Catalyzing Computing Podcast Episode 26 – Science and Technology for National Intelligence with John Beieler (Live from AAAS 2020)

Intro [00:00:10]

Khari: Hello, I'm your host, Khari Douglas, and welcome to Catalyzing Computing, the official podcast of the Computing Community Consortium. The Computing Community Consortium, or CCC for short, is a programmatic committee of the Computing Research Association. The mission of the CCC is to catalyze the computing research community and enable the pursuit of innovative, high-impact research.

This episode of the podcast was recorded live at the "This Study Shows," a Wiley podcast Sci-Mic stage at the 2020 AAAS Annual Meeting in Seattle, Washington. AAAS is the world's largest multidisciplinary scientific society and a leading publisher of cutting edge research through its science family of journals. Their annual meeting brings together scientists from across a range of disciplines with journalists and policymakers to share their work with each other. The theme of the 2020 annual meeting was envisioning tomorrow's earth. We're joined today by John Beieler, a former program manager at the Intelligence Advanced Research Projects Agency, or IARPA, and currently the director of Science and technology in the Office of the Director for National Intelligence, or ODNI. In this episode, we discussed how John began working in national security, the day in the life of an employee at IARPA and ODNI, and the technical challenges the intelligence community is facing. Enjoy.

Interview [00:01:10]

Khari: So can you tell me a little bit about your background? Your PhD is not in computer science, right?

John: No. First off, thanks for having me. Happy to have this chat and happy to tell a little bit about the kind of role that the intelligence community sees itself playing in science and technology more broadly.

So no. Political science PhD by background, bachelors in political science as well, so not computer scientist or kind of hard STEM by training. Stumbled into this backwards — I was very lazy as an undergrad and got told by a professor to do a project where I had to label a bunch of data in a very repeating pattern. This was when I was like a sophomore and I said, “This is the worst. I don't want to do this.” So I made friends with a computer scientist undergrad at Louisiana State University. Worked up a program to do that work for me and finished the work for my one year research assistantship in about a month and a half. So, you know, laziness is the father of all invention. Because of that, [I] really got into computer science and programming, which led to Penn State, which was a very quantitative political science department. Had the benefit of a National Science Foundation grant that led to quantitative political science and looking at big data. And then...yeah.

Khari: So what kind of work did you do research-wise while you were getting your PhD? Can you talk about any interesting projects or anything?

John: Yeah, so did a lot on protests. My kind of major claim to fame in grad school was generating a map of protests around the globe. That was a field called event extraction within human language technology. Information extraction: who did what to whom, when, where, why? So from a political standpoint, it was really generating data for other

political scientists to use to test hypotheses about international relations. But for me it was really an interesting hard language problem.

Khari: So what was the process to generate that data? Where did you get your signal from?

John: So basically we would work to scrape open news. So, you know, Reuters, Agence France-Presse, any wire stories that came across, and then we broadened our scope to basically anything that was news, even for a kind of loose definition of what constitutes news. Pull that data in and we had some algorithms that we used to extract basically the subject, the verb, and the object and then code that according to an ontology that we had so we could figure out, again, who was doing the what to whom.

Khari: Ok. So for people who might not know, can you explain the basics of how a machine learning system to parse a sentence works?

John: Yeah, so we originally did old school artificial intelligence, which, you know, basically expert systems. So rule-based systems that said, ”Hey, if a word is in this position in a sentence and it's next to these other words then it is the subject of this event, and if it's in this other place then it's the object of this event.” We quickly moved on to supervised machine learning approaches where we had people label data for us that basically said, “Hey. in this sentence that says, ‘the rebels attacked the town,’ that those words, ‘the rebels,’ that's the subject of that event. And ‘the town’ is the object and ‘attack’ is the verb.” That's obviously a simple sentence, but we would get more complex so we moved onto supervised learning approaches very, very quickly.

Khari: OK. So how did you end up going from, sort of, that academic research background to working in policy?

John: So there was a stop along the way, which was as a program manager, like you said, at IARPA. I'll note that it's an activity, not an agency.

Khari: Ok.

John: It's a very fine distinction, but one that's important to government people.

Khari: What is the distinction?

