MANCHESTER 1824

The University of Manchester

FuSeBMC - AI

Efficient Hybrid Fuzzing for Detecting Vulnerabilities and Achieving High Coverage in Software

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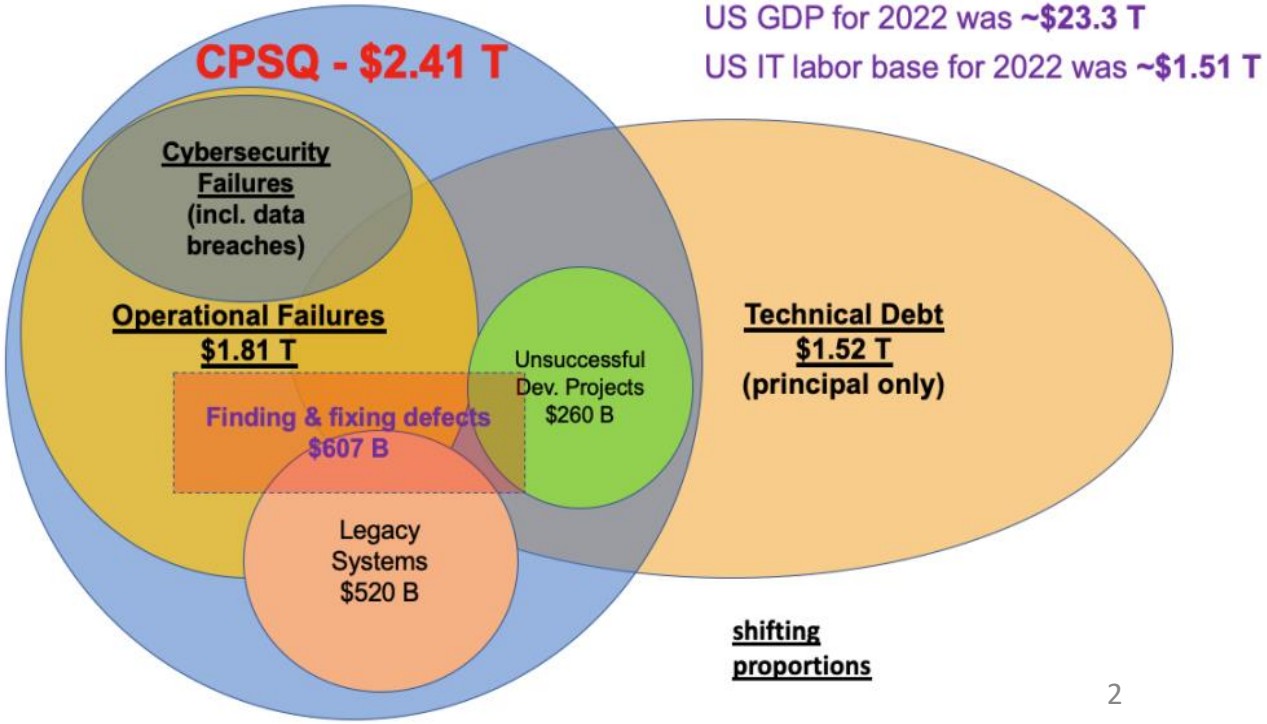
How much could software errors cost your business?

Poor software quality cost US companies **$2.41 trillion in 2022**, while the **accumulated software Technical Debt** (TD) has grown to **~$1.52 trillion**

