2025-2026 Framework for IEEE 2427-2025-Compliant AMS Test Benchmarking

Abstract:

Analog and Mixed-Signal (AMS) circuit testing has historically lacked a widely accepted defect modeling framework comparable to digital stuck-at and path-delay fault models, limiting reproducibility, scalability, and fair comparison across research works. The recent publication of the IEEE 2427-2025 standard establishes a unified methodology for analog defect modeling and coverage computation, enabling structured and comparable evaluation of test strategies. This project proposes the development of an automated and scalable benchmarking framework, designed to orchestrate defect universe construction, process variation management, simulation campaigns, and performance metric extraction for standardized AMS benchmark circuits. The platform aims to provide researchers with a reproducible and extensible infrastructure for implementing, evaluating, and systematically comparing test methodologies under IEEE 2427-compliant conditions.

Project description:

The objective of this internship is to implement an automated benchmarking framework compliant with the IEEE 2427-2025 to enable reproducible, scalable, and systematic evaluation of AMS test methodologies. The work will focus on two critical pillars of the benchmarking infrastructure, which have a direct impact on the reliability and comparability of published results. The first axis will address the automation of defect universe construction and simulation orchestration. This includes developing algorithms for structural and parametric defect injection into standardized netlists (ITC'17 and Infineon suites), managing Monte Carlo variations and process corners, and implementing a robust experiment manager capable of launching and monitoring large-scale simulation campaigns with minimal manual intervention. The second axis will focus on the standardization and automation of performance evaluation metrics. The goal is to design a unified evaluation layer capable of computing fault coverage, test escapes, yield loss, and classification metrics in a consistent and reproducible manner. Attention will be paid to scalability, data traceability, and modular architecture, with the aim of delivering a flexible and extensible platform suitable for fair comparison of test approaches.

Tasks of the internship:

- Design and implement an automated IEEE 2427-compliant benchmarking workflow, focusing on scalable defect universe generation, simulation orchestration, and experiment reproducibility.
- Develop and integrate standardized defect injection mechanisms and process variation management strategies to ensure consistent and comparable evaluation of AMS test methodologies.
- Implement and validate a unified performance evaluation module, and analyze the trade-offs between fault coverage accuracy, computational cost, data traceability, and scalability of large-scale simulation campaigns

Scientific environment:

The candidate will work within the TIMA Laboratory (https://tima.univ-grenoble-alpes.fr/) in collaboration with the AMfoRS (Architectures and Methods for Resilient Systems) research group.

Profile & requested skills:

We are looking for a highly motivated student from an Engineering School or a master's program (M1 or M2). The internship is primarily intended for students preparing a master's degree (M2 level), but it may also be adapted for a strong M1 student or a second-year engineering school student (2A). Applicants should have a background in computer engineering, microelectronics, or related disciplines. A strong foundation in Python programming and data processing is required, along with familiarity with Linux environments and proficiency in software engineering principles. Experience with simulation tools and a good understanding of analog and mixed-signal circuits would be appreciated.

Allowance: Internship allowance will be provided.

Application instructions:

If you are interested in the topic, please send your complete application to jules.kouamo@univ-grenoble-alpes.fr with emmanuel.simeu@univ-grenoble-alpes.fr and michele.portolan@siemens.com in CC.

A complete application consists of:

Cover letter: A brief motivation statement by the applicant, explaining their connection to the position, how the position aligns with their background, and how it supports their future career goals (maximum 1 page).

CV: Academic and professional background, detailing relevant experience, particularly research.

Relevance for Application: The applicant should include a clear description of how his or her scholarly background and expertise apply to the project outlined above and how they might add value to it.

Our laboratory welcomes applicants with diverse backgrounds and experiences. We regard gender equality and diversity as a strength and an asset.

Contacts:

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