

# What is Quantum Contextuality and Why Should You Care?

**Dr Bharti Kishor**

Agency for Science, Technology and Research (A\*STAR),  
Singapore

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This colloquium will be held in **ONLINE**.

**Online Venue:** Zoom. To receive the link, register in advance at  
[https://krs2.riken.jp/m/rqc\\_registration\\_form](https://krs2.riken.jp/m/rqc_registration_form)

Quantum contextuality is a fundamental concept that generalizes Bell nonlocality, which was recognized with the 2022 Nobel Prize in Physics. In this talk, I will introduce contextuality and its formulation through a graph-theoretic approach. I will present key results that explore different aspects of contextuality, including:

1. Self-testing contextual correlations (Physical Review Letters 122 (25), 250403)
2. Optimization-theoretic approach to Bell self-testing (PRX Quantum 3 (3), 030344)
3. Self-testing of a single quantum system: From theory to experiment (npj Quantum Information 9 (1), 103)
4. Self-testing via state-independent contextuality (Physical Review Letters 132 (14), 140201)

Along the way, we will also see how some of these ideas have been applied to solve open problems in discrete mathematics. If time permits, I will also discuss recent results on using contextuality to certify adversarial quantum devices ([IEEE Explore](#)) and its potential role in quantum error correction.