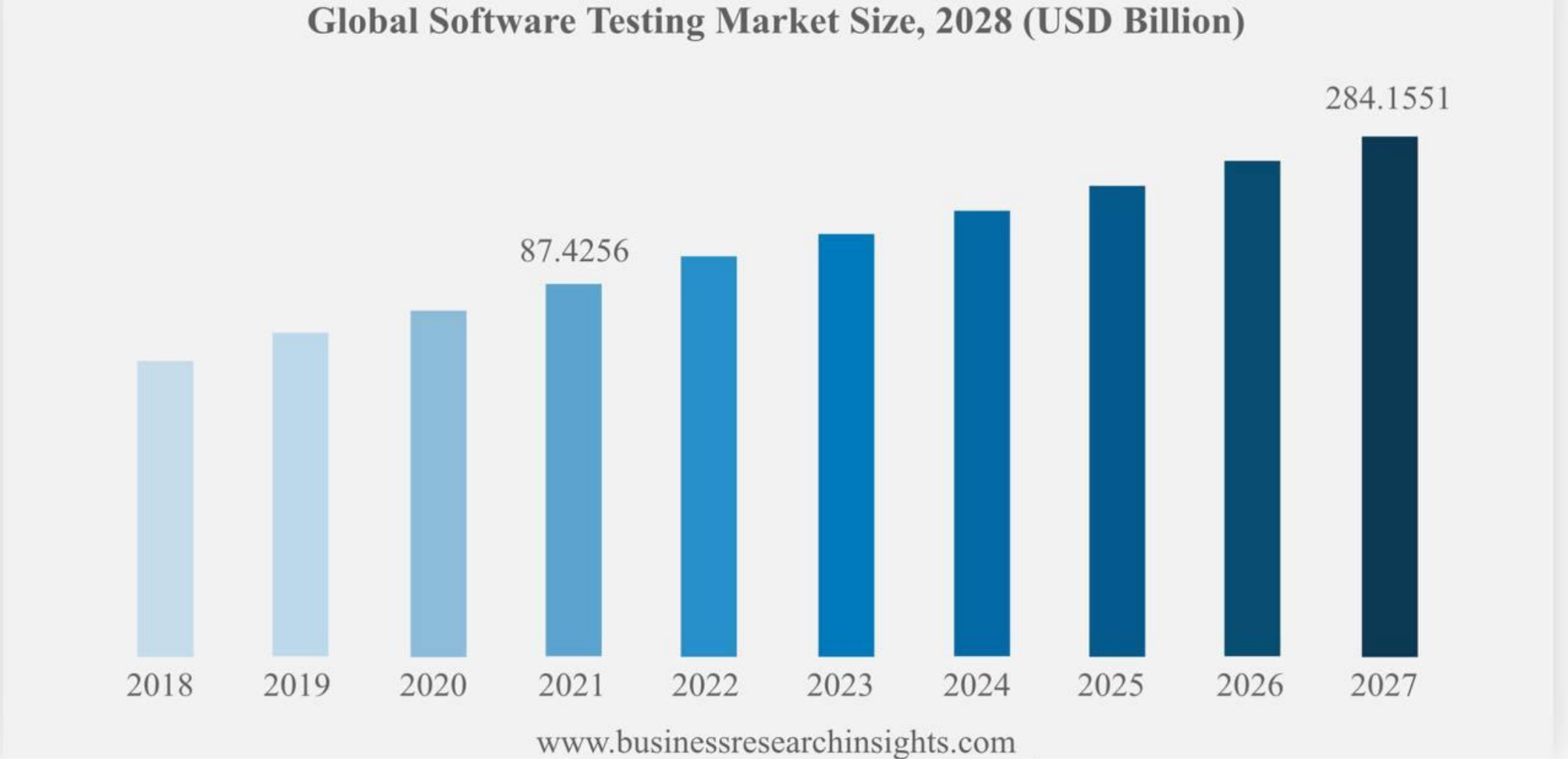


TD relies on temporary easy-to-implement solutions to achieve short-term results at the expense of efficiency in the long run

The cost of poor software quality in the US: A 2022 Report

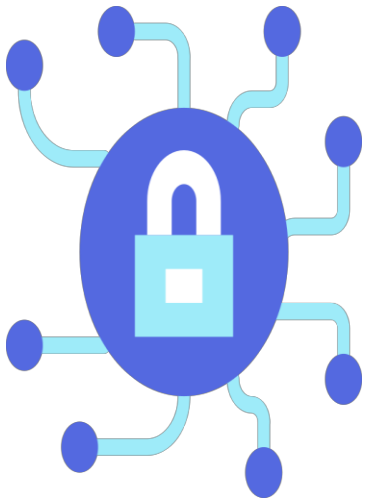
CISQ Consortium for Information & Software Quality™

