Professional Biography

Robert H. Lewis

I have been a tenured professor in the Mathematics Department at Fordham University for twenty-five years. I am now a full professor. I have taught virtually all the courses in the undergraduate mathematics curriculum and many in the computer science curriculum, as well as six graduate courses in mathematics. I have participated in the curriculum design of mathematics and computer science.

I was educated at Cornell as an algebraic topologist, specializing in cell complexes. I published three papers on that topic. I later received an MS in computer science. Since around 1988 my research has been as an applied mathematician in computer algebra. I have published eighteen papers on these topics. I worked on computational group theory with colleagues at CCNY. Since about 1996 I have become an interdisciplinary mathematician, having worked in computer science, signal processing and wavelet design, computer vision, rational drug design, operations research, computational biochemistry, global positioning systems, and cryptography. At the same time I have developed a cutting-edge computer algebra system Fermat for polynomial and matrix computations. I have also developed a new algorithm to solve systems of polynomial equations, called Dixon-EDF. Fermat has been instrumental in all of these projects.

I ran three successful NSF REU projects in 1988 – 1991, using computer algebra to search for certain kinds of higher dimensional spaces. We published the results. I have run undergraduate research projects with four students since 2010.

During the period 1996 – 1998 I was employed as a computer algebra consultant by a firm funded by the Department of Naval Research. There I helped to solve a significant problem in computer image analysis, called the "six line problem." On another topic, in 2003 I began a multi-year collaboration with mathematicians and computer scientists at several government installations near Washington.

In 2005 I began a significant collaboration in biochemistry with applied mathematicians at the University of New Mexico and U. California San Francisco. The first phase of our research was published in the 2007 paper, "Algorithmic Search for Flexibility Using Resultants of Polynomial Systems." Using my methods I computed a polynomial resultant of 200,000 terms and then developed an algorithm to determine flexibility. This research is ongoing and has been generalized to molecules, for which the resultant has hundreds of factors and millions of terms.

Since 2011 I have collaborated with colleagues on polynomial systems in GPS and geodesy.