Vinicius Silva Gomes

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Education

Universidade Federal de Minas Gerais *May 2021 – Aug 2026*
Bachelor's degree in Computer Science

- Grade: 93/100
- **Coursework:** Algorithms and Data Structures, Software Engineering, Computational Theory, Data Science and Machine Learning, Compilers, Computer Architecture, Operating Systems, Computer Networks

Centro Federal de Educação Tecnológica de Minas Gerais *Feb 2017 – Dec 2019*
Technical Course in Computer Science

- Grade: 85.71/100
- **Coursework:** Algorithms and Data Structures, Databases, Web and Mobile Development, Computer Architecture, Operating Systems, Computer Networks

Experience

Undergraduate Researcher in Formal Methods *Belo Horizonte, Brazil*
SMITE research group at UFMG *Jul 2023 – present*

- Advisor: Haniel M. Barbosa
- Integrated the SMT solver cvc5 (C++) with the proof checker Carcara (Rust) to enable generation and verification of proofs in the Alethe format within cvc5's regression tests
- Implemented a preprocessing step in cvc5 to automatically identify the minimal logic of problems
- Formalized in Alethe and implemented verification procedures in Carcara for the string calculus rules supported by cvc5, adapting and simplifying rules when necessary to streamline the reasoning process
- Currently implementing verification rules in Carcara for the string calculus supported by the SMT solver Princess (colaboring with Philipp Rümmer's team)

Fullstack developer *Lavras, Brazil*
Zeester *Sept 2021 – Mar 2023*

- Development and maintenance of an internal management platform and an online course platform focused on video streaming, with emphasis on implementing a complete in-app payment flow
- Modernized global state management by replacing an overloaded Redux architecture with a much simpler solution based on React's Context API
- Primarily worked with TypeScript, using React and React Native for building user interfaces, and Node.js with MongoDB for developing microservices

Mobile developer *Belo Horizonte, Brazil*
Geobyte *Feb 2021 – Jul 2021*

- Development and maintenance of a cross-platform iOS and Android application using React Native for data collection in remote areas
- Implemented an offline-first strategy with WatermelonDB to locally persist collected data in the absence of network coverage or internet connectivity

Fullstack developer *Lavras, Brazil*
Comp Júnior *Apr 2020 – Oct 2021*

- Development and maintenance of various software projects, both internal and client-facing, working across both frontend and backend using JavaScript
- Assisted the infrastructure team in reviewing and modernizing the applications deployment strategy
- Organized and created content for an internal training program on mobile development using JavaScript, React Native, and Expo

Projects

A Python implementation of the CDCL framework *github.com/vinisilvag/simple-cdcl*

- Designed and implemented a SAT solver using the Conflict-Driven Clause Learning (CDCL) algorithm
- Developed core SAT solving components: unit propagation with two-watched literals, clause learning, non-chronological backjumping, and the VSIDS decision heuristic
- Managed solver state with optimized data structures for fast literal assignment checks and conflict detection.
- Conducted benchmarking against MiniSat, analyzing correctness and performance trade-offs
- Tools used: Python

A GRASP + PR heuristic for the Graph Coloring Problem *github.com/vinisilvag/gcp-heuristics*

- Researched and implemented metaheuristics for the Graph Coloring Problem (GCP) in sparse graphs
- Implemented a literature-based Greedy Randomized Adaptive Search Procedure (GRASP) for the GCP
- Integrated Path-Relinking intensification strategy to explore intermediate solutions between elite candidates
- Compared performance against a Genetic Algorithm baseline and pure GRASP, analyzing solution quality and computational cost
- Tools used: Rust, Python

2D platformer game with custom C++/SDL engine *github.com/vinisilvag/fragments-of-the-sky*

- Developed a 2D platformer game inspired by titles such as Hollow Knight and Celeste
- Implemented core mechanics including character movement, double jump, and wall climbing
- Built a custom game engine in C++ with SDL, supporting sprite and animated sprite rendering, physics and collision system, sound, scene management, and UI handling
- Awarded 5th Best Game by the technical jury (DCC faculty) and 4th Best Game by audience choice out of 17 projects
- Tools used: C++, SDL

Data Science project on Football Player Chemistry Analysis and Prediction *github.com/vinisilvag/player-chemistry*

- Replicated the methodology of a research paper that proposed two metrics to measure offensive and defensive chemistry between pairs of players, adapting it to public datasets instead of proprietary data
- Collected and processed football match data from public providers
- Performed exploratory data analysis and standardized datasets to the SPADL (Soccer Player Action Description Language) format, widely adopted in football analytics
- Implemented the proposed chemistry metrics and analyzed the results obtained on public match data
- Tools used: Python, NumPy, Pandas, Matplotlib, scikit-learn

Technologies

Languages: C++, C, Python, Rust, Go, JavaScript, TypeScript

Diverse: Scrum, Git, SQL, NoSQL, LaTeX, Vim/Neovim, Docker, Linux

Language proficiencies

Portuguese: Native
English: Advanced