Market Size

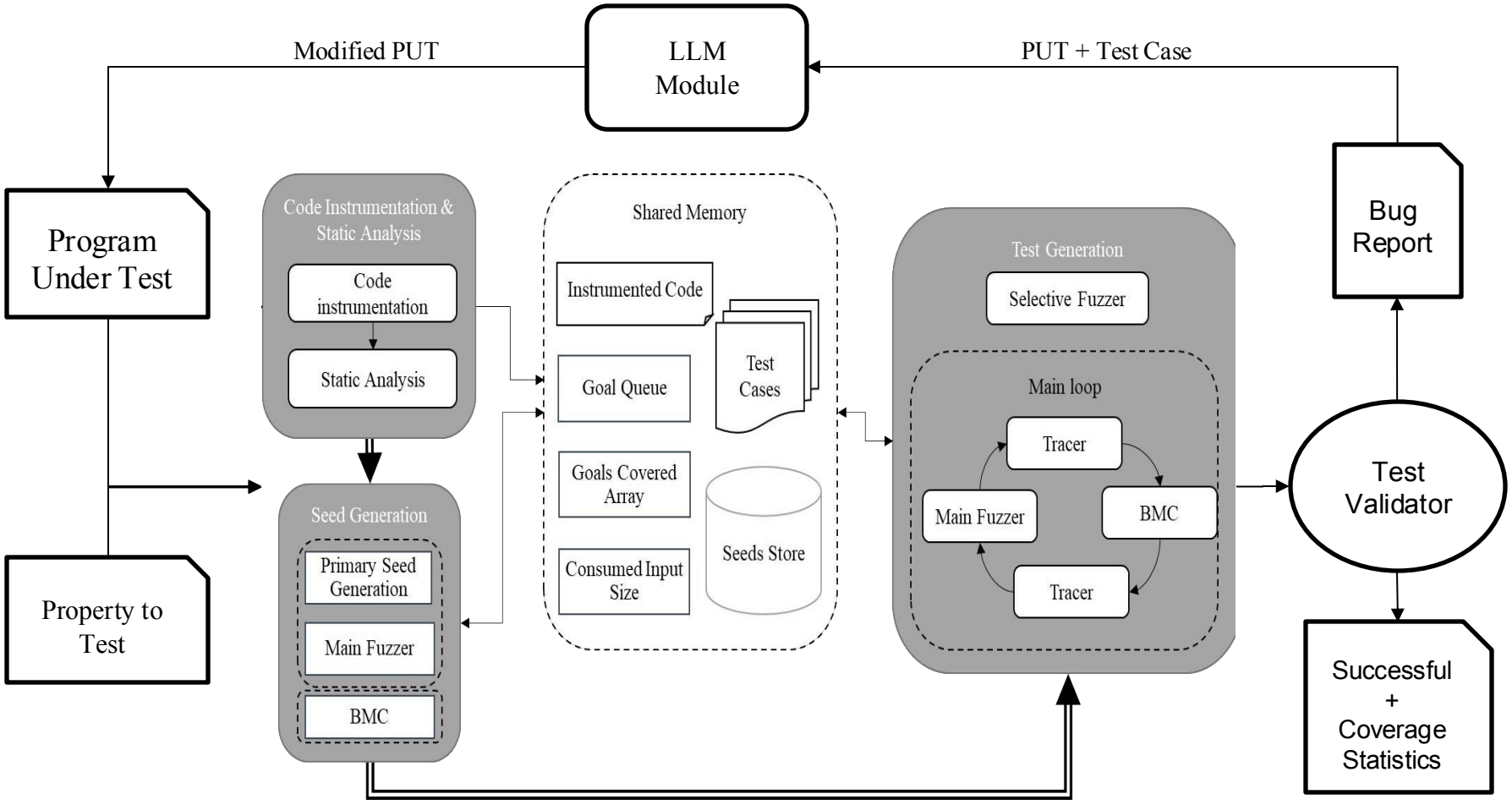

Global Software Testing Market Size, 2028 (USD Billion)
87.4256
284.1551
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
www.businessresearchinsights.com

