FIONA KIM:

combine our strength in both how to analyse the data and using really powerful computers to help us get there.

PROF SARAH BROUGH:
And Toby, how does the data science relate to artificial intelligence or AI?

PROF TOBY WALSH:
The two overlap but have parts that are disjoined. So there are parts of artificial intelligence that are data science, like machine learning. Equally, there are parts of AI that are data science, like all the stuff that we do with robots is particularly connected to data science. And then there are parts of data science that perhaps AI shouldn't be claiming, like old-fashioned statistics that has a long, venerable history within the Maths Faculty. But the two are very closely related. And I think the question is these days, Which is the sexiest job title? Is it data scientist or AI researcher?" It's hard to know what the answer is.

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YANAN FAN:

So this was a retrospective study and we had to go down to the very basic level of looking at each individual student and how they evaluated. So there are over a million individual student surveys that we have. And it's complex because there are many confounding factors. For example, the students own wham is known to affect how they perceive teaching in a lot more than many other factors... probably a lot more than many other factors, which was what we sort of suspect. And these are also, I mean, there are other things. Large class size and different - There are courses that are just not popular that always gets a lower rating. And there are also a lot of repeated measurements. So one lecturer is being evaluated by lots of different students and one course is being run several times by different. So it's really, really complex. And so to tease out those gender effects in fact, it turned out that there was a gender and a culture effect. By culture, we mean people with non-English speaking background. People who've come from a different culture or have a different... have an acI2.9 (v (ar)1.3 (e)2.7(al)2Wen)-6 (t.1 (ur)-0.7(s)(I2.9 (v (ar)1-2 (er)-1.78(i)-2 (me f).I.4 (h)-(i)-(e)-)-

so in - well, I shouldn't say that but it feels like it's particularly so in the fields of STEM fields where men are the, you know, how brilliant they are, how smart they are. And so now we're sort of going taking that analysis before there's a huge amount of text response that we get from the surveys as well. And it's again, we need to use some kind of a machine learning method to do that. Because there are literally millions of comments and we can't process that just by reading that and doing word clouding doesn't work because whatever comes up the largest isn't necessarily what is

sociological aspect coming through the data." And I can let some of those concerns go whilst also a year

look at the statistics - and I've looked at the statistics previously in this field could be quite easily or too easily dismissed when purely just looking through a qualitative one.

PROF SARAH BROUGH:
Cool. And from Yanan, I'd love to hear your perspective on this.

YANAN FAN:
I think that there is a lot of... there's actually a lot of data, and I think data, a proper analysis of those data could help in our conversation about gender equity. And I think we need more transparency from governments, from big institutions and grant agencies, for example. They sit on a huge amount of data and they're probably worried about, you know, other things than - there are probably many other things that they are worried about, I guess, in terms of releasing the data. But I think that all those data, if they were made transparent, we could learn a lot about inequality, I guess, from them. And then a lot more people will be looking at these data as well to help analyse them. Because I think that a bias, as Toby says, is not a simple... it's not like you recognise it's there and you can easily do something about it to make it go away. So the first step is to have that conversation and to see to what extent it's a problem. And maybe hopefully, a quantifiable way, because I think people listen to numbers more than they listen to - they tend to listen to numbers, I guess. And then, you know, think about what we could do to move forward and then keeping those records and monitoring progress with the help of data science. Yeah. So and probably I should just add that not yeah - so we've actually done a little experiment with trying to mitigate some of those biases and it's not been easy to do... to have that, to achieve what we hoped to achieve. Because we'rba7.2 (a)-7(lly)-0.6 li

