Title: Software Reliability Engineering: Algorithms and Tools

Thursday, 2/1/18 | 11am-12pm | West Hall, W106
Speaker: Dr. Lance Fiondella

Abstract: While there are many software reliability models, there are relatively few tools to automatically apply these models. Moreover, these tools are over two decades old and are difficult or impossible to configure on modern operating systems, even with a virtual machine. To overcome this technology gap, we are developing an open source software reliability tool for the software engineering community. A key challenge posed by such a project is the stability of the underlying model fitting algorithms, which must ensure that the parameter estimates of a model are indeed those that best characterize the data. If such model fitting is not achieved, users who lack knowledge of the underlying mathematics may inadvertently use inaccurate predictions. This is potentially dangerous if the model underestimates important measures such as the number of faults remaining or overestimates the mean time to failure (MTTF). To improve the robustness of the model fitting process, we have developed expectation maximization (EM) and expectation conditional maximization (ECM) algorithms to compute the maximum likelihood estimates of nonhomogeneous Poisson process (NHPP) software reliability models. This talk will present an implicit ECM algorithm, which eliminates computationally intensive integration from the update rules of the ECM algorithm, thereby achieving a speedup of between 200 and 400 times that of explicit ECM algorithms. The enhanced performance and stability of these algorithms will ultimately benefit the software engineering communities that use the open source software reliability tool.

Bio: Dr. Lance Fiondella is an assistant professor in the Department of Electrical & Computer Engineering at the University of Massachusetts Dartmouth. He received his PhD (2012) in Computer Science & Engineering from the University of Connecticut. Dr. Fiondella has published over 100 peer-reviewed journal articles and conference papers. Eight of his conference papers have been recognized with awards, including four with his students. His research has been funded by the Department of Homeland Security, Army Research Laboratory, Naval Air Systems Command, National Aeronautics and Space Administration, and National Science Foundation, including a CAREER award. He has supervised four Master’s theses and is the doctoral advisor of four PhD students.