



Departmental PhD Thesis Exam

Tuesday, August 26th, 2025 at 2:00 p.m. (sharp)
via Zoom / BA6183

PhD Candidate : Ramón Ronzón

Supervisor : Edward Bierstone

Thesis title : Partial desingularization preserving normal crossings and
minimal singularities in low dimension



Abstract

In this work, we address the problem of partial desingularization while preserving normal crossings for algebraic varieties of dimension ≤ 4 defined over an algebraically closed field of characteristic zero. The main result provides a sequence of smooth blowings-up where each blow-up preserves the normal crossings locus and such that the resulting variety has only singularities in a given *minimal finite list* $\mathcal{N}$, where each element in $\mathcal{N}$ is expressed in a precise local *normal form*. These elements are described using determinants of *circulant matrices*, which are the $n \times n$ matrices spanned by the permutation matrices associated to *cyclic permutations* of S_n . This result is the best possible since, in general, there is no resolution procedure which preserves the normal crossings locus and such that the resulting variety has only normal crossings singularities.