Saverio Mattia **Merenda**

Master's Student

Reggio Emilia - Parma, Italy

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Education

University of Parma — *Parma, Italy*

M.S. in Computer Science, Expected Graduation Year: July 2026 — *Sep. 2024 - Present*

- Topics: **Software Security**, **Quantum Computing**, **Machine Learning & AI**, **Compilers**.

University of Parma — *Parma, Italy*

B.S. in Computer Science, Grade: 108/110 — *Sep. 2021 - Jul. 2024*

- Thesis Title: *Construction of complete Control-Flow Graphs for bytecode EVM*.
- Best Marks: **Calculus**, **Programming**, **Algorithms & DS**, **Cloud Administration**, **Database**, **AI**, **HPC**.
- Got different ERGO scholarships which are given to promising students in Unipr.

Experience

University of Parma - Internship — *Parma, Italy*

Researcher and Software Developer — *Sep. 2023 - May 2024*

- **Development of EVMLiSA:** Played an integral role in the development of EVMLiSA, a specialized component of LiSA (Library for Static Analysis), aimed at constructing complete Control-Flow Graphs (CFGs) for Ethereum smart contracts. By leveraging these CFGs, orphan jumps are effectively resolved, enhancing the accuracy of the analysis. Through collaboration on the implementation of EVMLiSA, proficiency in software development and static analysis engineering was demonstrated, contributing to the advancement of tools for Ethereum blockchain analysis.
- **In-depth study of static analysis and abstract interpretation:** Initiated the internship with an intensive two-month period dedicated to an in-depth study of static analysis and abstract interpretation. This comprehensive exploration laid the foundation for subsequent contributions to the development of EVMLiSA.
- **Thoroughly study of design patterns for software development:** Diligently delved into the study of design patterns and frameworks essential for professional software development, enriching skills and knowledge in creating robust and scalable software solutions.

HeliopsyLab — *Reggio Emilia, Italy*

Software Developer — *Jan. 2021 - Sep. 2021*

- Developed and implemented cutting-edge management software for hospital facilities in the Lazio and Lombardia regions, streamlining operations and reducing administrative inefficiencies by 15%.
- Advanced new features within the Picasso and Mirth integration software, enhancing its capabilities and functionality.

Pico srl — *Reggio Emilia, Italy*

Software Developer — *May. 2019 - Jul. 2019*

- Engineered a user-friendly application for efficient management of diverse user profiles within a database. Enhanced security measures and optimized the existing system for improved performance.
- Designed an algorithm to construct a wizard-style exam, streamlining the assessment process for a more user-friendly experience.

Pubblications

2024 **FTfJP@ISSTA/ECOOP 2024**, V. Arceri, S. M. Merenda, G. Dolcetti, L. Negrini, L. Olivieri, E. Zaffanella: *"Towards a Sound Construction of EVM Bytecode Control-flow Graphs".* [link]

Talks

International Conferances and Workshop

2024 **Towards a Sound Construction of EVM Bytecode Control-flow Graphs,** 26th International Workshop on Formal Techniques for Java-like Programs, FTfJP 2024. [slides] — *Vienna, Austria*

Research Projects

Research Participant, "LLMs Meet Static Analysis: improving quality and reliability of AI-generated code" *Parma, Italy*

ISCRA PROJECT (CLASS C), CINECA *2024*

The goal of the project is to conduct an extensive quality and safety evaluation of the code generated with some of the most popular and open-source LLMs employing static analyzers, that can detect vulnerabilities and run-time errors statically, without executing the code. Once this information is available, it will be included in the code-generation task, to guide the LLM itself to produce a more precise and safe output, in which static analysis is somehow introduced in the pipeline of the code-generation task.

Tools and Software

EVMLiSA: an abstract interpretation-based static analyzer for EVM bytecode

JAVA, GRADLE *From Sep. 2023*

EVMLiSA is a specific implementation of a static analyzer using the LiSA (Library for Static Analysis) library to conduct static analysis of Ethereum Virtual Machine (EVM) bytecode. In particular, it is dedicated to generate a complete Control-Flow Graph (CFG) of smart contracts deployed on the Ethereum blockchain. EVMLiSA's primary objective is to provide semantic information and valuable warnings for developers and security auditors. EVMLiSA is distributed under the MIT license, and it is available on GitHub (`github.com/lisa-analyzer/evm-lisa`).

Events

2024 **Student,** Lipari Summer School on Abstract Interpretation. [link] *Lipari, Italy*

2024 **Conference participant,** CSV 2024, 3rd Challenges of Software Verification Symposium 2024. [link] *Venice, Italy*

Extracurricular Activity

Deep Neural Network

C++, PYTHON *2024*

- The DNN (Deep Neural Network) project is designed to create a neural network framework in C++ and it provides tools to define, train, and evaluate neural network models.
- This project enables training neural networks using backpropagation and gradient descent algorithms. Users can specify network architectures, activation functions, and training parameters. Additionally, it offers features for loading and saving trained models.
- Source Code: `github.com/unipr-org/deep-neural-network`

My-gpt4

PYTHON *2023*

- Crafted a cutting-edge Python integration leveraging multiple reverse-engineered language-model APIs, contributing to the decentralization of the AI industry.
- Source Code: `github.com/merendamattia/my-gpt4`

Tracking Messages on Bitcoin Blockchain using OP-RETURN field

JS, HTML *2022*

- Devised an innovative algorithm to securely trace immutably written messages within the Bitcoin blockchain, utilizing transaction hashes for enhanced transparency.
- Demo: `merendamattia.com/dev/btc/tracking/`
- Source Code: `github.com/merendamattia/op-return-tracking-message-bitcoin`

Development of Various Bots

PYTHON, JS *From 2021*

- Developed a sophisticated bot designed to navigate financial markets, employing strategic approaches to optimize profits while minimizing potential losses.
- Customized Telegram bots designed for personal optimization, streamlining and enhancing my daily routine.