

SMU POSTGRADUATE RESEARCH PROGRAMMES' PODCAST SERIES

THEORY OF CURIOSITY

Recommender Systems: The Future of Personalised Online Experiences

Hady: Welcome to Theory of Curiosity. In this podcast series, we get inside inquisitive minds of Singapore Management University's brightest researchers, combining the power of deep thinking, systematic experimentation, and vigorous investigation. Our postgraduate research professors and students reveal their findings on Digital Transformation, Growth in Asia, and Sustainable Living. Stay tuned for bite-sized insights on big questions that continue to shape our future.

Hi, I'm Hady. I'm currently a computer science professor at SMU. As a professor, we teach and research new technologies. As we grow increasingly dependent on digital services for most of our activities, I'm excited to learn about how technology can customise our online experiences. The key lies in uncovering user preferences from data. For that, we rely on artificial intelligence and machine learning.

One of the most meaningful aspects of my job is working with younger people. Encouraging and nurturing their aspirations keeps me young, too. Amongst the different kinds of students that walk through the doors of our University, we spend the most time with our PhD students. They labour over five years to produce a groundbreaking dissertation that advances their area of research. During this time, we have countless conversations, debates, and reviews that allows us to influence one another. So every PhD student always leaves a lasting impression.

In this episode of Theory of Curiosity, I'll be speaking to Tuan, who is a freshly minted PhD from the SMU School of Computing and Information Systems. Tuan was a brilliant student of mine whose research focused on recommender systems. As part of his research, he developed algorithms and intelligent systems that could extract information about a user's sentiment or preference for various types of products. In this discussion, we'll get an inside look at his research and insights on recommender systems, as well as his experience with his PhD pursuit. Hi Tuan, or shall I say, Dr Tuan, thank you for joining me.

Tuan: Thanks, Prof Hady. I'm excited to be here. This is my very first podcast.

Hady: Wow. We are so honoured. Shall we jump straight into it?

Tuan: Yeah, let's do it.

Hady: So we are going into recommender systems. I mean, this is a topic that probably is not familiar to a lot of the laypeople. So Tuan maybe can you just tell us a little bit more what recommender systems is and why it's so important?

Tuan: I think as the name suggests, it's recommender systems and the job is to give recommendations to people. Nowadays, if you look at the activities that you do on the web every day, I think it needs recommendation most of the time. Like you go watch movies, you go online shopping, you listen to music, you go and then read news and go to social networks to interact with your friends. So I would say recommender system play a key role in such activities. And we need recommender system because different users have their own preferences and it's unique in the sense that we need to recommend the items or the products that suit their taste.

Hady: But when we talk about recommendations. Isn't it the job of, like, a salesperson or a marketing professional? What are you doing as a computer scientist here?

Tuan: If you think about it, as a marketing problem, I would say marketing people most of the time focus on a particular product or just a few of them. For all the application I just mentioned earlier, the number of options or number of products that we look at are enormous. And in this particular case, we have a lot of data we can discuss about big data ideas later on. But I would say we need computer science, particularly people that actually can develop programmes to analyse such amount of data in order to aid the decisions of user on those platforms.

Hady: I see. So you mean like when you approach it from the point of marketing, we are looking from the company's point of view in terms of trying to promote a product. But here you're really focused on helping the users in getting the kind of products that they want or meet their needs.

Tuan: Yeah, you can think of that. But I would say another aspect is that we have a lot of data and we can't help humans actually look at every instances of those data. So we need computers to actually reduce the human labour in that process. And also the algorithms, I think is going to know preferences of every single user better than marketing people in that process.

Hady: How does this data help? What can we extract from this data that helps us to do this recommendation?

Tuan: So because of those forms of the interactive data between users and items, we kind of try to extract the familiarity or the patterns lying within such data, and we relied on similar users. So then we can actually recommend the items that similar user actually like to some of the users that have not been exposed to the items before.

Hady: Okay, so then how many recommender systems do we need? Do I need one for movies? Do I need one for my clothes? Do I need one for travel? I mean, isn't it complicated to have to do this every single time?

Tuan: Yeah, that's actually a very interesting question. I would say when we design algorithms for the recommender systems, we don't look at a particular application for the system. But the way we design algorithms is because the computer only look at those items or user interpret ID, which basically is digit numbers in computers that actually make the algorithms generalised to different scenarios. And you can actually make use of the same algorithms for different applications. You don't have to design a specific algorithm for each application.

Hady: I see. So then that is really brings up the potential of using computing. But in this case, you talk about different kinds of products, but how about different regions of the world? I mean, we all speak different languages. Don't we have different preferences? Because you know, different e-commerce platforms in different parts of the world? Like Amazon, the US, Taobao in China. I mean, you know, maybe we don't like the same things?

Tuan: Yeah. We have different platforms all over the regions like Tokopedia in Indonesia, right? Shopee, Lazada within our regions, and Amazon, Taobao, Alibaba and the others. They might sell some similar items, might be, there are also different items. But as I mentioned, the way we look at the problem is that we have a set of items. It's a general formulation, and we don't really need to look at a specific kind of items that they are selling. But we still can actually apply the same kind of algorithms and it still works on different platforms.