John: Um, agencies are bigger.

[Laughter]

So, technically, IARPA is sort of tucked under another agency, which is the Office of the Director of National Intelligence. We can talk more about that in a second, but IARPA was the stop off. So [I was] at IARPA running programs, funding researchers to do work in technical areas that were within my technical area. So rather than doing the research myself, I moved on to funding others to do research that was relevant to the problems of the intelligence community.

Khari: OK. So could you just explain a little bit of background on what IARPA is and what it does, and what ODNI is what it does?

John: Right. So I'll flip those, and I'll start with the ODNI and explain a little bit what the intelligence community is and what we do and then how IARPA fits into that. So the U.S. intelligence community is comprised of 17 agencies. These are the ones that people have heard about. You know, the Central Intelligence Agency, National Security Agency, the Office of the Director of National Intelligence. And then ones that you might not have heard of — so the Department of Treasury has an intelligence function, the

Department of Homeland Security, each of the military services. The U.S. Army has an intelligence function as well.

So the role of the Office of the Director of National Intelligence is to coordinate, enable, and integrate those other 16 agencies of the community. Make sure we're all marching together towards the same goal and getting after the hard problems of the United States national security enterprise. So, again, very much an integration function, and then within that IARPA is the basic R&D wing of the U.S. intelligence community.

ODNI stood up after 9/11. I will probably get this date wrong, but I think 2005, and IARPA was stood up shortly after that to basically mimic the role of DARPA, the Defense Advanced Research Projects Agency. DARPA is an agency unlike IARPA. So to basically play the role of DARPA, but for the [intelligence] community.

Khari: All right, got it. So what would the day in the life of a program manager at IARPA be like?

John: Only big thoughts, right? All the big thoughts, all the deep thinking.

The job is really to figure out…so we're not like the National Science Foundation. Where they, the NSF, funds a lot of basic research, does really great work, but for kind of the good of the scientific enterprise generally. IARPA is concerned with that, but again, the goal of the activity is to fund research that is of direct value to the intelligence community. So basically a lot of the work, daily work, of a program manager is figuring out, you know, what is the current state of the art within a field, like human language technology, and then where are the gaps that we have as an intelligence community. Then how do we marry those two together and translate the gaps in the community into basic research projects that we can fund academics and industry to get after.

Khari: Ok. Can you talk about any of the programs that you helped to manage while you were at IARPA, maybe like the BETTER program?

John: Yeah, definitely. So BETTER, which is the most fantastic acronym ever for a program.

[Laughter]

You know, not the best program, but it's the better program. Just trying to do asymptotically better. So that program stood up to figure out how we can apply some of the advanced human language technology approaches to the needs of an intelligence analyst, particularly looking at information retrieval — so search, like search text documents and information extraction...again, that event extraction that I talked about earlier — to the unique problems of an intelligence analyst, because the job of intelligence analysts is a little bit different than you going on Google trying to find some things.

Khari: Right.

John: The task is different, so you can't really take those technologies directly from the open and from industry and translate that into our problems. So the point of BETTER was to figure out, again, where are the gaps in semantic information extraction and information retrieval, and then pointing that at a particular problem that the intelligence community has.

Khari: Ok. So how do intelligence agents sort of get that information? What's their process if they're not using Google? I mean, you probably can't reveal too much of that….

[Laughter]

John: Yeah, so to kind of step back a little bit. The community has a bunch of data regardless of where it comes from. It can come from some of our more sensitive collection platforms or it can come from, you know, open source news reporting. So just imagine you're an analyst and you got a bucket of data sitting in front of you, and you're tasked with a particular question that a policymaker needs answered. What will happen after this world event? Why did this world event happen? You have to search through that bucket of data, usually in the span of two, three, four hours and come up with an answer. So you're probably an expert in your geographic area or, you know, maybe you're a world expert on protest, but you have to answer this specific question very quickly. So what BETTER was trying to figure out was how can we use existing information and then tailor it to your search in that big bucket of data, because, again, you don't have two days to figure out what exactly you're looking for. We had to get the right information to you as quickly as possible because the main takeaway is there's a ton of data, you have to search through it, and you have to give a good, solid, explainable answer very quickly.

