challenge? What lessons for defence when creating challenges?

02:02:04:21 - 00:02:31:14

Jamie Sherrah

Well definitely make it hard. Like don't make the the baseline accuracy like 95%. That's the first one. Yeah. I mean there's lots of lots of tips there. It is a lot of work. It's a lot of takes, a lot of iteration. There's a financial cost involved for labelling and things like that. You need to have, you know, no restrictions on sharing the data and you need to consult with a lot of people.

02:02:31:19 - 00:03:08:13

Jamie Sherrah

And, you know, we have plenty of people at AIML that have put out data sets, like we have one on visual vision and language navigation, for example. Yeah, I think, you know, make it relevant to your problem but interesting to academics and something that also is going to forward science and further science. So, you know, talk to academics about what are the gaps in the literature and in the data set world at the moment that this is going there to move towards.

02:03:09:22 - 00:03:36:08

Jamie Sherrah

So yeah, I, I have this idea that once you get the question right, the answer's kind of easy. And a lot of the time in research we don't we're trying to get the question right. And I know like with visual question answering, for example, that's been the case where they just keep iterating on the datasets, finding, you know, biases and limitations and problems and they keep bringing out more data sets to address that thing that.

02:03:37:12 - 00:03:57:16

Jason Whittle

I think I was predicted by Douglas Adams, wasn't it in his answer to the life of the universe and everything being 42 and then the next iteration being what was was the question. So

Sean also had a question. What's the current opportunity for Advanced Materials Design and development in Defence? Using utilising AI and machine learning models?

02:03:57:16 - 00:04:25:05

Jamie Sherrah

You can answer. Yeah, I mean, I don't have a lot of expertise in that field, but I would think that, you know, the idea of predicting properties from molecular design, you know, similar to the protein folding idea that that could be useful, but you can just hypothesise tons and tons of things and then try and use machine learning to predict it.

02:04:25:05 - 00:04:51:17

Jamie Sherrah

Whereas simulation might be not feasible, but machine learning might give you, you know, more of a, I guess, a a good suboptimal prediction. Yeah, I guess I'd encourage him to come in for a chat and you can talk about what the problems are in material design.

02:04:51:17 - 00:05:11:16

Jason Whittle

And there was a comment also from David Marlowe. If you're using simulation models to test machine learning AI concepts, there's a whole field of design and analysis of simulation experiments which allows you to assess what your model with less design points and replications to still get the information you need. Regarding the main impacts on the results. Yeah. Okay.

02:05:11:19 - 00:05:29:21

Jason Whittle

So we're actually a little bit over time for lunch. So I want to thank Jamie again and I want to thank all our speakers from this morning sessions. We have a break now for one hour and we will reconvene then. And so I hope to see you after lunch. Thank you all very much.

02:05:29:21 - 00:05:31:23

Jamie Sherrah

Thank you.