

Research statement

My research interests are algorithms, distributed systems, computer networks, software system design, and machine learning.

From 2000 to 2005 I studied the technology stack for service-oriented distributed systems and discovered that it was lack of a solution to service composition with conversational partners for my Ph.D. at the University of Georgia. I have proposed and implemented a design and analysis framework backed by graph algorithms to address the issue. My originality was rewarded with one publication on ACM Southeast Conference and one on IEEE International Conferences on Web Services.

After graduation in 2005, I joined AT&T labs, where I extended my research to issues that are related to large-scale computer networks. I utilized my experience with graph algorithms again in the development of an IPTV metro area network planning tool. The tool has not only automated verification of fiber path diversity to ensure network fault tolerance, but also shortened the network planning time for a metropolitan from 2 weeks to several hours. The algorithm was the first optimized solution to the triple play telecom network planning, which has led to a granted patent in 2010.

In addition to network planning research, I have also investigated methods to identify/locate wireline access network faults, using machine learning techniques. One patented approach is single-ended loop test, where per frequency tone data from DSLAM is used to predict faults on a twisted copper pair. This algorithm achieves 99.9% of fault detection rate with 0.01% false positive. This algorithm beats all other algorithms developed by companies such as ALU and Ericsson. It saved AT&T hundreds of millions of dollars for unnecessary dispatches over the last 10 years.

The 2010 decade marks the beginning of the mobile Internet era. A significant increase in Internet traffic and different quality of service requirements have posed new challenges to Internet operators. To overcome these challenges, my research goes back to studying distributed systems. I focus on building big data platforms using distributed systems. In addition, I study machine learning algorithms and their application to network operation insights.

I plan to balance research and teaching. Specifically, design each course with relevant content through research activities from literature review, the grant proposal to funded research work. I plan to combine research and teaching to develop deeper knowledge in each research area and find impactful projects for student coursework and thesis.

At AT&T labs I have gained experience working with different organizations to study the technical and business challenges and come up with research and development proposals. I have succeeded in securing funding for these proposals by agile and iterative proof of concept (POC) development. My patented projects are examples of funded research through proactive cross-organization interactions. The agile and iterative POC is key for clients to see the challenge and

its solution better. They often come up with more details for the requirements with a high-quality POC and their confidence in the proposal grows. I plan to utilize this kind of experience and skill set to carry on my future research endeavors in algorithms, computer networks, system design, and machine learning.