The mathematics of software reliability

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Abstract

Software controls your computer. It controls your phone, car, games, radio, television, microwave ovens, ATM, printer, and on and on. Indeed, it is nearly impossible to go through a day without interacting with software. And yet a single mistake—a bug—among the millions of instructions that make up the software can take a system into unplanned states. In the best of cases these unplanned states are only annoying. In the worst cases bugs can be disastrous.

Writing software is an intensely formal and precise activity performed by humans. People are not particularly well adapted to precise formal activities. Even the best software developers make mistakes that turn into software bugs. This talk will discuss statistical models that describe how software defects are introduced and discovered. These models allow us to characterize the reliability of new systems. Moreover, they explain why some large systems work with few problems while others never achieve satisfactory levels of reliability.

This talk should be accessible to undergraduates.