AIDAN ROY, University of Calgary, 2500 University Drive NW, Calgary, AB, T2N 1N4
Weighted complex projective 2-designs from bases

We introduce the problem of constructing weighted complex projective 2-designs from the union of a family of orthonormal bases. If the weight remains constant across elements of the same basis, then such designs can be interpreted as generalizations of complete sets of mutually unbiased bases, being equivalent whenever the design is composed of $d+1$ bases in dimension d. We show that, for the purpose of quantum state determination, these designs specify an optimal collection of orthogonal measurements. Using highly nonlinear functions on abelian groups, we construct explicit examples from $d+2$ orthonormal bases whenever $d+1$ is a prime power, covering dimensions $d + d = 6$, 10, and 12, for example, where no complete sets of mutually unbiased bases have thus far been found.

This is joint work with Andrew Scott.