Proposed Solution FuSeBMC-AI

- Use **Clang** tooling infrastructure
- Employ three engines in its **reachability analysis**: **one BMC and two fuzzing engines**
- Use a **tracer** to coordinate the various engines

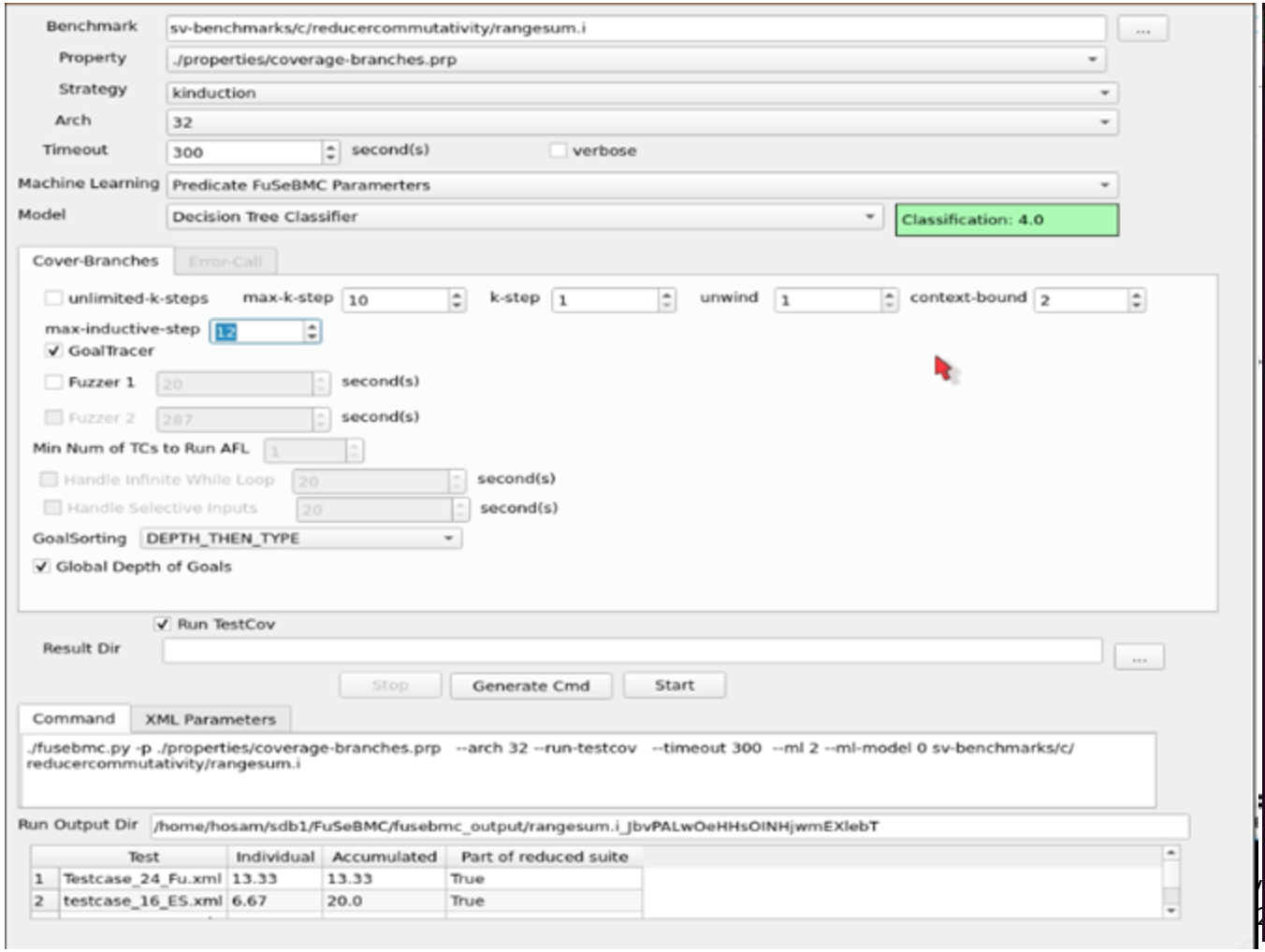


