The Biology of Software

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ABSTRACT

Biological design principles can potentially change the way we study, engineer, maintain, and develop large dynamic software systems. For example, computer programmers like to think of software as the product of intelligent design, carefully crafted to meet well-specified goals. In reality, large software systems evolve inadvertently through the actions of many individual programmers, often leading to unanticipated consequences. Because software is subject to constraints similar to those faced by evolving biological systems, we have much to gain by viewing software through the lens of biology. The talk will highlight how abstractions of biological processes can lead to new computational algorithms and engineering principles. Specifically, it will show how the biological concepts of Darwinian evolution and immunology can be applied to problems such as repairing software bugs and cybersecurity.

1 BIOGRAPHY

Stephanie Forrest is Professor of Computer Science and Director of the Biodesign Center for Biocomputation, Security and Society at Arizona State University. Before joining ASU in 2017, she was Distinguished Professor of Computer Science at the University of New Mexico in Albuquerque and served as Department Chair 2006-2007. She was educated at St. John's College (B.A.), and The University of Michigan (M.S. and Ph.D. in Computer Science). She is currently a member of the Santa Fe Institute External Faculty, serves on the CRA Board and Chairs its Government Affairs Committee.

Forrest's research studies the biology of computation and the computation of biology, including work on computational immunology, computer security, automated software repair, evolutionary computation, and biological modeling. Some of her awards include: the SFI Stanislaw Ulam Memorial Lectures (2013), the UNM Annual Research Lecture (2012), the ACM/AAAI Allen Newell Award (2011), and the Presidential Young Investigator Award (1991). She is a Fellow of the IEEE.

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