Khari: Yeah, that seems like a job that, obviously, AI or those kinds of systems can help with. What was the Mercury Challenge that related to BETTER?

John: Not directly, but it's an interesting take of the same problem. Because the fundamental job of the intelligence community is to provide actionable insight to policymakers in an actionable time period, so this thing happened, this other thing will likely happen next. And, again, communicate that not after three or six months, but in a time period that a policymaker could actually do something about it. So the Mercury Challenge — and happy to talk more about the long history that led up to that challenge — in particular was looking at forecasting world events. So [forecasting] political events like protests, or military actions, or violent non-state actor actions in an actionable time horizon. So, again, it was a real time forecasting challenge where we had, you know,

kind of hobby scientists use open data, develop algorithms, and then try to forecast events in real time 30 days in advance.

Khari: Ok. So you mentioned the history of that. Was there a long history leading up to that? Was there some kind of catalyzing event that really spurred this?

John: Yeah. So, again, forecasting generally is of wide interest to the national security community broadly. So at IARPA there were a few programs that happened. The first was a program called Open Source Indicators, which was using indicators from the open source to see if we could forecast things like political events or like flu outbreaks or, you know, other pandemics. So there's some interesting anecdotes there about signals and indicators like how many people cancel restaurant reservations.

Khari: Really? That can help you find that kind of thing?

John: Yeah, right. Because a lot of people are canceling their reservations at a restaurant it's indicative of a disease outbreak, right? Like the flu. So that was the initial work. There was a follow on program called Mercury that was looking at that but taking it a step further to see if some of those algorithms could be applied to our classified data. And then the Mercury Challenge was seeing what, again, the hobbyist community could do, because, to reiterate a little bit, IARPA funds academics and industry. So this was very much going to the lone scientist, the lone hobbyist, and seeing what they could do. Kind of similar to Kaggle competitions or some of the open data competitions that exist.

Khari: That's cool. How did you find those hobbyists? Did you...this was just an open call? You went and found them?

John: Yeah, so we partnered with one of the data competition platforms. We used TopCoder for this one in particular. They have a broad community of people that they

tap into anyways, and then, what might be surprising to people, we tweeted a lot about it. IARPA I actually had a pretty active Twitter account, so we'd send out tweets, press releases. We did some things like this where people came and interviewed me and we actually got fairly robust participation in the challenge.

Khari: So I guess, what role does ODNI, and maybe the intelligence community in general, see for hobby scientists or hobby creators to contribute?

John: Right, so from my point of view, this is...A strong, broad science and technology enterprise within the United States is of extreme value to us as a national security community. Even if you're not directly working on our national security problems having people who are, you know, data literate, who raised their kids to be data literate, who raise their kids to like STEM. Because these are all people that we want to come work for us maybe one day. So there are potential contributions directly to our mission through things like the Mercury Challenge and some other challenges that places like DARPA and IARPA run. But from my point of view, just a broadly STEM literate nation is of value to us to get after some of our hardest problems.

Khari: OK. Yeah, I mean, that makes a lot of sense, obviously, which I guess is sort of what AAAS is kind of all about. So in programs like BETTER or the Mercury Challenge, do you guys use real data? And if so, where do you get it from?

John: Yeah, so at IARPA they spend a lot of money on tests and evaluation. So a lot of the activities of the program go to testing the solutions that performers develop because we want to know that if something's developed it's right. So the data is generally out of that.

I keep saying we, again, no longer at IARPA, so speaking based on past experience. But IARPA spends a bunch of effort making sure that they get the right data so that they

can test those algorithms. So usually it's through trained teams of experts. So like in BETTER we had multilingual extraction, so we had a team of native Arabic speakers annotating data for us. We had teams of trained English speakers annotating English data for us and [it] actually took a ton of time to get there. So it's generating data through the test and evaluation process.

Khari: Ok. I saw another interview that you did where you mentioned something about like high resource versus low resource languages for doing machine learning. What's the difference between those two things?

