Hamilton Institute Student Seminar Series

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**Title:** Reducing a polynomial matrix to an equivalent second order polynomial matrix

**Abstract:** Polynomial matrices are one of the most studied objects in matrix theory and one of the more widely used tools in control theory. They are used to describe interconnections among the different parameters of the system, conditions that should be satisfied and generally the existing and desired behavior of a system.

The reduction of polynomial matrices of degree greater than two, to polynomial matrices of lesser degree, is a problem that has greatly concerned the control theory scientists. We will discuss reduction methods of a polynomial matrix of degree greater than two, to a second degree matrix, namely quadratification methods. We aim for the new, quadratic matrix, to have the same internal structure as the initial one. More specifically, we aim to preserve the finite zero and divisor structure and, when possible, the infinite zero or divisor structure. Additionally, we are interested in preserving the form that the matrix may have, for example if the matrix is symmetric, whenever that is possible.