

ICTS MONTHLY COLLOQUIUM

# Quantum State Interferography

Quantum state tomography (QST) has been the traditional method for characterization of an unknown state. Recently, many direct measurement methods have been implemented to reconstruct the state in a resource efficient way. Here we present an interferometric method, in which any qubit state, whether mixed or pure, can be inferred from the visibility, phase shift, and average intensity of an interference pattern using a single-shot measurement—hence, we call it quantum state interferography. This provides us with a “black box” approach to quantum state estimation, wherein, between the incidence and extraction of state information, we are not changing any conditions within the setup, thus giving us a true single shot estimation of the quantum state. An extension of the scheme to pure states involving  $d-1$  interferograms for  $d$ -dimensional systems (qudits) is also presented. The scaling gain is even more dramatic in the qudit scenario for our method, where, in contrast, standard QST, scales roughly as  $d^2$ .

## Urbasi Sinha

Urbasi Sinha is a Professor at the Raman Research Institute in Bangalore, India. She heads the Quantum Information and Computing (QuIC) laboratory at RRI as well as India's first project on satellite based secure quantum communications. The lab specializes in experiments on photonic quantum information processing including quantum computing and quantum communication, primarily using single and entangled photons. She is an associate faculty member at the IQC, Waterloo, Canada, and the CQIQC, Toronto, Canada. Her scientific recognitions include the Homi Bhabha Fellowship in the year 2017 and the 2018 ICTP-ICO Gallieno Denardo Award in Optics. She was recognised as one of Asia's Top 100 scientists by the Asian Scientist for the year 2019 and has been awarded the Simon's Emmy Noether Fellowship at the Perimeter Institute, Canada. In August 2020, she led the two-member winning team as a mentor, at the World Skills International Competition in Quantum Technology at the BRICS Future Skills Challenge, organised by the Russian Quantum Centre in Moscow with competitors from several countries worldwide.

3.30 pm,  
16 November 2020

ONLINE COLLOQUIUM

Use this link to join the Zoom meeting -  
<https://bit.ly/ictsMCnov20>

Meeting ID: 919 6772 1980  
Passcode : 306307

