

## Measurement of Source Code Readability Using Word Concreteness and Memory Retention of Variable Names

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March 31, 2016 @ 3:30 - 4:45 PM, CSB - Room 210

**Dr. Frank Xu** is an associate professor in the Department of Computer Science at Bowie State University. His areas of expertise include software security, software quality assurance, and applied formal methods. He has published more than 30 peer-reviewed papers in international journals and conference proceedings, including prestigious venues such as IEEE Transactions on Dependable & Secure Computing and IEEE Transactions on Reliability. Before joining Bowie State University, Dr. Xu was the director the Keystone Software Development Institute and an associate professor at Gannon University. He was successfully awarded over one million dollars from General Electric (GE) between 2008 and 2015 to develop and maintain GE locomotive remote monitoring and diagnostic systems.

**Abstract:** Source code readability is critical to software quality assurance and maintenance. This talk presents a novel approach to measurement of source code readability using Word Concreteness and Memory Retention (WCMR) of variable names. The approach considers programing and maintenance as processes of organizing variables and their operations to describe solutions to specific problems. The overall readability of given source code is calculated from the readability of all variables contained in the source code. The readability of each variable is determined by how easily its meanings are memorized (i.e., word concreteness) and how quickly they are forgotten overtime (i.e., memory retention). The empirical study has used 14 open source applications with over a half million lines of code and 10,000 defects. The result shows that WCMR-based source code readability correlates strongly with overall defect rates, and particularly with such bugs as bad programming practices, malicious code vulnerability, and correctness bug.

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