John: English is the highest resource language. And what “resources” means is labeled examples of things. So in the context of information extraction, like named entity recognition, is this word a place, a location, or a thing. So in English, there's a ton of labeled data for that. In some other language like Tagalog there's less labeled training data. So it's not necessarily reflective of how many people speak the language because there could be languages where there are a ton of native speakers, but not a ton of labeled resources. So this high resource vs. low resources really focuses on the amount of labeled, clean training data that can be used to develop some of these algorithms.

Khari: Ok. So is a high resource language always better? Or are there ever downsides to having data that is heavily labeled?

John: So there's a long history in the human language technology community looking at how to apply some of these tools to low resource languages. And that's also of interest to the...in my opinion, to the machine learning community more broadly, because right now deep neural networks need a ton of training data to make them work. And that's what's interesting about these low resource languages is that there isn't a ton of data to make them work. So it's an interesting problem from a pure machine learning perspective as well, which is how do we make these algorithms work in absence of a ton of label training data?

Khari: Are there any particular ideas you can comment on on how to do that?

John: I've got a bunch.

[Laughter]

So there's been a lot of work recently — and unfortunately, because of my job switch I haven't kept up with the literature as much — but there's been a lot of work on zero resource machine translation. So in machine translation if you're moving from English to French or something like that, historically, you've needed a lot of English data, you've needed a lot of French data, you've needed a lot of already translated data to learn that mapping, and that's super expensive. So there's been a push to say, "How can we learn to translate without those resources?" And so this notion of zero resource is, and I'm going to dive into the…

Khari: Go, go into the weeds.

John:...I'm going to use some jargon now, I'm sorry. But you learn how to map the words into a latent lexical space.

Khari: Ok. What is that?

John: Yeah, so a latent word space. So, oh man, teaching shows you what you don't know.

[Laughter]

So again, it's this underlying space and you map English words into it and you map French words into it. So if you've seen things like the vector embeddings and word

embeddings and things like that, it's kind of like learning that. But you learn this embedding so that English words are close to their similar French words. All right, so you learn how to map in that space and then you learn how to rotate basically the English space and the French space so that they're aligned.

Yeah, I know that's not a great example, and this is a podcast. I'm doing a lot of stuff with my hands so…

[Laughter]

Khari: So I guess a question I have is like languages are frequently constructed in different ways. The way English grammar works is different from the way Spanish grammar works and the place [words appear] in sentences [is different]. How do those kinds of mappings handle that problem?

John: Right. Yeah, so this was a big problem originally. Some of these techniques I'm talking about with learning the joint embeddings had a lot of problems when you move from Romance languages to non-Romance languages. So exactly to your point, moving from English to Chinese, where a single character in Chinese can represent a string of English words, that was really difficult to get some of these alignments. So some of the recent techniques coming out in the literature using things like reinforcement learning have gotten at this to learn a more complex latent lexical space to be able to transfer between languages that aren't exactly structured the same.

Khari: Ok. So when you have a successful program within IARPA, what's the process to take that to the next level? Because you said that's like the research arm for ODNI. So you come up with some great new technology, it can translate every single language, what happens?

John: Right, so having to be a little vague on specifics. At the end of the day, the job is to move this into the hands of — in the case of BETTER or something like that — into the hands of the intelligence analysts. So the people are actually doing the work. And that's why every IARPA program starts out with close collaboration with our mission partners.

To the previous points, this is why we want to make sure that we're solving a problem that's of relevance to the community so that whenever the program is done and everything wraps up, we have something that actually meets the needs of those analysts, and then hopefully there's a clean path to technology transition there. Moving from research to operations is always difficult, as I think anyone that's done basic research can probably attest to. But we want to be as close as possible to the actual real world mission needs of our partners.

Khari: OK. So earlier I asked you what the day in the life was of an IARPA program manager, but same question: What's a day in the life like of the director of S&T at ODNI?

John: Oh, you know, a lot of meetings.

[Laughter]

So the less snarky answer is it's really fantastic, because my experience moving from a researcher to an IARPA program manager is that you get a little bit of a broader view, because you're no longer the single researcher or team of researchers going after one hard problem, you're figuring out how to shape the totality of a research field. And it's a similar, for me at least, step change moving from a program manager to the director of S&T where my job is to set the strategic direction for the broad IC (intelligence community) science and technology enterprise. So, you know, I'm a little bit fish out of water some days because I'm a machine...I'm a political scientist by background, did

machine learning for a little while, and then I had to sit in meetings and talk about biology or quantum, which are things that I am not fully equipped to do, but have a great team of really smart people that make sure that we're getting after the right problems.

