Artificial Intelligence and Augmented Intelligence for Automated Investigations for Scientific Discovery

AI3SD Interview with Dr Terhi Nurmikko-Fuller
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Online Interview

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Contents

1 Interview Details

Title	AI3SD Interview with Dr Terhi Nurmikko-Fuller
Interviewer	MP: Michelle Pauli - MichellePauli Ltd
Interviewee	TNF: Dr Terhi Nurmikko-Fuller - Australian National University
Interview Location	Online Interview
Dates	16/02/2021

2 Biography

Figure 1: Dr Terhi Nurmikko-Fuller

Dr Terhi Nurmikko-Fuller: 'You can get a very good result with a very simple machine learning model'

Dr Nurmikko-Fuller is a senior lecturer in digital humanities at the Australian National University. Her research involves interdisciplinary experimentation into the ways digital technologies can be used in the humanities, arts, and social sciences, including the role of gamification and informal online environments in education. She is a member of the Australian Government Linked Data Working Group, a Fellow of the Software Sustainability Institute, UK; a Humanities, Arts, and Social Sciences Champion at eResearch South Australia's Data Enhanced Virtual Laboratory; a Research Fellow at the University of Illinois Urbana-Champaign, USA; and a member of the Territory Records Advisory Council, Treasury and Economic Development Directorate, Australian Capital Territory (ACT) Government.

In this Humans of AI3SD interview she discusses her circuitous path to where she is today, the joy of working with messy, ambiguous data, the role for digital humanities in putting ethics at the forefront of AI, and why early career researchers need to learn to work smart as well as hard.

3   Interview

MP: What's been your path to where you are today?

TNF: I'm a senior lecturer in digital humanities at the Center for Digital Humanities Research at the Australian National University (ANU) and how I got here is a long and complicated story with many twists and turns. My academic past is rich and covers a series of different disciplines. It involves very little in terms of a plan that got executed step by step and much more grasping opportunities and going through any door or window that might open.

I have a Bachelor of Arts with Honours in ancient history and archeology at the University of Birmingham, specialising in the study of the ancient cuneiform languages of Sumerian and Akkadian. They are from what is roughly equivalent to modern day Iraq, several thousand years ago. Sumerian is a linguistic isolate that has no known relatives either before it or after. Akkadian is the oldest known Semitic language, related to languages like Arabic. After my Honours, I continued on to do a master's degree reading these languages. However, this is a small discipline, with relatively few opportunities for career development.

Looking for opportunities to work with materials from the ancient world, I did a second master's degree, a MSc in Museum Studies at the University of Leicester. It had a large digital component and at that point I'd figured out that what was really exciting for me, was the digital space. It was also my first foray into the world of the Semantic Web and thus the digital humanities. I then worked in the GLAM (galleries, libraries, archives, museums) sector in various different countries, such as a local museum in Finland, the British Museum in London, and the National Museum of Egypt in Cairo.

After these industry experiences I found a PhD programme with a scholarship from the Engineering and Physical Sciences Research Council at the University of Southampton. It was a 'three plus one' programme: a one year master's degree and then three years of the PhD in Web Science, examining the co-constitution of the web as something that has technological and social considerations.

For my PhD thesis, I looked at how I could represent ancient literary narratives, the stories in these ancient Sumerian compositions, using ontologies, linked data, and semantic web technologies. It allowed me to weave those three master's degrees together in a meaningful way. In hindsight, it feels to me like they were all necessary to get me to where I was going.

After my PhD in Southampton, I went on to do my postdoc at the University of Oxford in a role specifically for someone who had experience of using linked data for humanities data. From there, I came over to Australia to my lecturing position at the ANU.

MP: What drew you to that field?

TNF: When I was little, I fell in love with Indiana Jones. I had a childhood dream to be an adventurer who went to old temples and ruins. By the time I went to university, I'd read everything that I could get my hands on in terms of ancient history. I thought "I know how this works. I know the Greek myths, I can name the pharaohs in order. You name it, I've got it". But then, it turns out that that's not what archeologists do. You don't get a whip and a hat on your first day.

But what drew me to Assyriology and to the ancient languages was that they were something completely new to me. I had so many opportunities already before coming to university to find out about ancient history. I come from an academic family and my parents encouraged me to pursue my interests and curiosities. They took me to the library and books were always available. When I got to university, I learnt about ancient Mesopotamia. The lecturer (Dr Alasdair Livingstone) gave this mind-blowing lecture, in which everything he said was fascinating and brilliant and exciting. And I was hooked from day one. My interest in the digital humanities came a bit later but I've always been fortunate enough to be able to pursue topics that I was intellectually and academically curious about.

MP: What is it about digital humanities that excites you so much?