FuSeBMC AI

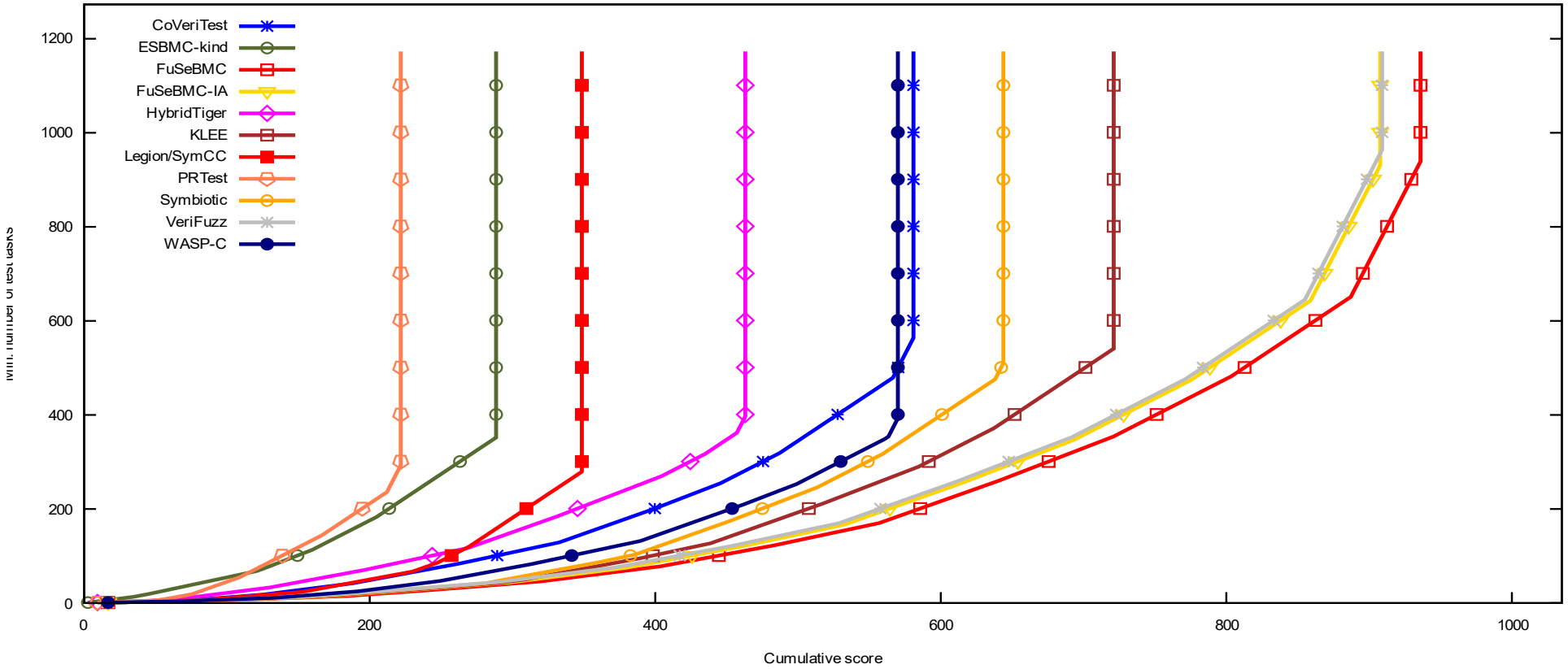


FuSeBMC-AI Software Project

FuSeBMC-AI source code is written in C++ and Python; it is available for download on GitHub. Also, the instructions for using the tool FuSeBMC-AI are given in the file README.