Khari: Ok. So I guess that sort of touches on a question I had: How...or what role do you think scientists and researchers can play in making sure data is available, especially from fields that might not normally talk to each other?

John: Right. So going back a little bit to IARPA days, one thing that we would do is make sure that all the data that I say we spent a lot of money to generate was made open source where possible. So we spent a lot of money, this is taxpayer dollars, these are public resources. So we try to open up that data to be a broad use of the research community and not just the performers that we would fund as a program manager. So I see that similarly in my role as the director of S&T, which is figuring out how to better communicate our problems to a broader swath of researchers and industry. Sometimes that's really hard because some of our problems aren't really easy to communicate like that. But I think we're better as a nation and we're better as a intelligence community when we're able to talk more openly with our partners, which is why I'm sitting here at a conference doing a podcast.

[Laughter]

Khari: Did you ever expect this?

John: No. Zero percent.

Khari: So you mentioned industry. How frequently does ODNI or IARPA collaborate with industry directly?

John: Yeah, very frequently. So recently we released an RFI, a request for information, that was broadly available. It was posted on a website called FedBizOps, and that was through our In-STeP program. That was basically, “Hey, here's all the technical areas that we care about, everything from artificial intelligence to quantum to bio to P&T to you name it. Send us your cool stuff. And then once you send that to us, we do our job and we go figure out who in the community is interested in that. And then we try to get a sit down between the companies and the mission people who are interested in that. So, to directly answer the question, all the time and we try to engage as broadly and as openly as possible.

Khari: So what's the incentive structure to get industry to participate? Is it just the goodness of their hearts or do you pay them or…

John: Little bit of column A, little bit of column B. You know, when there's something that we can work on there are obviously opportunities for contracts and work like that. But it's been my experience that a lot of companies just want to know what our hard problems are because we have some super wicked hard problems. And they just want to know what is it that you think is interesting. So even there's not a particular contract attached to that, just figuring out which way to direct some of their work is useful and interesting to them.

Khari: Ok. Could you discuss the AIM Initiative a little bit? That's to assure AI systems, right?

John: Woo, yeah. Do we have another hour on the podcast?

[Laughter]

So AIM is the augmenting intelligence using machines strategy and that is the U.S. intelligence community's strategy for how we're going to integrate artificial intelligence,

but not just AI also automation and augmentation, to, again, do the mission of the intelligence community better. So this is...a lot of times you might have an analyst that has two spreadsheets of data, like literal Excel spreadsheets, and is having to manually crunch those things together. We don't necessarily need machine learning to do that. We need like a Python script. But again, it's figuring out, to these previous points about BETTER...too much data, too much information, how can we use advanced technologies to better serve our mission users?

Khari: OK. So you mentioned earlier you're not a biologist, but I'm going to ask you about biology anyway.

John: Oh no.

Khari: I know there was an ODNI sponsored study examining the current state of the biology economy and outlining strategies to protect data and intellectual property. What were the key takeaways from that?

John: Yeah, a lot of thoughts about how….

Thank you for the question, I'll answer a slightly different one. The observation from the bioeconomy study is part of a broader narrative about the convergence of multiple fields. So what's interesting about the bioeconomy study is that it's no longer about just biology and the life sciences, there's a convergence of engineering via biomanufacturing. There's bioinformatics and bringing things like machine learning and artificial intelligence to genomics and things like that. There's things like the proliferation of genetic testing and genetic kits and things like that. So the major takeaway from the bioeconomy study, for me as a non-biologist, is the way that multiple fields are converging together in this one area with biology as the center, but touches on food production, touches on medicine, touches on life sciences, it touches on everything. And then from an intelligence community perspective, what are the threats associated

with that. As things are become so crosscutting and so intertwined, what do we need to worry about to help protect the nation?

Khari: Are there any particular risk factors that you can talk about on the podcast in those areas…

John: Uhh...

