SEMINAR

SCHOOL OF MATHEMATICS AND STATISTICS

DATE: 18, 20 & 22 FEBRUARY 2019

TITLE

Gaussian states and estimation of their mean and covariance parameters

VENUE | TIME

Seminar Room I
18th: 3:45–4:45 PM
20,22th: 4:30–5:30 PM

SPEAKER

Prof. K. R. Parthasarathy,
Emeritus Distinguished Scientist,
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ABSTRACT

We consider an n-mode quantum system with n position and n momentum observables. Position observables commute with each other. So do momenta. Thus there are $2n$ independent observables. In a Gaussian state the position observables have a joint normal distribution in R^n. Similarly, the momentum observables have a joint normal distribution. If p_i and q_i are the i-th momentum and position observables respectively then as operators they satisfy the canonical commutation relations: $[q_r, q_s] = 0$, $[p_r, p_s] = 0$, $[q_r, p_s] = i$ if $r = s$ and 0 otherwise. These are known as canonical commutation relations. Position and momentum observables have a $2n$-mean vector and a $2n \times 2n$ real strictly positive covariance matrix. Not every strictly positive matrix is a covariance matrix.Owingto uncertainty relations between position and momentum observables the covariance matrix has to satisfy a matrix inequality in the complex domain. Observables like $p_i^2 + q_i^2$ take discrete values eventhough each p_i and q_i has a normal distribution. They give rise to nonnegative integer valued observables, called particle counts. Our aim is to show how, from such particle counts, all the parameters of the Gaussian state can be estimated.