Competition on Software Testing 2023: Results of the `Cover-Error` Category

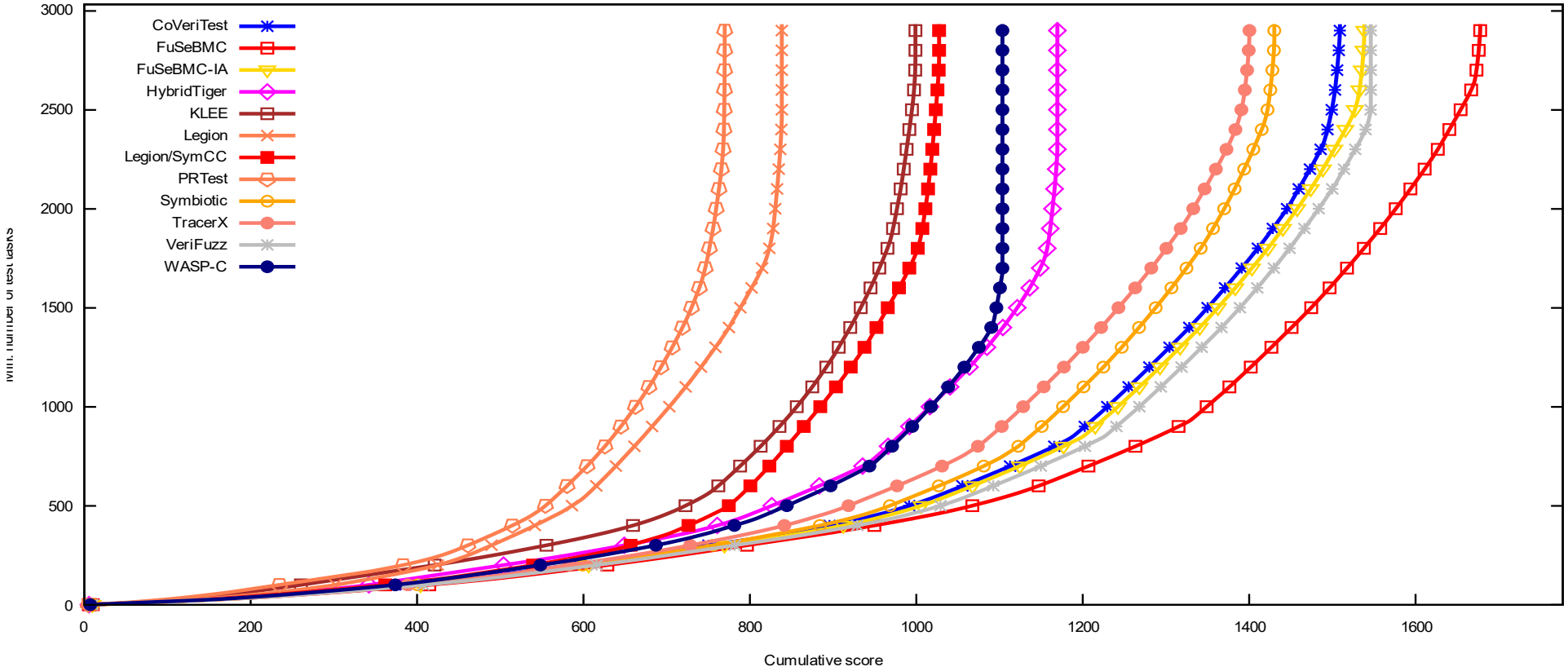


FuSeBMC achieved 1st place in `Cover-Error`

Alshmrany, K., Aldughaim, M., Bhayat, A., Cordeiro, L.: FuSeBMC v4: Smart Seed Generation for Hybrid Fuzzing - (Competition Contribution). FASE 2022: 336-340