Khari:..like, say, smart agriculture or something like that?

John: Yeah, to slightly spin this, it's like with...you mentioned securing the machine learning algorithms and we just had a panel before this where I was talking about the vulnerabilities in machine learning. As you introduce new technologies and novel and interesting ways that definition only opens up a broader threat space that we have to care about. So doing things like developing engineering principles around smart agriculture or smart medicine or biotechnology and things like that, it's a new compounding factor of things that we have to care about, because we no longer have to care about just the engineered protein we have to care about the machine learning algorithm that was used to find the things that we're gonna engineer. So it's really just considering the totality of the threat space and all the wonderful things we have to be terrified of.

Khari: OK. So this might not be exactly what ODNI does, but you kind of talk about the policy pipeline from the standpoint of...let's say you realize this is a major threat in smart agriculture. What would you then do to ensure that farmers or whoever was necessary took the necessary precautions to enforce them? Would you communicate that to the FTC or something like that?

John: Right, so there is open sharing where possible between the interagency process, but also in that case — and this is a little bit out of my lane as the science and

technology nerd — but, you know, that feeds up to an interagency process run by the White House. So like with the bioeconomy study, we saw that this was a technology area that we thought we should be interested in via this kind of horizon scanning thing that we do, and then we released this study and now anyone can use the results of that study. So similarly, if there's a particular threat we communicate via the appropriate channels, likely up to the White House and policymakers to say, “Here's the thing that we see. It is now your job to figure out what the policy response to that is.” Because again, as a community, we don't we don't make policy, we don't suggest policy, we just outline the kind of facts on the ground around what's happening.

Khari: Right. Since this is a live podcast, maybe we can see if anyone in the audience has a question that you're able to answer. If anyone does feel free, if not….

[Audience member asks a question]

Wait I'm going to repeat that, so the recording will pick it up. There are people in academia that say that intelligence is bad. Was that the question? What do we do?

John: Yeah, doing evil? Well, I like to think I'm not evil. I'm just a guy up here.

I think the way I would respond to that is to say there are threats in the world. There are threats, again, in this bioeconomy perspective there's a terrorism threat, there's threats by nation state actors. So there's bad people out there that want to do bad things to us, and our job as a community is to help protect against those and be the first line defense against that. So, you know, everything we do comports with the laws and policies of the United States of America. We have a lot of great transparency principles. Every year, the Office of the Director of National Intelligence releases a transparency report, which might seem like an oxymoron for the intelligence community, but we really do try to put

out as much information as possible to make sure everyone knows what we're doing and where our activities look like, again, within the bounds of law and policy.

We got an important mission and we try to get after that. To say one more thing about what's been interesting about being at IARPA and ODNI writ large is that everyone there really, really cares about the mission. I work with a lot of computer scientists that could very easily bounce out and go work in industry and do things like that, and they choose not to do that because they care about this mission and because they think it's important. So that's one of the really interesting, refreshing things about coming into work every day is everyone really, really cares about the thing that they're doing. Not to say that's not the case at tech companies or in other places, but just almost universally that's a shared trait amongst people that work in, especially the science and technology space, within the intelligence community.

Khari: How big are IARPA and ODNI? Just out of curiosity...

John: I can't speak to ODNI, but speaking to IARPA, it's uh...you can see this on the website, all the program managers are listed there. It's a couple dozen program managers and then a fair number of support staff to help out with that. But it's really a program manager driven organization akin to DARPA.

Khari: OK. So we touched on sort of the industry public sector thing earlier, but with a lot of the spending right now going on in industry, how much for the future of technology and sort of those security, intelligence issues are out of the government's hands? And are there ways to maybe put it more in the hands of the government?

John: So I think — and I think there are studies in numbers that bear this out — that basic R&D funding by the U.S. federal government still has an outsize effect on future spending. So this basic R&D funding that the federal government — to include the

Department of Defense and the intelligence community — provides provides the catalyst for a lot of these things.

