An Interview with Professor Jure Leskovec, Recipient of ACM SIGKDD 2023 Innovation Award

The ACM SIGKDD Innovation Award is conferred annually for outstanding technical innovations that have significantly influenced research and development in the field of knowledge discovery and data mining. 2023 Innovation Award recipient Dr. Jure Leskovec is professor of computer science at Stanford University and co-founder of Kumo.ai, a company bringing the most powerful graph learning approaches to relational data.

First, congratulations on your selection as the 2023 ACM SIGKDD Innovation Award honoree. What does this recognition mean to you?

Thank you, it's such an honor to be selected for the SIGKDD Innovation Award and it truly came as a surprise. I'm humbled by this recognition from academic and industry peers. Perhaps most gratifying is that the award shows appreciation for the impact of a given research area. And the award is not just for me, but it also for the excellent students and collaborators, without whose hard work and dedication none of this would be possible.

Would you please share a bit about yourself and your background?

As professor of computer science at Stanford, my general research area is applied machine learning for large interconnected systems, focusing on modeling complex, richly labeled relational structures, graphs, and networks. Applications of our work include reasoning, recommender systems, computational social science, and computational biology with an emphasis on drug discovery.

After completing my undergraduate studies in Slovenia, I moved to the U.S. to pursue my Ph.D. at Carnegie Mellon University, where I primarily explored graphs in social media. At the conclusion of my graduate program, I was fortunate enough to spend a year at Cornell and then landed at Stanford in 2009. I've always enjoyed working on hard practical problems, so over the years had great collaborations with industry from Facebook and LinkedIn to Twitter, Amazon and Pinterest, where I served as Chief Scientist for 7 years and built an entire family of AI capabilities that transformed the company and its business.

Thinking back on your early interests, when did you decide to go into the field of data science and machine learning?

Computers are these amazing machines that do useful work for humans. So, a machine that can learn from data is an ultimate instantiation of this. I always liked not just the engineering aspect of machine learning but also the angle of data science, where one uses data and computation to make new discoveries about the world around us. So, using computation to discover new knowledge, something that was yet unknown about the world, is the ultimate challenge and this has been fascinating to me ever since I started working with computers.

Admittedly, I never really planned but rather followed my curiosity. I get bored easily and always try to ask different questions. So, it's been a very natural, organic progression to where I am today.

It was also shaped by many dedicated mentors as well as various opportunities that life has brought over the years.

What does innovation mean to you?

At a high level, I view innovation as the desire to walk a path no one has walked before and doing so without a map or signposts along the way. It's an iterative process – we take steps, learn about their effectiveness, decide to progress or adjust course, all without losing sight of the bigger goal in front of us.

As I'm fortunate to have my work in computer science and data science span both academia and industry, I have two views of innovation. From the academic perspective, the objective of explore and show what is still possible and how the future might look like. In the industrial or applied engineering world, the goal of innovation is about solving a real-world problem by doing something better, faster or more accurately than before. In this realm, it's important to understand how to manage – or balance – the quest for innovation versus risk, asking ourselves what is the goal, what is still possible and what are the risks.

I tend to view innovation not as a goal but as a consequence of asking the right questions and then acting on them. When we land on the right question, it's as though we've crossed the mountain peak to find a previously unknown valley, with sunlight streaming in. As a researcher, I'm continuously surprised to learn of the (figurative) diversity of flora and fauna in these previously unexplored valleys. New way of thinking emerges and we amazing research is possible. By continuing to ask questions, we're more apt to experience these amazingly gratifying moments of discovery.

Can you share examples of how innovation manifests in your work?

I feel fortunate to have experienced several discoveries in my career, which is quite humbling. The very first paper of mine published by KDD was one such example of the discovery of a natural law in evolution of graphs. Numerous questions emerged: Is what I've found interesting? Is it contrary to what others think should be? Is my analysis wrong? Is the finding repeatable? These and other questions continue to shape my approach to innovation today.

In the early stages of the Covid 19 pandemic, I led a research project leveraging cell phone mobility data to better understand Covid transmission patterns. An initial question asked was, "Can we build a tool to predict more accurately how Covid will spread?" But we didn't stop there. We continued to push forward with additional questions: Which places are the most infectious? Does stay-at-home policy work? How should economy be opened? These are big questions and answers to them literally altered lives of hundreds of millions of people. We humbly pushed forward, scrutinizing every step. Ultimately, what we claimed still stands today; our findings have not been disproven.

Applying innovation to a business problem, at Kumo.ai, we're revolutionizing how predictive AI is being applied to enterprise data. We thought of relational databases as heterogeneous hypergraphs and by combining them with Graph Neurla Networks we invented a new field of Relational Deep Learning. This is another example of how a shift in perspective or asking different questions led us to discover a new continent. We can now train predictive AI without any feature engineering. It is data-driven end-to-end, which brings state of the art accuracy as well as speed. With Kumo one can quickly build accurate predictive models for important business tasks, such as determining which customer is likely to churn, which product a customer will purchase, or how much of a product should be manufactured to meet demand.

When did you first discover KDD and why is the organization important to you?

My initial involvement with KDD was as an undergraduate student in Slovenia, when a friend and I participated in – and won – the KDD. It was amazing to participate at KDD and meet great researchers. I've remained actively engaged with KDD ever since then. KDD is incredibly unique. KDD sits at the crossroads, where two rivers come together: an open-ended academic river and a high-impact industry river. At this convergence, the nutrients of both mixes, creating excitement and opportunity seldom found in other professional organizations. At its core, science is highly collaborative, and KDD offers an ideal community for exchange of ideas and ongoing conversation with similarly minded innovators.

What advice do you have for data scientists at the beginning of their careers?

We've already touched on the importance of zeroing in on the right questions to ask. It's crucial to determine the right problem to work on, and the right time to tackle it. Rather than being overly confident in your own conviction, I recommend remaining humble and being receptive to what the world – and the data - can teach you. AI, data science, and machine learning are all about iterative progress, so data scientists must be open to learn at every step, ready to admit when they are wrong, and willing to adjust course if that's where the data leads.

Professor Leskovec, thank you for taking the time to speak with us and share your perspective. Again, congratulations on receiving the ACM SIGKDD 2023 Innovation Award.