https://test-comp.sosy-lab.org/2023/

Competition on Software Testing 2023: Results of the `Cover-Branches` Category

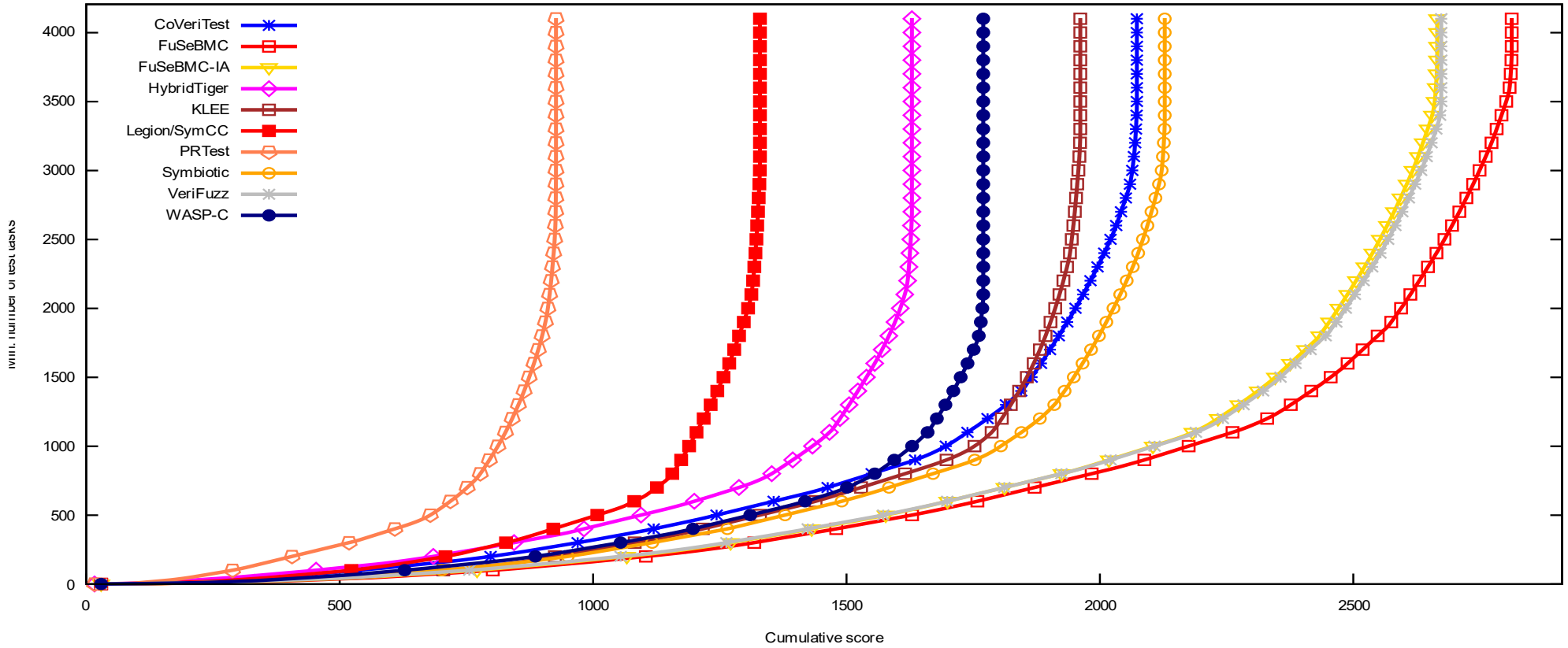


FuSeBMC achieved 1st place in `Cover-Branches`

Alshmrany, K., Aldughaim, M., Bhayat, A., Cordeiro, L.: FuSeBMC v4: Smart Seed Generation for Hybrid Fuzzing - (Competition Contribution). FASE 2022: 336-340

https://test-comp.sosy-lab.org/2023/

Competition on Software Testing 2023: Results of the `Overall` Category



FuSeBMC achieved 3 awards: 1st place in `Cover-Error`, 1st place in `Cover-Branches`, and 1st place in `Overall`

Alshmrany, K., Aldughaim, M., Bhayat, A., Cordeiro, L.: FuSeBMC v4: Smart Seed Generation for Hybrid Fuzzing - (Competition Contribution). FASE 2022: 336-340

https://test-comp.sosy-lab.org/2023/

Awards

FuSeBMC-AI received 18 significant awards from the International Competition on Software Testing (Test-Comp 2021 - 2024) organised by the European Joint Conferences on Theory and Practice of Software (ETAPS).