TNF: I love my job, I really do. I love experimenting and collaborating on things with people where everybody is wildly excited by it and the different things that each of us can contribute to the project to make it better than any just one of us could do alone. It's totally awesome and rad. In a lot of institutional and industry settings, there is not as much freedom and flexibility in terms of just trying things out and seeing if it's going to work. We get to do prototype building. We get to just try things out because the data we work with is so complicated and it's messy and it's incomplete and it's ambiguous. This is true of all humanities data. When you collaborate with people who are experts in different fields, you get access through their brains to all this wealth of information about a thing. And, they want you to grapple with the exciting edge cases that are quirky and weird and break the structure and you have to come up with these innovative, crazy ways of solving the problem. Regardless of whether you're talking about the data or the method, everyone I talk to is doing the thing that they are really into. I rarely meet people who are there just because it's a path that someone else has decided for them. Because we're small and unknown, it's a little niche of like-minded individuals who end up getting together. I think that's awesome.

MP: What about the potential of the field? What excites you about that? What is it opening up?

TNF: I think the potential of the field is immense. The real opportunity and benefit here is that the way we engage with our data is going to be something that is of interest to everyone.

I think digital humanities are a great way for the humanities arts and social sciences fields to show that they are relevant and interesting and have a lot to contribute to society and they're not just a niche thing for people sitting in an ivory tower, locked away from the general populace. The humanities have so many amazing things to offer society. And, when the kind of critical theoretical frameworks that humanities scholarship is founded on are applied to the computer science field, we can identify opportunities for more ethical, more thoughtful, more critical engagement.

We try to get our students from a humanities background to be braver at engaging with the digital, and our students from a computer science background to be braver at engaging with these very complex theoretical frameworks in which to evaluate their work before they implement it.

MP: How much progress are you making on that front? Because there is this constant discussion of yes, there needs to be more ethics in AI but how much progress is being made in this convergence?

TNF: I think it's getting better. We have more conversations now but we definitely need more interdisciplinary people involved in them. Even with issues that would seem relatively straightforward, sometimes the communications between different disciplines can be a tricky space. It can be complicated.

Could they be changing and improving faster? Sure. Wouldn't it be super if it wasn't a problem to begin with? Excellent. The most important thing I think is there needs to be a paradigm shift in the way that we approach research proposals for any kind of computational technological innovation. So, with AI, machine learning, deep learning, the semantic web and linked data, consideration of the ethics needs to come at the start of the research proposal and not tagged on at the end as a bit of a box-tick exercise.

MP: What are the challenges with trying to work in this interdisciplinary way?

TNF: I think the challenge of digital humanities is that it is like you're riding two galloping horses. And all you can do at all times is just pray that they don't bolt in opposite directions. There can be really fundamental differences in approach, maybe more than even the kind of value sets that different disciplines bring with them.

Computer science prioritises eliminating ambiguity. For a historian, the ambiguity, the uncertainty, the challenge is the exciting bit so you don't want to remove it. You can even reach a point where, in an effort to remove ambiguity, or gaps, the data becomes inaccurate. For example, if a date is missing, you might want to put in a default date like January 1st. But doing that would introduce a very serious error into the data.

Interdisciplinary work is great but it can be a challenge because often what happens is you end up having two or more experts in a room having a conversation and experts by very definition are people who've spent some considerable time acquiring skills and methods and approaches in a particular way. And they have value systems that have taught them that if they do things this way, that is good and they are rewarded. Then they talk to someone who has an equal, but completely different, value system and a different approach and those can clash.

MP: What surprises you about your work?

TNF: My job role is 60% research, 30% teaching, 10% service. I think most of the surprises that I get are in the context of teaching. We have a very specific pedagogy that my research centre uses, which is very much student-led, project-based and data-driven. We really value and emphasise giving students the creative freedom to approach things from whatever perspective they want. We are often given a dataset from our industry collaborators, such as a museum or archive, and it might be a hundred hours of video, or 25,000 metadata records or six pieces of glass with a hand-painted scenery. The task of the students is to develop a prototype or proof-of-concept of a digital resource that would open up that data to the public. Whenever the students are a bit stuck, they'll come to me and I'll make suggestions, but, without fail, they always think that my suggestions are really boring! Then they go off and come back with these absolutely mind-blowing ideas.

MP: What advice would you offer to early career researchers?

It's important to figure out the rules that you are being evaluated by and the reward system in which you sit. My third master's, PhD and postdoc were all in interdisciplinary research centres in a computer science school or department. I am now in an interdisciplinary research centre, which sits in a research school of humanities and the arts. Even though my research is on the same topic, using the same data and methodology, the criteria by which my success is assessed and measured has changed dramatically. My first piece of advice is to figure out how to work smart as well as hard.

The second is to be willing to be flexible, to go where opportunities arise, be willing to say, "Ok, this is not exactly what I wanted to do right now, but I can use this opportunity to learn something or gain some experience." Roll with the punches – for me the difference between starting as an undergraduate student and getting to my dream job was 15 years. But I totally wouldn't change anything because I wouldn't want to risk not being right where I am right now.