Hady: So now that we see how important these recommendations are. So let's get down to your dissertation. So if you can summarise it maybe in a couple of lines, what do you think you have done, you have achieved in this five years?

Tuan: Yeah, in my dissertation, I think the big part of the contribution is about learning preferences for recommender systems, but not only with the primary interaction that we usually

have, but we design algorithms and systems that also exploit other forms of information, which we refer as modalities like text or images that associated with the items or the social connection of the user in order to enrich the information and have better learned preferences and make accurate recommendations.

Hady: So in some sense, what you're saying is that different types of products may actually have different types of data that are attached to them that are important. So if I'm shopping for clothes, I should be looking at images. If I'm looking at what books to read, I may be more interested in the text content.

Tuan: Exactly. So, if we take the fashion items as an example, then the images of the items actually play a crucial role because if we look at user and his past interactions - so he bought those kind of items, fashion items, and then we can based on that interaction and the images of those items, we can actually try to provide the kinds of items, the style of the items that he prefers. So those are the key information. If we take the book recommendation as example, then the textbook content, even the title of the books or the abstract of the books that actually play a key role here to actually help us to provide the items.

Hady: So isn't the ultimate goal of recommendation is to essentially having a personalised experience to each individual user? Now, is that really important? In a sense that sometimes we watch movies, for example, the cinema is not even showing a few movies. Everybody wants to watch the same ones. Do you really need to personalise it?

Tuan: What you actually referring to, we usually refer as the popularity of the items. So that's just part of the thing that people prefer, like kind of popular items. But then there are also a lot of other items that don't have the popularity yet, or they are like newcomers. So then we also try to get users exposed to those new items. So then users are going to get more surprise or they're going to explore more of the items that they might not have chance to get exposed to if we don't have recommender system.

Hady: And now that we see that the market has been globalised in the sense that we can always get products from anywhere in the world, right? I mean, technically they are 5 million Singaporeans, maybe we can provide 5 million unique products. But if you think about in the whole world, there are billions of people, there could be enough number of people over the world where we can actually cater to their specific needs.

Tuan: I think nowadays, like online shopping is much easier and you actually can reach across the borders right. You don't have to actually get all the items that are available in your region, but you can actually go over to other countries. And if we actually have enough demand, then even the products are so specialised. We also have the demands from other regions. And with all these e-commerce platform, you can get those items. So I would say that is the good thing about our recent globalisation and digitalisation.

Hady: So in a sense, the more they get personal experiences, the more they might expect in the future that is going to drive us down this lane of hyper-personalisation. And, is that necessarily a good trend? But in any case, the technology is there to bring that world to us if indeed we get there.

Tuan: Yeah. I personally think that is a good thing because we want more and more of the products are very fit our need, and actually that in some sense improves our daily life, in a sense. So hyper-personalisation is a good thing, given that we actually exposed to a lot of options nowadays and a lot of information that we need to filter. So, this form of recommendation, I think it's a must, nowadays. It's not a need, but it's a must.

Hady: But don't you think that, let's say for us to hyper-personalise it to you, the more we will need to know about individuals. So that means that we need to be willing for the system to get to know more and more data about specific people. Do you think users generally are ready for that?

Tuan: Yeah. I think this thing is actually one of the things that kept bothering me during my research. So when person knows that we're working on recommendations, they are always concerned about the kind of data that this system that have from the user and especially the customer data in the hands of big tech companies nowadays. So maybe I actually want your thoughts on this aspect of the ethics and the personal privacy in our field.

Hady: Right. Well, it is the case that right now a lot of the things that we do online are being tracked in the system. In some ways, I think it depends on the context, they are certain, I mean, given this a person, right? Like for myself, there are certain contexts in which I don't mind to share some of this data. In that sense, let's say if you're just looking at what kind of news I'm reading or what kind of books I'm reading, that's perfectly fine because maybe that actually is going to help the system to recommend me better news, better books, and so on. But it could be some other domains, like, for example, let's say healthcare services or medical services, where I might be a

little more careful about sharing this sort of data, even if you can recommend me a better doctor in that sense. But even so, if you look at different people, I think different people have different levels of comfort. So if you look at Instagram, some people are oversharing. So I don't think they are so consumed by the privacy concerns. But I think it comes to case by case, the important thing really is education in the sense that if people understand that these are being tracked and they have some means for controlling the level in which they are sharing them, I guess I think it's probably fine.

Tuan: So it's all about education user in this particular?

Hady: The more they understand what benefits and the possible issues they may get, and then it's up to individuals to look into that. So we see all these issues, including hyper-personalisation, privacy concerns. I mean, these are surrounding issues that depends on the actual application of technology. But really, if you come back to your PhD, it's really about the technological aspects of recommendations. Now, the PhD itself takes a long time. I mean, it takes five years, and that's a significant commitment. If you can just recall, what was your intention at that point of time? What were you considering when you approached the question of doing a PhD in the first place?

