

Data Mining in EDA and Test - Principles, Opportunities, and Challenges

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Bio

Li-C. Wang is professor of ECE department and the Director of Computer Engineering of College of Engineering at University of CA, Santa Barbara. He received Ph.D. in 1996 from University of Texas at Austin. He was with the PowerPC Design Center, Motorola/IBM from 1996 to 2000, where he led various projects for PowerPC microprocessor test and verification. Dr. Wang received best paper awards from DATE-1998, IEEE VTS-1999, DATE-2003, VLSI DAT 2008 and 2011. He received the Technical Excellence Award from Semiconductor Research Cooperation (SRC) in 2010 for contribution on developing data mining technologies in the areas of test and validation. He co-founded the IEEE Microprocessor Test and Verification (MTV) Workshop, and is currently the program co-chair. He is currently serving or had served as technical PC member for various conferences and workshops including ITC, VTS, ICCAD, DATE, DAC, ISQED, HLDVT, ITSW, DATA, ATS, ICCD, VLSI-DAT, etc and is the general co-chair for IEEE VLSI-DAT symposium in 2014 and 2015. He is an associate editor of IEEE Trans. on CAD and also guest editors of a number of IEEE D&T, JETTA, and ACM TODAES special issues. From 2005, his research group has published more than 70 papers on the topics related to data mining and machine learning in EDA and test. In the last two years, he had given a number of tutorials on data mining in EDA and test, and had been invited to lecture on data mining in several conferences, including DAC, ICCAD, ASP-DAC and ISPD.

Abstract

Electronic Design Automation (EDA) and test have become major areas for applying data mining in recent years. In design and test processes, tremendous amounts of simulation and measurement data are produced and collected. These data present opportunities for applying data mining.

In this talk, I will first explain the working principles of data mining, including supervised learning, unsupervised learning and rule learning. Application examples will be presented to explain how an EDA/test problem can be formulated to facilitate the application of these learning techniques. Opportunities for applying data mining include problems in areas such as functional verification, simulation trace analysis, layout analysis, timing analysis, design-silicon correlation, Fmax prediction, delay testing, test cost reduction, diagnosis, and customer return analysis. These applications will be divided into two essential paradigms. In the knowledge discovery paradigm, the objective of data mining is to discover

interpretable and actionable knowledge. I will highlight the challenges in this paradigm and provide a summary of the recent application results in practice. In the prediction paradigm, the objective is to predict future outcomes or properties based on data available so far. The challenges in the second paradigm will also be highlighted with a summary of application results in practice. Experience of developing a data mining flow will be presented and promises of applying data mining will be demonstrated, both through results in selective applications based on industrial settings.

Keywords: Computer-Aided Design, Data Mining, Machine Learning, Test, Verification, Validation