



# COLLOQUIUM

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Using Randomness and Learning to Calculate Gröbner  
Bases in a Novel Way

Friday October 30th at 3pm on Zoom

<https://csuohio.zoom.us/j/91945126460>

*Bio:* Prof. Jamshidi Zelenberg a mathematician interested in topics related to computational algebraic geometry, algebraic statistics, distributed computing, and machine learning in general. She is currently an Assistant Professor of Computer Science and Mathematics at Lake Forest College (IL). Prof. Jamshidi Zelenberg received her B.A. in Mathematics from UC-San Diego, here M.S. in Mathematics from California State University (Los Angeles), and her Ph.D. in Mathematics from Penn State University. She is also a co-author of *Mathematics for Sustainability*, a textbook designed to be a general education requirement for non-STEM majors.

*Abstract:* We know how to solve a system of linear equations--the majority of college-educated people have been exposed to Gaussian elimination at one point in their life. To solve a system of polynomial equations, however, can be very tricky. The current method is to understand the ideal generated by the polynomial system and calculate that ideal's Gröbner basis (BG). The method for calculation is analogous to Gaussian elimination and is referred to as Buchberger's (BOOK-burger) algorithm. Other approaches to the problem, like the F4 and F5 algorithms, can be thought of as different varieties of Buchberger's algorithm. Improvements on the current algorithm are difficult to achieve as the method is difficult to distribute and can become wildly complex. In this talk, we discuss potential improvements using ML predictions with some preliminary results. There is growing interest in determining if we can improve the computation when predictions are possible.