Tuan: Yes, I would say firstly, I decided to join the PhD because I was inspired by the usefulness of the field of machine learning and artificial intelligence at first. And when I actually got into the PhD, I think the training during the past five years, I've been trained a lot on the different scientific methods to conduct research, to analyse problems. And most of the time I deal with new problems that no one have looked at before. Those make me feel more confident and comfortable when I actually approach a new problem. Besides that, I think it also helped me to think more deeply and critically about new problems. And nowadays, I think the future coming problems are all new problems that we don't know how to solve. And the PhD training actually helped me strengthen my skills in that sense. And I can actually feel more comfortable solving a new problem. But I would think a PhD training in computer science actually opened a lot of doors for you after you graduate, especially in the tech industry. A lot of position- they actually require PhD qualifications. And I would think mainly because the position doesn't require the person to make a lot of decision in the ambiguity scenarios. And I think those scenarios are actually most fit with the PhD training. That's why it is required here.

Hady: Because these new companies are inventing new products all the time, right? I mean, just ten years ago, we don't have the same kind of technologies that we have today. I mean, 20 years ago, search engine is not the same. So that sounds exciting. I mean, this is the future of science, you get to redefine the upcoming industries and how we do things in the world. Now, there are a lot of gains, it seems, but how is the experience itself? Would you say it's enjoyable?

Tuan: I will say, yes, it's enjoyable. My PhD, personally, I would think that the enjoyment comes from a lot of aspects. I would say I myself can actually put my personal stamp in a lot of projects that I have been done during my PhD. We share our findings via publications. We go to conference, we meet people, discuss ideas and influence each other. Those are the interesting aspects. And fortunately, because we are in the computer science is also engineering disciplines in the sense that we open source, we do open source, we build software, we do open source. And one particular example in our research group, actually we build a collect library, which is a library that has collections, recommendation algorithms. Those actually not only have the researchers, but also the practitioners in the industry to build software on top of that library. So I would think those are the enjoyment that I have gained during my PhD.

Hady: So you think it's not all in the lab just slaving away at your desktop, but you actually get a lot of interactive experiences where you work with students, you work with interns, you even went for an internship too. And all those different experiences help to build up a lot of these transferable skills, being able to manage projects and communicate effectively in terms of your ideas, your thoughts, and articulate it so that it becomes convincing, but knowing also how to define the critical importance that they have and how they can be supported by evidence. So all those sounds like great things that you have gained throughout your PhD. At this point that you're done with your PhD now, right? Is this the end? So what's next for you? Are you still going to be doing research?

Tuan: Yeah. My plan after graduation is to join global tech company that actually specialise in recommendations. In part, I'm not going to academia, but with this particular position in the tech company, with tech company, I'm still involved in the research and also help the companies to build up their production. And those features that I'm going to work on are related to my dissertation. So I would say it's a good fit for me at the moment.

Hady: Right. I think it's very gratifying to be able to look at the kind of things that you research off for five years and eventually look at it in production having an effect on millions of people. That's great. I'm happy for you, Tuan.

Tuan: Yes, thank you.

Hady: So it might not at all be solitary pursuit, just by yourself. I mean, in some sense, there is the broader academy community. And if you can just reflect back on your community experiences over the last five years, what are those?

Tuan: If I look back over the past five years, first, the people that I have interacted with the most, you as my advisor, and also other PhD fellows, especially in our research group. Those are the people that I have most of a close relationship with over the past five years. And we actually have activities, outing activities. And one of those are the ones that we went to 'Archery Tag' in Kovan, and then after that, we came out and had dinner together. Those are one of the particular events we had a lot of fun with together. Besides that, I would say we went to conferences. We actually met other people at conferences in our research field. And with that, I would say we have this opportunity. This particular opportunity comes from someone in the industry and actually bring me to lead an internship with them. Back to the University, we also have other communities and we have events with other PhD students, not only in our School of Computing and Information System but also from other schools like School of Business or School of Economics. Interacting with those PhD fellows helped me to gain more perspectives and understand more about their own research in their own fields. Yeah, I would say those are the different kind of relationships that actually make up to the whole journey that I have.

Hady: That sounds like a great experience in itself in terms of getting exposure, not just to do your research by yourself, but importantly to be in the company of a lot of like-minded people. And I suppose that keeps you motivated and to keep going as well as to learn from others as well. So that's great. Thank you, Tuan, that was such a refreshing conversation. I hope this will not be the last time that we will talk to one another. Even as you graduate, I suppose you will still get to meet one another in conferences or other events. Knowing how productive your research has been in your PhD, I look forward to what else you're going to achieve in the coming years.

Tuan: Thank you, Prof. And I would love to see you in the future events.

Hady: To our listeners, what do you think? Do recommender system make your life easier and better? What do you imagine your personalised online experiences would be like in the future? In the coming episodes, we'll be having more insightful conversations around research work that continues to shape and excite our world. If you like what you've heard, please follow this series and share them with your community. If you'd like to find out more about the SMU School of Computing and Information Systems PhD programmes, visit smu.sg-scis/phd. For other academic Research PhD programmes, visit smu.sg/phd.

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