You can go...you can trace the history of a lot of these things back to the early days of modern tech that we use right now. You know, DARPA loves to call out Siri and the Internet, if you've heard of it. That kind of started with basic R&D funding out of the federal government and that's still the case today. Then, particularly for our use in the intelligence community, figuring out areas that we think are important but might be market failures. So leaning a little bit on the previous panel that we did, talking about this notion of AI assurance and AI security, that's a place where we think is important globally, but is of particular importance to us as we deploy machine learning out that we want to make sure it's assured. So we focus on areas like that where we think there might be a little bit of a market failure, where corporate research and development might not actually fill that gap.

Khari: Ok. Anyone else in the audience have a question. Throw it back out there. Chad, you have a smile, like maybe you have something you want to say.

[Audience member asks a question]

To summarize that, what are the biggest challenges for machine learning and what's coming next?

John: If I knew what was coming next, I probably wouldn't be up here as a government official, recording a podcast. I'd be doing something else with that knowledge. But to kind of get to the failure modes point, and going back to the AIM strategy I talked about earlier: really what we're focused on is kind of the human centred design aspects of this. So, again, how do we incorporate machine learning into an analyst workflow? So it's not about machine learning for machine learning sake, it's about getting after the job of the analysts and figuring out the best way to insert these things into that process and then

doing that with kind of eyes wide open about what those failure modes look like. Knowing this is not a perfect solution, but it's a useful tool to have in the tool box, and then how do we accurately and adequately incorporate that into workflows.

Khari: So we're at AAAS, it's a big meeting for scientists. Do you have any tips or I don't know, food for thought for a scientist, both social and physical scientists, who are interested in pursuing a career in national security or just within the government more broadly.

John: Yeah. So, again, to the extent you can try to engage with us on the things we put out, even if it's not via a directly funded issue. You know, if you see a program that we're working on that largely indicates our areas of interest. As a practical matter, we do have a fairly high bar for bringing people into the community. The standards that it takes to get something like a security clearance are widely publicized. So if this is something you're interested in making sure that you comport with that. Other than that just doing super good, excellent work. We welcome all comers and we have, again, really hard national level problems and so we need everyone kind of rowing in the same direction. So the more people the better.

Khari: Ok. What do you personally, not necessarily speaking for the government, [what is] sort of your like long term 20 year vision for what we could be able to do with machine learning and AI in the future? If you had your dream intelligence gathering system what would it be?

John: An ML that makes PowerPoint for me.

[Laughter]

There's that. But again, I think that there we are just at the very beginning of understanding what a lot of this stuff will mean, so I think there's still a long time horizon

to figure out how a lot of this work will integrate into actual human processes in everyday life. And so to the earlier question about what's next, we're still drafting off of work that was published in the ‘80s, so who knows what will be published in the next 10 years that we'll be working on over the next 50. But I think the opportunity space here is super broad. And I'm excited to see what great researchers and people at conferences like this generate.

Khari: Is there anything we didn't touch upon already that you want people to know about?

John: No, I already did my spiel about the mission and how great everyone we work with this. But no, I just want to thank you for this opportunity and thank everyone that's sitting out here listening to me. This has been fantastic already and so look forward to continuing the conversation with folks.

Khari: Yeah. Thanks for being here. Final call for questions before we end the interview?

[Audience member asks a question]

What are the best things students should learn if they want to get into this area?

John: Yeah, I've been showing a little bit of my bias as a political scientist that masquerades as a data scientist, a machine learning person. I think the marriages of fields is something that's really interesting. So not just being a machine learning researcher and not being just a political scientist, but being both, because I think that really enables you to grok and understand what the really hard problems are and then get after those. So really, really focusing on the interdisciplinary nature, cross cutting issues, and then, you know, it's the classic liberal arts education. Like being the whole

person and then figuring out how that can impact substantive research questions. That'd be my advice.

Khari: All right. Well, thanks for being here, John. It was nice to talk to you and thank you AAAS for having us at the This Study Shows," a Wiley podcast, Sci Mic Studio. That's the end.

John: Thank you.

Outro [00:35:41]

That's it for my interview with John Beieler. We'll be back soon with new episodes. Until then, remember to like, subscribe and rate us five stars on iTunes. You can learn more about the CCC on our website, http://cra.org/ccc/, and read more about the CCC at the AAAS meeting on our blog at https://www.cccblog.org/. Until next time, peace.