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Profile

Rust Software Engineer with research interests in cybersecurity and cryptography. Currently working at Vaultree and pursuing a M.Sc. in Computer Science at UFOP.

Experience

Senior Software Engineer, Vaultree (Remote) *Apr 2025 – Present*
Software Engineer, Vaultree (Remote) *Dec 2022 – Apr 2025*
Contributed to the development of Vaultree's always-encrypted encrypted database management solutions. Working in an Agile team, doing software development/testing, code optimization and code review. Learned how to work in a fast-paced environment, and how to develop, maintain and lead large codebases. Detailed activities include:

- Developed Vaultree always-encrypted database drivers for Java, Rust, and Python.
  - Helped to develop support for Vaultree's query engine for PostgreSQL, MySQL, and BigQuery.
- Development of Vaultree database management applications.
  - Database migration tools for onboarding, offboarding and maintainance of encrypted schemas.
  - Database replication tools for near-real-time mirroring of encrypted schemas.
  - Terminal UI (TUI) application for managing encryption schemes.
  - Shell Read-Eval-Print-Loop (REPL) environments for quick database interaction.
- Development of customer-oriented products using the Vaultree SDK.
- Leading the development of different codebases and products.
- Translation of customer requirements into technical specifications and timeframes.
- Participation on hiring processes and technical interviews.
- Development of internal testing tools and deployment automation.

Performance Engineer, Dell Technologies (Remote) *Mar 2022 – Dec 2022*
Developed tools to assess Non-Functional Requirements (Performance, Capacity, Scalability, Availability, Reliability, etc.) of Dell's Financial Services. Worked on automating performance assessments using Python, Flask, Dynatrace, Docker, SQL, and NeoLoad for stress testing. The role required cross-functional collaboration to ensure that applications met performance benchmarks before production deployment. Detailed activities include:

- Development of Python-based automation tools for performance testing and monitoring.
- Collect and analysis of performance requirements in collaboration with stakeholders.
- Writing performance strategy documents to define testing approaches and success criteria.
- Execution of performance benchmarks and load tests using NeoLoad, Dynatrace, Splunk, etc.

- Development of automated scripts to process and analyze performance test results.
- Generation of official performance reports for internal teams and leadership.
- Decision-making on production deployments by providing Go/No-Go recommendations based on performance criteria.

Full-Stack Engineer, Fundação Gorceix *Mar 2019 – Oct 2019*
Developed a web application to automate the process of monitoring deliveries within a network of a multinational oil company. Worked as a full-stack developer using Java 9, implementing the Model-View-Controller (MVC) pattern with the Spring Framework. The project involved database integration, front-end development, and system optimization to ensure real-time tracking and reporting. Detailed activities include:

- Development of a web application for monitoring and managing deliveries of a multinational oil company.
- Backend development using Java 9 and the Spring Framework (MVC pattern).
- Database integration using MySQL and SQL Server.
- Implementation of front-end features using jQuery, Ajax, and Bootstrap.
- Development of RESTful APIs for real-time data synchronization.
- Testing and debugging to ensure a seamless user experience.

Education

M.Sc. in Computer Science, UFOP *2023 – Present*
Computer Science M.Sc candidate working in the Rage Against the Machine (Learning) research group, which focuses on adversarial machine learning. Detailed research activities include:

- Research on the confidentiality vulnerabilities on federated learning (FL) protocols. Inference attacks, model inversion attacks, and membership inference attacks.
- Research on the feasibility of using of Homomorphic Encryption (HE) to protect the confidentiality of model and the data during the training process for Natural Language Processing (NLP) tasks.

B.Sc. in Computer Science, UFOP, MG *2018 – 2022*
Participated in fellowship programs, research projects, and extracurricular activities. Graduated with a thesis on Information Retrieval. Detailed research activities include:

- Research on Learning To Rank (LTR) techniques for multi-label text classification problems.
- Development of an end-to-end textual search engine for educational and research purposes.
- Development of a focused web page crawler based on genre and content.

Technical Civil Engineering & High School, IFMG, MG *2015 – 2017* High school education with a focus on technical civil engineering.

Highlighted Projects

Thsi section highlights some of my projects and contributions to open-source software. The list is not exhaustive.

SEALy: Microsoft SEAL bindings for Rust and Python.
SEALy is a project that aims to create FFI bindings from the famous SEAL library for Rust and Python. The main

goal of this project is to provide a simple and fast way to install SEAL for both programming languages. The SEALy bindings are a continuation from the 'seal_fhe' crate, with the support for the CKKS scheme and the addition of new features like batch encoders, that allow us to overcome the size barriers of the ciphertext tensors and create AI applications easily with high-dimensional encrypted ciphertext. The project is still in development and the source code can be found here: `https://github.com/marcosfpr/sealy`.

FedHE: Federated Learning Strategies using Homomorphic Encryption.
This project is an implementation of Federated Learning strategies using the Flower framework and the SEALy library. The main goal of this project is to provide a simple interface to implement Federated Learning strategies with Homomorphic Encryption. With this project, we can easily train a model in a federated way without sharing plaintext gradients to the 3rd party server. The project is still in development and the source code can be found here: `https://github.com/marcosfpr/fedhe`.

Publications

[1] M Júnior, TA Rezende, MF Pontes, D Assis, and G Tavares. Development of a focused web page crawler based on genre and content. In *Proceedings of the 20th international conferences on www/internet 2021 and applied computing 2021*, pages 77–84, 2021.

[2] Marcos F Pontes, Rodrigo C Pedrosa, Pedro H Lopes, and Eduardo J Luz. Evaluating federated learning with homomorphic encryption for medical named entity recognition using compact bert models. In *Simpósio Brasileiro de Tecnologia da Informação e da Linguagem Humana (STIL)*, pages 48–56. SBC, 2024.

References available upon request.