1154-65-2646 **Hayden J Ringer*** (hringer@mathematics.byu.edu), 146W 1230N, Apt 335, Provo, UT 84604.

Multivariate Rootfinding Using Chebyshev Approximation and Möller-Stetter Matrices.

Root-finding algorithms are key kernels in many areas of scientific computing. However, there are few robust methods for finding all, or even several, roots of multivariate systems. We present a method for finding all the common roots of a system of multivariate smooth functions lying within a compact set in $\mathbb{R}^n$. Our method utilizes multivariate Chebyshev polynomials to approximate smooth functions to high precision, and then uses a generalized form of the companion matrix, known as a Möller-Stetter matrix, to find the roots of the approximate polynomial system. We explore the numerical properties that the algorithm exploits in order to avoid a number of obstacles. We compare our method to other popular multivariate root-finding methods, including Chebfun2 and Bertini. (Received September 17, 2019)