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Using Machine Learning to Model How Students Learn to Program

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Abstract. Gaining insight into how students learn to program is a critical factor in improving software engineering education. Despite the potential wealth of educational indicators expressed in students' approaches to completing programming assignments, how students arrive at their final solution is largely overlooked in courses--only their final program submission is evaluated as an indicator of their understanding of how to solve a particular programming problem. In this talk, we present a methodology which uses machine learning techniques to autonomously create a graphical model of how students in an introductory programming course progress through a programming assignment. We subsequently show that this model is predictive of which students will struggle with material presented later in the class. Our eventual goal is to be able better understand students' learning and the conceptual difficulties they may encounter as novice programmers so as to be able to provide better and more personalized guidance to them during their learning process, and ultimately improve education in software engineering.

About Prof. Mehran Sahami:

Mehran Sahami is an Associate Professor and Associate Chair for Education in the Computer Science department at Stanford University. He is also the Robert and Ruth Halperin University Fellow in Undergraduate Education. Prior to joining the Stanford faculty, he was a Senior Research Scientist at Google for several years. His research interests include computer science education, machine learning, and web search. He is co-chair of the ACM/IEEE-CS joint task force on Computer Science Curricula 2013, which is responsible for creating curricular guidelines for undergraduate programs in Computer Science at an international level. He also serves on the ACM Education Board and was the founder and first chair for the annual Symposium on Educational Advances in Artificial Intelligence (EAAI). He has published numerous technical papers, including the book "Text Mining: Classification, Clustering and Applications." He has over 20 patent filings on a variety of topics including web search, recommendation engines in social networks, and email spam filtering that have been deployed in commercial applications. He received his BS, MS, and Ph.D. in Computer Science from Stanford University.