Blockchain protocols made efficient and scalable

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Abstract: Blockchain protocols such as Bitcoin have created the possibility of highly decentralized computing. However, existing blockchain protocols suffer from various problems: (1) energy inefficiency, (2) large confirmation latency (order of hours), and (3) lack of scalability (performance does not improve as more nodes are added to the system). In this talk, we highlight our work in solving these bottlenecks. A primary contribution is the abstraction of the blockchain using tree-processes, which have both a randomized component as well as an adversarial component. We then use this abstraction to prove sharp phase-transitions of these processes yielding security theorems for the corresponding blockchain protocols. We then show how to use this abstraction to achieve (1) energy efficiency and (2) optimal confirmation latency. Finally, we show that (3) the scalability bottleneck of blockchains can be solved using an interesting connection to the classical result of Blackwell in dynamic game theory.

Bio: Sreeram Kannan is currently an assistant professor at University of Washington, Seattle. He was a postdoctoral scholar at University of California, Berkeley between 2012-2014 before which he received his Ph.D. in Electrical Engineering and M.S. in mathematics from the University of Illinois Urbana Champaign. He is a recipient of the 2019 UW ECE outstanding teaching award, 2017 NSF Faculty Early CAREER award, the 2013 Van Valkenburg outstanding dissertation award from UIUC, a co-recipient of the 2010 Qualcomm Cognitive Radio Contest first prize, a recipient of 2010 Qualcomm (CTO) Roberto Padovani outstanding intern award, a recipient of the SVC Aiya medal from the Indian Institute of Science, 2008, and a co-recipient of Intel India Student Research Contest first prize, 2006. His research interests include the applications of information theory and learning to blockchains, computational biology and wireless networks.