the data that goes in, the questions that are being asked, and kind of thorough transparency analysis. Although yeah, Toby, what would you like to add? PROF TOBY WALSH: So, I mean, one obvious thing that - and data PROF TOBY WALSH: So, I mean, one obvious thing that - and data scientists often do this is that this work, if you don't want to be sexist, don't include gender as one of the inputs. And that's a common trick that people would do. But as we're discovering, that is not adequate. That is not enough just to remove that protect... what we call a protected variable from the input. Certainly, if you include it, then if you're not very careful, you will end up with sexist decisions. But there was a wonderful example last year. Apple released a new trendy credit card. I mean, a big PR disaster when it was discovered that the credit limits it was offering women were much less than men with all things being considered. They hadn't included gender as one of the inputs but it had picked up other clues in the data, in post people's applications that were correlated with gender. And then then because women had traditionally been offered lower credit limits than men in the past when the historical data was trained, it perpetuated those biases. So just... so even a very switched-on company like Apple can make big mistakes like that. And so these are not easy things to fix, just eliminating the variable. And there are lots of other things that are correlated with the protected variable.

PROF SARAH BROUGH:
It's fascinating. Next question. If these surveys have been shown to be biased - in my experience, surveys have been shown to be biased against women and culturally and linguistically diverse people - what ethical implications does that present when they are used in promotions or any kind of performance review? Doesn't this mean they should be scrapped? Yanan, love to hear your take on this.

YANAN FAN:
Oh, that's a hard question. I think to... there's two ways you can look at these surveys. I do see that they have a purpose in keeping the - by and large they do keep us on our toes and try to make us perform better in terms of giving the students the best that we can. So I'm not 100% convinced that these surveys don't do that. But there are obviously issues that as we see that are there. So it may be, I think we are trying to look at different ways of overcoming this bias problem or potential bias problem. And it's not an easy way to solve. It may be that we just... we could just look at rather than, you know, have a benchmark based on the average, which if you only have 30% women in the average, it is going to be dominated by men's behaviour. Then it will be very hard for females to get high...better scores. But maybe we could get to the stage where we maybe would just evaluate women and men differently just because there may be evidence that they are evaluated differently anyway. So that might be a way of solution. But I'm not sure scrapping these surveys completely would be beneficial for students either. But there isn't - Maybe we need a better way to do this. Yeah.

PROF SARAH BROUGH:
I think I would agree with you there that there is value in the surveys and hearing... there is a lot of value in hearing from our students and what they think of the courses. And we get valuable feedback on ways to improve the course that you can't see standing at the metaphorical front. But yeah, considering those biases, I think it's going to be an ongoing and important task to work out how they get included in assessments of efficacy, ability. So moving on to the next question, the

methods used for analysing comments. Have they been shown to be significantly better than traditional, less technological methods such as grounded theory, content analysis or thematic analysis? Now, I'm going to go to Fiona on this one.

FIONA KIM: So with the method selected -

And that's having a significant effect. And we're gonna have to address that in the years to come because the long-term effects of that are going to be severe.

PROF SARAH BROUGH:
There was some wide nodding on the panel to that one, Toby! Moving on to that, I'm aware that we're running out of time a bit. The next comment is having interviewed hundreds of high-achieving high school students applying for a higher ATAR course, when asked, what was their favourite subject? 90% replied Maths, both male and female applicants. However, I have a ten-year-old boy who does robotics, Rubik's Cube, chess and soccer, and these are already boy-focused at such a young age with few girls participating apart from the soccer. Mums and dads are on the side-lines, cheering their girls on at soccer. It would be great to better educate, support parents, to feel empowered to cheer their girls on in Maths, robotics and chess, etc. I absolutely agree. I have one of those boys who very much meets that criteria and would love to see more girls obsessed, focused on those things as well. I'm going to move just to the last question really quickly and see if we can answer this in one minute. Do researchers have to access to the code algorithm to find a bias? What happens if it's proprietary code? I think, Toby, that might be a good one for you.

PROF TOBY WALSH:
Excellent question. And it is more challenging. And there have been a number of cases where the code has been proprietary and they've refused to release it. And so people like to try and reverse-engineer to work out what the biases are. But you know, these... we end up in legal questions as to