https://test-comp.sosy-lab.org/2024/

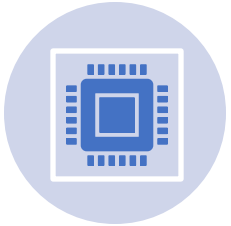
Publications

- Published paper in Fundamental Approaches to Software Engineering – 24th International Conference, FASE 2021
- Published paper in The International Conference on Tests and Proofs, TAP 2021
- Published paper in Fundamental Approaches to Software Engineering – 25th International Conference, FASE 2022
- Published paper in The Formal Aspects of Computing Journal FAC 2024
- Published paper in IEEE Secure Development Conference, SecDev 2022
- Published paper in Fundamental Approaches to Software Engineering – 26th International Conference, FASE 2023

FuSeBMC-AI ’s Impact: Awards and Industrial Deployment

18 awards from the international competitions on software testing (Test-Comp) 2012-2024 at **FASE.**

Most Influential tool at international Competitions 2021-2024.



It is classified as **Green testing tool (low Consumption of CPU and Memory).**

The ability to **detect vulnerabilities** effectively and quickly compared with **state-of-the-art tools**.

Practical and academic contributions illustrated in **6 Published papers** in the field.

SOURCE CODE SECURITY WITH FUSEBMC-AI

FUSEBMC-AI
JANUARY, 2024

Overview

FuSeBMC-AI aims to revolutionize software testing. Originating from collaborations with ARM and Intel, it addresses the need for robust automated testing tools, targeting software developers.

Industry Context

The rising complexity of software has made manual testing impractical. The market for automated testing tools exceeds $51.8 Billion annually. FuSeBMC-AI offers a powerful solution to detect and repair security vulnerabilities whilst keeping the number of false alarms minimal, meeting the growing demand for secure coding tools.

The Need

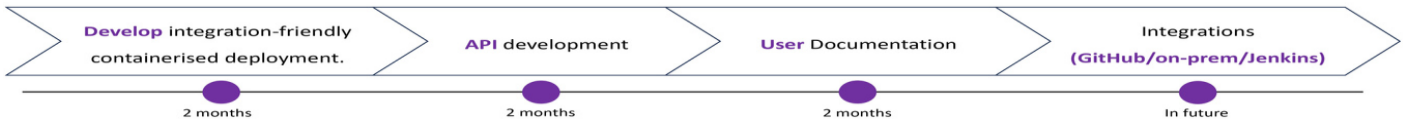
Manual testing is impractical due to high costs, complexity, and a shortage of skilled testers. Existing automated tools often fail to identify or fix security issues and can generate many false alarms, creating additional challenges for developers. There is a pressing need for powerful and reliable testing tools to prevent cyber-attacks.

Innovative Solution

FuSeBMC-AI combines advanced verification and AI methods to detect and fix over 40 types of security vulnerabilities in C language source code (can be extended to other languages). It generates detailed bug reports with locations, types, and suggested fixes, enhancing security and reliability, and enabling continuous learning of software developers. This has earned FuSeBMC-AI 18 Intl. awards in competitions compared to tools from Amazon, Tata, Intel, and others.

Development Stage and Roadmap

We have validated our core technologies in the industry via partnerships with Arm, Ethereum, Intel, and Nokia. From market validation interviews, we have identified a tangible need for this technology across several high-security sectors. Next, we need to develop the core technology in an integration-friendly manner.



Our Team

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AI Specialist,
Advisor, Professor

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Consultant, Researcher,
Cybersecurity Specialist

Prof. Lucas Cordeiro
Cybersecurity Specialist,
Advisor, Professor

Dr. Rachel Pooley
Innovation Discovery
Manager

Thank you …

FuSeBMC AI

Find out more about FuSeBMC-AI at :
https://github.com/FuSeBMC/

GitHub

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