Safexpress Centre for Data, Learning and Decision Sciences

Schedule for SCDLDS Short Courses of Quantum Computing and Causal Inference

February 21-22, 2025

Day 1: February 21, 2025 — Venue: AC-03-LR-005

Time	Speaker	Title
10:00 AM - 11:00 AM	Jaikumar Radhakrishnan	From Classical Randomized to Quantum Computation - I
Break		
11:30 AM - 12:30 PM	Jaikumar Radhakrishnan	From Classical Randomized to Quantum Computation - II
Break		
02:30 PM - 03:30 PM	Piyush Srivastava	Introduction to Causal Inference - I
Break		
04:00 PM - 05:00 PM	Piyush Srivastava	Introduction to Causal Inference - II

Day 2: February 22, 2025 — Venue: AC-02-LR-208-209

Time	Speaker	Title
10:00 AM - 11:00 AM	Piyush Srivastava	Introduction to Causal Inference - III
Break		
11:30 AM - 12:30 PM	Piyush Srivastava	Introduction to Causal Inference - IV
Break		
02:30 PM - 03:30 PM	Jaikumar Radhakrishnan	From Classical Randomized to Quantum Computation - III
Break		
04:00 PM - 05:00 PM	Jaikumar Radhakrishnan	From Classical Randomized to Quantum Computation - IV

Abstracts

Title: From classical randomized to quantum computation

Speaker: Jaikumar Radhakrishnan

Affiliation: International Centre for Theoretical Sciences (ICTS-TIFR), Bengaluru

Abstract: We will introduce classical deterministic computation as processing information stored in the form of bits and acted upon by logical gates. Using this model we will describe how simple tasks are performed on the computer. We will introduce elements in our circuits whose actions are random and modelled by specifying probabilities, and study the resulting model of randomized computation using linear algebraic notation and terminology, analogous to the ones used in quantum computation. We will study the circuit framework for quantum computation and note where it is similar and fundamentally different from classical randomized computation. We will illustrate the power of quantum computation by describing quantum algorithms, games and protocols that appear to outperform their classical counterparts. We will not expect prior familiarity with quantum physics or computer science. Our discussion will be accessible to anyone comfortable with algebra and probability at the level of first-year undergraduate courses.

Title: A short introduction to causal inference

Speaker: Piyush Srivastava

Affiliation: School of Technology and Computer Science, Tata Institute of Fundamental Research

Abstract: Observations show a correlation between whether an individual smokes and whether they develop lung disease. But how does not formally establish that this implies that smoking can "cause" lung disease? We will discuss how questions like this have been formalized in statistics, especially using the language of probabilistic graphical models. If time permits, we will also discuss some open questions regarding the computational aspects of these formalizations.