



**Speaker:** Alan Liddell  
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4:00 PM

129 Hayes-Healy Hall

**Title:** A hybrid symbolic-numeric approach to exceptional sets of generically zero-dimensional systems

**Abstract:**

Exceptional sets of a parameterized polynomial system are the sets in parameter space where the fiber has higher dimension than at a generic point. Such sets arise in kinematics, for example, in designing mechanisms which move when the generic case is rigid. In 2008, Sommese and Wampler showed that one can use fiber products of bounded order to compute exceptional sets since they become irreducible components of larger systems. We propose an alternative approach using rank constraints on Macaulay matrices. This hybrid symbolic-numerical approach first symbolically constructs the appropriate matrices and then uses numerical algebraic geometry to solve the rank-constraint problem. We demonstrate the method on several examples, including exceptional RR dyads, lines on surfaces in  $C^3$ , and exceptional planar pentads.