Statistical Engineering Division Seminar

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Room B111, Technology Bldg.
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Testing Mathematical Software

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The problem of testing mathematical software is almost as old as mathematical software. It was part of the work on computer implementation technology at the National Bureau of Standards in 1952 (see Hoffman, et al., 1953). As in other aspects of the development of software, however, there is no "magic bullet". Testing has been called "experimental computer science"; and it retains many of the hallmarks of an experimental science.

Quality in software is most often a result of an organized, systematic approach, in which design is not relegated to a role secondary to development. The various components of software, the algorithms (that is, the mathematical processes), the computer implementation of the computational algorithms, and the user interface must all be considered both separately and together. Testing algorithms is the least experimental of the component testing. Convergence results, stability analyses, and other purely analytic results may be used to identify good algorithms, and the good algorithms become part of the design specifications. Computer testing must be designed into the development process, so that it occurs at every stage. Both standard data sets and randomly generated data sets can be used. Both known solutions and internal consistency tests can be used for verification. The user interface must also be tested. As with other aspects of testing, it can begin in the early design phase. It is the most subjective, and is often best accomplished by focus groups.

This talk will survey various approaches to software testing and will discuss a "data-based" random test generator.

James E. Gentle is University Professor of Computational Statistics in the Institute for Computational Sciences and Informatics at George Mason University. Before coming to George Mason, from 1979 to 1992, he was Director of Research and Design at IMSL, Inc., in Houston. He received the Ph.D. in Statistics in 1974 at Texas A&M University under H. O. Hartley. His research interests are in statistical computing and computationally intensive methods in statistics. He is a Fellow of the American Statistical Association and a member of the International Statistical Institute.

(A NIST Shuttle is scheduled 30 minutes before the talk for pickup from NIST North.)

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